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The Effect Of Manipulating Individual Consequences And Training Demands On Experiences Of Pressure With Elite Disability Shooters

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1 Running head: Training Demands, Consequences, and Pressure

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

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Abstract

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

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

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50 The Effect of Manipulating Individual Consequences and Training Demands on

51 Experiences of Pressure with Elite Disability Shooters

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

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

74 (Reeves, Tenenbaum, & Lidor, 2007), and field hockey studies (Mesagno, Harvey, & Janelle,
75 2011). Yet, despite growing interest and successful PT interventions (e.g., Bell et al., 2013;
76 Lawrence et al., 2014), little research has investigated how to systematically create
77 pressurized training environments in sport.

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

90 In a follow-up study, Stoker and colleagues (2017) tested the effectiveness of this PT
91 framework by investigating the impact of manipulating these two categories of stressors (i.e.,
92 demands and consequences) on athletes' experiences of pressure, heart-rate, anxiety intensity
93 and direction. Specifically, elite netballers performed a shoulder pass drill while exposed to
94 demand stressors (e.g., time constraint), consequence stressors (e.g., monetary reward), or a
95 combination of demand and consequence stressors. Results revealed that manipulating
96 consequences, or a combination of demands and consequences, significantly increased
97 perceived pressure, heart-rate, and cognitive anxiety, whilst manipulating demand stressors
98 alone did not. However, while manipulating demand stressors were important for impacting

99 performance, manipulating these stressors alone was found to have no impact on pressure.

100 Thus, the results revealed mixed support for the effect of training demands on pressure and

101 strong support for the effects of consequences on pressure and demands on performance.

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

123

Methods

124 **Participants**

125 After institutional ethics approval was obtained, the sample was identified
126 purposively in accordance with the previous research upon which the current study was based
127 (see Stoker et al., 2017). These requirements included recruiting participants: (i) of
128 elite/international standard; (ii) that belonged to a sporting program that wanted to PT; (iii)
129 that were not in a competition phase; (iv) that met regularly for training; (v) and that used a
130 venue with private training facilities. In line with these requirements, six elite athletes from
131 the Great Britain disability shooting team were invited to participate in the study. The
132 participating sport and athletes provided consent for the present research to be publicized
133 without anonymity. Initial contact was made with the Performance Director of British
134 Disability Shooting via the team Sport Psychologist. The research study was approved due to
135 the sports' desire to develop the teams' knowledge and experience of PT. Athletes
136 volunteered to participate following permission from the Performance Director and informed
137 consent was then obtained from each athlete. The participants were aged between 20 and 41
138 years ($M_{\text{age}} 28.67$; $SD = 8.82$) and had performed at the elite level for an average of 9.83
139 years ($SD = 6.34$). At the time of the study, the team was beginning the initial stage of
140 preparation for a World Cup tournament. It was expected that the participants' relatively high
141 level of international experience might mean that they perceive pressure as facilitative, thus,
142 pressure might positively impact performance (cf. Oudejans & Pijpers, 2009). For this same
143 reason, it was anticipated that it might be challenging to identify stressors that are meaningful
144 enough to generate high levels of pressure in their elite sample.

145 **Design**

146 The coaching framework developed by Stoker and colleagues (2016) was adopted to
147 examine the effects of individually manipulating a task, performer, environmental, forfeit,
148 reward or judgment stressor on the athletes' experiences of pressure. A within subject design

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

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

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

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

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

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

212 In conditions where consequence stressors were introduced, this was achieved via
213 manipulating forfeit, judgment, and reward stressors (cf. Bell et al., 2013; Driskell et al.,
214 2014; Lawrence et al., 2014; Oudejans & Pijpers, 2009; Stoker et al., 2016; Stoker et al.,
215 2017). In the forfeit condition, the participants were required to perform a staged media
216 conference if they did not achieve their required score. During this forfeit, the athlete was
217 required to answer questions for five minutes in front of an audience consisting of the
218 Performance Director, coaches, and some members of the management team. The questions
219 related to why they had failed to hit their required score, and the audience were primed and
220 provided with a list of questions created by the coaches, such as “why do you think you failed
221 the challenge?”, to help ensure that there was a consistently tough but supportive climate (cf.
222 Bell et al., 2013) across the interviews. In the reward condition, the participant with the
223 highest score across all of the reward conditions received £200 at the end of the experiment

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

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

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

266 **Procedure**

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

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

288 The experiment took place outside of a laboratory, in an applied shooting setting, so
289 specific steps had to be taken to reduce confounding variables. The experiment took place in
290 a shooting hall that was completely secluded and thus bereft of bystander observation.

291 Excluding the judgment condition where the Performance Director was present, only the first
292 and last authors were present during the conditions. Athletes were asked not to discuss their
293 experiences with fellow participants until the study was complete. A script was followed for
294 all conditions, to ensure the same narrative was delivered to each participant. All the
295 conditions took place within the athletes' normal training hours. Athletes were restricted to
296 completing only one condition per day and the experiment took place over three weeks.

297 **Data Analysis**

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

310

Results

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

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

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

334 Discussion

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

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

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

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

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

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

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

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

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

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

437 **Applied Implications**

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

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

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

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

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

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

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

501 **Limitations**

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

515 **Future Research**

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

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

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

543 **Conclusion**

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

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

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