

Perfectionism and Grit in Competitive Sport

DUNN, John G.H., CORMIER, Danielle L., KONO, Shintaro, CAUSGROVE
DUNN, Janice and RUMBOLD, James <<http://orcid.org/0000-0002-1914-1036>>

Available from Sheffield Hallam University Research Archive (SHURA) at:

<http://shura.shu.ac.uk/28514/>

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

Published version

DUNN, John G.H., CORMIER, Danielle L., KONO, Shintaro, CAUSGROVE DUNN, Janice and RUMBOLD, James (2021). Perfectionism and Grit in Competitive Sport. *Journal of Sport Behavior*, 44 (2).

Copyright and re-use policy

See <http://shura.shu.ac.uk/information.html>

Perfectionism and Grit in Competitive Sport

by

John G. H. Dunn*¹

Shintaro Kono¹

Danielle L. Cormier²

Janice Causgrove Dunn¹

James L. Rumbold³

*Address correspondence to Dr. John Dunn; Faculty of Kinesiology, Sport, and Recreation; 3-100 University Hall, Van Vliet Complex, University of Alberta, Edmonton, Alberta, Canada, T6G 2H9. (Phone: +1-780-492-2831) E-mail: john.dunn@ualberta.ca

¹ Authors are with the Faculty of Kinesiology, Sport, and Recreation at the University of Alberta, Canada.

² Author is with the College of Kinesiology at the University of Saskatchewan, Canada.

³ Author is with the College of Health, Wellbeing and Life Sciences at Sheffield Hallam University, UK.

Accepted for publication: 25th January, 2021

PERFECTIONISM AND GRIT

1 **Abstract**

2 This study investigated the degree to which perfectionistic strivings and perfectionistic concerns
3 were associated with two dimensions of grit—namely, consistency of interests and perseverance
4 of effort—in a sample of 251 intercollegiate varsity athletes ($M_{age} = 20.34$ years, $SD = 2.0$).
5 Perfectionism and grit were both conceptualized and measured as multidimensional domain-
6 specific constructs. Results of structural equation modeling (SEM) analyses revealed that
7 perfectionistic strivings was positively associated with consistency of interests ($\beta = .49, p < .001$)
8 and perseverance of effort ($\beta = .92, p < .001$). In contrast, perfectionistic concerns was
9 negatively associated with both consistency of interests ($\beta = -.47, p < .001$) and perseverance of
10 effort ($\beta = -.66, p < .001$). Results highlight the importance of differentiating between athletes'
11 perfectionistic strivings and perfectionistic concerns in sport, as well as the importance of
12 treating consistency of interests and perseverance of effort as separate components of grit. The
13 results indicate that perfectionistic strivings more closely align with adaptive correlates for
14 athletes in sport whereas perfectionistic concerns more closely align with maladaptive correlates
15 in sport. Future research that examines the combined effects of perfectionism and grit on the
16 achievement-striving process in competitive sport is recommended.

17

18 *Keywords:* Motivation; Nomological network; Personality; Validity

41 accomplishment of very high personal performance standards in sport (Gotwals et al., 2012).
42 *Perfectionistic concerns* represent the degree to which athletes become overly concerned with
43 the possibility and/or consequences of failing to meet these high standards in sport (Gotwals et
44 al., 2012). Research indicates that heightened perfectionistic strivings are often associated with
45 adaptive correlates in sport including superior performance, heightened intrinsic motivation,
46 reduced burnout, enhanced body image, heightened perceived ability, enhanced concentration,
47 and the use of problem-focused coping strategies (Gotwals et al., 2012; Hill, Mallinson-Howard,
48 et al., 2018; Jowett, Mallinson, et al., 2016). In contrast, research indicates that heightened
49 perfectionistic concerns are predominantly associated with maladaptive correlates including
50 reduced performance, heightened amotivation, lower confidence, heightened cognitive anxiety,
51 lower optimism, heightened anger/dejection, lower self-esteem, and heightened rumination
52 (Gotwals et al., 2012; Hill, Mallinson-Howard, et al., 2018; Jowett, Mallinson, et al., 2016). The
53 fact that strivings and concerns tend to show quite different patterns of relationships with
54 adaptive and maladaptive correlates in sport has led some researchers to refer to perfectionism as
55 a dual-effect characteristic (MacNamara & Collins, 2015) or a double-edged sword (Stoeber,
56 2014).

57 Although there is a high degree of agreement among researchers that heightened
58 perfectionistic concerns are predominantly maladaptive in sport (see Gotwals et al., 2012; Hill,
59 Mallinson-Howard, et al., 2018; Jowett, Mallinson, et al., 2016), theorists continue to debate
60 whether perfectionistic strivings should be viewed as having adaptive or maladaptive qualities.
61 Some researchers have consistently espoused the view that heightened perfectionistic strivings
62 play adaptive roles in sport (Stoeber, 2011, 2012, 2014)—particularly when the overlap with
63 perfectionistic concerns is controlled (Gotwals et al., 2012) or when high strivings are
64 accompanied by low concerns (Dunn et al., 2020; Lizmore et al., 2016). In contrast, other

65 researchers have consistently adopted the position that heightened strivings are largely
66 destructive or harmful to athletes in sport (Flett & Hewitt, 2005, 2014; Hall, 2006, 2016).

67 This adaptive versus maladaptive debate among perfectionism researchers has been
68 fueled, in part, by the fact that positive relationships have also been found between facets of
69 perfectionistic strivings and criterion variables that are viewed as having largely maladaptive
70 consequences for athletes in sport. These correlates have included mastery-avoidance goals,
71 external regulation, fear of failure, and self-criticism (Gotwals et al., 2012; Hill, Mallinson-
72 Howard, et al., 2018). Such findings have led some theorists to propose that the role of
73 perfectionistic strivings in sport is, at best, “ambiguous: perhaps beneficial [for the athlete]
74 ...some of the time, but most likely bad for the athlete most of the time” (Hill, Madigan, Smith,
75 et al., 2020, p. 411). To shed more light on this debate, the present study examined associations
76 between perfectionistic strivings (and perfectionistic concerns) and grit—a construct that has
77 received little attention from perfectionism researchers but has been predominantly linked to
78 adaptive functioning in sport and non-sport settings.

79 **Grit**

80 Grit is conceptualized as a multidimensional personality disposition that captures the
81 degree to which people maintain interest and focus on an important goal (or goals) over long
82 periods of time—labelled *consistency of interests*—and the degree to which people persevere
83 towards accomplishing these goals despite adversity, failure, and boredom—labelled
84 *perseverance of effort* (Duckworth et al., 2007). With very few exceptions (see Anestis & Selby,
85 2015; Lucas et al., 2015), research indicates that grit is predominantly associated with adaptive
86 characteristics and outcomes in a variety of achievement contexts. For example, heightened grit
87 has been associated with heightened self-regulation and achievement in military cadets (Kelly et
88 al., 2014), heightened academic achievement in high school students (Muenks et al., 2017),

89 increased use of deliberate practice in children competing in national spelling competitions
90 (Duckworth et al., 2011), heightened emotional intelligence in undergraduate students (Maddi et
91 al., 2013), higher optimism in school teachers (Duckworth et al., 2009), reduced procrastination
92 in university students (Wolters & Hussain, 2015), and lower burnout levels in medical residents
93 (Salles et al., 2014).

94 Studies with athletes also show that grit is predominantly associated with a range of
95 adaptive characteristics and behaviors in sport. For example, Toering and Jordet (2015) reported
96 that grit was positively associated with self-restraint and impulse control in elite Norwegian
97 soccer players. Significant positive correlations between grit and sport engagement were found
98 in competitive wheelchair basketball players (Atkinson & Martin, 2020; Martin et al., 2015), and
99 between grit and perceived readiness for competition, self-efficacy, and optimism in competitive
100 male swimmers (Olefir, 2018). Larkin et al. (2016) reported that elite youth soccer players with
101 higher levels of grit spent significantly more time engaged in soccer-related activities than
102 players who had lower levels of grit. Furthermore, in a study of high-performance adult athletes,
103 Poczwardowski et al. (2014) attributed the successful transition of athletes into a residential
104 Olympic training centre in the United States to heightened levels of grit.

105 Tedesqui and Young (2018) examined links between dimensions of grit (i.e., consistency
106 of interests and perseverance of effort) and deliberate practice (DP) in athletes who competed in
107 a variety of individual and team sports. Results indicated that perseverance of effort was a
108 significant positive predictor of deliberate practice, prompting the authors to conclude that
109 athletes who have higher perseverance of effort may have a “personality advantage to persevere
110 through the highly effortful conditions of DP” (p. 110) that can lead to athletic success. Tedesqui
111 and Young (2018) also demonstrated that higher consistency of interests corresponded with a
112 reduced tendency for athletes to contemplate changing sports or quitting their sport entirely.

113 Gilchrist et al. (2018) proposed that grit should primarily be viewed as an adaptive personality
114 characteristic in sport because it has the potential to “facilitate [athletes’] achievement, retention,
115 and maintenance of effortful behaviors...[underpinning] the number of hours that must be spent
116 developing sport-specific skills” (p. 1).

117 **The Current Study**

118 Why would we expect perfectionistic strivings and perfectionistic concerns to be
119 associated with consistency of interests and perseverance of effort? As noted by Stoeber et al.
120 (2018), “perfectionistic strivings and concerns have different motivational qualities...[and]
121 distinctive motivational footprints” (p. 36); perfectionistic strivings reflect predominantly
122 approach-oriented motivational tendencies whereas perfectionistic concerns reflect
123 predominantly avoidance-oriented motivational tendencies (Stoeber et al., 2018). In the same
124 way, at the heart of grit (i.e., consistency of interests and perseverance of effort) lies approach-
125 oriented motivational and action tendencies that sustain and drive individuals in their efforts
126 towards accomplishing valued long-term goals despite setbacks and adversity (Chen et al., 2018;
127 Duckworth & Gross, 2014).

128 Given that the pursuit of high performance standards is a defining characteristic of
129 perfectionistic strivings, and the degree to which people stay focused on the pursuit of personally
130 meaningful goals is an essential feature of grit, it seems reasonable to anticipate that higher
131 perfectionistic strivings would correspond with higher levels of grit (see Houston et al., 2020).
132 On theoretical and practical grounds, it would be both counterintuitive and counterproductive for
133 athletes who are driven to attain very high standards of personal performance in sport (i.e., high
134 perfectionistic strivings) to have an accompanying motivational disposition that would likely
135 impede their efforts to attain these lofty performance goals (i.e., low grit). We hypothesized that
136 perfectionistic strivings would be positively associated with consistency of interests and

137 perseverance of effort in sport. If results confirm these hypotheses, support for the adaptive
138 potential of perfectionistic strivings would be evident.

139 The tendency to worry about the possibility and consequences of personal failure is a
140 defining characteristic of heightened perfectionistic concerns. Any display of personal failure is
141 particularly threatening to athletes who have high perfectionistic concerns, because failure in
142 competition (or training) publicly conveys a lack of personal competence that, in turn, can
143 threaten athletes' identity and self-worth (Flett & Hewitt, 2016). Research has also shown that
144 athletes with heightened perfectionistic concerns have a tendency to use avoidance-coping
145 strategies when performance difficulties are encountered (Dunn et al., 2014). Avoiding
146 engagement (or re-engagement) with a stressor that poses the threat of failure can serve to
147 protect the athlete's self-worth by ensuring that more failure and negative social evaluation
148 cannot occur, but may ultimately impede the athlete's ability to function effectively in the
149 presence of the stressor if it is re-encountered.

150 Given that competitive sport is replete with moments where athletes experience personal
151 failure and performance difficulties in practice and competition (Anshel, 2016), and grit
152 represents an individual's propensity for sustained engagement in activities over long periods of
153 time despite obstacles and setbacks (Duckworth et al., 2007), the motivational underpinnings of
154 heightened perfectionistic concerns are theoretically at odds with heightened grit. Moreover, on
155 both theoretical and practical grounds, athletes who are not overly concerned about failure and
156 who are not driven by the need to avoid failure (i.e., low perfectionistic concerns) would almost
157 certainly benefit from a motivational disposition (i.e., high grit) that sustains engagement in the
158 achievement domain over long periods of time (Kelly et al., 2014). We hypothesized that
159 perfectionistic concerns would be negatively associated with consistency of interests and
160 perseverance of effort in sport. If results confirm these hypotheses, support for the maladaptive

161 potential of perfectionistic concerns would be evident.

162 We are aware of only one study that has provided evidence linking perfectionism and grit
163 in athletes. Fawver et al. (2020) examined perfectionism and grit in a sample of 169 youth alpine
164 skiers. Perfectionism was assessed with an established self-report measure of perfectionism in
165 sport—the Sport-Multidimensional Perfectionism Scale-2 (Sport-MPS-2; Gotwals & Dunn,
166 2009)—and grit was assessed using Duckworth et al.’s (2007) Grit Scale. Small-to-medium
167 positive correlations were found between the *personal standards* (PS) and *organization* (ORG)
168 subscales of the Sport-MPS-2 and a composite grit score ($r_s = .15$ and $.32$ respectively). In
169 contrast, small-to-medium negative correlations were found between the *concern over mistakes*
170 (COM), *doubts about actions* (DAA), *perceived parental pressure* (PPP), and *perceived coach*
171 *pressure* (PCP) subscales of the Sport-MPS-2 and a composite grit score ($r_s = -.17, -.27, -.15,$
172 and $-.17$ respectively). The directions of these correlations are in line with our hypotheses given
173 that PS and ORG represent facets of perfectionistic strivings and COM, DAA, PPP, and PCP
174 represent facets of perfectionistic concerns (Dunn et al., 2016).

175 Fawver et al.’s (2020) study is the first to provide valuable insight into the relationships
176 between perfectionism and grit in athletes. However, we note that the authors summed all 12
177 items contained within Duckworth et al.’s (2007) Grit Scale to create a composite grit score. The
178 appropriateness of creating a composite grit score has recently been challenged in the literature
179 (e.g., Credé et al., 2017; Newland et al., 2020; Tedesqui & Young, 2019) and limits the degree to
180 which a more nuanced understanding of the relationships between perfectionism and dimensions
181 of grit (i.e., consistency of interests and perseverance of effort) can be attained.

182 We also note that Fawver et al. treated grit as a global/generic personality disposition.
183 This approach is in keeping with Duckworth et al.’s (2007) original conceptualization of grit and
184 is consistent with methods employed in many studies that have examined grit in athletes (e.g.,

185 Tedesqui & Young, 2017, 2018). However, Duckworth has also acknowledged the possibility
186 that people could show vastly different levels of grit in different areas of their lives (see
187 Duckworth & Quinn, 2009, p. 173)—a position that aligns with a domain-specific
188 conceptualization of grit. Indeed, a number of researchers have recently provided evidence that a
189 greater understanding of grit can be attained when conceptualized and measured as a domain-
190 specific construct. For example, Cormier et al. (2019) found that grit levels among intercollegiate
191 student-athletes differed as a function of the achievement domain within which grit responses
192 were considered (i.e., sport, school, and “life-in-general”). Researchers have also demonstrated
193 that domain-specific measures of grit have stronger predictive validity than domain-general
194 measures of grit in a variety of performance settings (see Cormier et al., 2019; Mondak, 2020;
195 Schmidt et al., 2019). These findings have led some researchers to advocate for the domain-
196 specific measurement of grit in achievement contexts.

197 Finally, Fawver et al. examined perfectionism at the facet/subscale level and reported
198 bivariate correlations between the six subscales of the Sport-MPS-2 and grit. Although the Sport-
199 MPS-2 is an established measure of perfectionism in sport, theorists have argued that
200 perfectionistic strivings and perfectionistic concerns are broad higher-order dimensions of
201 perfectionism that are best captured when multiple indicators of both constructs are employed
202 (Stoeber & Madigan, 2016). By utilizing items and subscales from different instruments,
203 researchers are able to alleviate concerns that corresponding results may be “model specific” to
204 single instruments or subscales that might be used to measure each higher-order dimension of
205 perfectionism (Hall et al., 2012; Hill, Madigan, & Jowett, 2020; Stoeber & Madigan, 2016).
206 Consequently, many perfectionism researchers have adopted the approach where subscales from
207 more than one instrument are utilized in an effort to obtain a more comprehensive assessment of
208 perfectionistic strivings and perfectionistic concerns in athletes (e.g., Lizmore et al., 2017, 2019;

230 questionnaire asked athletes to provide information about their age, gender, and sport experience.

231 ***Perfectionism***

232 Perfectionism was measured by a self-report instrument containing 52 items taken from
233 two established measures of perfectionism in sport—the *Sport-MPS-2* (Gotwals & Dunn, 2009)
234 and the *Multidimensional Inventory of Perfectionism in Sport* (MIPS; Stoeber et al., 2006). All
235 42 items from the Sport-MPS-2 were included in the inventory to measure *Personal Standards*
236 (PS [7 items]; e.g., “I set higher achievement goals than most athletes who play my sport”),
237 *Concern Over Mistakes* (COM [8 items]; e.g., “If I play well but only make one obvious mistake
238 in the entire game, I still feel disappointed with my performance.”), *Perceived Parental Pressure*
239 (PPP [9 items]; e.g., “My parents want me to be better than all other players who play my
240 sport”), *Perceived Coach Pressure* (PCP [6 items]; e.g., “My coach expects excellence from me
241 at all times: both in training and competition”), *Doubts About Actions* (DAA [6 items]; e.g., “I
242 rarely feel that I have trained enough in preparation for a competition”), and *Organization* (ORG
243 [6 items]; e.g., “I follow pre-planned steps to prepare myself for competition”). Ten items were
244 taken from the MIPS to measure *Striving for Perfection* (SP [5 items]; e.g., “In sport, it is
245 important to me to be perfect in everything I attempt”) and *Negative Reactions to Imperfection*
246 (NRI [5 items]; e.g., “In sport, I become furious if I make mistakes”). Dunn et al. (2016)
247 provided factorial validity evidence in a sample of intercollegiate student-athletes supporting the
248 combination of the PS, ORG, and SP subscales to represent the higher-order dimension of
249 perfectionistic strivings and the combination of the COM, PPP, PCP, DAA, and NRI subscales to
250 represent the higher-order dimension of perfectionistic concerns.

251 Items were randomly ordered throughout the instrument. Participants responded to items
252 using a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*) with higher subscale scores
253 representing higher levels of perfectionism. Validity and reliability evidence supporting the use

254 of the aforementioned items/subscales to measure perfectionism in sport can be found in the
255 literature (e.g., Dunn et al., 2016; Gotwals & Dunn, 2009; Lizmore et al., 2017; Rasquinha et al.,
256 2014).

257 **Grit**

258 Grit was measured using a domain/sport-specific version of Duckworth et al.'s (2007)
259 *Grit Scale*. The domain-specific measure (see Cormier et al., 2019) contains five items that
260 measure *Consistency of Interests* in sport (CI; e.g., "I often set a goal but later choose to pursue a
261 different one") and six items that measure *Perseverance of Effort* in sport (PE; e.g., "I have
262 overcome setbacks to conquer an important challenge"). The domain-specificity of the
263 instrument is created by including the phrase, "*As an athlete in sport...*" before each item along
264 with some minor wording changes to several items (i.e., the word "project" is replaced with the
265 word "goal"). Participants responded to items using a 7-point scale (i.e., 1 = *not at all like me*; 7
266 = *exactly like me*). All consistency of interests items were reverse-scored whereupon higher
267 composite scores on each subscale represented higher levels of grit. Adequate levels of internal
268 reliability ($\alpha \geq .68$) for the consistency of interests and perseverance of effort subscales of the
269 Grit Scale have been reported in studies involving athletes (e.g., Tedesqui & Young, 2017, 2018,
270 2019). Cormier et al. (2019) provided evidence supporting the two-factor structure of this
271 domain-specific version of the Grit Scale using data provided by the current sample of athletes as
272 well as adequate levels of internal consistency for the consistency of interests subscale ($\alpha = .82$)
273 and the perseverance of effort subscale ($\alpha = .79$).

274 **Procedure**

275 After receiving institutional ethics approval, data collection episodes were scheduled with
276 each team. Data collection (using a paper-and-pencil format) took place at least 48 hours before
277 or after competition in classroom settings. Participants provided written voluntary consent and

278 were treated in accordance with the ethical guidelines of the American Psychological
279 Association. Coaches and training staff were not present at the time of test administration.

280 **Data Analysis**

281 We initially conducted a MANOVA to screen for gender differences across the
282 perfectionism and grit subscales (Fawver et al., 2020). This step was conducted to determine if it
283 was appropriate to combine male and female responses into a single data set to enhance the
284 power of subsequent analyses. Gender was entered as the independent variable and the
285 perfectionism and grit subscales were entered as the dependent variables in the analysis.

286 We employed a two-step approach to conduct a structural equation modeling (SEM)
287 analysis (Anderson & Gerbing, 1988). In the first step, we conducted a confirmatory factor
288 analysis (CFA) to ensure that our measurement models had an acceptable fit with our data
289 (Anderson & Gerbing, 1988; McDonald & Ho, 2002). This precursory use of CFA has been
290 adopted in previous SEM studies that have examined perfectionism in sport (e.g., Jowett, Hill, et
291 al., 2013, 2016). In the CFA, all four latent variables (i.e., perfectionistic strivings, perfectionistic
292 concerns, consistency of interests, and perseverance of effort) were modeled together and
293 correlated with one another (Jowett, Hill, et al., 2013, 2016). The analysis was conducted using
294 IBM SPSS Amos 26 with maximum likelihood (ML) estimation. For model identification, we
295 scaled one loading per latent variable. Figure 1 shows the original CFA model that we tested.

296 After establishing an adequate fit in the CFA (following the removal of two grit items),
297 we employed SEM (using Amos 26 and ML estimation) to assess our hypotheses and determine
298 whether higher-order dimensions of perfectionism (i.e., perfectionistic strivings and
299 perfectionistic concerns) were associated with consistency of interests and perseverance of effort.
300 The effect of gender was controlled in the analysis (i.e., all exogenous variables were correlated
301 with gender and all endogenous variables were regressed on gender). Figure 2 contains the

302 model that we tested in the second step of the SEM analysis.

303 For both CFA and SEM, model fit was evaluated using a combination of fit indices
304 (Kline, 2016). Specifically, we used the χ^2 goodness-of-fit statistic, comparative fit index (CFI),
305 Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA; 90% confidence
306 interval), and standardized root mean squared residual (SRMR). In accordance with guidelines
307 proposed by Marsh et al. (2004), and adopting the same cut-off criteria that have been used in
308 previous SEM studies examining relationships between higher-order dimensions of
309 perfectionism and various criterion variables (e.g., Jowett, Hill et al., 2013, 2016; Madigan et al.,
310 2015) we employed the following cut-off values to indicate an acceptable model fit: CFI close to
311 or greater than .90, TLI close to or greater than .90, RMSEA close to or less than .10, and SRMR
312 close to or less than .10. Cut-off values for a good model fit were set in accordance with
313 guidelines provided by Hu and Bentler (1999): CFI close to or greater than .95, TLI close to or
314 greater than .95, RMSEA close to or less than .06, and SRMR close to or less than .08.

315 **Results**

316 **Preliminary Analyses**

317 Fourteen missing data points (out of a possible 15,813 item responses) existed within the
318 data set; no systematic pattern was evident among the missing data. Each missing data point was
319 replaced by computing an intra-individual mean item score from the remaining items in the
320 corresponding subscale to which the missing data point belonged (see Graham et al., 2003).

321 The multivariate test statistic from the MANOVA that we conducted to screen for gender
322 differences was significant: Wilks' $\Lambda = .85$, $F(10, 240) = 4.10$, $p < .001$, partial $\eta^2 = .15$.
323 Follow-up univariate F -tests (see Table 1) revealed significant differences on three of the ten
324 dependent variables. Male athletes had significantly higher mean personal standards and striving
325 for perfection scores than female athletes, whereas female athletes had significantly higher mean

326 perceived coach pressure scores than male athletes. However, corresponding effect sizes (partial
327 η^2) for all univariate contrasts were $\leq .04$, and therefore failed to meet the criterion value of .06
328 that is indicative of a medium effect size (Cohen, 1988). We concluded that meaningful or
329 practically significant gender differences were not present within the data.

330 We also conducted a Box's M test to examine the homogeneity/heterogeneity of the
331 variance-covariance matrices for male and female participants. Results indicated that the
332 variance-covariance matrices were not sufficiently heterogeneous across gender to cause
333 concern: Box's M = 90.28, $F(55, 153210.65) = 1.53, p > .001$ (see Tabachnick & Fidell, 1996).
334 In light of the MANOVA and Box's M results, scores for men and women were combined into a
335 single data set for all remaining analyses. Means, standard deviations, correlations, and internal
336 consistency coefficients for the combined data set ($N = 251$) are contained in Table 2.

337 **Bivariate Correlations**

338 With the exception of the personal standards and striving for perfection subscales,
339 perfectionism subscales were significantly correlated with consistency of interests. Specifically,
340 concern over mistakes, negative reactions to imperfection, perceived parental pressure, perceived
341 coach pressure, and doubts about actions were negatively correlated with consistency of
342 interests, whereas organization was positively correlated with consistency of interests. Six
343 perfectionism subscales were significantly correlated with perseverance of effort. The concern
344 over mistakes, negative reactions to imperfection, and doubts about actions subscales were
345 negatively correlated with perseverance of effort, whereas personal standards, striving for
346 perfection, and organization were positively correlated with perseverance of effort. The overall
347 pattern of the bivariate correlations indicates that higher scores on subscales measuring facets of
348 perfectionistic concerns (i.e., concern over mistakes, negative reactions to imperfection,
349 perceived parental pressure, perceived coach pressure, and doubts about actions) were generally

350 associated with lower levels of grit. In contrast, higher scores on subscales measuring facets of
351 perfectionistic strivings (i.e., personal standards, striving for perfection, and organization) were
352 generally associated with higher levels of grit.

353 Given that some researchers continue to treat grit as a composite/unidimensional
354 construct in studies involving athletes (e.g., Albert et al., 2019; Atkinson, & Martin, 2020;
355 Fawver et al., 2020; Meyer et al., 2017; Rhodes et al., 2018), we sought to determine if a more
356 nuanced understanding of grit could be attained when consistency of interests and perseverance
357 of effort were treated as separate constructs. To this end, we examined the differences in the size
358 of relations between each perfectionism subscale and the consistency of interests and
359 perseverance of effort subscales.³ Using Glass and Hopkins' (1984) formula for testing
360 differences between dependent correlations (see Formula 15.7, p. 311), we found statistically
361 significant differences on four of the eight perfectionism subscales. Specifically, personal
362 standards was more strongly correlated with perseverance of effort than with consistency of
363 interests ($t [248] = 3.54, p < .001$), organization was more strongly correlated with perseverance
364 of effort than with consistency of interests ($t [248] = 4.86, p < .001$), doubts about actions was
365 more strongly correlated with perseverance of effort than with consistency of interests ($t [248] =$
366 $2.25, p < .01$), and perceived coach pressure was more strongly correlated with consistency of
367 interests than with perseverance of effort ($t [248] = 2.25, p < .05$). These results indicate that in
368 many instances, the strength of relationships between facets of perfectionism and dimensions of
369 grit are different, supporting the position that a more nuanced understanding of relationships
370 between perfectionism and grit is achieved when grit is treated as a multidimensional construct.

³ Goodness of fit indices obtained from an initial maximum likelihood confirmatory factor analysis that was conducted upon the 11 items of the Grit Scale indicated that the latent dimensionality of the instrument was better captured by two factors representing consistency of interest and perseverance of effort ($\chi^2 [43] = 97.358, p < .001$; CFI = .942; TLI = .926; RMSEA = .071 [90% CI: .053, .09]; SRMR = .059) than a single composite grit factor ($\chi^2 [44] = 337.139, p < .001$; CFI = .689; TLI = .611; RMSEA = .164 [90% CI: .148, .180]; SRMR = .119).

371 **Confirmatory Factor Analysis**

372 Prior to conducting the SEM analysis, data were screened for the presence of univariate
373 and multivariate outliers. No univariate outliers were detected (i.e., all standardized z -scores for
374 each variable were < 4.0 ; see Bors, 2018; Pituch & Stevens, 2016). However, two multivariate
375 outliers were identified (Mahalanobis distances = 34.079 and 31.172; $\chi^2 [10]_{\text{critical}} = 27.877, p <$
376 $.001$; see Tabachnick & Fidell, 1996) and subsequently removed from the data set. Skewness
377 values for all observed variables in the SEM analysis ranged from to 0.79 to -1.50, and kurtosis
378 values ranged from 2.58 to -0.79, indicating that there were no concerns with the distributional
379 characteristics of the observed variables (Kline, 2016). All variance inflation factors (VIFs)
380 among the observed variables ranged from to 1.16 to 3.06, indicating that there were no concerns
381 with multicollinearity (Kline, 2016).

382 Following our initial CFA, the collective values for the model fit indices indicated that an
383 adequate model fit had not been obtained: $\chi^2 (146) = 350.871, p < .001$; CFI = .893; TLI = .875;
384 RMSEA = .070, 90% CI [.060, .081]; SRMR = .088; AIC = 412.92; and BIC = 420.64. To
385 determine if a better fitting model could be attained (while heeding Marsh et al.'s [2004]
386 cautions that better fitting models must nonetheless make theoretical sense), we examined
387 modification indices and conducted a local fit assessment (Kline, 2016) by inspecting the
388 residual covariance matrix. No theoretically meaningful changes to the model (based on
389 modification indices) were apparent, and none of the corresponding changes would have led to
390 substantial improvements in model fit. However, the local fit assessment revealed one
391 consistency of interests item (i.e., CI5; "*As an athlete in sport, I become interested in new*
392 *pursuits/goals every few months*") and one perseverance of effort item (i.e., PE8; "*As an athlete*
393 *in sport, setbacks don't discourage me*") that had disproportionately high numbers of inflated
394 residuals. These items also had the lowest loadings on their respective factors (CI5 = .58; PE8 =

395 .32). We subsequently removed these items and conducted another CFA.

396 Although removing items can increase the risk of capitalizing on chance (Marsh et al.,
397 2004), it is worth noting that in a previous study examining the factor structure of the Grit Scale
398 with athletes, Tedesqui and Young (2017) also dropped PE8 due to a low negative factor loading
399 (-.27) on the perseverance of effort factor. Moreover, inspection of Tedesqui and Young's factor
400 analytic results (p. 171) reveals that item CI5 had the lowest factor loading of any consistency of
401 interests item in the final exploratory factor analytic solution (.46) and confirmatory factor
402 analytic solution (.43) that were retained by the authors. Given Tedesqui and Young's findings,
403 and our current findings, it is possible that there are some systematic issues with the two items
404 (i.e., CI5 and PE8) in the context of measuring grit in athletes. We therefore felt more confident
405 that we were not simply capitalizing on chance when removing the two items.

406 Following the removal of CI5 and PE8, the CFA provided an acceptable fit: $\chi^2(113) =$
407 234.111, $p < .001$; CFI = .920; TLI = .904; RMSEA = .066, 90% CI [.054, .078]; SRMR = .084;
408 AIC = 314.11; and BIC = 320.37. Given that the initial model and the revised model were not
409 nested within each other, we used AIC and BIC to compare the results of the two CFAs (Kline,
410 2016). These information theory metrics integrate model fit and complexity, favoring simpler
411 models for their replicability. Although AIC and BIC are data-specific and no absolute criteria
412 are available, we deemed the nearly 100-point decreases in the two indices as evidence of a
413 better model. Figure 3 shows the final CFA solution following the removal of CI5 and PE8.

414 **Relationships Between Perfectionistic Strivings, Perfectionistic Concerns and Grit**

415 We applied SEM to the (revised) model with items CI5 and PE8 removed; results are
416 shown in Figure 4.⁴ An acceptable model fit was obtained: $\chi^2(126) = 260.482$, $p < .001$; CFI =
417 .914; TLI = .896; RMSEA = .066, 90% CI [.054, .077]; and SRMR = .082. Perfectionistic

⁴ A copy of the covariance matrix for this model is available upon request from the authors.

418 strivings was positively correlated with perfectionistic concerns ($r = .51, p < .001$), and
419 consistency of interests was positively correlated with perseverance of effort through their
420 disturbances ($r = .38, p < .01$). In accordance with our hypotheses, perfectionistic strivings was
421 positively associated with consistency of interests ($\beta = .49, p < .001$) and perseverance of effort
422 ($\beta = .92, p < .001$), whereas perfectionistic concerns was negatively associated with consistency
423 of interests ($\beta = -.47, p < .001$) and perseverance of effort ($\beta = -.66, p < .001$). These results
424 indicate that higher perfectionistic strivings correspond with higher levels of grit, and higher
425 perfectionistic concerns correspond with lower levels of grit. Collectively, perfectionistic
426 strivings and perfectionistic concerns (while controlling for gender) accounted for 21% of the
427 variance in consistency of interests and 57% of the variance in perseverance of effort.

428 Discussion

429 The current study sought to examine the degree to which perfectionistic strivings and
430 perfectionistic concerns were associated with athletes' consistency of interests and perseverance
431 of effort in sport. We hypothesized that perfectionistic strivings would be positively associated
432 with both dimensions of grit, and perfectionistic concerns would be negatively associated with
433 both dimensions of grit. Bivariate correlations (Table 2) and SEM results (Figure 4) largely
434 supported our hypotheses.

435 All three perfectionism subscales that measure facets of perfectionistic strivings (i.e.,
436 personal standards, striving for perfection, and organization) had small-to-medium positive
437 correlations with consistency of interests and perseverance of effort (see Table 2). All five
438 perfectionism subscales that measure facets of perfectionistic concerns (i.e., concern over
439 mistakes, negative reactions to imperfection, doubts about actions, perceived parental pressure,
440 and perceived coach pressure) had small-to-medium negative correlations with consistency of
441 interests. Three subscales measuring facets of perfectionistic concerns (i.e., concern over

442 mistakes, negative reactions to imperfection, and doubts about actions) had small-to-medium
443 negative correlations with perseverance of effort, while the two remaining subscales that
444 measure facets of perfectionistic concerns—namely, perceived parental pressure and perceived
445 coach pressure—were unrelated to perseverance of effort.

446 The magnitude of the bivariate correlations between the eight perfectionism subscales
447 and the two grit subscales were generally quite small, suggesting that the relationships between
448 specific facets of perfectionism (i.e., at the subscale level) and consistency of interests and
449 perseverance of effort are not particularly strong. Similar findings were reported by Houston et
450 al. (2020) who asked a sample of 132 undergraduate students to complete Hewitt and Flett’s
451 (1991) domain-general measure of perfectionism (i.e., the Multidimensional Perfectionism Scale
452 [MPS]) and the 12-item domain-general Grit Scale. None of the three MPS subscales were
453 significantly correlated with consistency of interests, and the socially prescribed perfectionism
454 subscale was also unrelated to perseverance of effort. However, the self-oriented perfectionism
455 and other-oriented perfectionism subscales of the MPS had small-to-medium significant
456 correlations with perseverance of effort ($r_s = .29$ and $.19$ respectively).

457 The size of the correlations we obtained are also quite similar to the size of the
458 correlations between Sport-MPS-2 subscales and a composite measure of grit reported by
459 Fawver et al.’s (2020) in their study of youth alpine skiers (r_s ranged from $-.15$ to $.32$). However,
460 it is worth noting that the direction of 15 of the 16 correlations between perfectionism subscales
461 and grit subscales in this study, and the direction of all six correlations reported in Fawver et al.’s
462 study between Sport-MPS-2 subscales and grit were in the theorized directions. Specifically,
463 higher scores on facets of perfectionistic strivings were typically associated with higher levels of
464 grit, and higher scores on facets of perfectionistic concerns were typically associated with lower
465 levels of grit. Collectively, these results support the position held by many perfectionism

466 researchers that heightened perfectionistic strivings are associated with adaptive characteristics
467 and outcomes in sport (e.g., Dunn et al., 2020; Lizmore et al., 2017; Stoeber, 2011, 2102, 2014),
468 whereas perfectionistic concerns are associated with maladaptive characteristics and outcomes in
469 sport (Gotwals et al., 2012; Hill, Mallinson-Howard, et al., 2018).

470 The SEM results (Figure 4) shed further light on the debate surrounding the adaptive
471 qualities of perfectionistic strivings in sport because the SEM analysis accounts for the
472 overlap/correlation between perfectionistic strivings and perfectionistic concerns. In other words,
473 the paths between perfectionistic strivings and consistency of interests ($\beta = .49$) and
474 perseverance of effort ($\beta = .92$) capture the associations between the constructs after the
475 correlation between perfectionistic strivings and perfectionistic concerns is controlled ($r = .51$:
476 see Figure 4). As such, the SEM results support Hill, Mallinson-Howard, and colleagues' (2020)
477 contention that perfectionistic strivings "are likely to contribute to more adaptive outcomes" (p.
478 126) for athletes in sport when the overlap between strivings and concerns is controlled (also see
479 Gotwals et al., 2012). When the overlap between perfectionistic strivings and perfectionistic
480 concerns is controlled, some perfectionism theorists have suggested that it may be more
481 appropriate to talk about *pure* perfectionistic strivings and *pure* perfectionistic concerns (see
482 Jowett, Mallinson, et al., 2016; Stoeber, 2014) rather than perfectionistic strivings and
483 perfectionistic concerns.

484 Our examination of the differences in the strength of the correlations between each
485 perfectionism subscale and the two grit subscales enabled us to determine if there is value in
486 differentiating between consistency of interests and perseverance of effort when studying grit in
487 athletes (Tedesqui & Young, 2018, 2019). In the case of four (out of eight) perfectionism
488 subscales, the size of the correlation with consistency of interests was significantly different than
489 the corresponding correlation with perseverance of effort. Personal standards, organization, and

490 doubts about actions all had significantly stronger correlations with perseverance of effort than
491 consistency of interests, whereas perceived coach pressure was more strongly correlated with
492 consistency of interests than perseverance of effort. These differences would have remained
493 undetected had we treated grit as a composite/unidimensional construct. This is an important
494 issue because, as noted previously, many sport psychology researchers continue to combine
495 athletes' consistency of interests and perseverance of effort responses into a single composite
496 scale score when studying grit in sport (e.g., Albert et al., 2019; Atkinson & Martin, 2020;
497 Fawver et al., 2020; Sigmundsson et al., 2020).

498 Having established that four of the eight perfectionism subscales were more strongly
499 associated with one dimension of grit than the other, we offer some tentative theoretical
500 explanations as to why these differences may have occurred. Consistency of interests capture the
501 degree to which people maintain interest and focus on important goals over long periods.
502 However, as noted by Duckworth in an interview with Perkins-Gough (2013), consistency of
503 interests has little to do with responding to adversity or failure. In contrast, perseverance of effort
504 captures the degree to which people persevere in the face of personal adversity, setbacks, and
505 failure in pursuit of important goals (Duckworth et al., 2007). Given that athletes frequently
506 encounter personal failure and adversity in sport (Anshel, 2016), it is conceivable that personal
507 standards and organization are more strongly associated with perseverance of effort (than
508 consistency of interests) because these variables share similar approach-oriented motivational
509 underpinnings that enable athletes to react positively when personal failure is encountered (see
510 Lizmore et al., 2017). Doubts about actions—a facet of perfectionistic concerns—may also be
511 more strongly correlated with perseverance of effort because doubts about actions is more
512 strongly linked to avoidance-oriented motivational/action tendencies when personal failure and
513 adversity are encountered in sport (Dunn et al., 2014; Lizmore et al., 2017). We are unsure why

514 perceived coach pressure was more strongly correlated with consistency of interests than
515 perseverance of effort and therefore do not offer any tentative explanation for this finding. More
516 research is required to determine if similar differences in the magnitude of correlations would
517 emerge with an independent sample of athletes or if the present results are a function of some
518 unknown idiosyncratic characteristics of the current sample.

519 The bivariate correlation analyses provide valuable insight into relationships between
520 perfectionism and grit at the facet/subscale level. However, when multiple subscales from
521 different measures of perfectionism are combined to create higher-order dimensions of
522 perfectionism—i.e., perfectionistic strivings and perfectionistic concerns—researchers are
523 afforded greater confidence that their results (at the facet/subscale level) do not simply represent
524 “model-specific aspects of perfectionistic strivings and concerns” (Stoeber & Madigan, 2016, p.
525 48). In this context, “model-specific aspects” refer to variations in item/subscale content that
526 exist between different measures of perfectionism (Hall et al., 2012; Stoeber & Madigan, 2016).
527 Creating higher-order dimensions of perfectionism (and using multiple subscales from different
528 measures of perfectionism) through the SEM analysis enabled us to alleviate much of these
529 concerns.

530 Results of the SEM analysis (Figure 4) indicate that perfectionistic strivings was
531 positively associated with consistency of interests and perseverance of effort in sport (after
532 controlling for gender and the overlap with perfectionistic concerns). This finding supports our
533 initial contention that the motivational underpinnings of perfectionistic strivings (i.e., setting and
534 striving for the attainment of very high performance standards) are theoretically at odds with a
535 motivational disposition that would likely undermine athletes’ efforts to achieve their lofty
536 performance goals in sport (i.e., low grit). The likelihood of achieving the high standards of
537 performance that are integral to high perfectionistic strivings will almost certainly be enhanced if

538 athletes engage in a long-term commitment to accomplishing their performance goals in sport
539 (i.e., high consistency of interests) and persevere towards accomplishing these goals despite
540 setbacks, adversity, and failure (i.e., high perseverance of effort). Unfortunately, the cross-
541 sectional design of this study makes it impossible to determine if higher strivings actually lead to
542 higher grit, and/or if higher grit may lead to higher strivings. It is possible that increases in
543 perfectionistic strivings in sport lead athletes to develop heightened grit as they come to the
544 realization that heightened consistency of interests and perseverance of effort can enhance their
545 chances of achieving high performance standards. However, it is also plausible that increased
546 grit in sport may lead athletes to develop higher perfectionistic strivings as they come to the
547 realization that their consistent focus and perseverance of effort under conditions of failure can
548 enhance their ability to achieve higher performance standards. Future research is required to
549 determine if there is a causal/directional process at work underlying the associations between
550 perfectionistic strivings, consistency of interests, and perseverance of effort in sport, and to
551 understand the mechanisms by which perfectionistic strivings and grit may influence each other
552 (if they influence each other at all).

553 SEM results also supported our hypothesis that perfectionistic concerns would be
554 negatively associated with consistency of interests and perseverance of effort. Research has
555 shown that heightened perfectionistic concerns are typically associated with avoidance-oriented
556 goals (Eum & Rice, 2011) and grit is primarily associated with approach-oriented goals (Muenks
557 et al., 2017). Research has also shown that heightened perfectionistic concerns correspond with
558 lower levels of engagement (Fawver et al., 2020), and grit provides the impetus for people to
559 stay engaged with the pursuit of personally meaningful goals over long periods of time (Kelly et
560 al., 2014). Consequently, it makes theoretical sense that higher perfectionistic concerns would
561 correspond with lower consistency of interests and perseverance of effort. Athletes who have

562 high perfectionistic concerns are motivated to avoid displaying personal incompetence (Flett &
563 Hewitt, 2016) therefore persevering in the face of setbacks, failure, and adversity may heighten
564 the threat of negative social evaluation if further failure was to be encountered (Dunn et al.,
565 2014). It is possible that high perfectionistic concerns motivate athletes to avoid public displays
566 of failure to such an extent that the development of grit in sport is hindered. However, it is also
567 conceivable that the constant engagement and re-engagement with the achievement-striving
568 process in sport that comes with heightened consistency of interests and perseverance of effort
569 (Tedesqui & Young, 2018) may reduce athletes' perfectionistic concerns. In other words,
570 athletes may come to the realization that making progress towards their long-term achievement
571 goals is a mechanism by which they can protect their self-concept. Future research is obviously
572 required to assess the validity of these speculative hypotheses.

573 The combination of high perfectionistic strivings with low perfectionistic concerns has
574 been labeled as an "adaptive profile" of perfectionism in sport (Dunn et al., 2020; Vaartstra et al.,
575 2018), and higher levels of grit are generally viewed as having adaptive roles in the achievement-
576 striving process for athletes (Fawver et al., 2020; Gilchrist et al., 2018; Tedesqui & Young, 2018,
577 2019). It therefore seems reasonable to suggest that the combination of high perfectionistic
578 strivings, low perfectionistic concerns, high consistency of interests, and high perseverance of
579 effort in athletes might be a particularly adaptive personality profile that facilitates talent
580 development and the pursuit of high achievement in sport. Future research would be valuable in
581 determining if and how different combinations of perfectionistic strivings, perfectionistic
582 concerns, consistency of interests, and perseverance of effort might impact the achievement-
583 striving process of athletes in the competitive sport domain. This seems like an important line of
584 inquiry given that sport psychologists associate elements of heightened perfectionism and grit
585 with elite performance in sport (Hardy et al., 2017; Hodges et al., 2017), yet no studies have

586 determined if or how different combinations of perfectionism and grit might influence the
587 achievement striving process in sport for athletes.

588 Perseverance of effort helps athletes sustain effort despite personal failure, adversity, and
589 setbacks. Consequently, it is possible that perseverance of effort could moderate relationships
590 between higher-order dimensions of perfectionism and the way that athletes cope when faced
591 with prolonged drops in performance. For example, research has previously shown that athletes
592 with higher perfectionistic concerns are inclined to use avoidance or disengagement coping
593 strategies (as opposed to problem-focused strategies) when faced with a performance slump
594 (Dunn et al., 2014). It is conceivable that athletes with high perfectionistic concerns might be
595 less inclined to use avoidance/disengagement coping strategies (and more inclined to use
596 problem-focused coping strategies) in the face of prolonged failure if they had higher (as
597 opposed to lower) perseverance of effort. The search for moderator variables in perfectionism
598 research has been identified as a key research endeavor by numerous theorists because
599 determining “whether perfectionism is desirable or debilitating will depend upon the degree to
600 which a particular dimension [of perfectionism] is exhibited...and what other *individual*
601 *differences* [emphasis added] and contextual factors are evident” in the achievement setting (Hill,
602 Jowett, et al., 2018, p. 170; also see Stoeber, 2018, p. 342). We suggest that a worthwhile line of
603 inquiry in future research would be to explore the degree to which grit might moderate
604 perfectionism-outcome relationships, particularly when athletes are struggling to attain desired
605 performance levels over prolonged periods of time.

606 Researchers and theorists regard perfectionism (see Arana et al., 2017) and grit (see Park
607 et al., 2018) as malleable or changeable personality dispositions. Consequently, practitioners and
608 researchers in sport have developed interventions to alter athletes’ perfectionism levels (e.g.,
609 Lizmore et al., 2018) and grit in sport (e.g., Rhodes et al., 2018). One approach (from cognitive-

610 behavioral therapy) that has been used to reduce individuals' perfectionistic concerns focuses
611 upon teaching people how to cognitively-restructure the meaning of personal failure (Egan &
612 Shafran, 2018). In the sport setting, athletes could be taught to reframe a debilitating view of
613 failure (i.e., failure is to be avoided at all costs to protect one's self image), to a more facilitative
614 perspective (i.e., failure is a natural/necessary part of the performance process that provides
615 opportunities for personal growth and improvement; Lizmore et al., 2018). Similarly,
616 interventions to enhance grit have focused upon developing a growth mindset in individuals
617 where people are taught to view failure as a natural part of the performance process that presents
618 opportunities to learn and grow (Duckworth, 2017; Dweck, 2006). From an applied perspective,
619 it would be valuable for practitioners and researchers to know if mental-training interventions
620 that target one construct (i.e., perfectionism or grit) might simultaneously create changes in the
621 other construct. An illustration of such an outcome is evident in a mental-training intervention
622 that targeted self-compassion in athletes. Mosewich et al. (2013) conducted a study in which
623 intercollegiate female athletes underwent a 7-day intervention to enhance self-compassion. Not
624 only was the intervention successful in improving athlete self-compassion, the intervention had
625 the added benefit of reducing athletes' concern over mistakes. It is conceivable that interventions
626 aimed at reducing perfectionistic concerns by teaching athletes how to cognitively restructure the
627 meaning of failure in a facilitative manner may also enhance athlete grit (or vice-versa). Future
628 research is necessary to assess the validity of this proposal.

629 **Limitations and Future Directions**

630 The current study has a number of limitations. First, as noted previously, the study
631 employed a cross-sectional correlational design that limits the degree to which causal inferences
632 can be made about how perfectionism and grit might influence each other. Moreover, given that
633 we did not take any measures of athlete performance, we cannot determine if or how

634 perfectionism and grit might collectively influence performance and achievement striving over
635 time. Another potential limitation relates to the fact that we used a domain-specific approach to
636 measure perfectionism and grit. Although such an approach can actually be viewed as a
637 methodological strength of the study (see Cormier et al., 2019; Dunn et al., 2005; Mondak,
638 2020), it does limit the degree to which results can be generalized to other achievement contexts
639 beyond the domain of sport (e.g., academic settings, vocational settings, performing arts, etc.).
640 Future research that examines perfectionism and grit using both domain-general and domain-
641 specific measures in different achievement settings seems warranted.

642 The fit-indices for the model that we retained following the SEM analysis (Figure 4)
643 provided evidence of an adequate fitting model, but fell short of criteria used to identify a good
644 fitting model. Consequently, we recommend a degree of caution when interpreting the results of
645 the SEM analysis. It is possible that our analysis was underpowered, and this impacted model fit:
646 use of a larger sample size (and/or better indicators of each latent variable) may have helped in
647 this regard (Kim, 2005). Moreover, we only obtained an adequate model fit following the
648 removal of two grit items from the model. Whenever researchers remove items from an
649 instrument, threats to content representativeness and internal validity can occur. In this regard,
650 however, we again note that Tedesqui and Young (2017) removed two items from the Grit Scale
651 (one of which was the same item we removed) in order to obtain an acceptable fit when
652 assessing the latent structure of the Grit Scale with athletes. As suggested by Meyer et al. (2017),
653 more research examining the conceptualization and measurement of grit in sport is required.

654 We further speculate that a better model fit might have been attained had we limited the
655 number of perfectionism subscales in the model. As has been done in a number of studies that
656 have previously employed SEM to examine relationships between higher-order dimensions of
657 perfectionism and various criterion variables in sport, researchers have only used the personal

658 standards and striving for perfectionism subscales to measure perfectionistic strivings, and the
659 concern over mistakes and negative reactions to imperfection subscales to measure
660 perfectionistic concerns (e.g., Madigan et al., 2015, 2018; Stoeber et al., 2009). Researchers may
661 have adopted this approach because there is a belief among some sport perfectionism theorists
662 that the personal standards, striving for perfectionism, concern over mistakes, and negative
663 reactions to imperfection subscales capture the most central characteristics of perfectionistic
664 strivings and concerns in sport (Hill, Mallinson-Howard, et al., 2020; Stoeber & Madigan, 2016).
665 In regard to this viewpoint, it is interesting to note that these four subscales loaded more strongly
666 on the perfectionistic strivings and perfectionistic concerns variables respectively than any of the
667 other perfectionism subscales we included in the CFA. That being said, had we followed this
668 approach and only included the four perfectionism subscales in the model, we would have run
669 the risk of underrepresenting other relevant aspects of the two higher-order dimensions of
670 perfectionism that have been established in the literature (for a related discussion see Dunn et al.,
671 2016). Nevertheless, we acknowledge the possibility that including subscales that some theorists
672 regard as being less central to perfectionistic strivings (e.g., organization) and perfectionistic
673 concerns (e.g., doubts about actions) may have created error variance that undermined model fit.
674 Future research that replicates our study with independent samples is required to determine
675 whether the current model-fit indices (and the existence of potentially problematic items and
676 subscales) are a function of idiosyncratic sample characteristics or the result of systematic
677 measurement/theoretical issues that require further investigation.

678 Finally, we note that a number of issues surrounding the conceptualization of grit—as
679 measured by the Grit Scale (Duckworth et al., 2007) or the Short Grit Scale (Duckworth &
680 Quinn, 2009)—have been raised in the literature. For example, results of a meta-analysis
681 conducted by Credé et al. (2017) revealed a strong positive correlation between grit and overall

682 conscientiousness ($\rho = .84$). Credé et al. concluded that grit might simply represent “a
683 repackaging of conscientiousness or one of the facets of conscientiousness” (p. 502). Other
684 theorists have also proposed that grit may be indistinguishable from self-control (Vazsonyi et al.,
685 2019). In light of these concerns, we point to the results of Tedesqui and Young’s (2018) study
686 with athletes where subscales of the Grit Scale were stronger predictors of deliberate practice and
687 sport commitment than either conscientiousness or self-control. Other research conducted with
688 athletes has reported bivariate correlations between consistency of interests, perseverance of
689 effort, and self-control ranging in size from .24 to .56 (e.g., Shields et al., 2018; Tedesqui &
690 Young, 2018; Toering & Jordet, 2015). Although these correlations indicate considerable overlap
691 between facets of grit and self-control, the magnitude of this overlap does not appear to provide
692 sufficient evidence to conflate the constructs in athletes.

693 In the context of sport, Meyer et al. (2017) argued that “little if any evidence exists to
694 support the significance of...[grit] in the sport domain” (p. 363) when grit is conceptualized and
695 measured by the Grit Scale and Short Grit Scale. We note, however, that since Meyer et al. made
696 this comment, numerous studies have successfully used the Grit Scale or Short Grit Scale to shed
697 light upon the role that grit plays for athletes in sport (e.g., Albert et al., 2019; Atkinson &
698 Martin, 2020; Fawver et al., 2020; Newland et al., 2020; Rhodes et al., 2018; Shields et al., 2018;
699 Tedesqui & Young, 2017, 2018, 2019). We propose that researchers continue to use the Grit
700 Scale (or derivatives thereof) to measure consistency of interests and perseverance of effort in
701 sport until alternative validated measures may be developed. We also recommend that
702 researchers look to determine when, where, and under what circumstances it may be better to
703 study grit in athletes using domain-specific or domain-general measures.

704 **Conclusion**

705 Although this study will not end the debate among perfectionism researchers regarding

706 the potential for heightened perfectionistic strivings to play an adaptive role in sport, the results
707 do provide evidence supporting this perspective. Specifically, all three facets of perfectionistic
708 strivings (i.e., personal standards, striving for perfection, organization) had small-to-medium
709 positive correlations with perseverance of effort—a dimension of grit that is frequently
710 associated with adaptive functioning in sport (e.g., Tedesqui & Young, 2017, 2018). Moreover,
711 the associations between perfectionistic strivings and both dimensions of grit (Figure 4) were
712 positive and statistically significant ($ps < .001$). These findings support the position of
713 perfectionism researchers that perfectionistic strivings are likely to be associated with adaptive
714 functioning in sport when the overlap with perfectionistic concerns is controlled (Gotwals et al.,
715 2012; Hill, Mallinson-Howard, et al., 2020; Stoeber, 2011).

716 The current study also extends the work of Fawver et al. (2020) and enhances our
717 understanding of the relationships between perfectionism and grit in sport. Although we contend
718 that our study has a number of methodological and conceptual strengths over Fawver et al.'s
719 (2020) work (e.g., we treated grit as multidimensional domain-specific construct, and
720 perfectionism was examined at a higher-order level), it is important to acknowledge that the
721 specific purpose of Fawver et al.'s study was not to examine relationships between perfectionism
722 and grit. Rather, Fawver et al. set out to determine whether grit and perfectionism were
723 associated with various performance-related criterion variables including the amount of time
724 youth skiers spent practicing and overall race performance during the competitive season. As
725 such, although the current study is the first to conduct an in-depth examination of the
726 relationships between higher-order dimensions of perfectionism and domain-specific grit in
727 sport, Fawver et al.'s study sheds important light upon the roles that perfectionism and grit have
728 for athlete training-behaviors and performance in a manner that the current study fails to provide.

729 Finally, it is important to acknowledge that the vast majority of existing studies that have

730 examined grit in sport have employed a domain-general approach using either the Grit Scale or
731 Short Grit Scale (e.g., Albert et al., 2019; Fawver et al., 2020; Larkin et al., 2016; Newland et al.,
732 2020; Shields et al., 2018; Tedesqui & Young, 2017, 2018, 2019). This approach has provided
733 valuable insight into how grit operates in sport. Therefore, it is important that researchers do not
734 simply abandon the domain-general assessment of grit in athletes. However, we do suggest that
735 future research is needed to identify when, where, and under what conditions it may be more
736 valuable to use a domain-specific approach over a domain general approach (or vice versa) when
737 studying athlete grit in sport.

738 In the concluding chapter of her book on grit, Duckworth (2017) adopted the following
739 position about how grit operates in a person's life:

740 To be gritty is to keep putting one foot in the front of the other. To be gritty is to hold fast
741 to an interesting and purposeful goal. To be gritty is to invest, day after week after year,
742 in challenging practice. To be gritty is to fall down seven times, and rise eight. (p. 275)

743 We support Duckworth's position, and propose that a particularly worthwhile direction for future
744 research would be to examine if, how, and under what situational conditions perfectionism and
745 grit interact with each other to impact the way athletes feel, think, behave, and perform in sport.

746

References

- 747 Albert, E., Petrie, T. A., & Moore, E. W. G. (2019). The relationship of motivational climates,
748 mindsets, and goal orientations to grit in male adolescent soccer players. *International*
749 *Journal of Sport and Exercise Psychology*. Advance online publication.
750 <https://doi.org/10.1080/1612197X.2019.1655775>
- 751 American Psychological Association. (n.d.). *Personality*. <https://www.apa.org/topics/personality>
- 752 Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review
753 and recommended two-step approach. *Psychological Bulletin*, *103*(3), 411-423.
754 <https://doi.org/10.1037/0033-2909.103.3.411>
- 755 Anestis, M. D., & Selby, E. A. (2015). Grit and perseverance in suicidal behavior and non-
756 suicidal self-injury. *Death Studies*, *39*(4), 211–218.
757 <https://doi.org/10.1080/07481187.2014.946629>
- 758 Anshel, M. H. (2016). *Failure: The value of overcoming mistakes in sports and in life*. Rowman
759 and Littlefield.
- 760 Arana, F. G., Miracco, M. C., Galarregui, M. S., & Keegan, E. G. (2017). A brief cognitive
761 behavioural intervention for maladaptive perfectionism in students: A pilot study.
762 *Behavioural and Cognitive Psychotherapy*, *45*(5), 537-542.
763 <https://doi.org/10.1017/S1352465817000406>
- 764 Atkinson, F., & Martin, J. (2020). Gritty, hardy, resilient, and socially supported: A replication
765 study. *Disability and Health Journal*, *13*(1), 100839.
766 <https://doi.org/10/1016/j.dhjo.2019.100839>
- 767 Bors, D. (2018). *Data analysis for the social sciences: Integrating theory and practice*. Sage.
- 768 Chen, C., Ye, S., & Hangen, E. (2018). Predicting achievement goals in the East and West: The
769 role of grit among American and Chinese university students. *Educational Psychology*,

- 770 38(6), 820-837. <https://doi.org/10.1080/01443410.2018.1458975>
- 771 Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum.
- 772 <https://doi.org/10.4324/9780203771587>
- 773 Cormier, D. L., Dunn, J. G. H., & Causgrove Dunn, J. (2019). Examining the domain specificity
- 774 of grit. *Personality and Individual Differences, 139*, 349-354.
- 775 <https://doi.org/10.1016/j.paid.2018.11.026>
- 776 Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic
- 777 synthesis of the grit literature. *Journal of Personality and Social Psychology, 113*(3),
- 778 492-511. <https://doi.org/10.1037/pspp0000102>
- 779 Cronbach, L., & Meehl, P. (1955). Construct validity in psychological tests. *Psychological*
- 780 *Bulletin, 52*(4), 281-302. <https://doi.org/10.1037/h0040957>
- 781 Duckworth, A. L. (2017). *Grit: Why passion and resilience are secrets to success*. Penguin
- 782 Random House.
- 783 Duckworth, A. L., & Gross, J. J. (2014). Self-control and grit: Related but separable
- 784 determinants of success. *Current Directions in Psychological Science, 23*(5), 319-325.
- 785 <https://doi.org/10.1177/0963721414541462>
- 786 Duckworth, A. L., Kirby, T. A., Tsukayama, E., Berstein, H., & Ericsson, K. A. (2011).
- 787 Deliberate practice spells success: Why grittier competitors triumph at the National
- 788 Spelling Bee. *Social Psychological and Personality Science, 2*(2), 174-181.
- 789 <https://doi.org/10.1177/1948550610385872>
- 790 Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and
- 791 passion for long-term goals. *Journal of Personality and Social Psychology, 92*(6), 1087–
- 792 1101. <https://doi.org/10.1037/0022-3514.92.6.1087>
- 793 Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale

- 794 (Grit-S). *Journal of Personality Assessment*, 91(20), 166-174.
795 <https://doi.org/10.1080/00223890802634290>
- 796 Duckworth, A. L., Quinn, P. D., & Seligman, M. E. P. (2009). Positive predictors of teacher
797 effectiveness. *Journal of Positive Psychology*, 4(6), 540–547.
798 <https://doi.org/10.1080/17439760903157232>
- 799 Dunn, J. G. H., Causgrove Dunn, J., Gamache, V., & Holt, N. L. (2014). A person-oriented
800 examination of perfectionism and slump-related coping in female intercollegiate volleyball
801 players. *International Journal of Sport Psychology*, 45(4), 298-324.
802 <https://doi.org/10.7352/IJSP2014.45.298>
- 803 Dunn, J. G. H., Gotwals, J. K., & Causgrove Dunn, J. (2005). An examination of the domain
804 specificity of perfectionism among intercollegiate student-athletes. *Personality and*
805 *Individual Differences*, 38(6), 1439–1448. <https://doi.org/10.1016/j.paid.2004.09.009>
- 806 Dunn, J. G. H., Gotwals, J. K., Causgrove Dunn, J., & Lizmore, M. R. (2020). Perfectionism,
807 pre-competitive worry, and optimism in high performance athletes. *International Journal*
808 *of Sport and Exercise Psychology*, 18(6), 749-763.
809 <https://doi.org/10.1080/1612197X.2019.1577900>
- 810 Dunn, J. G. H., Gotwals, J. K., Causgrove Dunn, J., Selzler, A.-M., Lizmore, M. R., Vaartstra,
811 M., Sapieja, K. M., & Gamache, V. E. (2016). A multi-sample investigation of the higher-
812 order latent dimensionality of the Sport-Multidimensional Perfectionism Scale-2.
813 *Psychology of Sport and Exercise*, 27, 150-156.
814 <https://doi.org/10.1016/j.psychsport.2016.08.006>
- 815 Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House.
- 816 Egan, S. J., & Shafran, R. (2018). Cognitive-behavioral treatment for perfectionism. In J. Stoeber
817 (Ed.), *The psychology of perfectionism: Theory, research, applications* (pp. 284-305).

- 818 Routledge.
- 819 Eum, K. U., & Rice, K. G. (2011). Test anxiety, perfectionism, goal orientations, and academic
820 performance. *Anxiety, Stress, & Coping*, *24*(2), 167-178.
821 <https://doi.org/10.1080/10615806.2010.488723>
- 822 Fawver, B., Cowan, R. L., DeCouto, B., Lohse, K. R., Podlog, L., & Williams, A. M. (2020).
823 Psychological characteristics, sport engagement, and performance in alpine skiers.
824 *Psychology of Sport and Exercise*, *47*, 101616.
825 <https://doi.org/10.1016/j.psychsport.2019.101616>
- 826 Flett, G. L., & Hewitt, P. L. (2005). The perils of perfectionism in sports and exercise. *Current*
827 *Directions in Psychological Science*, *14*(1), 14-18. [https://doi.org/10.1111/j.0963-](https://doi.org/10.1111/j.0963-7214.2005.00326.x)
828 [7214.2005.00326.x](https://doi.org/10.1111/j.0963-7214.2005.00326.x)
- 829 Flett, G. L., & Hewitt, P. L. (2014). “The perils of perfectionism in sports and exercise”
830 revisited: Toward a broader understanding of the pressure to be perfect and its impact on
831 athletes and dancers. *International Journal of Sport Psychology*, *45*(4), 395-407.
832 <https://doi.org/10.7352/IJSP2014.45.395>
- 833 Flett, G. L., & Hewitt, P. L. (2016). Reflections on perfectionism and the pressure to be perfect
834 in athletes, dancers and exercisers. In A. P. Hill (Ed.), *The psychology of perfectionism in*
835 *sport, dance and exercise* (pp. 296-319). Routledge.
- 836 Gilchrist, J. D., Fong, A. J., Herbison, J. D., & Sabiston, C. M. (2018). Feelings of pride are
837 associated with grit in student-athletes and recreational runners. *Psychology of Sport and*
838 *Exercise*, *36*, 1–7. <https://doi.org/10.1016/j.psychsport.2017.12.009>
- 839 Glass, G. V., & Hopkins, K. D. (1984). *Statistical methods in education and psychology* (2nd
840 ed.). Prentice-Hall.
- 841 Gotwals, J. K., & Dunn, J. G. H. (2009). A multi-method multi-analytic approach to establishing

- 842 internal construct validity evidence: The Sport Multidimensional Perfectionism Scale 2.
843 *Measurement in Physical Education and Exercise Science*, 13(2), 71–92.
844 <https://doi.org/10.1080/10913670902812663>
- 845 Gotwals, J. K., Stoeber, J., Dunn, J. G. H., & Stoll, O. (2012). Are perfectionistic strivings in
846 sport adaptive? A systematic review of confirmatory, contradictory, and mixed evidence.
847 *Canadian Psychology*, 53(4), 263–279. <https://doi.org/10.1037/a0030288>
- 848 Graham, J. W., Cumsille, P. E., & Elek-Fisk, E. (2003). Methods for handling missing data. In J.
849 A. Schinka, & W. F. Velicer (Eds.), *Handbook of psychology: Research methods in*
850 *psychology* (Vol. 2, pp. 87-114). Wiley.
- 851 Hall, H. K. (2006). Perfectionism: A hallmark quality of world class performers, or a
852 psychological impediment to athletic development? In D. Hackfort & G. Tenenbaum
853 (Eds.), *Essential processes for attaining peak performance* (Vol. 1, pp. 178-211). Meyer &
854 Meyer.
- 855 Hall, H. K. (2016). Reflections on perfectionism and its influence on motivational processes in
856 sport, dance, and exercise. In A. P. Hill (Ed.), *The psychology of perfectionism in sport,*
857 *dance and exercise* (pp. 275-295). Routledge.
- 858 Hall, H. K., Hill, A. P., & Appleton, P. R. (2012). Perfectionism: A foundation for sporting
859 excellence or an uneasy pathway toward purgatory? In G. C. Roberts & D. C. Treasure
860 (Eds.), *Advances in motivation in sport and exercise* (3rd ed., pp. 129-168). Human
861 Kinetics.
- 862 Hardy, L., Barlow, M., Evans, L., Rees, T., Woodman, T., & Warr, C. (2017). Great British
863 medalists: Psychosocial biographies of super-elite and elite athletes from Olympic sports.
864 *Progress in Brain Research*, 232, 1-119. <https://doi.org/10.1016/bs.pbr.2017.03.004>
- 865 Hewitt, P. L., & Flett, G. L. (1991). Perfectionism and self and social contexts:

- 866 Conceptualization, assessment, and association with psychopathology. *Journal of*
867 *Personality and Social Psychology*, 60(3), 456-470. <https://doi.org/10.1037/0022->
868 3514.60.3.456
- 869 Hill, A. P. (2016). *The psychology of perfectionism in sport, dance and exercise*. Routledge.
- 870 Hill, A. P., Jowett, G. E., & Mallinson-Howard, S. H. (2018). Perfectionism in sport, dance, and
871 exercise. In J. Stoeber (Ed.), *The psychology of perfectionism: Theory, research,*
872 *applications* (pp. 155-174). Routledge.
- 873 Hill, A. P., Madigan, D. J., & Jowett, G. E. (2020). Perfectionism and athlete engagement: A
874 multi-sample test of the 2 x 2 model of perfectionism. *Psychology of Sport and Exercise*,
875 48, 101664. <https://doi.org/10.1016/j.psychsport.2020.101664>
- 876 Hill, A. P., Madigan, D. J., Smith, M. M., Mallinson-Howard, S. H., & Donachie, T. C. (2020).
877 Perfectionism. In D. Hackfort & R. J. Schinke (Eds.), *The Routledge encyclopedia of sport*
878 *and exercise psychology: Theoretical and methodological concepts* (Vol. 1, pp. 405-412).
879 Routledge. <https://doi.org/10.4324/9781315187228>
- 880 Hill, A. P., Mallinson-Howard, S. H., & Jowett, G. E. (2018). Multidimensional perfectionism in
881 sport: A meta-analytic review. *Sport, Exercise, and Performance Psychology*, 7(3), 235-
882 270. <https://doi.org/10.1037/spy0000125>
- 883 Hill, A. P., Mallinson-Howard, S. H., Madigan, D. J., & Jowett, G. E. (2020). Perfectionism in
884 sport, dance, and exercise: An extended review and reanalysis. In G. Tenenbaum & R. C.
885 Eklund (Eds.), *Handbook of sport psychology* (4th ed., Vol. 1, pp. 121-157). Wiley.
- 886 Hodges, N. J., Ford, P. R., Hendry, D. T., & Williams, A. M. (2017). Getting gritty about
887 practice and success: Motivational characteristics of great performers. *Progress in Brain*
888 *Research*, 232, 167-173. <https://doi.org/10.1016/bs.pbr.2017.02.003>
- 889 Houston, J. M., Luchner, A., Davidson, A. J., Gonzales, J., Steigerwald, N., & Leftwich, C.

- 890 (2020). The bright and dark aspects of grit in the pursuit of success. *Psychological*
891 *Reports*. Advance online publication. <https://doi.org/10.1177/0033294120907316>
- 892 Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure
893 analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*,
894 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- 895 Jordet, G. (2015). Psychological characteristics of expert performers. In J. Baker & D. Farrow
896 (Eds.), *Routledge handbook of sport expertise* (pp. 106-120). Routledge.
897 <https://doi.org/10.4324/9781315776675>
- 898 Jowett, G. E., Hill, A. P., Hall, H. K., & Curran, T. (2013). Perfectionism and junior athlete
899 burnout: The mediating role of autonomous and controlled motivation. *Sport, Exercise,*
900 *and Performance Psychology*, 2(1), 48-61. <https://doi.org/10.1037/a0029770>
- 901 Jowett, G. E., Hill, A. P., Hall, H. K., & Curran, T. (2016). Perfectionism, burnout and
902 engagement in youth sport: The mediating role of basic psychological needs. *Psychology*
903 *of Sport and Exercise*, 24, 18-26. <https://doi.org/10.1016/j.psychsport.2016.01.001>
- 904 Jowett, G. E., Mallinson, S. H., & Hill, A. P. (2016). An independent effects approach to
905 perfectionism in sport, dance, and exercise. In A. P. Hill (Ed.), *The psychology of*
906 *perfectionism in sport, dance and exercise* (pp. 85-149). Routledge.
- 907 Kelly, D. R., Matthews, M. D., & Bartone, P. T. (2014). Grit and hardiness as predictors of
908 performance among West Point cadets. *Military Psychology*, 26(4), 327-342.
909 <https://doi.org/10.1037/mil0000050>
- 910 Kim, K. H. (2005). The relation among fit indexes, power, and sample size in structural equation
911 modeling. *Structural Equation Modeling*, 12(3), 368-390.
912 https://doi.org/10.1207/s15328007sem1203_2
- 913 Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford

- 914 Press.
- 915 Larkin, P., O'Connor, D., & Williams, A. M. (2016). Does grit influence sport-specific
916 engagement and perceptual-cognitive expertise in elite youth soccer? *Journal of Applied
917 Sport Psychology, 28*(2), 129–138. <https://doi.org/10.1080/10413200.2015.1085922>
- 918 Lizmore, M., Dunn, J., & Brennan, E. (2018, October 4). *Developing and assessing the impact
919 of a mental-training intervention targeting athletes' perfectionistic concerns in sport*
920 [Conference presentation]. Association for Applied Sport Psychology Conference,
921 Toronto, ON, Canada.
- 922 Lizmore, M. R., Dunn, J. G. H., & Causgrove Dunn, J. (2016). Reactions to mistakes as a
923 function of perfectionism and situation criticality in curling. *International Journal of Sport
924 Psychology, 47*(1), 81-101. <https://doi.org/10.7352/IJSP2016.47.081>
- 925 Lizmore, M. R., Dunn, J. G. H., & Causgrove Dunn, J. (2017). Perfectionistic strivings,
926 perfectionistic concerns, and reactions to poor personal performances among
927 intercollegiate athletes. *Psychology of Sport and Exercise, 33*, 75-84.
928 <https://doi.org/10.1016/j.psychsport.2017.07.010>
- 929 Lizmore, M. R., Dunn, J. G. H., Causgrove Dunn, J., & Hill, A. P. (2019). Perfectionism and
930 performance following failure in a competitive golf-putting task. *Psychology of Sport and
931 Exercise, 45*, Article 101582. <https://doi.org/10.1016/j.psychsport.2019.101582>
- 932 Lucas, G. M., Gratch, J., Cheng, L., & Marsella, S. (2015). When the going gets tough: Grit
933 predicts costly perseverance. *Journal of Research in Personality, 59*, 15–22.
934 <https://doi.org/10.1016/j.jrp.2015.08.004>
- 935 MacNamara, A., & Collins, D. (2015). Profiling, exploiting, and countering psychological
936 characteristics in talent identification and development. *The Sport Psychologist, 29*(1), 73-
937 81. <https://doi.org/10.1123/tsp.2014-0021>

- 938 Maddi, S. R., Erwin, L. M., Carmody, C. L., Villarreal, B. J., White, M., & Gundersen, K. K.
939 (2013). Relationships of hardiness, grit, and emotional intelligence to internet addiction,
940 excessive consumer spending, and gambling. *Journal of Positive Psychology*, 8(2), 128-
941 134. <https://doi.org/10.1080/17439760.2012.758306>
- 942 Madigan, D. J., Hill, A. P., Anstiss, P. A., Mallinson-Howard, S. H., & Kumar, S. (2018).
943 Perfectionism and training distress in junior athletes: The mediating role of coping
944 tendencies. *European Journal of Sport Science*, 18(5), 713-721.
945 <https://doi.org/10.1080/17461391.2018.1457082>
- 946 Madigan, D., Stoeber, J., & Passfield, L. (2015). Perfectionism and burnout in junior athletes: A
947 three-month longitudinal study. *Journal of Sport & Exercise Psychology*, 37(3), 305-315.
948 <https://doi.org/10.1123/jsep.2014-0266>
- 949 Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-
950 testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing
951 Hu and Bentler's (1999) findings. *Structural Equation Modeling*, 11(3), 320-341.
952 https://doi.org/10.1207/s15328007sem1103_2
- 953 Martin, J. J. (2018). *Handbook of disability sport and exercise psychology*. Oxford University
954 Press. <https://doi.org/10.1093/oso/9780190638054.001.0001>
- 955 Martin, J. J., Byrd, B., Watts, M. L., & Dent, M. (2015). Gritty, hardy, and resilient: Predictors
956 of sport engagement and life satisfaction in wheelchair basketball players. *Journal of*
957 *Clinical Sport Psychology*, 9(4), 345–359. <https://doi.org/10.1123/jcsp.2015-0015>
- 958 McDonald, R. P., & Ho, M. H. R. (2002). Principles and practice in reporting structural equation
959 analyses. *Psychological Methods*, 7(1), 64-82. <https://doi.org/10.1037/1082-989X.7.1.64>
- 960 Meyer, B. B., Markgraf, K. M., & Gnacinski, S. L. (2017). Examining the merit of grit in
961 women's soccer: Questions of theory, measurement, and application. *Journal of Applied*

- 962 *Sport Psychology*, 29(3), 353-366. <https://doi.org/10.1080/10413200.2016.1255277>
- 963 Mondak, J. J. (2020). Citizen grit: Effects of domain-specificity, perseverance, and consistency
964 on political judgment. *Personality and Individual Differences*, 163, 110059.
965 <https://doi.org/10.1016/j.paid.2020.110059>
- 966 Mosewich, A. D., Crocker, P. R. E., Kowalski, K. C., & DeLongis, A. (2013). Applying self-
967 compassion in sport: An intervention with women athletes. *Journal of Sport & Exercise*
968 *Psychology*, 35(5), 514-524. <https://doi.org/10.1123/jsep.35.5.514>
- 969 Muenks, K., Yang, J. S., & Wigfield, A. (2017). Associations between grit, motivation, and
970 achievement in high school students. *Motivation Science*, 4(2), 158-176.
971 <https://doi.org/10.1037/mot0000076>
- 972 Newland, A., Gitelson, R., & Legg, W. E. (2020). Examining the relationship between mental
973 skills and grit in senior Olympic athletes. *Journal of Aging and Physical Activity*, 28(4),
974 658-667. <https://doi.org/10.1123/japa.2019-0304>
- 975 Olefir, V. (2018). Personality resources as a mediator of the relationship between antecedents of
976 stress and pre-competitive anxiety. *Journal of Physical Education and Sport*, 18(4), 2230-
977 2234. <https://doi.org/10.7752/jpes.2018.04335>
- 978 Park, D., Yu, A., Baelen, R. N., Tsukayama, E., & Duckworth, A. L. (2018). Fostering grit:
979 Perceived school goal-structure predicts growth in grit and grades. *Contemporary*
980 *Educational Psychology*, 55, 120-128. <https://doi.org/10.1016/j.cedpsych.2018.09.007>
- 981 Perkins-Gough, D. (2013). The significance of grit: A conversation with Angela Lee Duckworth.
982 *Educational Leadership*, 71(1), 14-20.
- 983 Pituch, K. A., & Stevens, J. P. (2016). *Applied multivariate statistics for the social sciences:*
984 *Analyses with SAS and IBM's SPSS* (6th ed.). Routledge.
985 <https://doi.org/10.4324/9781315814919>

- 986 Poczwardowski, A., Diehl, B., O'Neil, A., Cote, T. A., & Haberl, P. (2014). Successful
987 transitions to the Olympic training center, Colorado Springs: A mixed-method exploration
988 with six resident-athletes. *Journal of Applied Sport Psychology, 26*(1), 33-51.
989 <https://doi.org/10.1080/10413200.2013.773950>
- 990 Preckel, F., & Brunner, M. (2020). Nomological nets. In V. Zeigler-Hill & T.K. Shackelford
991 (Eds.), *Encyclopedia of personality and individual differences* (pp. 3246-3249). Springer.
992 <https://doi.org/10.1007/978-3-319-24612-3>
- 993 Rasquinha, A., Dunn, J. G. H., & Causgrove Dunn, J. (2014). Relationships between
994 perfectionistic strivings, perfectionistic concerns, and competitive sport level. *Psychology*
995 *of Sport and Exercise, 15*(6), 659–667. <https://doi.org/10.1016/j.psychsport.2014.07.008>
- 996 Rhodes, J., May, J., Andrade, J., & Kavanagh, D. (2018). Enhancing grit through functional
997 imagery training in professional soccer. *The Sport Psychologist, 32*(3), 220-225.
998 <https://doi.org/10.1123/tsp.2017-0093>
- 999 Salles, A., Cohen, G. L., & Mueller, C. M. (2014). The relationship between grit and resident
1000 well-being. *The American Journal of Surgery, 207*(2), 251–254.
1001 <https://doi.org/10.1016/j.amjsurg.2013.09.006>
- 1002 Schmidt, F. T. C., Fleckenstein, J., Retelsdorf, J., Eskreis-Winkler, L., & Möller, J. (2019).
1003 Measuring grit: A German validation and a domain-specific approach to grit. *European*
1004 *Journal of Psychological Assessment, 35*(3), 436-447. [https://doi.org/10.1027/1015-](https://doi.org/10.1027/1015-5759/a000407)
1005 [5759/a000407](https://doi.org/10.1027/1015-5759/a000407)
- 1006 Shields, D. L., Funk, C. D., & Bredemeier, B. L. (2018). Can contesting orientations predict
1007 grittier, more self-controlled athletes? *The Journal of Positive Psychology, 13*(5), 440–448.
1008 <https://doi.org/10.1080/17439760.2017.1350738>
- 1009 Sigmundsson, H., Clemente, F. M., & Loftesnes, J. M. (2020). Passion, grit and mindset in

- 1010 football players. *New Ideas in Psychology*, 59, 100797.
- 1011 <https://doi.org/10.1016/j.newideapsych.2020.100797>
- 1012 Stoeber, J. (2011). The dual nature of perfectionism in sports: relationships with emotion,
1013 motivation, and performance. *International Review of Sport and Exercise Psychology*,
1014 4(2), 128-145. <https://doi.org/10.1080/1750984x.2011.604789>
- 1015 Stoeber, J. (2012). Perfectionism and performance. In S. M. Murphy (Ed.), *Oxford handbook of*
1016 *sport and performance psychology* (pp. 294-306). Oxford University Press.
1017 <https://doi.org/10.1093/oxfordhb/9780199731763.001.0001>
- 1018 Stoeber, J. (2014). Perfectionism in sport: A double-edged sword. *International Journal of Sport*
1019 *Psychology*, 45(4), 385-394. <https://doi.org/10.7352/IJSP2014.45.385>
- 1020 Stoeber, J., Damian, L. E., & Madigan, D. J. (2018). Perfectionism: A motivational perspective.
1021 In J. Stoeber (Ed.), *The psychology of perfectionism: Theory, research, applications* (pp.
1022 19-43). Routledge.
- 1023 Stoeber, J., & Madigan, D. J. (2016). Measuring perfectionism in sport, dance, and exercise:
1024 Review, critique, recommendations. In A. P. Hill (Ed.), *The psychology of perfectionism in*
1025 *sport, dance and exercise* (pp. 31-56). Routledge.
- 1026 Stoeber, J., Otto, K., & Stoll, O. (2006). *MIPS: Multidimensional Inventory of Perfectionism in*
1027 *Sport (English Version)*. [Unpublished manuscript]. School of Psychology, University of
1028 Kent, UK. <https://kar.kent.ac.uk/41560/>
- 1029 Stoeber, J., Stoll, O., Salmi, O., & Tiikkaja, J. (2009). Perfectionism and achievement goals in
1030 young Finnish ice-hockey players aspiring to make the Under-16 national team. *Journal of*
1031 *Sports Sciences*, 27(1), 85-94. <https://doi.org/10.1080/02640410802448749>
- 1032 Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd ed.). HarperCollins.
- 1033 Tedesqui, R. A. B., & Young, B. W. (2017). Investigating grit variables and their relations with

- 1034 practice and skill groups in developing sport experts. *High Ability Studies*, 28(2), 167-180.
- 1035 <https://doi.org/10.1080/13598139.2017.1340262>
- 1036 Tedesqui, R. A. B., & Young, B. W. (2018). Comparing the contribution of conscientiousness,
1037 self-control, and grit to key criteria of sport expertise development. *Psychology of Sport
1038 and Exercise*, 34, 110-118. <https://doi.org/10.1016/j.psychsport.2017.10.002>
- 1039 Tedesqui, R. A. B., & Young, B. W. (2019). Relationships between athletes' self-reported grit
1040 levels and coach-reported practice engagement over one sport season. *Journal of Sport
1041 Behavior*, 42(4), 509-523.
- 1042 Toering, T., & Jordet, G. (2015). Self-control in professional soccer players. *Journal of Applied
1043 Sport Psychology*, 27(3), 335–350. <https://doi.org/10.1080/10413200.2015.1010047>
- 1044 Vaartstra, M., Dunn, J. G. H., & Causgrove Dunn, J. (2018). Perfectionism and perceptions of
1045 social loafing in competitive youth soccer. *Journal of Sport Behavior*, 41, 475-500.
- 1046 Vazsonyi, A.T., Ksinan, A.J., Jiskrova, G.K., Mikuška, J., Javakhishvili, M., & Cui, G. (2019).
1047 To grit or not to grit, that is the question! *Journal of Research in Personality*, 78, 215-226.
1048 <https://doi.org/10.1016/j.jrp.2018.12.006>
- 1049 Wolters, C. A., & Hussain, M. (2015). Investigating grit and relations with college students' self-
1050 regulated learning and academic achievement. *Metacognition Learning*, 10(3), 293-311.
1051 <https://doi.org/10.1007/s11409-014-9128-9>

Table 1

Descriptive Statistics, Internal Consistencies, and Univariate Contrasts for Men and Women Across all Subscales

Subscales	Men			Women			Univariate test statistics		
	<i>M</i>	(<i>SD</i>)	α	<i>M</i>	(<i>SD</i>)	α	<i>F</i> (1, 249)	<i>p</i>	Partial η^2
Perfectionism ^a									
Personal standards	3.86	(0.52)	.71	3.61	(0.61)	.80	12.17	< .001	.04
Striving for perfection	3.97	(0.69)	.84	3.65	(0.84)	.89	10.59	< .01	.04
Organization	3.78	(0.73)	.89	3.61	(0.80)	.89	3.08	n.s.	.01
Concern over mistakes	2.87	(0.79)	.83	2.94	(0.82)	.84	0.45	n.s.	.00
Negative reactions to imperfection	2.98	(0.70)	.75	2.99	(0.81)	.81	0.04	n.s.	.00
Doubts about actions	2.18	(0.62)	.76	2.30	(0.70)	.82	2.17	n.s.	.01
Perceived parental pressure	2.14	(0.69)	.80	2.17	(0.93)	.91	0.12	n.s.	.00
Perceived coach pressure	3.20	(0.66)	.72	3.39	(0.68)	.80	5.53	< .05	.02
Grit ^b									
Consistency of interests	5.17	(1.05)	.85	4.94	(0.98)	.78	3.14	n.s.	.01
Perseverance of effort	5.67	(0.87)	.82	5.73	(0.76)	.73	0.16	n.s.	.00

Note. *N* = 251 (149 men; 102 women)^a Items measured on a 5-point scale.^b Items measured on a 7-point scale.

Table 2

Mean Item Subscale Scores, Standard Deviations, Correlations, and Internal Consistency Values (α) for Full Sample

	Perfectionism ^a								Grit ^b		Gender ^c
	PS	SP	ORG	COM	NRI	DAA	PPP	PCP	CI	PE	
PS	(.76)	.56***	.39***	.31***	.30***	-.08	.21**	.19**	.09	.33***	-.19**
SP		(.87)	.26***	.44***	.47***	.06	.17**	.18**	.11	.24***	-.16**
ORG			(.89)	-.01	.07	-.20**	.07	.09	.15*	.46***	-.10
COM				(.83)	.76***	.46***	.28***	.44***	-.15*	-.19*	.03
NRI					(.78)	.39***	.23***	.40***	-.15*	-.14*	.00
DAA						(.79)	.16*	.25**	-.25**	-.40***	.06
PPP							(.88)	.25***	-.13*	-.02	-.03
PCP								(.75)	-.13*	.03	.12*
CI									(.82)	.36***	-.10
PE										(.74)	.01
<i>Mean</i>	3.76	3.84	3.71	2.90	2.98	2.22	2.16	3.28	5.07	5.71	-
<i>SD</i>	0.57	0.77	0.76	0.81	0.75	0.65	0.79	0.68	1.03	0.82	-

Note. $N = 251$. Internal consistency values are in parentheses along the main diagonal. Bivariate correlations (r) are contained in the upper triangular matrix. Correlations between gender and all variables were computed with Kendall's τ . Subscale abbreviations: PS = personal standards; SP = striving for perfection; ORG = organization; COM = concern over mistakes; NRI = negative reactions to imperfection; DAA = doubts about actions; PPP = perceived parental pressure; PCP = perceived coach pressure; CI = consistency of interests; PE = perseverance of effort.

^a Items measured on a 5-point scale.

^b Items measured on a 7-point scale.

^c Gender coded: 1 = male, 2 = female.

* $p < .05$. ** $p < .01$. *** $p < .001$.

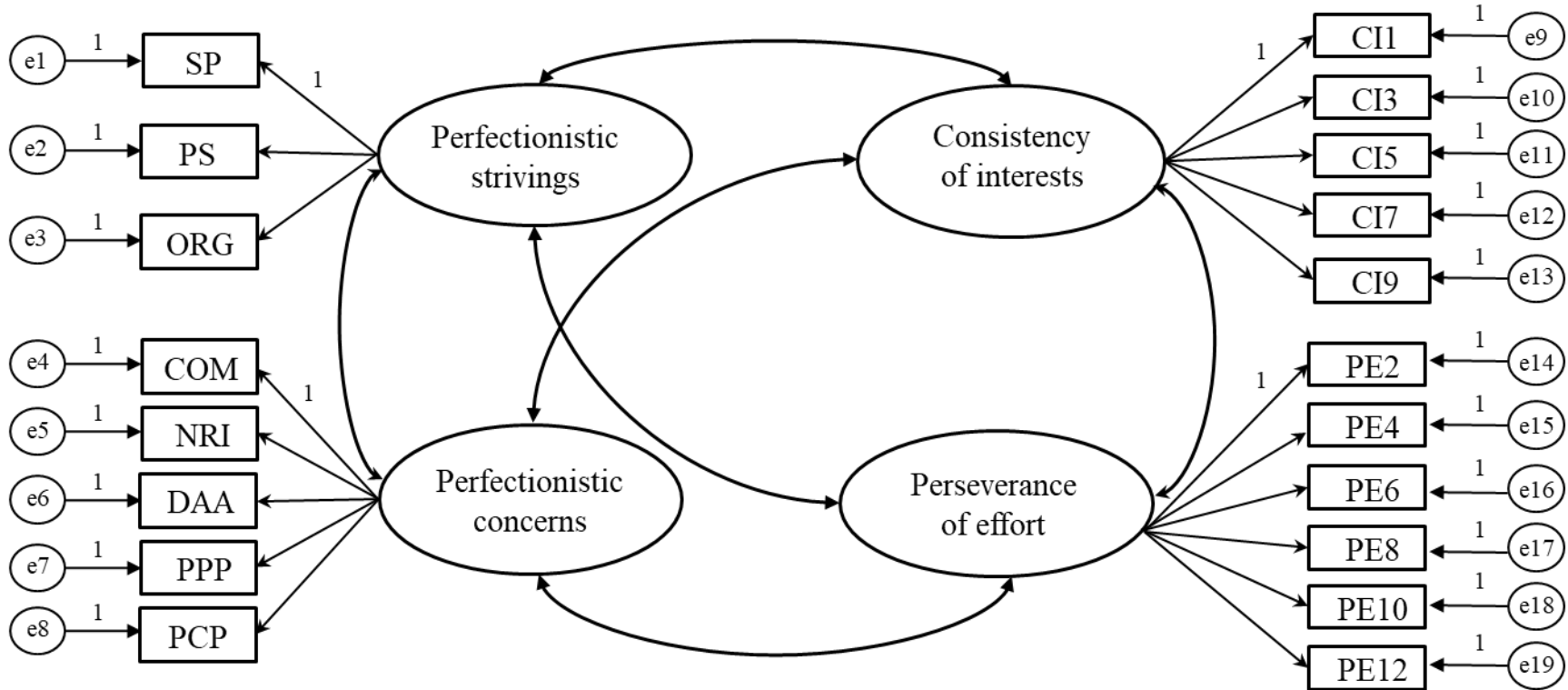


Figure 1

Theoretical model for confirmatory factor analysis. Abbreviations: SP = striving for perfection; PS = personal standards; ORG = organization; COM = concern over mistakes; NRI = negative reactions to imperfection; DAA = doubts about actions; PPP = perceived parental pressure; PCP = perceived coach pressure; CI = consistency of interests items; PE = perseverance of effort items.

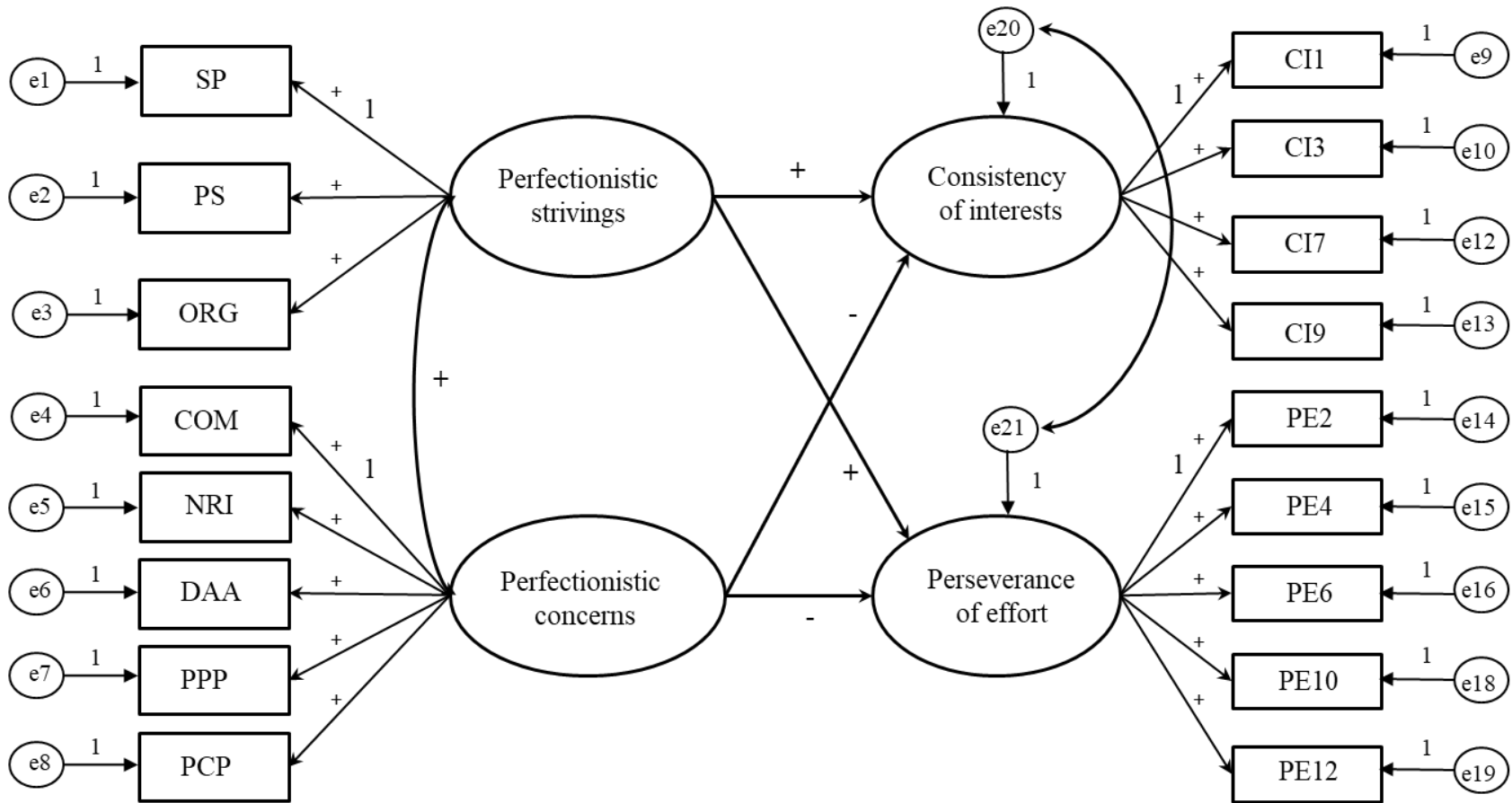


Figure 2

Theoretical model for structural equation modeling analysis. Plus signs (+) indicate positive paths, correlations, or loadings. Negative signs (-) indicate negative paths, correlations, or loadings. Abbreviations: PS = personal standards; SP = striving for perfection; ORG = organization; COM = concern over mistakes; NRI = negative reactions to imperfection; DAA = doubts about actions; PPP = perceived parental pressure; PCP = perceived coach pressure; CI = consistency of interests items; PE = perseverance of effort items.

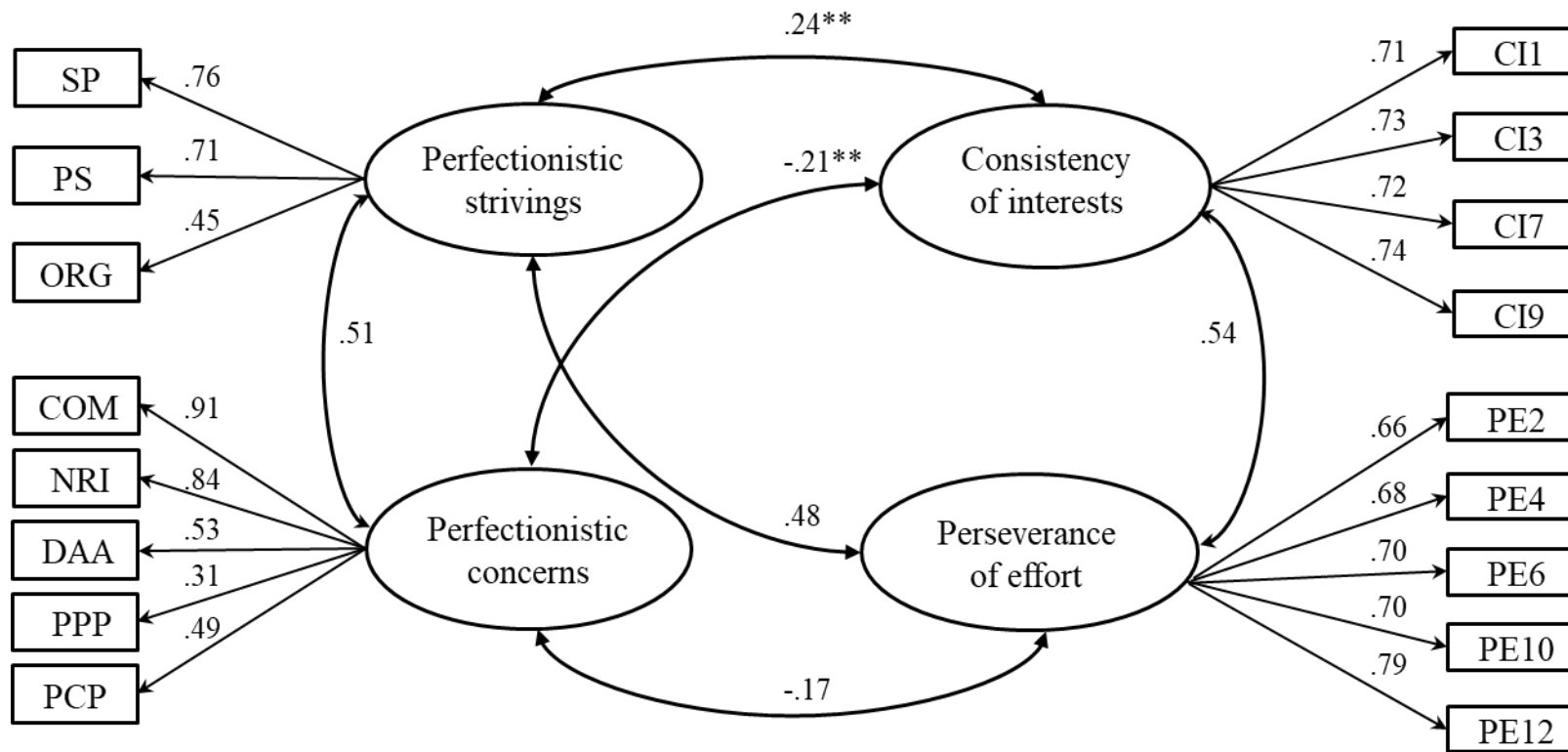


Figure 3

Final confirmatory factor analysis model following the removal of items CI5 and PE8. Errors have been omitted for the sake of brevity. All parameters are standardized, and significant at $p < .001$ unless otherwise specified. Abbreviations: SP = striving for perfection; PS = personal standards; ORG = organization; COM = concern over mistakes; NRI = negative reactions to imperfection; DAA = doubts about actions; PPP = perceived parental pressure; PCP = perceived coach pressure; CI = consistency of interests items; PE = perseverance of effort items.

** $p < .01$

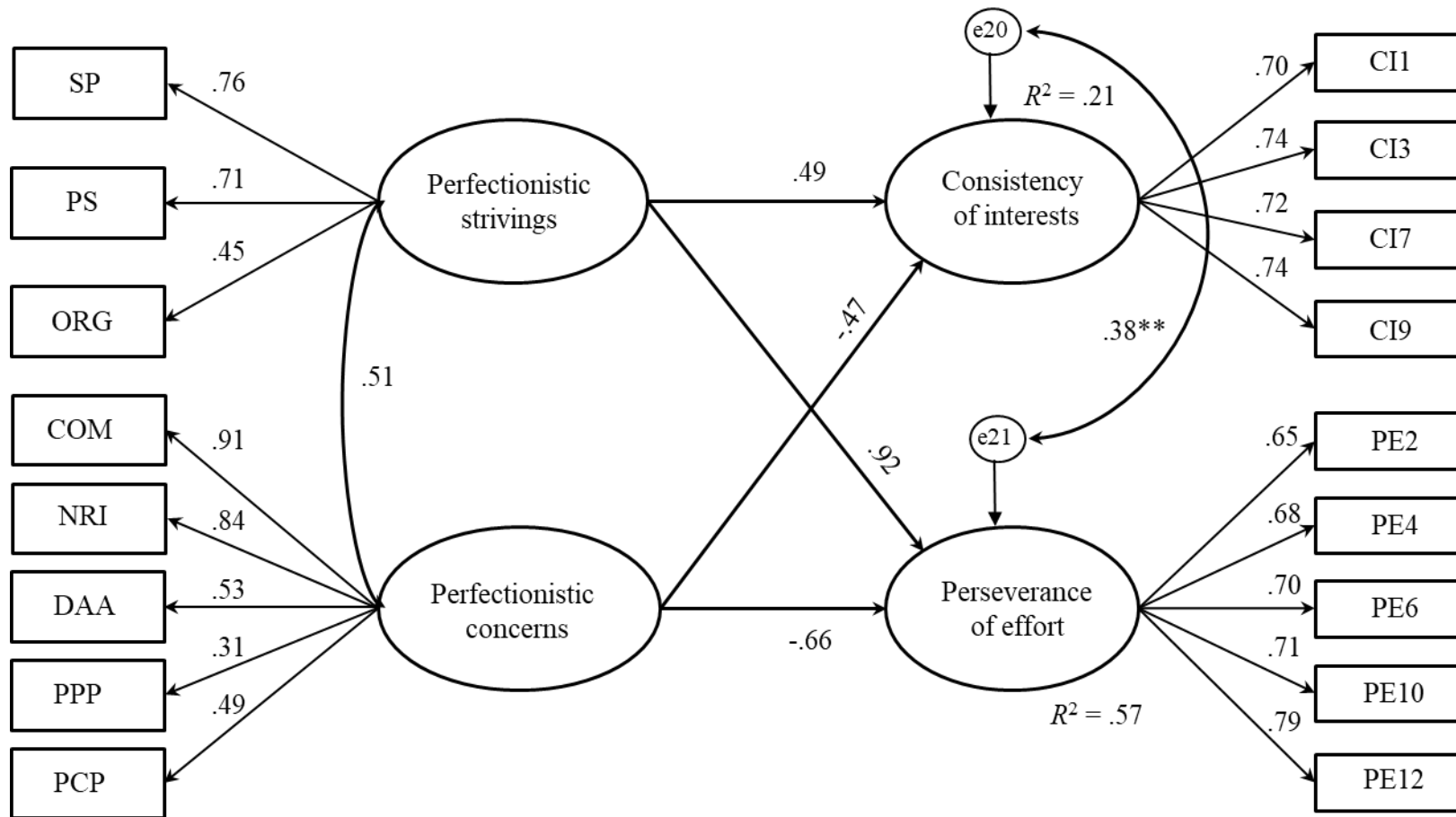


Figure 4

Final model ($N = 249$). Errors have been omitted for the sake of brevity. All parameters are standardized and significant at $p < .001$ unless otherwise specified. Gender (male = 1, female = 2) was controlled: path from gender to consistency of interest = .35 ($p < .001$), path from gender to perseverance of effort = .05 ($p = .49$). Correlation between gender and strivings = $-.30$ ($p < .001$); correlation between gender and concerns = .05 ($p = .47$). Abbreviations: SP = striving for perfection; PS = personal standards; ORG = organization; COM = concern over mistakes; NRI = negative reactions to imperfection; DAA = doubts about actions; PPP = perceived parental pressure; PCP = perceived coach pressure; CI = consistency of interests items; PE = perseverance of effort items. ** $p < .01$