

**The effect of manipulating individual consequences and training demands on experiences of pressure with elite disability shooters**

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10 The Effect of Manipulating Individual Consequences and Training Demands on  
11 Experiences of Pressure with Elite Disability Shooters

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**Abstract**

30 In previous research, multiple demands and consequences were manipulated simultaneously  
31 to examine methods for pressure training (Stoker et al., 2017). Building on literature, in this  
32 study a single demand or consequence stressor was manipulated in isolation. Specifically, in  
33 a matched, within-subject design, six international shooters ( $M_{\text{age}} = 28.67$ ) performed a  
34 shooting task whilst exposed to a single demand (task, performer, environmental) or  
35 consequence (reward, forfeit, judgment) stressor. Perceived pressure, anxiety (intensity and  
36 direction), and performance was measured. Compared to baseline, manipulating demands did  
37 not affect pressure or anxiety. In contrast, pressure and cognitive anxiety significantly  
38 increased when judgment or forfeit consequence stressors were introduced. Thus, the findings  
39 lack support for manipulating demands but strongly support introducing consequences when  
40 pressure training. Compared to baseline, the judgment stressor also created debilitating  
41 anxiety. Hence, in terms of introducing a single stressor, judgment appeared most impactful  
42 and may be most effective for certain athlete populations.

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49 *Key words: stressor, demands, pressure, consequences, choking, anxiety*

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51 The Effect of Manipulating Individual Consequences and Training Demands on  
52 Experiences of Pressure with Elite Disability Shooters

53 Performance pressure, defined as “any factor or combination of factors that increases  
54 the importance of performing well on a particular occasion” (Baumeister, 1984; p. 610), has  
55 been shown to cause individuals to perform below their actual ability (DeCaro, Thomas,  
56 Albert, & Beilock, 2011). Referred to as choking (Baumeister, 1984), a body of literature has  
57 been dedicated towards exploring interventions for preventing this type of underperformance  
58 (Hill, Hanton, Matthews, & Fleming, 2010). Some previous approaches for reducing choking  
59 have been identified and include pre-performance routines (Mesagno, Marchant, & Morris,  
60 2008), quiet eye training and analogy learning (Vine, Moore, Cooke, Ring, & Wilson, 2013),  
61 and implicit learning (Hill, Hanton, Matthews, & Fleming, 2010). Additionally, stressor-  
62 exposure approaches have recently grown in popularity and are proving to be an effective  
63 means for preventing choking worthy of continued investigation (e.g., Lawrence et al., 2014;  
64 Oudejans & Pijpers, 2009; Stoker, Lindsay, Butt, Bawden, & Maynard, 2016).

65 Pressure training (PT) can be defined as a stressor-exposure program that specifically  
66 focusses on reducing choking and developing performance under pressure by strategically  
67 exposing individuals to pressurized environments (cf. Oudejans & Pijpers, 2009; Stoker et al.,  
68 2017). Previous research has provided an indication that pressure training can be used to  
69 successfully prevent choking and enhance performance. For example, Bell, Hardy, and  
70 Beattie (2013) undertook research that exposed elite youth cricketers to a number of  
71 consequence stressors during training. Results showed that these players made significant  
72 improvements in objective and subjective mental toughness scores, indicating an enhanced  
73 ability to perform under pressure. In wider research, stressor-exposure methods have also

74 been shown to be impactful across a range of sports, such as cricket (Bell et al., 2013), soccer  
75 (Reeves, Tenenbaum, & Lidor, 2007), and field hockey studies (Mesagno, Harvey, & Janelle,  
76 2011). Yet, despite growing interest and successful PT interventions (e.g., Bell et al., 2013;  
77 Lawrence et al., 2014), little research has investigated how to systematically create  
78 pressurized training environments in sport.

79         Addressing this issue, Stoker and colleagues (2016) investigated elite coaches'  
80 methods for pressure training. A framework was developed which indicated that elite coaches  
81 managed the demands of training (via the manipulation of task, performer, and environmental  
82 stressors) to control the difficulty of the training session. Task stressors involved  
83 manipulating the rules of play, performer stressors involved manipulating the physical and  
84 psychological functioning of an athlete and environmental stressors involved manipulating  
85 external surroundings. This framework also documented that coaches introduced  
86 consequences into training alongside the manipulated demands. These consequences could be  
87 judgment stressors, such as being evaluated by peers, rewards, such as selection, or forfeits,  
88 such as missing a training session. In managing these two facets of training (i.e., training  
89 demands and consequences), coaches perceived themselves to create performance enhancing  
90 PT environments.

91         In a follow-up study, Stoker and colleagues (2017) tested the effectiveness of this PT  
92 framework by investigating the impact of manipulating these two categories of stressors (i.e.,  
93 demands and consequences) on athletes' experiences of pressure, heart-rate, anxiety intensity  
94 and direction. Specifically, elite netballers performed a shoulder pass drill while exposed to  
95 demand stressors (e.g., time constraint), consequence stressors (e.g., monetary reward), or a  
96 combination of demand and consequence stressors. Results revealed that manipulating  
97 consequences, or a combination of demands and consequences, significantly increased  
98 perceived pressure, heart-rate, and cognitive anxiety, whilst manipulating demand stressors

99 alone did not. However, while manipulating demand stressors were important for impacting  
100 performance, manipulating these stressors alone was found to have no impact on pressure.  
101 Thus, the results revealed mixed support for the effect of training demands on pressure and  
102 strong support for the effects of consequences on pressure and demands on performance.

103         In summary of the research highlighted previously, Stoker and colleagues developed  
104 (2016) and tested (2017) a framework for systematically creating pressurized training  
105 environments. Their findings indicated strong support for the role of consequences in  
106 generating pressure and mixed support for the influence of training demands. In light of these  
107 findings and wider research that has also provided consistent evidence for consequences and  
108 mixed support for demands (e.g., Bell et al., 2013; Mesagno et al., 2011; Weinberg, Butt, &  
109 Culp, 2011), there appears to be a need to provide further clarity regarding the distinct roles  
110 of these two stressors when creating pressurized training environments. Indeed, Stoker and  
111 colleagues suggested that in further investigating this area it could be important to examine  
112 the specific effects of manipulating each individual demand (i.e., task, performer or  
113 environmental) or consequence (i.e., reward, forfeit or judgment) stressor on performance.  
114 Such research could refine knowledge regarding the precise effects of training demands and  
115 consequences. Additionally, such an exploration could provide additional insight regarding  
116 which specific demand or consequence stressors coaches should manipulate in order to  
117 maximize their time and resources. With these considerations in mind, in the present study a  
118 PT framework that was generated by Stoker and colleagues (2016) was used to examine the  
119 specific effect of each individual demand (i.e., task, performer, or environmental) and  
120 consequence (i.e., reward, forfeit, or judgment) stressor on experiences of pressure. It was  
121 hypothesized that each individual demand and consequence stressor would increase  
122 experiences of pressure and that increasing each demand stressors would negatively affect  
123 performance.

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## Methods

### 125 Participants

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### 146 Design

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After institutional ethics approval was obtained, the sample was identified purposively in accordance with the previous research upon which the current study was based (see Stoker et al., 2017). 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 private training facilities. In line with these requirements, six elite athletes from the Great Britain disability shooting team were invited to participate in the study. The participating sport and athletes provided consent for the present research to be publicized without anonymity. Initial contact was made with the Performance Director of British Disability Shooting 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 Performance Director and informed consent was then obtained from each athlete. The participants were aged between 20 and 41 years ( $M_{\text{age}} 28.67$ ;  $SD = 8.82$ ) 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 perceive pressure as facilitative, thus, pressure might positively impact performance (cf. Oudejans & Pijpers, 2009). 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.

The coaching framework developed by Stoker and colleagues (2016) was adopted to examine the effects of individually manipulating a task, performer, environmental, forfeit,

149 reward or judgment stressor on the athletes' experiences of pressure. A within subject design  
150 was used with 7 conditions: baseline, task, performer, environmental, forfeit, reward, and  
151 judgment conditions. Across all conditions, the participants performed a moderately easy  
152 shooting exercise to avoid both floor and ceiling effects once stressors were introduced. To  
153 ensure that the exercise was moderately easy for the specific participants, it was required that  
154 the athletes' head coach select the exercise. Specifically, in line with previous literature (e.g.,  
155 Stoker et al., 2017), the researchers gave clear instructions for the head coach to design a  
156 shooting exercise that would be experienced by all the participants as "moderately easy".  
157 There were no manipulations to the training demands of the exercise or the consequences in  
158 the baseline conditions. One stressor was manipulated in isolation across all the experimental  
159 conditions (i.e., in the task condition, one task stressor was manipulated). In the three demand  
160 conditions (the task, performer, and environmental conditions), the manipulation of stressors  
161 were designed to make the training demands moderately difficult. In the three consequences  
162 conditions (the forfeit, reward, and judgment conditions), the manipulation of stressors were  
163 designed to increase the perception of meaningful performance-contingent outcomes.

164 **Experimental design.** The study was designed in collaboration with the National  
165 Governing Body of British Disability Shooting and conducted over a seven-month period.  
166 Regarding the identification and designing of consequences, meetings were held with the  
167 participants where they were asked to identify consequences that created pressure in training,  
168 competition, social, and professional situations (Stoker et al., 2017). The coaching framework  
169 generated by Stoker et al. (2016) was used to guide the discussions and this ensured questions  
170 identified specific reward, forfeit, and judgment stressors. Following these meetings, the final  
171 experimental reward, forfeits, and judgments stressors were agreed upon via meetings with  
172 the Coaches, Performance Director, and support staff. The demand stressors and shooting  
173 exercise were designed by the coaches, and utilized their extensive knowledge of specific

174 exercises and their athletes' capabilities. Following the piloting of the stressors and  
175 conditions with athletes who were on the team but not participating in the study, none of the  
176 stressors were modified for the experiment. Participation in the conditions was randomized so  
177 that each participant experienced the conditions in a different sequence.

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

190       **Conditions.** In accordance with Stoker and colleagues' (2016) framework, task,  
191 performer, and environmental variables were manipulated to shape stressors relating to the  
192 demands of training. In line with previous literature (Stoker et al., 2017), a time stressor was  
193 used in the task condition. Specifically, as designed by the coaches, participants were given  
194 only six minutes to take their 10 shots. Due to the range of athletes' disabilities, and the  
195 differential effect that physical stressors may have on athletes' functional capabilities,  
196 performer stressors were required to be cognitive in nature. For example, physical pre-fatigue  
197 was omitted as an option, as were physical apparatus, clothing, and equipment stressors.  
198 However, the coaches identified that cognitive pre-fatigue was a suitable performer stressor

199 that was also ecologically valid. Following deliberation of several potential cognitive pre-  
200 fatigue stressors, the coaches selected the Stroop test (Stroop, 1935). This stressor was  
201 selected due to its ability to expose athletes to increased stress and mental fatigue (Provost &  
202 Woodward, 1991) that could be reflective of competition (cf. Knicker et al., 2011). Athletes  
203 were screened for dyslexia. Several environmental stressors were available for use. For  
204 example, the athletes occasionally competed abroad with heightened temperature and  
205 regularly competed in different venues with varied lighting conditions. Consequently, heat  
206 and light manipulations were considered. However, given that there are consistently  
207 indiscriminate auditory distractions at competition (cf. Driskell, Sclafani, & Driskell, 2014),  
208 and that previous research has utilized such a stressor (Stoker et al., 2017), a sound stressor  
209 was utilized. Thus, environmental stressors were managed via the addition of a noise  
210 distraction in the form of a repeating beep. A sound system was placed 8 foot away from the  
211 performer and played a beep 12 times per minute at a volume of 80 decibels (cf. Stoker et al.,  
212 2017).

213         In conditions where consequence stressors were introduced, this was achieved via  
214 manipulating forfeit, judgment, and reward stressors (cf. Bell et al., 2013; Driskell et al.,  
215 2014; Lawrence et al., 2014; Oudejans & Pijpers, 2009; Stoker et al., 2016; Stoker et al.,  
216 2017). In the forfeit condition, the participants were required to perform a staged media  
217 conference if they did not achieve their required score. During this forfeit, the athlete was  
218 required to answer questions for five minutes in front of an audience consisting of the  
219 Performance Director, coaches, and some members of the management team. The questions  
220 related to why they had failed to hit their required score, and the audience were primed and  
221 provided with a list of questions created by the coaches, such as “why do you think you failed  
222 the challenge?”, to help ensure that there was a consistently tough but supportive climate (cf.  
223 Bell et al., 2013) across the interviews. In the reward condition, the participant with the

224 highest score across all of the reward conditions received £200 at the end of the experiment  
225 (Oudejans & Pijpers, 2009). In the judgment condition, the Performance Director was present  
226 during the exercise and was positioned six feet away, facing the athlete. Participants were  
227 shown a document which was used by the Performance Director to evaluate them (scores out  
228 of 10) on their ability to handle the pressure of the task, ability to focus on the task, and  
229 motivation towards the task (cf. Stoker et al., 2017).

230 **Measures.** Previous pressure research within and outside of sport settings (e.g.,  
231 Kinrade, Jackson, & Ashford, 2015; Reeves et al., 2007) has assessed perceptions of  
232 performance pressure using a self-report, Likert-type scale. In line with this research, a self-  
233 report scale was adopted in the present study where 1 indicated “no pressure” and 7 indicated  
234 “extreme pressure”. Additionally, as previous pressure research has examined heart-rate and  
235 self-reported anxiety to provide an indication of experiences under pressure (e.g., Oudejans &  
236 Pijpers, 2009; Stoker et al., 2017), these measures were also adopted in the present study.  
237 Regarding anxiety, previous literature has suggested that self-reported state anxiety may be  
238 an indicator of pressure to perform (cf. Mesagno et al., 2011). Specifically, previous studies  
239 of performance under pressure have measured anxiety using both shortened (Oudejans &  
240 Pijpers, 2009) and complete (Kinrade et al., 2015) questionnaires. While shortened and  
241 complete questionnaires have received criticism for lack of validity, abbreviated scales  
242 receive consistent support when expediency is paramount (Williams, Cumming, & Balanos,  
243 2010). Consequently, the shortened Immediate Anxiety Measurement Scale (IAMS; Thomas,  
244 Hanton, & Jones, 2002) was used to measure anxiety in the present study. The IAMS is  
245 recognized as a valid and reliable method for assessing state cognitive anxiety, somatic  
246 anxiety, and self-confidence (Williams et al., 2010). The instrument contains three items that  
247 measure the intensity and direction of cognitive anxiety, somatic anxiety, as well as self-  
248 confidence. The scale contained one item for each of these constructs that included: “I am

249 cognitively anxious”, “I am somatically anxious”, and “I am confident”. Participants rated  
250 their experience of each of these items on a seven-point Likert scale ranging from 1 (not at  
251 all) to 7 (extremely). Respondents also rated the degree to which they perceived the intensity  
252 of each symptom to be either facilitative (+3) or debilitating (-3) towards performance.  
253 Consistent with previous research (e.g., Stoker et al., 2017), both intensity and direction  
254 dimensions were included in the instrument because of their potential to reveal different  
255 insights regarding the specific impact of the stressors used in the study. Heart-rate data was  
256 monitored using a Nexus-4 encoder (Mindmedia, 2004) and captured by means of Bluetooth  
257 to a laptop running Mind Medias Biotrace+ software. A Nexus-4 dedicated electrocardiogram  
258 (ECG) lead with silver nitride electrodes was positioned on the participants’ skin in  
259 accordance with lead II chest placement guidelines (Mindmedia, 2004). The electrodes  
260 attached to the Nexus-4 encoder, which was positioned on the athlete’s waist band. Raw data  
261 was collected at a sampling rate of 2000Hz and the average heart beats per minute (bpm)  
262 were calculated using Biotrace+ functions. Participants’ average bpm was calculated from  
263 when the shooting exercise began to when their last shot had been taken, or when time had  
264 run out. Regarding performance, a Sius Ascor electronic system (SA 921, Sius Ascor,  
265 Effretikon, Switzerland) was used to measure the performance accuracy of each shot in  
266 relation to the center of the target.

## 267 **Procedure**

268         Prior to the start of the experiment, a group session took place with all of the  
269 participants. The study brief was provided to the athletes and consent was obtained. The  
270 IAMS items were discussed with the participants to ensure that they understood what each  
271 item represented and details regarding biofeedback measures were also discussed. In each  
272 condition, the Nexus-4 encoder heart-rate monitor was attached to the participant. It was then  
273 explained to the athletes that they would have 10 shots, over 10 minutes, to warm-up. The

274 participants completed an IAMS and reported their perceived pressure before having their  
275 heart-rate data recorded as they performed the warm-up. This warm-up exercise was used to  
276 collect baseline scores. Following the warm-up, there was a break of five minutes before the  
277 participants performed the shooting exercise in a specific condition. Each participant was  
278 provided details of the specific condition of the exercise, including the stressors they would  
279 be exposed to, before they completed another IAMS and reported their perceived pressure.  
280 Participants then completed the condition whilst their heart-rate was recorded. In each  
281 condition, the participants performed the shooting exercise whilst exposed to the manipulated  
282 stressor. According to the condition, some stressors were administered prior to performing  
283 the shooting exercise (i.e., the performer stressor) and some were administered during the  
284 performance (i.e., the beep from the sound system). In conditions where there were  
285 consequences, condition-relevant stressors were delivered immediately following completion  
286 of the condition, with the exception of the reward condition. In the reward condition, the  
287 reward was administered on the last day of the experiment. This clause was made clear to  
288 participants when they received the condition explanation.

289         The experiment took place outside of a laboratory, in an applied shooting setting, so  
290 specific steps had to be taken to reduce confounding variables. The experiment took place in  
291 a shooting hall that was completely secluded and thus bereft of bystander observation.  
292 Excluding the judgment condition where the Performance Director was present, only the first  
293 and last authors were present during the conditions. Athletes were asked not to discuss their  
294 experiences with fellow participants until the study was complete. A script was followed for  
295 all conditions, to ensure the same narrative was delivered to each participant. All the  
296 conditions took place within the athletes' normal training hours. Athletes were restricted to  
297 completing only one condition per day and the experiment took place over three weeks.

## 298 **Data Analysis**

299 The independent variables were the task, performer, environmental, forfeit, reward,  
300 and judgment stressors manipulated across the conditions. The dependent variables were  
301 heart-rate, performance, and self-reported pressure, anxiety, and confidence. The overall  
302 baseline for each participant was calculated by averaging their own scores across the six  
303 warm-ups (i.e., the average of their score from the task condition warm-up, the performer  
304 condition warm-up, etc.). A one-way ANOVA with repeated measures was used to identify if  
305 there were differences amongst the means for pressure, heart-rate, self-reported anxiety  
306 (intensity and direction), confidence (intensity and direction), and performance between each  
307 pressure condition and the baseline. Partial eta squared ( $\eta_p^2$ ) was used as an indicator of  
308 effect size for ANOVA calculations and a critical alpha level of .05 was set. Pairwise  
309 comparisons ( $p = <0.05$ ) were performed to identify the conditions in which significant  
310 differences occurred. Bonferroni corrections were used to control for Type I error.

### 311 **Results**

312 Mean scores for perceived pressure, cognitive and somatic anxiety (intensity and  
313 direction), self-reported confidence (intensity and direction), heart-rate (bpm), and  
314 performance are presented below.

315 A significant main effect was found for perceived pressure,  $F(6, 30) = 10.87, p <$   
316  $.001; \eta_p^2 = .69$ ). Pairwise comparisons indicated that pressure was significantly higher in the  
317 forfeit ( $M = 4.9, SD = 1.08$ ) and judgment condition ( $M = 4.5, SD = .96$ ) as compared with  
318 the baseline ( $M = 1.83, SD = .40$ ). In addition, scores in the forfeit condition were  
319 significantly higher than scores in the performer condition ( $M = 2.8, SD = .65$ ). A significant  
320 main effect was found for performance score,  $F(6, 30) = 5.78, p = <.001; \eta_p^2 = .54$ ). Pairwise  
321 comparisons showed that scores in the judgment condition ( $M = 99.48, SD = 18.80$ ) and the  
322 task condition ( $M = 99.15, SD = 16.05$ ) were significantly lower than scores in the baseline  
323 condition ( $M = 102.07, SD = 20.04$ ).

324 A significant main effect was found for cognitive anxiety intensity,  $F(6, 30) = 7.07, p$   
325  $= < .001; \eta_p^2 = .59$ ). Pairwise comparisons indicated scores in the forfeit ( $M = 4.17, SD = .12$ )  
326 and judgment condition ( $M = 4.50, SD = 1.02$ ) were significantly higher than the baseline  
327 condition ( $M = 1.05, SD = .05$ ). A significant main effect was also found for cognitive  
328 anxiety direction,  $F(6, 30) = 5.07, p = .001; \eta_p^2 = .50$ ). With a mean value of  $-1.5 (SD = .02)$ ,  
329 anxiety in the judgment condition was interpreted as more debilitating than in the baseline  
330 condition ( $M = .03, SD = .00$ ). In addition, there was a significant main effect for somatic  
331 anxiety intensity,  $F(6, 30) = 3.33, p = .012; \eta_p^2 = .40$ ), confidence intensity,  $F(6, 30) = 2.44, p$   
332  $= .049; \eta_p^2 = .74$ ), and heart-rate,  $F(6, 30) = 3.96, p = .005; \eta_p^2 = .44$ ). However, following  
333 Bonferroni post hoc analysis, there were no significant differences found in the pairwise  
334 comparisons. There was no main effect for somatic anxiety and confidence direction.

### 335 Discussion

336 Building on previous literature (i.e., Mesagno et al., 2011) and specific to the PT  
337 framework generated by Stoker and Colleagues (2016; 2017), the present investigation was  
338 designed to examine the effects of manipulating a single task, performer and environmental  
339 (i.e., a training demand) forfeit, reward or judgment stressor (i.e., a consequence of training)  
340 on experiences of pressure. This research was conducted to provide further clarification  
341 regarding whether consequences are more effective than demand stressors at generating  
342 pressure and also by highlighting which specific, individual stressors have the greatest  
343 impact. This information would further provide insight regarding the most effective means of  
344 systematically creating pressure and could be useful for maximizing a coach's or  
345 practitioner's time, efforts, and resources when creating a pressurized training environment.

346 Results revealed that perceived pressure and cognitive anxiety intensity were  
347 significantly higher in two of the consequences conditions (i.e., the forfeit, and judgment  
348 condition), as compared with the baseline condition. Also, perceived pressure was

349 significantly lower in the performer condition as compared with the forfeit condition. In  
350 previous literature, rewards, forfeits, and judgment stressors have been utilized as part of  
351 wider interventions and indicated to be important for creating pressure and anxiety (e.g., Bell  
352 et al., 2013; Mesagno et al., 2011; Reeves et al., 2007). Indeed, examples of forfeits have  
353 included physical or ego punishments, such as cleaning up the changing room, or missing a  
354 training session (Bell et al., 2013), and rewards have commonly taken the form of monetary  
355 incentives (Oudejans & Pijpers, 2009). Also, judgment stressors that increase pressure are  
356 indicated to include peer or coach evaluation (Driskell et al., 2014; Kinrade et al., 2015).  
357 Along these lines, wider research consistently supports consequences as an important factor  
358 when creating pressure, and results of the present study further extend knowledge from these  
359 investigations. Specifically, it was found that consequences were not merely important but,  
360 rather, essential for producing pressure as indicated by the fact that pressure was only ever  
361 increased when consequences were present.

362         In contrast to consequences, previous evidence has been more inconsistent regarding  
363 the role of training demands when creating pressurised training environments (Stoker et al.,  
364 2017). For example, there are examples of support, such as in literature indicating that  
365 coaches successfully utilized demand-based manipulations to create challenge and pressure  
366 (cf. Weinberg et al., 2011). As well as this support, it has been documented that coaches and  
367 researchers have manipulated demands to increase pressure. For instance, Oudejans and  
368 Pijpers (2009) successfully generated pressure by manipulating task and environmental  
369 stressors in such a way that participants had to perform a dart exercise from a height. On the  
370 other hand, however, there are also examples of demands being manipulated with no impact  
371 on performance pressure. When testing a coaching pressure training framework, for example,  
372 Stoker and colleagues (2017) manipulated training demands to find pressure and anxiety  
373 remained unaffected, unless consequences were also simultaneously introduced. Considering

374 previous research in light of the current study, the presented findings highlight that  
375 manipulating task, performer, and environmental demand-stressors had no impact on pressure  
376 and anxiety experiences. Thus, in consideration of the PT coaching framework that  
377 underpinned this study (Stoker et al., 2016), these findings support previous research (Stoker  
378 et al., 2017) which indicates that manipulating the demands of training, in isolation, may not  
379 be effective at creating pressurized training environments. Indeed, considering the consistent  
380 support for consequences, there is an argument supporting the need to ensure any demand-  
381 based manipulations are coupled with consequences when desiring to increase pressure.

382         In the present study, regarding the most effective stressor at producing a pressurised  
383 environment, it was found that pressure and cognitive anxiety intensity were significantly  
384 higher in the forfeit and judgment condition while changes in the reward condition were not  
385 significant. Results therefore highlight that the potential reward (of £200) was not as  
386 impactful on experiences of pressure as the forfeit of having to perform a task in front of the  
387 team or the stressor of being judged by the Performance Director (PD) whilst performing. It  
388 was also found that levels of cognitive anxiety in the judgment condition were interpreted as  
389 significantly more debilitating than facilitating towards performance. Thus, there is an  
390 indication that manipulating judgment had the most overall impact of any stressor. This  
391 stressor may have had such a substantial effect on perceived pressure due to the fact that the  
392 PD's opinion, given their provision over important decisions like selection, is critical to  
393 success. Previous research also found support for judgment as an impactful stressor in  
394 pressurised training contexts. Specifically, Mesagno and colleagues (2011) found judgment  
395 stressors, such as performing in front of teammates, significantly increased anxiety in a high-  
396 pressure training context more so than a monetary reward. This research combines with the  
397 findings of the present study to suggest that judgment stressors, such as being watched by an

398 important other, may present coaches with the most impactful stressor in pressurised training  
399 environments.

400         The judgment stressor also impacted upon performance negatively. Specifically,  
401 performing in front of the PD significantly decreased shooting accuracy, as compared with  
402 the baseline. Previous literature has documented similar findings. For instance, Lawrence et  
403 al. (2014) examined golf putts with and without consequences and discovered that the  
404 introduction of a judgment stressor could negatively impact performance. This finding could  
405 be an indication that the participants in the present study were unable to manage the increased  
406 pressure induced by the consequence and thus performance suffered. Specifically, in the  
407 present study, as well as performance being impeded, pressure and cognitive anxiety was  
408 significantly increased when the judgment stressor was introduced. Hence, bearing in mind  
409 that attempts to cope with pressure can be either successful or unsuccessful (Hill et al., 2010),  
410 it is possible that participants' efforts to manage the increased pressure were not effective. In  
411 terms of what led to the underperformance, it could be possible that increases in cognitive  
412 anxiety were the cause. Previous research supports this possibility (Mesagno et al., 2011),  
413 where performance has been negatively impacted in a high-pressure condition by increases in  
414 self-presentation as induced by judgment stressors. Notably, these results contrast with the  
415 findings of Stoker et al. (2017) where it was discovered that consequences did not impact  
416 performance. Specifically, elite netballers were exposed to consequences in a PT exercise  
417 and, while it was found that consequences impacted perceived pressure, they had no affect on  
418 performance. However, the netballers in Stoker and colleagues' (2017) study were  
419 accustomed to PT, whereas the sample in the present study did not. Hence, the specific  
420 experiences of the netballers, as opposed to the shooters in the present study, may have  
421 resulted in them being better equipped to manage pressure and thus provide a better  
422 performance. It is possible that the mixed findings seen within the present study and previous

423 literature may be an indication that some participants manage pressure in such a manner that  
424 performance is maintained while others do not. Indeed, this is supported by research  
425 indicating that stressor familiarity facilitates better coping (Driskell & Johnston, 1998).

426         The demand-based task stressor also impacted accuracy, supporting previous research  
427 (e.g., Driskell et al., 2014) such as Stoker et al. (2017) which explored the same PT coaching  
428 framework and found that manipulating the training demands negatively affected shoulder-  
429 passing accuracy. This previous research also discovered a significant main effect for self-  
430 confidence intensity but post hoc analyses did not reveal significant differences amongst the  
431 conditions. Yet, observation of the means demonstrated a trend where confidence was lower  
432 in conditions where performance was significantly reduced. The results of the present study  
433 discovered the same finding, and wider research has indicated that better performances  
434 facilitate perceptions of increased confidence (Skinner, 2013), suggesting that confidence can  
435 be affected by the standard of performance. Thus, considering this previous research and the  
436 trends identified in the present study, there may be some support for the notion that demand  
437 stressors can mediate confidence due to their ability to affect performance.

#### 438 **Applied Implications**

439         Results of the present study revealed that pressure only increased in conditions where  
440 consequences were introduced. Combining these findings with previous research (e.g.,  
441 Lawrence et al., 2014; Mesagno et al., 2011; Oudejans & Pijpers, 2009; Reeves et al., 2007),  
442 collectively there is growing research indicating that consequences might be integral for  
443 creating pressure in training environments. Previous research has indicated that different  
444 types of consequences might induce contrasting types of choking. Specifically, reward and  
445 forfeits have been linked with distraction forms of choking, while judgment has been linked  
446 with self-focus methods of choking (DeCaro et al., 2011; Hill et al., 2010). Consequently,  
447 coaches and applied practitioners ought to consider PT as a method for increasing coping

448 through using consequences to introduce pressure, which could focus on the introduction of  
449 forfeits and rewards, or judgment, depending on the type of choking that the athlete needs to  
450 overcome (cf. Mesagno et al., 2011).

451         Of all the stressors manipulated, the judgment stressor had the biggest impact on  
452 participants' experiences of anxiety and pressure. Hence, results of the present study  
453 highlight that consequences are essential when striving to create pressure. Moreover, within  
454 certain athlete populations, a specific category of consequence, such as judgment, might  
455 provide coaches with the most effective means for creating a pressurized training  
456 environment. This point is important for coaches looking to maximize their resources. With  
457 this in mind, specific to the condition of consequences, it is important to consider individual  
458 differences. For example, if a coach was planning to deploy judgment stressors, consideration  
459 could be lent to recipients' perceptions of significant others, relationships within the team,  
460 and their motives to impress. In addition, consequences involving key decision-makers  
461 influencing an athlete's selection, and individuals that can influence levels of self-  
462 consciousness could be considered (cf. Bell et al., 2013; Mesagno et al., 2011; Stoker et al.,  
463 2016).

464         As it was found that the manipulation of demand stressors made no difference to  
465 perceived pressure, findings also suggest that it might not be effective to rely upon these  
466 stressors in applied settings to produce pressure. Yet, these stressors always negatively  
467 impacted performance. Hence, collectively the findings indicate that demands and  
468 consequences may have distinct roles when PT. Specifically, while demand stressors could be  
469 critical for shaping performance, consequences appear essential for producing pressure.  
470 However, previous research such as Weinberg and colleagues (2011), supports the notion that  
471 coaches may rely on more demand-based manipulations as a means for creating pressure.  
472 Furthermore, literature has predominantly indicated consequences are important, but not

473 essential, when creating pressure (e.g., Bell et al., 2013; Oudejans & Pijpers, 2009; Reeves et  
474 al., 2007). Therefore, there may be a need to expand knowledge in applied and scientific  
475 arenas regarding the distinct roles of demands and consequences when PT.

476         Although it was found that the demand stressors did not affect perceptions of  
477 pressure, coaches should consider other important effects that training demands have when  
478 PT. Increasing the demand stressors was found to negatively impact performance. In  
479 addition, while post hoc analyses did not reveal significant differences, a significant main  
480 effect was found for self-confidence intensity and means were observed to show that  
481 confidence was lower in conditions where performance was significantly reduced. In line  
482 with previous research that has found similar results (e.g., Stoker et al., 2017), and wider  
483 literature indicating that performance mediates perceptions of confidence (Skinner, 2013), the  
484 present results could suggest that demands are important when pressure training for enabling  
485 coaches to challenge performance and potentially mediate confidence. Also, when pressure  
486 training, previous research (Stoker et al., 2016) identified that coaches used the demands of  
487 training to expose athletes to challenges that mirrored competition. In this way, training  
488 demands may be important for facilitating the development of the ability to perform the  
489 specific skills needed for competition under pressure. Furthermore, research has suggested  
490 that similarity between training and competition demands can encourage transference of  
491 skills into the competition environment (e.g., Driskell et al., 2014). Thus, training demands  
492 appear to be instrumental for encouraging the transfer of skills from PT to competition. Also,  
493 literature has documented that individuals can lose psychological flexibility if they are  
494 repeatedly exposed to the same contextual demands due to the training task encouraging the  
495 repetition of a single behaviour (Driskell & Johnston, 1998). This is due to the athlete  
496 persisting with a single response, even when the behaviour is no longer correct. Hence, by  
497 varying training demands, these stressors can be used to promote adaptability and

498 psychological flexibility while PT. Thus, collectively, demand stressors may be a critical  
499 component for influencing transferability, psychological flexibility, challenging performance,  
500 and, potentially, mediating confidence when PT; further research on confidence is needed so  
501 as to provide a definitive conclusion.

## 502 **Limitations**

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

## 516 **Future Research**

517 Methods for monitoring how individuals are experiencing a pressurised training  
518 session, in real-time, might be enhanced by incorporating more biofeedback. For instance,  
519 biofeedback is emerging as an increasingly popular tool in elite sport and, if further  
520 investigated, could provide a means for better assessing responses to pressure. Exemplifying  
521 this, previous research has revealed that heart-rate decelerates immediately prior to the  
522 execution of a closed-skill, such as pistol shooting, and Lacey and Lacey (1980) theorized

523 why this occurred. Specifically, it was highlighted that this deceleration, which resulted in a  
524 more effective focusing of attention and superior performance, was associated with a  
525 decreased amount of feedback to the brain. In contrast, it was also theorized that heart-rate  
526 would accelerate if athletes explicitly monitored their skills, such as the movements of their  
527 arms during the putting stroke. With this research in mind, there is an argument for future  
528 studies to investigate heart-rate deceleration and self-focus theories of choking under  
529 pressure. Further research in this area could provide additional insights into  
530 psychophysiological activity and thus advance our understanding of methods for monitoring  
531 and managing responses under pressure.

532         In addition to advancing methods of monitoring, there is a need to conduct novel  
533 studies investigating longitudinal PT interventions as currently such literature is scarce (cf.  
534 Lawrence et al., 2014; Oudejans & Pijpers, 2009; Reeves et al., 2007). With this in mind,  
535 researchers are encouraged to develop knowledge on the most effective means for conducting  
536 PT over longer periods, such as an Olympic/Paralympic cycle, so as to better understand how  
537 PT can reduce choking under pressure. Additionally, such research could be accompanied by  
538 advances in approaches to analysis, which are also encouraged. For example, it has been  
539 indicated that one route from stressor to sub-optimal performance occurs via pressure  
540 increasing anxiety (Hill et al., 2010). Exploring these relationships and evidencing this  
541 progression, such as within a longitudinal PT intervention, would provide an insightful step  
542 forward for PT literature that moves beyond simply tracking how these measures increase  
543 and decrease over different time periods and situations.

#### 544 **Conclusion**

545         Synonymous with previous research (Stoker et al., 2017), the findings of the present  
546 study revealed that pressure only increased in conditions where consequences were  
547 introduced. Notably, the judgment stressor had the greatest influence of all and, thus, may

548 present coaches with the most effective consequence for maximizing pressure. It was also  
549 found that manipulating demand stressors in isolation did not influence pressure in any  
550 condition. Yet, these stressors always negatively impacted performance. Thus, collectively  
551 the findings support and build on Stoker and colleagues' (2016) framework by indicating that  
552 demands and consequences can have distinct roles when PT; demand stressors could be  
553 critical for shaping performance whereas consequences appear essential for producing  
554 pressure. These findings have important applied implications. First, previous research  
555 suggested that coaches might rely on demands, not consequences, to produce pressure (cf.  
556 Weinberg et al., 2011). Second, literature has predominantly indicated consequences are  
557 important, but not essential, when creating pressure (e.g., Oudejans & Pijpers, 2009).  
558 Therefore, there may be a need to expand knowledge in applied and scientific arenas  
559 regarding the potentially distinct roles of demands and consequences when PT. In light of  
560 these points, the results of the present study contribute findings to underpin methods for  
561 systematically creating and exposing athletes to PT environments. However, literature on this  
562 topic is still in its infancy and additional theory must be developed to ensure applied PT  
563 research is underpinned with comprehensive and empirical evidence.

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