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Perfectionism and Performance Following Failure in a Competitive Golf-Putting Task

by

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Running head: Perfectionism and Performance

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Abstract

Objectives: Perfectionism is linked to an array of cognitive, affective, and behavioral correlates in sport. However, research examining links between perfectionism and performance in competition, especially following failure, is scarce. The purpose of this study was to examine the interaction between two higher-order dimensions of perfectionism—perfectionistic strivings and perfectionistic concerns—in predicting golf-putting performance following failure in competition.

Design: A correlational design was employed.

Method: Ninety-nine (52 female) intercollegiate athletes (M age = 20.51 years, SD = 1.79) completed a domain-specific measure of perfectionistic strivings and perfectionistic concerns in sport. Athletes competed in two trials of a golf-putting task against a research confederate. After the first trial of ten putts (and before the second trial of ten putts) athletes were provided false-failure feedback indicating that they were losing the competition to their opponent. Performance was measured by the total distance each putt finished from the intended target.

Results: Moderated hierarchical regression analysis with Johnson-Neyman technique to probe interactions revealed that, following failure, perfectionistic strivings is associated with better performance when perfectionistic concerns is lower, but associated with worse performance when perfectionistic concerns is higher.

Conclusions: Dimensions of perfectionism predict performance following competitive failure and the presence of higher (versus lower) perfectionistic concerns appears to be a key determining factor in how athletes perform.

Keywords: perfectionistic strivings; perfectionistic concerns; performance; sport; athletes

48 **Perfectionism and Performance Following Failure in a Competitive Golf-Putting Task**

49 Perfectionism is among the most studied personality characteristics in sport and has been
50 consistently linked to a wide variety of cognitive, affective, and behavioral responses in athletes
51 (for a recent review see Hill, Mallinson-Howard, & Jowett, 2018). Despite the extensive body of
52 research that has examined perfectionism in sport, very few studies have investigated links
53 between perfectionism and athletic performance. The dearth of research in this area seems
54 surprising given that: (a) a key objective of sport/performance psychology research is to
55 understand psychological factors that impact human performance (see Raab, Lobinger, Hoffman,
56 Pizzera, & Laborde, 2016), and (b) competitive performance is arguably one of the most
57 important aspects of an athlete's life (Hill, Appleton, & Mallinson, 2016). Thus, the general
58 purpose of this study was to examine relationships between perfectionism and athlete
59 performance in a competitive setting. We were particularly interested in this relationship in the
60 context of competitive failure.

61 **Multidimensional Perfectionism**

62 Perfectionism is viewed by many contemporary perfectionism theorists as a
63 multidimensional personality characteristic comprised of two higher-order dimensions that are
64 often labelled perfectionistic strivings and perfectionistic concerns (Dunn et al., 2016; Stoeber &
65 Otto, 2006). In the context of sport, *perfectionistic strivings* (PS) reflect “aspects of
66 perfectionism associated with [athletes'] self-oriented striving for perfection and the setting of
67 very high personal performance standards” (Gotwals, Stoeber, Dunn, & Stoll, 2012, p. 264). By
68 contrast, *perfectionistic concerns* (PC) reflect “those aspects of perfectionism associated with
69 [athletes'] concerns over making mistakes, fear of negative social evaluation, feelings of
70 discrepancy between one's expectations and performance, and negative reactions to
71 imperfection” (Gotwals et al., 2012, p. 264).

72 Evidence suggests that PS in sport is often ambivalent or ambiguous. This is evident in
73 that it is associated with a mix of adaptive and maladaptive processes/outcomes among athletes.
74 For example, PS is positively correlated to both ego and task orientation, intrinsic and extrinsic
75 motivation, and self-confidence and anxiety (Gotwals et al., 2012; Hill et al., 2018; Jowett,
76 Mallinson, & Hill, 2016). However, when the overlap with PC is controlled (viz., residual PS is
77 examined) typically only the associations with adaptive processes/outcomes in athletes remain
78 (e.g., task orientation, intrinsic motivation, self-confidence). This pattern of findings reflects a
79 complex set of beliefs and underpinning motives that imbue personal achievement with an
80 extreme sense of importance. This importance can energize personal effort and task focus but
81 may also contribute to more worry and negative self-evaluation concerning possible failure.
82 When more problematic self-evaluative tendencies are removed (leaving residual PS) or PS are
83 accompanied by lower PC, what remains are the highly energizing qualities or a more challenge-
84 appraisal mindset (Dunn, Gotwals, Causgrove Dunn, & Lizmore, 2019).

85 On the other hand, PC is comparatively less complex than PS in sport and is typically
86 associated with maladaptive, unhealthy, or dysfunctional processes/outcomes. For example,
87 regardless of whether the overlap with PS is controlled, PC is positively correlated with burnout,
88 rumination, anxiety, fear of failure, amotivation, and performance avoidance goals in athletes
89 (see Hill et al., 2018). This pattern of findings reflects a more insidious set of beliefs and motives
90 that include deeply entrenched fears and concerns over negative social evaluation and failure.
91 These concerns heighten the sense of threat associated with social and competitive settings and
92 encourages a failure-avoidance mindset (Dunn et al., 2019). Moreover, removing the more
93 personally oriented features of PS, and examining residual PC, or examining PC when
94 accompanied by lower PS, appears to do little to quell these strong social fears.

95 **Perfectionism and Athletic Performance**

96 We are aware of only six published studies that have examined links between
97 perfectionism and performance in athletic/sport contexts (Anshel & Mansouri, 2005; Hill, Hall,
98 Duda, & Appleton, 2011; Madigan, Stoeber, Culley, Passfield, & Hill, 2018; Stoeber, Uphill, &
99 Hotham, 2009; Stoll, Lau, & Stoeber, 2008; Thompson, Kaufman, De Petrillo, Glass, & Arnkoff,
100 2011).¹ These studies have employed a range of performance tasks including balancing tasks
101 (Anshel & Mansouri, 2005), sport-specific technical tasks (Madigan, Stoeber, Culley, et al.,
102 2018), and actual competitive performance (Stoeber et al., 2009). The results of these studies
103 have provided mixed findings with respect to relationships between perfectionism and
104 performance. Three studies found that perfectionistic strivings was associated with enhanced
105 performance (Madigan, Stoeber, Culley, et al., 2018; Stoeber et al., 2009; Stoll et al., 2008), one
106 study found that strivings was associated with reduced performance (Anshel & Mansouri, 2005),
107 and two studies found no relationship between strivings and performance (Hill et al., 2011;
108 Thompson et al., 2011). With respect to perfectionistic concerns, two studies reported that
109 concerns was associated with reduced performance (Anshel & Mansouri, 2005; Thompson et al.,
110 2011) and four studies found no relationship between concerns and performance (Hill et al.,
111 2011; Madigan, Stoeber, Culley, et al., 2018; Stoeber et al., 2009; Stoll et al., 2008).

112 Against the backdrop of these inconsistent findings, we were interested in three issues:
113 (1) the relationship between perfectionism and athletic performance in a distinctly competitive
114 setting, (2) examination of this relationship under conditions of competitive failure, and (3) the
115 interaction between perfectionistic strivings and perfectionistic concerns in predicting
116 performance.

117 In regards to the first issue, only Stoeber et al. (2009) have examined the perfectionism-

¹ Hill, Stoeber, Brown, and Appleton (2014) examined links between perfectionism at a team level and team performance. Given that Hill et al. measured team performance, it is not discussed in the current study.

118 performance relationship in an actual *competitive* setting—where competition is defined as:

119 An activity involving multiple parties that are attempting to achieve an exclusive goal,
120 one which cannot be held in common or shared among the parties, and in which there are
121 some set of rules, guidelines, or constraints on the means for participating and achieving
122 the goal. (The Sports Ethicist, 2013)

123 Examining the perfectionism-performance relationship in competitive settings (as
124 opposed to settings that focus upon intrapersonal, self-referenced, or self-improvement
125 evaluations of performance) is important because competition increases the likelihood for
126 interpersonal judgements of competence to occur. These judgements may increase the potential
127 for athletes' perfectionistic tendencies to impact performance, particularly when the possibility
128 of threat, negative evaluation, or failure exists within the environment (Dunn et al., 2019;
129 Lizmore, Dunn, & Causgrove Dunn, 2017). Finally, competition is a defining and inherent part
130 of sport. Therefore, examination of the relationship between perfectionism and athletic
131 performance in a competitive setting provides ecological validity for any conclusions drawn
132 regarding this relationship.

133 We adopt the position that evaluative- or interpersonally-based competitive failure is
134 important because it has the potential to send a salient message to perfectionistic athletes that
135 they are flawed relative to other people in the social/competitive environment and that they are
136 failing to achieve their lofty performance standards. Individuals with higher PS and PC are
137 hypersensitive to failure and are driven to avoid public displays of personal imperfection or
138 personal inadequacy (Flett & Hewitt, 2016). Thus, conditions involving interpersonally-based
139 evaluative failure in competition should be particularly threatening to the sense of self and
140 personal identity of these individuals (Hewitt, Flett, & Mikail, 2017). In turn, this threat may
141 result in what Flett and Hewitt (2016) have described as perfectionistic reactivity. Responses

142 such as anger, dejection, mistake rumination (overthinking past or anticipated mistakes), social
143 comparison rumination (excessive attention to the status or performance of competitors),
144 avoidance behaviors, and poorer performance are examples of such reactivity (Flett & Hewitt,
145 2005, 2016).

146 In regards to the second issue, only two studies have examined the perfectionism-
147 performance relationship in athletic/sport contexts under conditions of personal failure. Anshel
148 and Mansouri (2005) provided self-referenced false-failure feedback (“You are failing to reach
149 your previous best”) to participants on a stabilometer balancing task and measured subsequent
150 performance. Results indicated that higher perfectionistic strivings (personal standards) and
151 higher perfectionistic concerns (concern over mistakes, doubts about actions, and parental
152 expectations) corresponded with lower performance (i.e., less time) on the balancing task
153 following failure. Hill et al. (2011) provided similar self-referenced false-failure feedback to
154 student-athletes who were engaged in a series of maximal-effort 6-minute cycling ergometer
155 time-trials. Unlike Anshel and Mansouri’s findings, Hill et al. found no link between
156 perfectionism (i.e., self-oriented perfectionism) and performance following failure and noted
157 only changes in self-report measures (e.g., effort and perceived threat). Given that both studies
158 employed intra-personal self-referenced or self-comparison performance tasks, the degree to
159 which perfectionism is associated with athletic performance under conditions of competitive
160 failure remains unexamined in sport.

161 In regards to the third issue, almost every study that has examined the perfectionism-
162 performance relationship in athletic/sport settings—with the notable exception of Stoll et al.
163 (2008)—has focused upon the independent relationships of strivings and concerns with
164 performance. This leaves an important gap in the literature because perfectionistic strivings and
165 perfectionistic concerns coexist in athletes and are theorized to work in conjunction with each

166 other to impact performance (Dunn et al., 2019). This proposition is supported in Stoll et al.'s
167 investigation of perfectionism and performance in a series of basketball shooting tasks where
168 strivings and concerns interacted to predict shooting performance. Specifically, high strivings
169 combined with high concerns corresponded with the greatest performance increments/
170 improvements, and high strivings combined with low concerns corresponded with the smallest
171 performance increments. Stoll et al. noted that their findings were unexpected and difficult to
172 explain, especially when considered in the context of existing research indicating that heightened
173 perfectionistic concerns is largely associated with maladaptive processes and outcomes in sport
174 (see Hill et al., 2018). Clearly more research is needed to examine the potential interaction effect
175 of perfectionistic strivings and perfectionistic concerns on athletic performance.

176 **Present Study**

177 In consideration of the aforementioned issues, the purpose of this study was to examine
178 the interaction of athletes' perfectionistic strivings and perfectionistic concerns in predicting
179 (golf putting) performance following competitive failure. Based on current research examining
180 perfectionism and performance, we hypothesised that the relationship between perfectionistic
181 strivings and performance following competitive failure would depend on levels of
182 perfectionistic concerns. We specifically hypothesised that in the context of lower perfectionistic
183 concerns, perfectionistic strivings would be associated with better performance, and in the
184 context of higher perfectionistic concerns, perfectionistic strivings would be associated with
185 poorer performance.

186 **Method**

187 **Participants**

188 Forty-seven male and 52 female intercollegiate varsity athletes ($N = 99$; M age = 20.51
189 years, $SD = 1.79$) from a large Canadian university participated in the study (M varsity sport

190 experience = 2.51 years, $SD = 1.79$). Thirty-seven athletes competed in individual sports and 62
191 competed in team sports at the intercollegiate level.

192 After receiving approval from the institutional research ethics board, participation was
193 solicited by the principal investigator at team meetings scheduled throughout the academic year
194 and through the support of the university athletic board—a student-athlete body that had
195 representation across varsity sports at the university. During recruitment, participants were
196 informed that the study would examine psychological factors associated with performance in
197 competition and that participation would require athletes to compete against a matched-ability
198 opponent. Participants were also informed that the winner of each individual competition would
199 receive a \$5 gift certificate to a local food outlet and the overall winner of each ‘matched-ability
200 bracket’ (described below) would further receive a \$25 gift certificate to the same food outlet
201 when all data collection for the entire study was completed.

202 Athletes signed up for the study using an online application that required them to (a)
203 select a date and time when they could participate, and (b) indicate their golf ability level to
204 ensure they would compete against a matched-ability opponent. Participants rated their ability in
205 one of five performance categories; each category included a ‘lay description’ of a person’s golf
206 ability (ranging from “novice” to “very high proficiency”) and a ‘handicap’ range (where a lower
207 handicap is indicative of superior golf performance).² Fifty-three athletes identified their golf
208 ability as ‘novice’ (i.e., golfed less than 10 times in their lives), 19 identified as ‘low proficiency’
209 (i.e., golf handicap range 31-40), 15 identified as ‘moderate proficiency’ (i.e., golf handicap
210 range 21-30), 7 identified as ‘high proficiency’ (i.e., golf handicap range 11-20), and 5 identified
211 as ‘very high proficiency’ (i.e., golf handicap ≤ 10). Given that the study was presented as a

² For readers who wish a more detailed overview of the World Handicap System (WHS) that is used in the game of golf, the following website is recommended: <https://www.whs.com/>

212 competition among varsity athletes at the university, the only inclusion criterion was that
213 participants had to be on the current roster of a varsity sport team at the institution where the
214 study was being conducted. All participants were treated in accordance with the ethical
215 guidelines of the American Psychological Association (APA, 2010) and written informed
216 consent was obtained from all participants prior to commencing the study protocols in the
217 laboratory.

218 **Task Procedures and Laboratory Description**

219 The putting task required two athletes to simultaneously compete against one another
220 over two ten-putt trials in a laboratory that had two green synthetic-carpet putting surfaces on the
221 floor. The two putting surfaces (2.6 m wide x 9.2 m long; stimpmeter reading = 11.90) were
222 separated by a curtain (see Figure 1) that allowed competitors to see each other's putting strokes
223 but not the final outcome of each putt. On each surface, five starting points were marked at
224 distances of 3.2, 3.8, 4.4, 5.0, and 5.6 m from the centre of a flat target ('hole') that was clearly
225 marked by a small circular piece of tape at the opposite end of the surface. A space of 2.8 m of
226 putting surface remained beyond the hole. The objective of the task was to putt each ball such
227 that it stopped as close as possible to the centre of the target when it came to rest. Given that the
228 ball could pass directly over the target on the putting surface, the task was to stop the ball as
229 close to the target as possible rather than making the ball 'drop into a hole' as is typically the
230 objective in golf. In golf parlance, this is often referred to as 'dead weight putting.' Participants
231 were informed that the winner would be determined by which athlete achieved the smallest
232 cumulative straight-line distance from the centre of the target across the two trials.

233 The two competitors arrived at the laboratory at the designated time and were greeted by
234 two researchers. Unbeknown to the participant, the matched-ability opponent was a research
235 confederate. After everyone had been introduced and a brief overview of the competitive task

236 had been provided (including a reminder that the opponent was of similar ability and that a gift
237 certificate was to be awarded to the winner) the two competitors were directed towards tables
238 and chairs at the far end of their respective sides of the curtain (see Figure 1) and instructed to
239 complete a brief demographic questionnaire and a self-report measure of perfectionism (see
240 Measures section). Each competitor was then given the option to select an identical left- or right-
241 handed (90 cm Lynx Black Cat) putter and was asked to take two practice putts from the furthest
242 and closest distance. After taking the practice putts, the two competitors returned to their
243 respective tables and completed a self-report measure of cognitive state anxiety, state optimism,
244 and perceived threat (see Measures section). Both competitors simultaneously commenced with
245 Trial 1 (T1) by putting ten balls from the same series of starting points that had been specified by
246 the researchers. The distance that each putt finished from the center of the target was recorded,
247 after which the ball was removed from the putting surface before the next putt was taken.

248 After completing T1, participants saw the two researchers conferring about the scores of
249 the two competitors. The participant and confederate were then invited to the front of the
250 laboratory where the participant was provided with false-failure feedback indicating that his/her
251 total distance score (reported in centimeters) was 17% worse (i.e., higher) than the confederate's
252 score. The 'true' cumulative distance for the first ten putts of the participant and the 'fake'
253 cumulative distance for the confederate were written on a whiteboard located at the front of the
254 laboratory where both competitors could see the two scores during the second trial. The
255 participant and confederate returned to the back of the laboratory where they again completed the
256 measure of cognitive state anxiety, state optimism, and perceived threat before commencing with
257 the next ten putts for T2.

258 Although there was no specific theoretical basis for choosing the value of 17% as the
259 performance deficit, we felt this value would convey the message to participants that they were

260 losing the competition (thereby increasing the degree of threat/stress) but there was still a
261 reasonable opportunity to overcome the deficit in the second round of putting. We did not want
262 to create a sense of hopelessness by using a very large deficit nor did we want to use a very small
263 deficit where participants would not feel much threat to their goal of winning the competition.
264 We also wanted to create a performance deficit that ‘felt real’ to participants. A very small
265 deficit for athletes who felt they were performing poorly may jeopardize internal validity, and a
266 very large deficit for people who felt they were performing well could also threaten internal
267 validity. Finally, we chose the value of 17% because it is not an ‘intuitively obvious/simple’
268 value. We considered this important because we were wary of the potential for participants to
269 talk about their experiences with other teammates who might participate in the study and
270 therefore avoided ‘intuitively simple’ values such as 10% or 20% or 50%.

271 Upon completion of T2, the participant and confederate were invited to the front of the
272 laboratory where they were given their respective cumulative scores for the two trials and a
273 winner was identified. In anticipation that participants might talk to their fellow varsity athletes
274 (i.e., future participants) about their experiences in the study, an attempt was made to further
275 protect the illusion of competition by randomly selecting approximately half of the participants
276 as winners and the other half as losers. Each winner was handed a \$5 gift card and both
277 competitors were thanked for their participation. At the end of the school year when all data had
278 been collected, every participant was informed by email of the deception that had occurred.
279 Participants who had initially been informed that they lost their competition were invited to
280 collect a \$5 gift card and the actual winners of the five matched-ability brackets (i.e., lowest
281 cumulative putting distance across the two trials) were awarded their \$25 gift certificates.

282 **Measures**

283 **Perfectionism.** A domain-specific measure of perfectionism that combined items from

284 the Sport-Multidimensional Perfectionism Scale-2 (Sport-MPS-2; Gotwals & Dunn, 2009) and
285 the Multidimensional Inventory of Perfectionism in Sport (MIPS; Stoeber, Otto, & Stoll, 2006)
286 was used to assess participants' perfectionistic strivings and perfectionistic concerns in sport.
287 Stoeber and Madigan (2016) argue that because "perfectionistic strivings and perfectionistic
288 concerns are broad, higher-order dimensions that cannot be fully captured with single indicators
289 [i.e., subscales]" (p. 48), a greater coverage of the breadth of the two dimensions is most likely to
290 be achieved when multiple subscales/indicators are used to measure each dimension (also see
291 Dunn et al., 2016). To this end, we measured (a) perfectionistic strivings with the seven items
292 from the Personal Standards subscale of the Sport-MPS-2 and five items from the Striving for
293 Perfection subscale of the MIPS, and (b) perfectionistic concerns with the eight items from the
294 Concern Over Mistakes subscale of the Sport-MPS-2 and five items from the Negative Reactions
295 to Imperfection subscale of the MIPS. This follows the same procedures that have been used in
296 previous investigations of athletes' perfectionist tendencies in sport (e.g., Lizmore et al., 2017;
297 Madigan, Stoeber, Culley, et al., 2018; Madigan, Stoeber, Forsdyke, Dayson, & Passfield, 2018;
298 Rasquinha, Dunn, & Causgrove Dunn, 2014).

299 In previous studies that have used the aforementioned combination of items/subscales to
300 measure perfectionistic strivings and perfectionistic concerns in athletes, the sets of items within
301 the respective composite subscales have demonstrated excellent internal/factorial validity (see
302 Lizmore et al., 2017; Rasquinha et al., 2014) and acceptable levels of internal consistency (i.e.,
303 all $\alpha \geq .70$: see Lizmore et al., 2017; Madigan, Stoeber, Culley, et al., 2018; Madigan, Stoeber,
304 Forsdyke, et al., 2018; Rasquinha et al., 2014). Respondents rated items on a 5-point scale (1 =
305 *strongly disagree*; 5 = *strongly agree*). Composite subscale scores were averaged (i.e., returned
306 to the 5-point scale) with higher composite subscale scores reflecting higher levels of
307 perfectionistic strivings and perfectionistic concerns in sport.

308 **Pre-performance cognitions/perceptions.** To determine the success/validity of the
309 failure manipulation—with success being evident if participants experienced elevated stress
310 levels following the false-failure feedback—self-report measures of cognitive state anxiety, state
311 optimism, and perceived threat were taken. These variables were selected because they have all
312 been linked with stress-related responses of athletes in competitive sport (see Raab et al., 2016).
313 The three constructs were measured by single-item indicators using the same item-response
314 format contained within Krane’s (1994) Mental Readiness Form (MRF).

315 Participants were instructed to consider how they “currently feel about this competition”
316 and to use three separate 11-point semantic differential scales to rate their immediate levels of
317 cognitive anxiety (“Right now my thoughts are...” [1 = *not at all worried*; 11 = *very worried*]),
318 optimism (“Right now I am feeling...” [1 = *not at all optimistic*; 11 = *very optimistic*]), and
319 perceived threat (“Right now I find this situation...” [1 = *not at all threatening*; 11 = *very*
320 *threatening*]). The MRF and corresponding 11-point response format have been used
321 successfully in studies (e.g., Cox, Russell, & Robb, 1999; Duncan et al., 2016) to measure
322 cognitive anxiety, somatic anxiety, and state confidence in athletes immediately prior to
323 competition. Concurrent validity evidence supporting the use of the cognitive anxiety item of the
324 MRF was provided by Krane (1994) using a sample of 116 intercollegiate (cross country)
325 athletes.

326 Krane (1994) reported that the cognitive anxiety item of the MRF (using the 11-point
327 response format) had a strong positive correlation ($r = .76, p < .01$) with the cognitive anxiety
328 subscale of the Competitive State Anxiety Inventory-2 (CSAI-2; Martens, Burton, Vealey,
329 Bump, & Smith, 1990), a strong negative correlation ($r = -.52, p < .01$) with the state confidence
330 subscale of the CSAI-2, and a moderate positive correlation ($r = .35, p < .05$) with the
331 concentration disruption subscale of the Sport Anxiety Scale (SAS; Smith, Smoll, & Schutz,

1990). The single-item Likert-type response format of the MRF is recommended for use when “expediency is an important concern” for researchers and participants (Krane, 1994, p. 189).³

Performance. Putting performance was assessed by the cumulative straight-line distance that the putts in each trial deviated from the centre of the target. Measurements for each putt were taken to the nearest millimetre using a laser measuring device (Bosch GLM 15). Lower distances were indicative of better (i.e., more accurate) putting performance.

Analytic strategy. The relationship between perfectionism and putting performance following failure was examined using moderated hierarchical regression. Trial 2 (T2) putting performance was the dependent variable. Trial 1 (T1) putting performance was entered in the first predictor block, and the two dimensions of perfectionism were added in the second predictor block. In order to examine the moderation effect of perfectionistic strivings and perfectionistic concerns on putting performance under conditions of failure, a third (and final) predictor block was assessed that included all variables and an interaction term (PS*PC). PS and PC were mean-centred prior to the analyses. The Johnson-Neyman (J-N) technique was used to probe significant interactions (see Bauer & Curran, 2005). This technique identifies regions in which the effect of X (perfectionistic strivings) on Y (putting performance following failure) is statistically significant ($p < .05$) based on scores on Z (perfectionistic concerns). All analyses were conducted using SPSS (version 24) and PROCESS macro (version 2.6).

350

Results

³ The single-item measures of threat and optimism are not contained in the original MRF. As such, there is no previously established validity evidence supporting their use. We therefore examined the size and direction of the correlations between the three items using the current data. Cognitive anxiety was positively correlated with threat ($r = .68, p < .001$) and negatively correlated with optimism ($r = -.34, p < .001$) at the pre-manipulation period, and positively correlated with threat ($r = .61, p < .001$) and negatively correlated with optimism ($r = -.14, p = .20$) at the post-manipulation period. Threat was negatively correlated with optimism at the pre- ($r = -.34, p < .001$) and post manipulation periods ($r = -.16, p = .12$). Although two of the correlations were not statistically significant, all six correlations were in the expected directions, thereby providing initial validity evidence supporting the use of the three items to assess the success of the failure manipulation.

351 **Preliminary Data Analysis**

352 Only two missing data points were obtained from a total of 3,069 items (i.e., missing data
353 response rate = 0.07%) on the self-report measures. The two missing data points (on separate
354 perfectionism items) were replaced with intra-individual mean-item scores calculated from each
355 respondent's scores on the other items from the corresponding perfectionism subscale (see
356 Graham, Cumsille, & Elek-Fisk, 2003). The perfectionistic strivings ($\alpha = .84$) and perfectionistic
357 concerns ($\alpha = .86$) subscales both had acceptable levels of internal consistency.

358 Of the five participants who self-identified as 'very high proficiency' golfers (i.e., golf
359 handicaps ≤ 10) three indicated that they were also members of the varsity golf team. Moreover,
360 the five high-proficiency athletes reported playing an average of 57 rounds of golf each year (SD
361 = 28.20) in comparison to the participants from the other four ability levels who reported an
362 average of 4.14 rounds per year ($SD = 9.10$). Given the small number of athletes comprising the
363 'very high proficiency' group, their competitive experience, and the degree to which their annual
364 rates of play differed from the rest of the sample, the data from these five athletes were excluded
365 from the analyses. The final sample contained 42 male and 52 female participants. Data were
366 combined across gender into a single data set given that the covariance matrices for males and
367 females (for T1 performance, T2 performance, strivings, and concerns) were deemed
368 homogeneous: Box's $M = 6.758$, $F(10, 36489.72)$, $p = .777$. Table 1 contains the descriptive
369 statistics (i.e., means, standard deviations, and bivariate correlations [r]) for perfectionistic
370 strivings, perfectionistic concerns, T1 putting performance, and T2 putting performance.

371 **Manipulation check.** To determine if the provision of the false-failure feedback after T1
372 was successful in creating conditions of perceived competitive failure—as would be evident if
373 participants reported elevated levels of stress—a repeated-measures MANOVA was conducted
374 to examine differences in pre-task cognitive anxiety, state optimism, and perceived threat

375 between T1 (i.e., prior to the first ten putts) and T2 (i.e., after the false-failure feedback). A
376 statistically significant multivariate within-subjects test statistic was obtained: Wilks' $\Lambda = .802$,
377 $F(3, 91) = 7.482, p < .001$, partial $\eta^2 = .198$. Follow-up univariate F -tests revealed statistically
378 significant differences for cognitive anxiety ($F[1, 93] = 6.373, p < .05$), state optimism ($F[1,$
379 $93] = 14.719, p < .001$), and perceived threat ($F[1, 93] = 12.295, p < .001$). More specifically,
380 following the false-failure feedback, participants reported higher cognitive state anxiety ($M_{T2} =$
381 $5.18, SD_{T2} = 2.33; M_{T1} = 4.56, SD_{T1} = 2.39$), lower state optimism ($M_{T2} = 5.85, SD_{T2} = 2.24; M_{T1}$
382 $= 6.52, SD_{T1} = 2.19$), and higher perceived threat ($M_{T2} = 3.84, SD_{T2} = 2.41; M_{T1} = 3.19, SD_{T1} =$
383 2.24) in comparison to T1. Although the corresponding effect sizes (Cohen's [1977] d for
384 dependent means) were relatively small—cognitive anxiety ($d = .26$), state optimism ($d = .40$),
385 and perceived threat ($d = .32$)—the direction and magnitude of the changes in scores on each
386 variable do suggest that participants, on average, experienced the putting task as a competitive
387 event in which failure had occurred.

388 **Predicting Putting Performance**

389 Prior to conducting the regression analysis, data were screened for the presence of
390 univariate and multivariate outliers. Standardized z -scores were computed for all variables
391 contained in the analysis. Only two scores were identified as possible univariate outliers ($z_1 =$
392 3.63 and $z_2 = 3.85$) using the criterion of $z > |3.29|$ as a potential lower boundary (see Tabachnick
393 & Fidell, 1996). However, these two scores did not qualify as univariate outliers when Stevens'
394 (1992) criterion of $z > |4|$ was applied (also see Hair, Anderson, Tatham, & Black, 1998). Given
395 that all subsequent Cook's distances were small (i.e., $\leq .061$)—indicating that the removal of any
396 individual case would not have a major influence on the regression results—and the two cases
397 may or may not qualify as potential univariate outliers (depending upon the criterion applied for
398 this purpose), scores from all 94 participants were included in the regression analysis. No

399 multivariate outliers were present in the data (i.e., all individuals had a Mahalanobis distance less
 400 than $\chi^2 [4]_{\text{critical}} = 18.467, p < .001$). No concerns regarding multicollinearity were identified (see
 401 Tabachnick & Fidell, 1996) given that all bivariate correlations among predictor variables in
 402 each analysis were $\leq |.59|$ and all Variance Inflation Factors (VIFs) were ≤ 2.001 .

403 Multiple regression analysis revealed that T1 putting performance significantly predicted
 404 T2 putting performance: $R^2 = .35, F(1, 92) = 48.57, p < .001, B = 0.44, p < .001$. Adding PS and
 405 PC in the second block of the analysis did not significantly improve the predictive ability of the
 406 model, $R^2 = .36, F(3, 90) = 16.92, p < .001, R^2 \text{ change} = .02, F \text{ change}(1, 90) = 1.06, p = .351$.
 407 Neither PS nor PC was a significant predictor of T2 performance after controlling for T1
 408 performance: PS ($B = -50.22, p = .189$), PC ($B = -1.07, p = .973$). Adding the interaction term
 409 (PS*PC) revealed that there was a significant interaction when predicting T2 putting
 410 performance (after controlling for T1 performance): $R^2 = .42, F(4, 89) = 15.87, p < .001, R^2$
 411 $\text{change due to interaction} = .06$ and $f^2 = .10, F \text{ change}(1, 89) = 8.54, p = .004, B = 135.57, p$
 412 $= .004$. The interaction term indicates that as PC increases by one unit, the effect of PS on
 413 performance after failure increases by 135.57 cm (i.e., putts get further away from the target).
 414 The results of these analyses are shown in Table 2.

415 The J-N technique provided additional information regarding the interaction and
 416 indicated that the conditional effect of PS on putting performance was statistically significant (p
 417 $< .05$) when PC was ≤ 2.80 , and statistically significant when PC was ≥ 4.53 (i.e., the conditional
 418 effect was not statistically significant in between these values). In addition, the conditional effect
 419 of PS when PC was ≤ 2.80 ($n = 40$) corresponded to better following failure and the conditional
 420 effect of PS when PC was ≥ 4.53 ($n = 1$) corresponded to worse performance following failure.
 421 This latter finding requires a note of caution, however, as only one case in the sample exceeded
 422 this value (1.06% coverage). The results of this analysis are depicted in Figure 2.

423

Discussion

424 The purpose of this study was to examine the interaction of athletes' perfectionistic
425 strivings and perfectionistic concerns in predicting (golf putting) performance following
426 competitive failure. We hypothesised that in the context of lower perfectionistic concerns,
427 perfectionistic strivings would be associated with better performance (i.e., less deviation from
428 the target) and in the context of higher perfectionistic concerns, perfectionistic strivings would be
429 associated with poorer performance (i.e., greater deviation from the target). Our analyses
430 provided support for this hypothesis.

431 **Perfectionism and Competitive Performance**

432 In comparing our findings to the only other study that has examined the relationship
433 between perfectionism and performance in a competitive sport setting (i.e., Stoeber et al., 2009),
434 we note some similarities and differences in findings. Similar to Stoeber et al. (2009), at the
435 bivariate level, higher perfectionistic strivings was related to better performance (at T1 and T2)
436 and perfectionistic concerns was unrelated to performance (here golf-putting as opposed to
437 triathlon-race performance). However, unlike Stoeber et al. we did not find that perfectionistic
438 strivings uniquely predicted subsequent performance when controlling for previous
439 performances. That is, Stoeber et al. found that perfectionistic strivings predicted race
440 performance after controlling for season-best and/or personal-best performances (and
441 perfectionistic concerns), whereas we did not find that strivings predicted putting performance
442 after controlling for previous performance (and perfectionistic concerns). In explaining this
443 difference, it is possible that the association between perfectionistic strivings and performance in
444 competition is evident for performance generally, but is absent following competitive failure. In
445 other words, in terms of unique effects, perfectionistic strivings may initially provide a
446 motivational or energizing force for athletes pursuing lofty performance standards in competitive

447 settings, but these benefits may be lost when athletes realise that their performance goals—which
448 include victory over opponents—are in jeopardy.

449 As to why this might be the case, Hall (2016) proposed that when athletes who have
450 higher perfectionistic strivings experience failure or performance difficulties in competition, they
451 may be more likely to call their competence into question. In Hill et al.'s (2011) study of
452 athletes' cycling-ergometer performance following false-failure feedback, athletes high in self-
453 oriented perfectionism (i.e., a facet of perfectionistic strivings) experienced higher levels of
454 threat and reportedly withdrew effort to a greater degree in the trials following failure than
455 athletes who had low self-oriented perfectionism. Hill et al. speculated that more threat is
456 experienced and more effort withdrawn by those higher in self-oriented perfectionism because
457 these individuals may have adopted an irrationally important view of the need to achieve their
458 high personal performance standards. Under conditions of failure, such individuals may become
459 vulnerable to exaggerating the negative consequences of their perceived failure, question their
460 level of competence, and subsequently reduce effort accordingly.

461 An alternative explanation as to why heightened perfectionistic strivings may not have
462 performance benefits following failure surrounds the fact that the valued goal of attaining high
463 personal performance standards has been blocked. This thwarting of a personally meaningful
464 goal may lead to a form of cognitive interference. In this instance, cognitive interference could
465 occur when performers turn their attention away from the task at hand and redirect their attention
466 inwardly towards judgements of personal inadequacy and the possible harm that their
467 underachievement (i.e., failure) may inflict upon their performance-contingent self-worth (Blatt,
468 1995). Turning attention away from the task at hand is, of course, likely to do little to aid athlete
469 performance in competitive sport settings (Gotwals, Dunn, Causgrove Dunn, & Gamache, 2010)
470 and may detract from any previous behaviors that the athlete had been employing to aid

471 performance.

472 Drawing on research in sport, we are mindful of the potential roles that performance-
473 approach goals (i.e., a motivational orientation that is generally conducive to better performance
474 in sport: Lochbaum & Gottardy, 2015) and performance-avoidance goals (i.e., a motivational
475 orientation that is generally more detrimental to performance in sport: Lochbaum & Gottardy,
476 2015) might play in initiating various types of perfectionistic reactivity (e.g., reduced effort and
477 reduced concentration) and impacting performance. Specifically, changes in perceived
478 competence (Morris & Kavussanu, 2008) and associated outcome expectancies (Schnelle,
479 Brandstätter, & Knöpfel, 2010) may shift athletes' endorsement from one achievement goal to
480 the other, which in turn can lead to different performance outcomes in competitive sport (see
481 Halvari & Kjörmo, 1999). In addition, Stoeber et al. (2009) found that the degree to which
482 athletes endorsed performance-approach goals relative to performance-avoidance goals
483 explained the relationships between perfectionistic strivings and race performance in triathlon.
484 More research is needed in order to test these proposed mechanisms and to examine how the
485 mindset of perfectionistic athletes may be altered once they experience failure. Regardless of the
486 underlying reasons why strivings and concerns may be linked to performance, the current
487 findings strengthen Flett and Hewitt's (2016) position that "advances in understanding the role of
488 perfectionism in sport...[requires greater] consideration of the contexts that participants find
489 themselves in" (p. 302), particularly when athletes experience failure in competition.

490 **Interaction of Perfectionism and Performance Following Competitive Failure**

491 The unique effects of strivings and concerns on performance were superseded by an
492 interaction effect. The interaction indicated that perfectionistic strivings was associated with
493 comparatively better performance following failure when perfectionistic concerns was lower, but
494 associated with worse performance when perfectionistic concerns was higher. This finding

495 appears consistent with other research in sport that has examined combinations of perfectionistic
496 strivings and perfectionistic concerns in various ways. Much of the work conducted by Dunn and
497 colleagues with athletes has illustrated that a combination of higher perfectionistic strivings with
498 lower perfectionistic concern is associated with an array of comparatively adaptive
499 characteristics/responses including an optimistic challenge-mindset going into competition
500 (Dunn et al., 2019), enhanced concentration (Gotwals et al., 2010), and the use of problem-
501 focussed coping strategies to deal with stressful situations (Dunn, Causgrove Dunn, Gamache, &
502 Holt, 2014). Similarly, Gaudreau and colleagues have found that when comparing subtypes of
503 perfectionism in samples of athletes that include higher perfectionistic strivings and lower or
504 higher perfectionistic concerns, the combination of higher strivings with lower concerns typically
505 corresponds with more adaptive characteristics/responses in sport (e.g., Gaudreau & Verner-
506 Filion, 2012). The interaction effect we found in the current study extends previous research by
507 illustrating how this pattern is also evident for athletic performance following failure in
508 competition.

509 Also in keeping with previous research, the interaction effect provides evidence that as
510 the presence of perfectionistic concerns increased, the positive influence of perfectionistic
511 strivings on performance decreased until it was not statistically significant. Again, there is
512 evidence from other research that shows this is the case for outcomes other than sport
513 performance such as athlete burnout, emotion regulation, and general sporting experiences (Hill,
514 2013; Hill & Davis, 2014; Mallinson, Hill, Hall, & Gotwals, 2014). This finding is in line with
515 the theoretical views of Hall (2016) who proposed that under conditions of perceived failure,
516 “any form of perfectionism which encompasses tendencies for self-critical appraisal [i.e.,
517 heightened perfectionistic concerns] may negatively affect” athletic performance (p. 280: also
518 see Flett & Hewitt, 2016). Importantly, in the current study we identify “a tipping point” for

519 when this is the case and when perfectionistic concerns appear to neutralise the performance
520 benefits of perfectionistic strivings following failure. This tipping point was actually lower than
521 the score that corresponds to the mid-point of the response scale (i.e., 3.0) for perfectionistic
522 concerns and therefore indicates that even lower levels of perfectionistic concerns can be
523 problematic in this regard.

524 Perhaps the most novel aspect of our findings is that we also found tentative evidence
525 that the relationship between perfectionistic strivings and better performance is eventually
526 reversed at higher levels of perfectionistic concerns. The importance of the presence (and relative
527 absence) of perfectionistic concerns, then, is evident not only in terms of cancelling out any
528 performance benefits of perfectionistic strivings, but may also be apparent in terms of triggering
529 psychological processes through which higher perfectionistic strivings becomes problematic for
530 athletes' performance. We speculate that following competitive failure, higher levels of both
531 dimensions of perfectionism may lead to behaviors that would otherwise not be evident at other
532 levels of either dimension. For example, higher levels of concentration disruption, a desire for
533 escape, and heightened competitive anxiety may represent a distinct pattern of perfectionistic
534 reactivity (Flett & Hewitt, 2016) that occurs when performance difficulties are encountered by
535 athletes who exhibit a strong personal commitment to the pursuit of very high personal
536 performance standards that is underpinned by fear, doubt, and concern regarding their
537 performances.

538 **Practical Implications**

539 The current results have potential implications for practitioners (e.g., coaches, sport
540 psychologists, and even parents) who work with athletes in an effort to optimize athletic
541 performance. It seems reasonable to suggest that athletes should be educated about the high
542 likelihood of encountering personal failure, adversity, and performance setbacks in competition,

543 and that such encounters have the potential to increase cognitive anxiety, increase perceived
544 threat, and reduce optimism. Enhancing athlete self-awareness in this regard, and helping
545 athletes to accept that failure and adversity are natural/inevitable (though unwanted) parts of the
546 performance process may mitigate the degree to which athletes—especially those with high
547 perfectionistic concerns—might engage in harsh self-criticism (Hall, 2016) or lose the desire to
548 give maximal effort in pursuit of achieving optimal performance levels (Hill et al., 2011).
549 Enhanced self-awareness and acceptance of personal failure/adversity in athletes has been
550 previously linked to positive growth experiences and the attainment of very high performance
551 standards in competitive sport (see Howells & Fletcher, 2015).

552 The current results also support the need to develop and implement mental-training
553 programs that are geared towards reducing athletes' perfectionistic concerns in sport (Dunn et
554 al., 2019; Gotwals et al., 2012). What is less clear, however, is whether perfectionistic strivings
555 should also be the target of mental-training programs for athletes. Few, if any, coaches or
556 athletes would likely endorse the setting of lower personal performance standards to achieve
557 competitive success in high-performance sport. On this issue, it is worth considering the
558 difference between exceptionally high (but attainable) performance goals and unrealistically high
559 perfectionistic goals, and how differences between the two may be best identified by *what*
560 athletes are trying to achieve, the meaning athletes give to success and failure, and how athletes
561 think and feel about themselves following failure. As noted by Gustafsson and Lundqvist (2016),
562 when sport psychologists work to address potentially destructive perfectionistic tendencies in
563 athletes, it may be best “to emphasize that it is not about lowering standards but...[is more about
564 helping] the client [athlete] broaden his/her understanding of performance and to develop their
565 self-evaluation so it is not totally dependent on [performance-based] achievements” (p. 213). As
566 such, interventions do not necessitate reducing standards, per se. Rather, effective interventions

567 may need to ensure that athletes do not hold onto unrealistic perfectionistic goals that undermine
568 how they deal with setbacks and compromise motivation, wellbeing, and performance over time.

569 **Limitations and Future Directions**

570 Although the current research sheds important light upon relationships between
571 perfectionistic strivings, perfectionistic concerns, and competitive performance under conditions
572 of perceived failure, the study does contain a number of limitations. For example, our study lacks
573 ‘ecological validity’ in the sense that participants were engaged in a laboratory-based
574 competitive scenario (albeit against an opponent). This potentially limits the degree to which our
575 results can be generalized to ‘real-world’ competitive sport contexts where athletes compete in
576 their primary sports and where it seems likely that achieving success (or avoiding failure) would
577 be more highly valued than winning or losing a laboratory-based golf-putting task for a small
578 monetary reward. That being said, we speculate that the interaction effect of strivings and
579 concerns on performance may actually be stronger in a real-world competitive setting where
580 athletes are likely to be more emotionally invested in the potential consequences of failure and
581 the outcome of the competitive event. Given that (a) our sample likely included a mix of
582 participants who placed varying degrees of value/importance on the task, and (b) perceived task-
583 value has been linked to domain-specific perfectionism in sport and academe (see Dunn,
584 Causgrove Dunn, & McDonald, 2012), future research may benefit from assessing the degree to
585 which variations in task value mediate relationships between athletes’ perfectionistic strivings,
586 perfectionistic concerns, and performance in competition.

587 We also acknowledge that it is currently not possible to determine whether our findings
588 would have changed had we used a different value for the proportional performance deficit that
589 was provided to participants (i.e., 17%) through the false-failure feedback. For example, we do
590 not know if the provision of a performance deficit greater than 17% (indicating a larger degree of

591 personal failure) would have created more stress/threat, and in turn potentially magnified the role
592 that heightened perfectionistic concerns had upon performance. We also do not know if a
593 performance deficit less than 17% would have reduced the degree of threat/stress, and in turn,
594 potentially minimised the role that heightened perfectionistic concerns had upon performance.
595 More research is needed to examine the degree to which the magnitude of performance failure
596 during competition may interact with athletes' perfectionistic tendencies to impact performance.

597 Another potential limitation of this study revolves around the fact that we do not know if
598 any form of self-selection bias existed within the sample. More specifically, we do not know if
599 athletes with lower levels of perfectionistic concerns (on average) tended to volunteer for the
600 study while those with higher perfectionistic concerns avoided the study in order to protect their
601 self-concept in the possible event that they performed poorly in the head-to-head competition. If
602 such a self-selection bias did take place, the range of scores on athletes' perfectionistic concerns
603 might be restricted which could attenuate or obfuscate the potential impact of perfectionistic
604 concerns on performance. That being said, the means and standard deviations for strivings and
605 concerns (see Table 1) are similar to those reported in a study with intercollegiate athletes who
606 completed the same measure of perfectionism used in this study (see Rasquinha et al., 2014).

607 Finally, it must be acknowledged that we do not know the extent to which our results can
608 be generalized to different competitive tasks/sports, or to athletes who compete at different levels
609 of competition. For example, it is possible that individual performance may be easier to 'hide' in
610 team-sport settings where social-loafing strategies can be employed by individuals to protect
611 themselves against negative social evaluation and corresponding threats to their self-concept
612 should failure occur (see Vaartstra, Dunn, & Causgrove Dunn, 2018). These opportunities to
613 avoid blame for any potential failure are less available in individual-sport settings. Similarly,
614 previous research has shown that athletes who compete in lower levels of competition may have

615 lower perfectionistic strivings and concerns than athletes who compete in higher levels of
616 competition (see Rasquina et al., 2014). More research is required to determine if the
617 aforementioned factors potentially moderate the relationships between strivings, concerns, and
618 performance in sport.

619 **Conclusion**

620 Despite these limitations, the current study is the first to demonstrate that the presence of
621 higher (versus lower) perfectionistic concerns appears to be a key determining factor in how
622 athletes respond to failure in competition. We thus reiterate our suggestion that practitioners and
623 researchers who are interested in designing and/or implementing mental-training programs to
624 help athletes respond most effectively to failure in competition will be best served if the central
625 focus of such interventions is targeted at reducing athletes' perfectionistic concerns in sport. This
626 is especially emphasized in cases where athletes are already displaying heightened perfectionistic
627 strivings and are engaging with competitive sport environments where performance failures are
628 almost inevitable.

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784 Table 1

785 *Means, Standard Deviations, and Bivariate Correlations for Perfectionistic Strivings, Perfectionistic Concerns, Trial-1 Putting*786 *Performance, and Trial-2 Putting Performance*

| Variables | Perfectionistic strivings ^a | | Perfectionistic concerns ^a | | Trial-1 putting performance ^b | | Trial-2 putting performance ^b | |
|-----------------------------|--|---------------|---------------------------------------|---------------|--|---------------|--|---------------|
| | <i>M</i> | (<i>SD</i>) | <i>M</i> | (<i>SD</i>) | <i>M</i> | (<i>SD</i>) | <i>M</i> | (<i>SD</i>) |
| | | 3.61 | (0.52) | 2.93 | (0.59) | 73.23 | (33.90) | 59.00 |
| Perfectionistic concerns | .41*** | | - | | | | | |
| Trial-1 putting performance | -.30** | | -.11 | | - | | | |
| Trial-2 putting performance | -.29** | | -.12 | | .59*** | | - | |

787

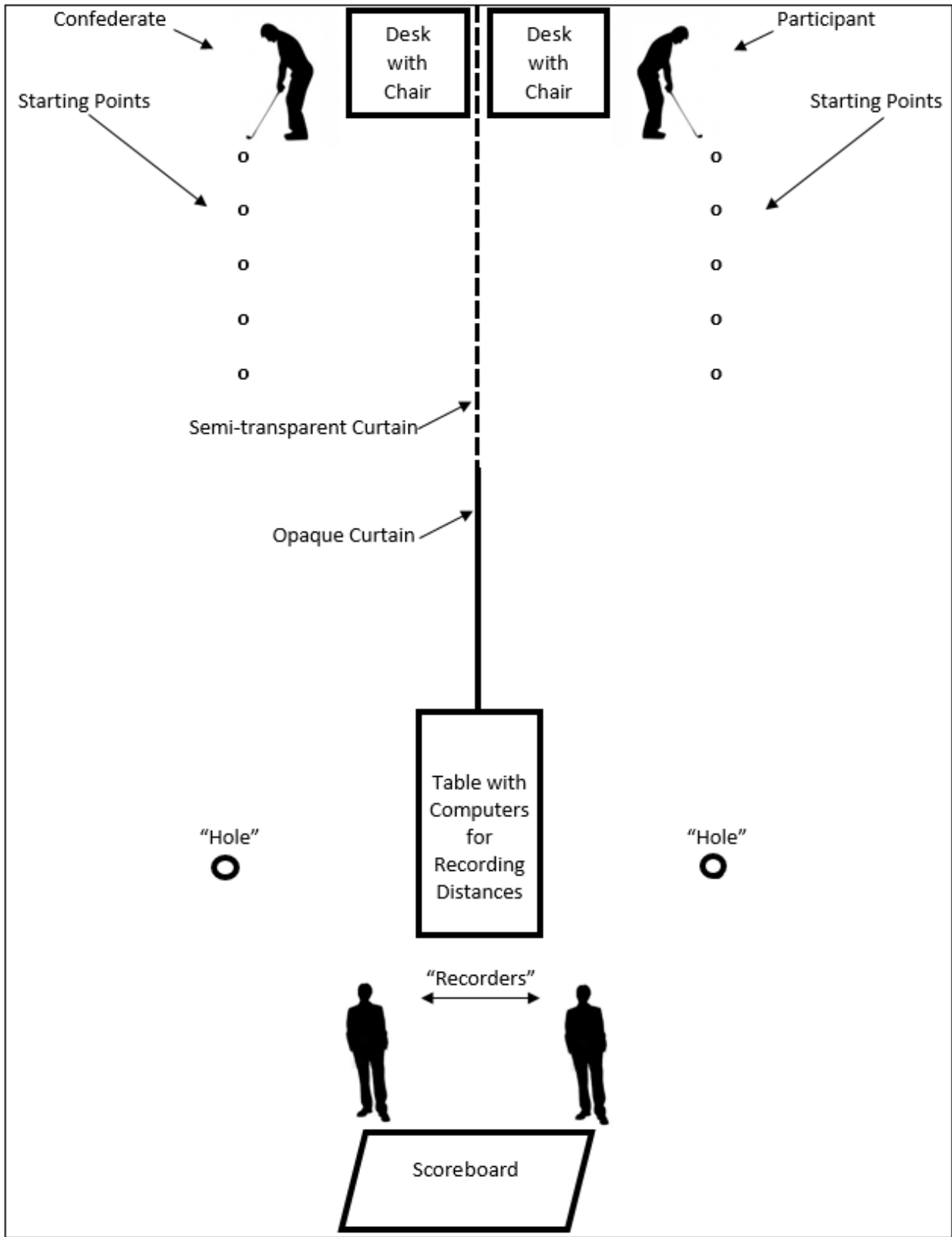
788 *Note.* Correlations (*r*) are contained in the lower triangular matrix.789 ^a Items measured on a 5-point scale.790 ^b Mean distance from target per putt (cm). Lower scores represent better performance.791 ** $p < .01$. *** $p < .001$. ($n = 94$).

792 Table 2

793 *Regression Analysis Predicting Trial-2 Putting Performance Following Failure*

| Predictor variable | R^2 | ΔR^2 | ΔF | B | β | t |
|---------------------|-------|--------------|------------|--------|---------|---------|
| Block 1 | .35 | | 48.57** | | | |
| Trial-1 performance | | | | 0.44 | .59 | 6.97*** |
| Block 2 | .36 | .02 | 1.06 | | | |
| Trial-1 performance | | | | 0.41 | .55 | 6.22*** |
| PS | | | | -50.22 | -.13 | -1.32 |
| PC | | | | -1.07 | -.01 | -0.03 |
| Block 3 | .42 | .06 | 8.54** | | | |
| Trial-1 performance | | | | 0.42 | .57 | 6.64** |
| PS | | | | -48.86 | -.12 | -1.34 |
| PC | | | | -10.69 | -.03 | -0.35 |
| PS*PC | | | | 135.57 | .24 | 2.92*** |

794 *Note.* PS = Perfectionistic strivings; PC = Perfectionistic concerns.795 ** $p < .01$. *** $p < .001$, all two-tailed ($n = 94$).

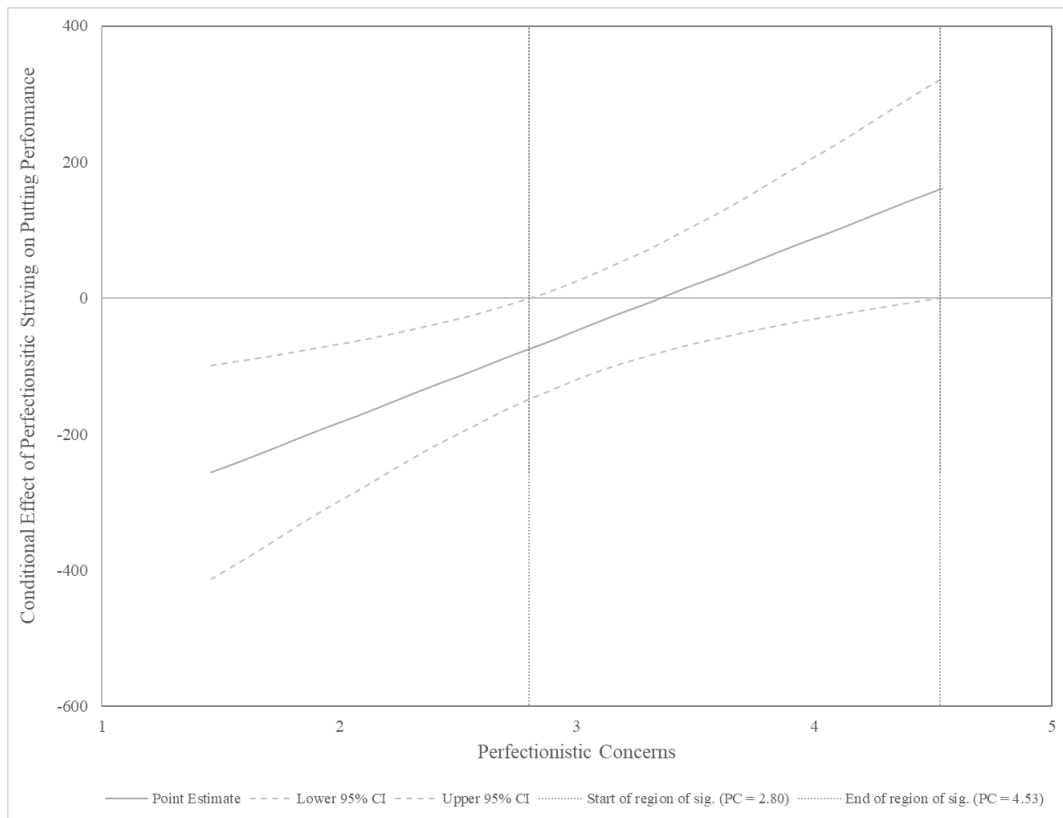


796

797 *Figure 1.* Graphical representation (not to scale) of laboratory set-up.

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801

802 *Figure 2.* Conditional effect of perfectionistic strivings on putting performance following failure
 803 as a function of perfectionistic concerns (y-axis denotes improvement [-] or decrement [+] in
 804 performance following competitive failure)