

The 2x2 model of Perfectionism and Exercise Dependence

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The 2×2 model of Perfectionism and Exercise Dependence

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Abstract

We examined the influence of perfectionism on exercise dependence using the 2×2 model of perfectionism. This model posits that interactions between different forms of perfectionism; self-oriented (SOP) and socially prescribed perfectionism (SPP) conduce to different outcomes. Three hundred and seventy-six college students completed an online survey measuring exercise behaviour, dependence and perfectionism. When accounting for participant gender, we failed to find significant interactions between subtypes of perfectionism and exercise dependence. In contrast to our hypotheses and the tenets of the model, the highest levels of exercise dependence were mostly associated with high levels of SOP, as well as high levels of both SOP and SPP . This study adds to previous work that has questioned the tenets of the model as they apply to exercise. However, our results still highlight the importance of examining within-person combinations of perfectionism.

Keywords: Perfectionism, Exercise Dependence, 2×2 Model, Gender, Exercise

19 The 2×2 model of Perfectionism and Exercise Dependence

20 Exercise has numerous benefits for physical and psychological health (CDC, 2020).
21 However, exercise can become problematic when individuals become reliant on it. This state is
22 often referred to as exercise dependence (ED; Hausenblas & Downs, 2002b). When this happens,
23 exercise predicts a number of detrimental physical and psychological outcomes such as burnout
24 and injury (see Hausenblas & Downs, 2002b). In recent years, researchers have begun to explore
25 antecedents of ED, in order to understand the factors that contribute to exercise becoming
26 problematic (Gotwals et al., 2012; Hall et al., 2007). One relevant factor here is perfectionism
27 (Flett & Hewitt, 2005). In the past, two types of perfectionism, self-oriented perfectionism (SOP)
28 and socially prescribed perfectionism (SPP), have been studied separately, and have been shown
29 to be associated with various maladaptive exercise behaviors (Hall et al., 2009; Hausenblas &
30 Downs, 2002b). Those higher in either SOP or SPP are more likely to have high rates of ED, as
31 concerns over mistakes and high personal standards can both contribute to demonstrating
32 incompetence and reduce control over achievement (i.e., body image), thus increasing the need
33 to exercise (Hall et al., 2009; Hausenblas & Downs, 2002b; Miller & Mesagno, 2014). More
34 recently, researchers have begun to study these dimensions of perfectionism in combination
35 (Gaudreau, 2013), to understand the influence of different within-person combinations on
36 various outcomes, most notably under the guise of the 2×2 model of perfectionism (MOP;
37 Gaudreau & Thompson, 2010).

38 The 2×2 MOP is based on the premise that SOP and SPP co-exist in individuals
39 (Gaudreau & Thompson, 2010), and that different within person combinations will conduce to
40 different outcomes. The model posits four subtypes of perfectionism that include Pure SPP (high
41 levels of SPP and low levels of SOP), Pure SOP (high levels of SOP and low levels of SPP),

42 mixed perfectionism (high levels of both SPP and SOP) and non-perfectionism (low levels of
43 both SPP and SOP). Individuals characterized as Pure SPP strive for perfection mainly due to
44 others exerting pressure, whereas those characterized as Pure SOP hold high standards deriving
45 from the self and not others. Mixed perfectionists perceive pressure from others and their own
46 personal standards, while non-perfectionists do not perceive either (Gaudreau & Thompson,
47 2010). The model has four theoretically driven hypotheses: H1a) pure SOP is associated with
48 either better, or H1b) poorer, or H1c) comparable outcomes than non-perfectionism; H2), pure
49 SPP is associated with the most detrimental outcomes compared to all other subtypes; H3) mixed
50 perfectionism is associated better outcomes than pure SPP; and H4) poorer outcomes than pure
51 SOP.

52 The model has been tested extensively within the sport literature(see Gaudreau, 2016;
53 Hill & Madigan, 2017). This work has demonstrated that Pure SPP is the most detrimental
54 within-person combination of perfectionism (H2; Gaudreau & Verner-Filion, 2012) as it is
55 associated with athlete burnout (Hill, 2013), lower self-esteem (Gotwals et al., 2003), and
56 negative affect (Sagar & Stoeber, 2009). Mixed perfectionism has also been shown to predict
57 detrimental outcomes. (Gaudreau, 2016; Hill & Madigan, 2017). In contrast, the effects of Pure
58 SOP are more inconclusive in its relationship to different aspects in the sport domain (Hill &
59 Madigan, 2017). Pure SOP predicts adaptive or positive factors (i.e., positive affect and goal
60 progress; Crocker et al., 2014), but is also associated with exhaustion in dancers (Nordin-Bates et
61 al., 2017). These findings have provided support for understanding the differences in sport
62 experiences for the different within person combinations of perfectionism (Mallinson-Howard et
63 al., 2018).

64 Within the exercise domain, limited examinations of the model have been completed. To
65 date only two studies have tested the model in exercise (Deck et al., 2019; 2020). One study
66 investigated the model in relation to enjoyment and boredom in exercise and found a significant
67 interaction between SOP and SPP for boredom, but not for enjoyment (Deck et al., 2019).
68 Contrary to the predictions of the model, Pure SOP (and not Pure SPP) was the strongest
69 predictor of boredom. A second study investigated the tenets of the model in relation to social
70 physique anxiety (SPA). Significant interactions between SOP and SPP were evident but again
71 these were not in the models' predicted directions (Deck et al., 2020) as the highest levels of
72 SPA were found for those who were characterized as Pure SOP. On the basis of these studies
73 Deck et al. (2019; 2020) tentatively suggested that the model may be better suited for
74 achievement domains, such as academics and sport as opposed to exercise (where the emphasis
75 on achievement is less). However, there are some aspects of exercise that are more akin to
76 achievement settings. Indeed, evidence suggests that ED is more of an achievement situation
77 than regular exercise (Hall et al., 2007; Lichtenstein et al., 2014) due to some of the antecedents
78 of ED manifesting from goals and wanting control over the body (Cashmore, 2008).

79 ED is characterized by a craving for leisure time exercise activity that can result in a
80 pattern of exercise behavior that is determinantal (Hausenblas & Downs, 2002b). Symptoms
81 include consistent continuance of exercise, a tolerance for exercise that leads to increased
82 amounts of exercise, lack of control when trying to reduce or discontinue exercise, increased
83 time spent in activities, and having intention effects where more exercise is done than intended
84 (Hausenblas & Downs, 2002b). ED has been positively associated with, and also shown to be an
85 outcome of perfectionistic traits (Hall et al., 2009; Hill et al., 2015; Miller & Mesagno, 2014).
86 Despite the perfectionism-dependence relationship being established, it is unclear if the various

87 within-person combinations will predict ED differently. Understanding the influence of within-
88 person combinations of perfectionism has important implications for practitioners who may need
89 to intervene to change exercise dependent behaviors and their associated outcomes. Moreover,
90 while the 2×2 MOP has produced inconsistent results within the exercise domain (Deck et al.,
91 2019; 2020), findings for perfectionism and ED may be more similar to findings from the sport
92 literature. The achievement aspects of ED may shed light on why previous predictions in
93 exercise were not supported.

94 Given the previously established relationship between perfectionism and ED (Hagan &
95 Hausenblas, 2013; Hill, 2013), in addition to the achievement aspects of ED (Hall et al., 2007;
96 Lichtenstein et al., 2014), we chose in the present research to examine the within person
97 combinations of perfectionism as proposed in the 2×2 MOP and their relationships with ED. As
98 ED has been associated with many negative consequences (Hausenblas & Downs, 2002b), our
99 hypotheses were based on ED being maladaptive in nature. We hypothesized that pure SOP
100 compared to non-perfectionism would be associated to either better (lower ED; H1a), or poorer
101 (higher ED; H1B) or comparable outcomes (H1c). Further, we hypothesized that pure SPP would
102 be associated with higher ED compared to all other subtypes (H2), and that mixed perfectionism
103 would be associated with lower ED than pure SPP (H3) and higher ED than pure SOP (H4).

104 **Method**

105 **Participants & Procedure**

106 Following ethics approval, we recruited participants from two second-year undergraduate
107 university classes. Participants completed an online survey, that took ~25 minutes to complete.
108 All participants received a letter of invitation and gave informed consent before proceeding to
109 data collection. Three hundred and seventy-six participants (65% female) took part ($M_{age} = 20,$

110 $SD = 1.4$, range 18-26). The majority of the participants were Caucasian (69%), while the
111 remaining participants reported being, Aboriginal (1%), Asian (15%) and other (15%).

112 **Measures**

113 **The Godin Leisure Time Exercise Questionnaire** (GLETQ; Godin & Sheppard, 1985).

114 The GLETQ is a self-report measure of leisure-time exercise habits based on a typical 7-day
115 week. Respondents are asked to indicate the number of times per week they engage in strenuous
116 (i.e., running, hockey), moderate (i.e., fast walking, tennis), and mild exercise (i.e., yoga,
117 bowling) at 15-minute intervals. Exercise scores are calculated by multiplying the number of
118 times participants indicated participating in an activity by 15. Weekly exercise minutes are then
119 calculated by adding the number of minutes for mild, moderate and strenuous activity. The
120 GLETQ is considered a valid and reliable instrument for classifying individuals by their exercise
121 behavior (i.e., active or not; see Amireault & Godin, 2015). We included intensity of exercise as
122 a covariate as it has previously shown some influence on both perfectionism and exercise
123 behavior (Hibbard & Walton, 2014; Shanmugam & Davies, 2015).

124 **The Multidimensional Perfectionism Scale** (MPS; Hewitt & Flett, 1989). The scale
125 comprises three subscales that measure perfectionism. The subscales used in the current study
126 were self-oriented perfectionism (SOP), and socially prescribed perfectionism (SPP).

127 Participants rated 30 items (15 per scale) on a 7-point Likert scale, from 1 (*agree*) to 7
128 (*disagree*). Each item from each subscale was added to create a total score for each type of
129 perfectionism. Hewitt et al. (1991) have demonstrated adequate reliability and validity for all
130 subscales of the MPS.

131 **Exercise Dependence Scale** (EDS; Hausenblas & Downs, 2002a). Participants were asked to
132 respond to 21 items (seven subscales with three items each) of ED; withdrawal effects, tolerance,

133 continuance, lack of control, reduction in other activities, time, and intention effects) that ask
134 how each item reflects their current exercise beliefs and behaviors. Items are rated on a 5-point
135 Likert scale from (1) *Never* to (5) *Always*. An overall total score of all 30 items was used to
136 create an ED total score. Totals of each subscale were also calculated. For reliability, validity and
137 psychometric properties, see Downs et al. (2004).

138 **Data Analysis**

139 We screened data for missing values and four cases were deleted due to incomplete data (i.e.,
140 missing an entire subscale). The remaining missing values in the data set were determined to be
141 missing at random, thus we replaced these using an expectation maximization algorithm (EM;
142 Tabachnick & Fidell, 2001). Coefficient alphas for all scales of each instrument were
143 satisfactory; all subscales were $>.70$.

144 Based on previous work (Gaudreau, 2012) we tested the predictions of the 2x2 model
145 using moderated hierarchical regression. First, we performed a regression analyses using total
146 ED scores. Next, to examine the differences amongst the various aspects of ED, we conducted
147 regression analyses for each individual subscale of the EDS. We entered gender and exercise
148 intensity as covariates. Gender was found to be significant and kept for each of the models.
149 Exercise intensity was not significant, and was removed.

150 No interactive effects were found for total ED for any of the ED subscales. Support for
151 the 2x2 MOP can be obtained in the absence of interactive effects by utilizing Gaudreau's (2012)
152 analytical approach. When interactions are not present Gaudreau (2012) recommends running
153 multiple regression analyses with unstandardized values and the interaction term removed and
154 then plotting predicted values as follows:

155 (1) \hat{Y} of Non-perfectionism = Intercept + (B_{SOP} * low SOP) + (B_{SPP} * low SPP).

156 (2) \ddot{Y} of pure SOP = Intercept + (B_{SOP} * High SOP) + (B_{SPP} * low SPP).

157 (3) \ddot{Y} of pure SPP = Intercept + (B_{SOP} * Low SOP) + (B_{SPP} * High SPP).

158 (4) \ddot{Y} of mixed perfectionism = Intercept + (B_{SOP} * High SOP) + (B_{SPP} * High SPP).

159 **Results**

160 **Descriptive Analysis**

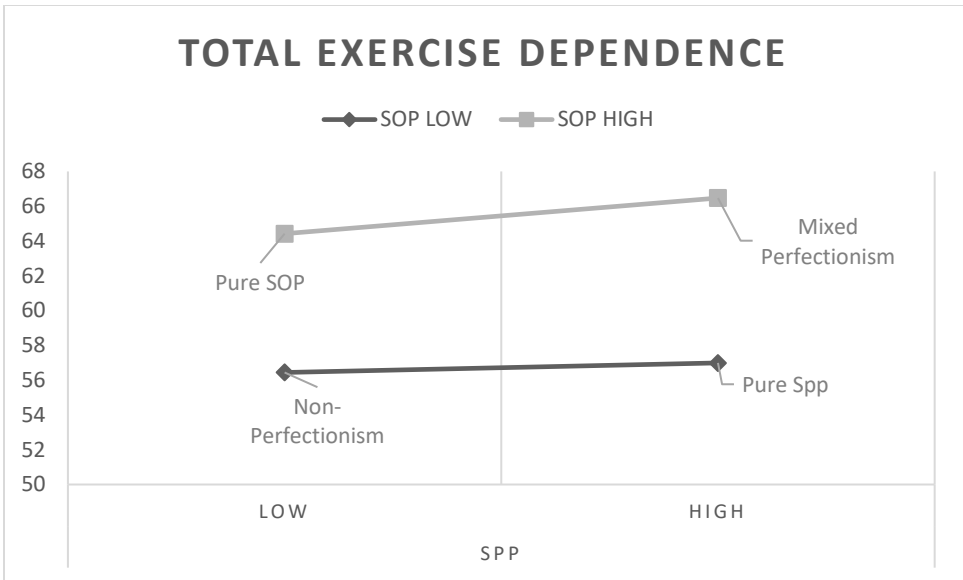
161 Of the participants, 62% indicated during a typical week that they exercised often,
162 engaging in mild exercise for more than 15 minutes an average of 6 times ($SD = 3.8$) or 90
163 minutes, moderate exercise 5 times ($SD = 3.3$) or 75 minutes, and vigorous exercise on average
164 3.7 times per week ($SD = 2.17$) or 55.5 minutes. Participants indicated taking part in a number
165 of different exercise activities, at various levels, including but not limited to, running, walking,
166 yoga, intramural sports, dance, soccer, rugby, and group fitness classes. Both SOP ($M = 67.6$)
167 and SPP ($M = 62.05$) were positively correlated with total exercise dependence ($M = 61.20$); (r
168 $(374) = .255, p = .0001$) and ($r (374) = .174, p = .0001$), respectively.

169 **Main Analysis**

170 **Total Exercise Dependence.** Gender had a significant influence on dependence ($B =$
171 $1.14, \beta = .38, t = 3.01, p = 0.004$) with males reporting higher levels of ED than females. SOP
172 was a significant positive predictor of total ED ($B = 3.82, \beta = .21, t = .95, p = 0.00$). SPP was not
173 significant ($B = 1.17, \beta = .94, t = 1.25, p = .22$). Based on Gaudreau's (2012) guidelines the
174 predicted values for total ED based are shown in Figure 1. Mixed perfectionism was associated
175 with the highest levels of ED, followed by Pure SOP. Pure SPP and non-perfectionism were
176 associated with lower ED levels.

177 **Figure 1**

178 *Total Exercise Dependence*



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Withdrawal. Gender had a significant effect on withdrawal ($B = -1.699, \beta = .414, t = -$

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4.1015, $p = 0.00$) with females reporting higher levels than males. SPP was a significant positive

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predictor of exercise withdrawal ($B = .55, \beta = .22, t = 2.45, p = 0.02$). whilst SOP was not a

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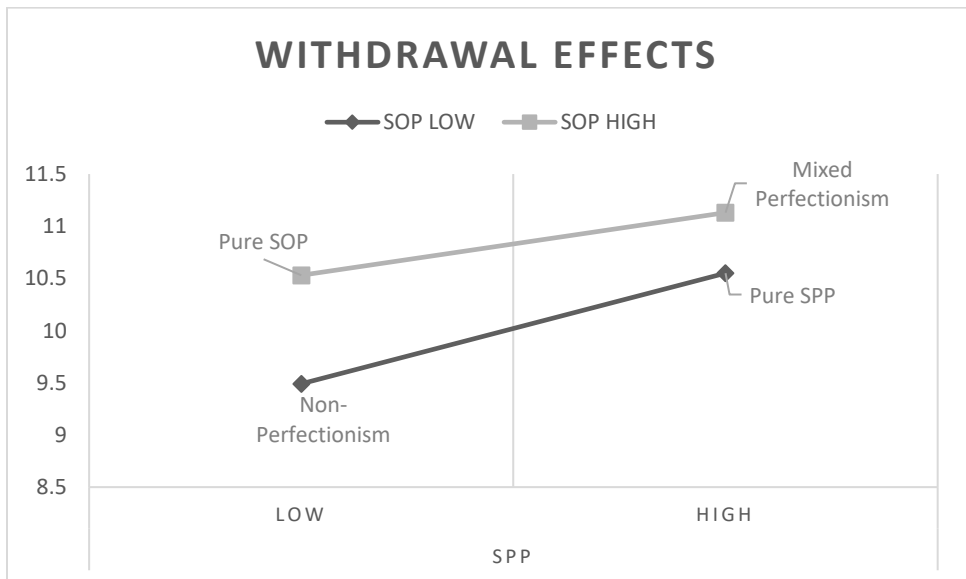
significant predictor ($B = .26, \beta = .23, t = 1.13, p = 0.26$). As with total ED, mixed perfectionism

184

was associated with the highest levels of withdrawal (see Figure 2).

185 **Figure 2**

186 *Exercise Dependence Withdrawal Effects*



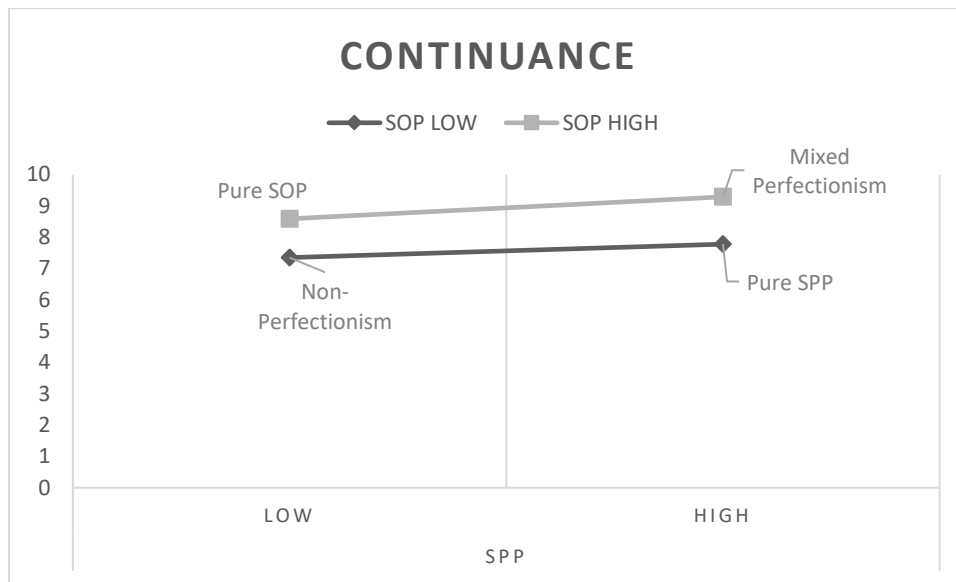
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188 **Continuance.** Gender did not have an effect ($B = .6146, \beta = .4353, t = 1.4118, p = .16$).
 189 SOP was a significant predictor of exercise continuance ($B = .51, \beta = .24, t = 2.14, p = 0.03$),
 190 while the effect of SPP approached significance ($B = .45, \beta = .24, t = 1.91, p = .06$). See Figure 3
 191 for predicted values of each within-person combination of perfectionism.

192 **Figure 3**

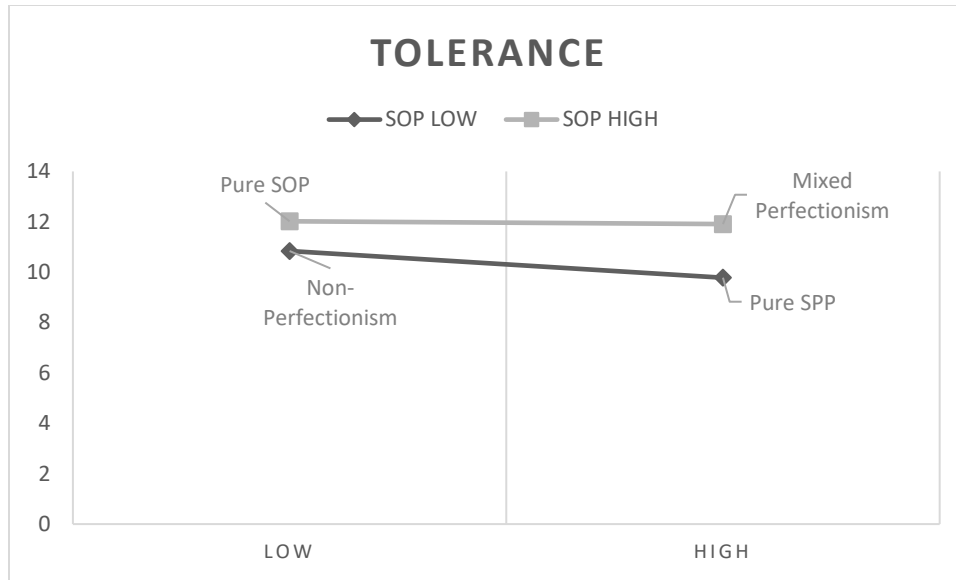
193 *Exercise Dependence Continuance*

194



195 **Tolerance.** Gender was significant ($B = 1.1356, \beta = .377, t = 3.009, p = 0.00$) with males
 196 reporting higher levels of tolerance than females. SOP was a significant predictor of exercise
 197 tolerance ($B = .84, \beta = .21, t = 4.06, p = 0.00$) while SPP was not ($B = -.30, \beta = .20, t = -1.45, p$
 198 $= 0.15$). See Figure 4 for the predicted values.

200 Figure 4 – Exercise Dependence Tolerance

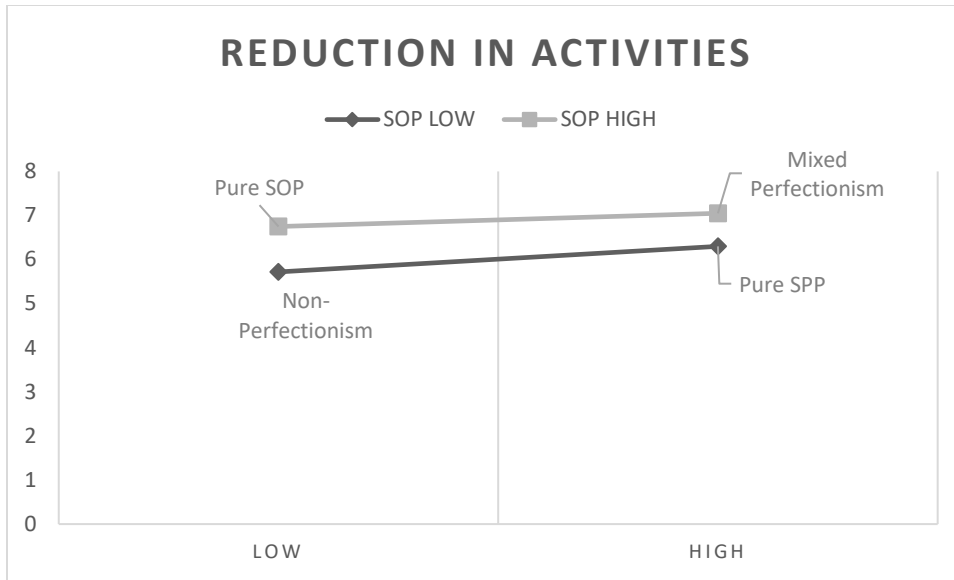


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 202 **Lack of Control.** Gender approached significance ($B = .679, \beta = .361, t = 1.877, p =$
 203 0.06) with males reporting a greater lack of control than females. Neither SOP ($B = .335, \beta =$
 204 $.19, t = 1.77, p = 0.07$) or SPP ($B = .28, \beta = .20, t = 1.47, p = 0.14$) were significant predictors of
 205 this subscale.

206 **Reduction in Other Activities.** Gender had significant effect ($B = .5844, \beta = .2626, t =$
 207 $2.225, p = 0.03$) with males reporting higher levels than females. Both SOP ($B = .37, \beta = .14, t =$
 208 $2.55, p = 0.01$) and SPP ($B = .29, \beta = .14, t = 2.01, p = 0.04$) were significant predictors of
 209 exercise reduction in other activities. See Figure 5 for predicted values. Consistent with our other
 210 findings, the highest levels of reduction were associated with mixed perfectionism, followed by
 211 Pure SOP

212 **Figure 5**

213 *Exercise Dependence Reduction in Activities*

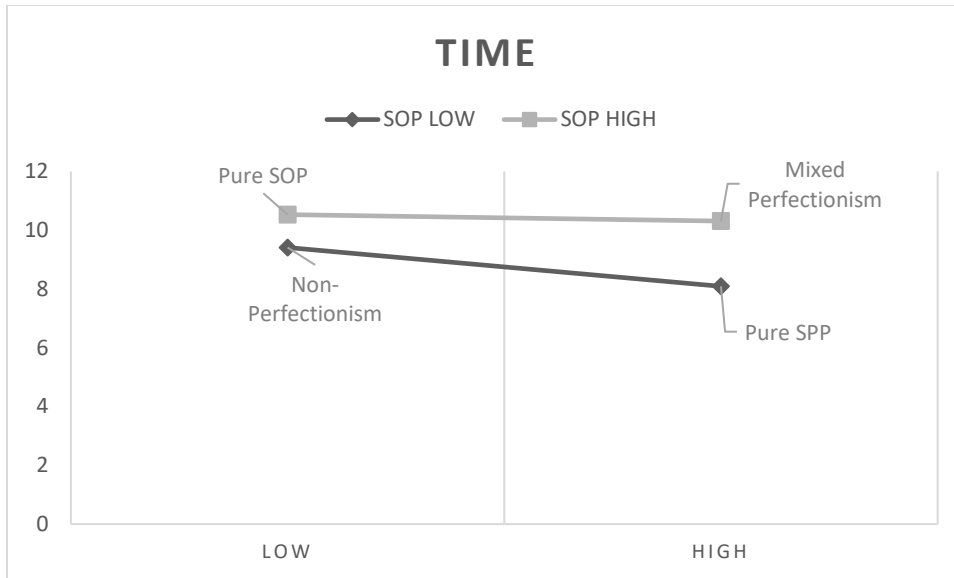


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216 **Time.** Gender was a significant covariate ($B = 1.394$, $\beta = .3851$, $t = 3.6215$, $p = 0.00$)
 217 with males reporting higher levels of time spent in activities necessary to obtain exercise than
 218 females. Both SOP ($B = .88$, $\beta = .21$, $t = 4.14$, $p = 0.00$) and SPP ($B = -.41$, $\beta = .21$, $t = -1.98$, $p =$
 219 0.05) were significant predictors of exercise time. See Figure 6 for the predicted values. Pure
 220 SOP and mixed perfectionism were associated with the highest levels of time spent exercising,
 221 with lower values for non-perfectionism and Pure SPP.

222 **Figure 6**

223 *Exercise Dependence Time*



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Intention Effects. Gender had a significant effect on intentions ($B = .941, \beta = .364, t =$

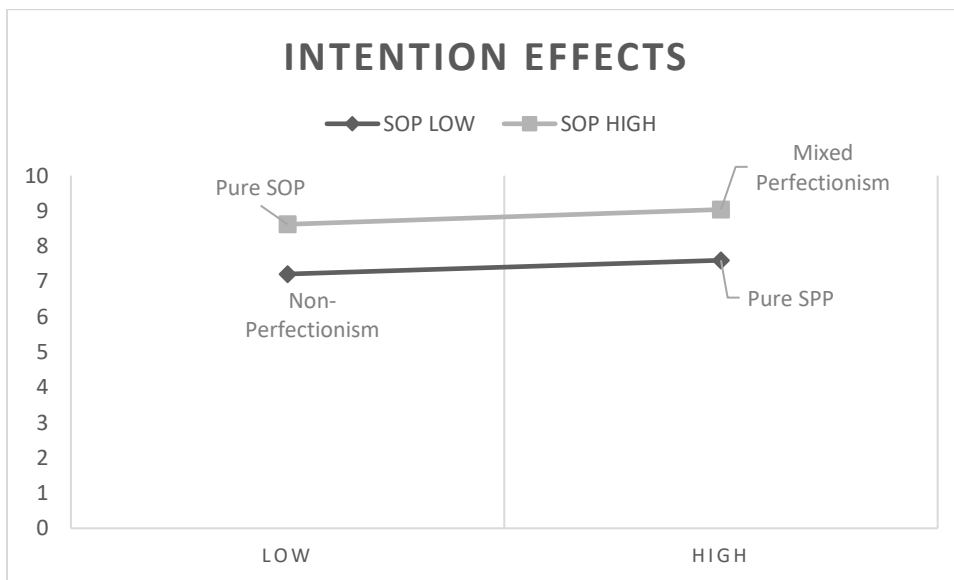
226 $2.584, p = 0.01$) with males reporting higher levels than females. SOP was a significant predictor

227 of exercise intention effects ($B = .61, \beta = .20, t = 3.04, p = 0.00$), while SPP was not ($B = .30, \beta$

228 $= .20, t = 1.54, p = 0.12$).. See Figure 7 for the predicted values.

229 **Figure 7**

230 *Exercise Dependence Intention Effects*



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Discussion

234 The 2×2 MOP proposes four within-person combinations of dispositional perfectionism,
235 and using this theoretical model, the purpose of this study was to examine the interactive effects
236 of SOP and SPP on ED. As with the previous exercise studies conducted with the model, our
237 findings supported the value of considering within person combinations of perfectionism.
238 However, we failed to find interactions between SOP and SPP on EDs, and the precise nature of
239 the findings do lead to questions regarding some of the theoretical hypotheses of the model as
240 they pertain to exercise.

241 Given that previous research has shown that perfectionism may be a precursor to ED
242 (Hagan & Hausenblas, 2003), and based on the 2×2 MOP, we hypothesized that Pure SPP would
243 be the most detrimental within-person combination of perfectionism and would be positively
244 associated with ED (H2). Contrary to this hypothesis, we found SPP to be associated with lower
245 levels of ED (both at a general and subscale level), particularly in comparison to mixed
246 perfectionism and SOP, although SPP led to higher feelings of withdrawal than non-
247 perfectionism. In addition, the higher levels of mixed perfectionism in comparison to Pure SPP
248 are contrary to H3. For some aspects of ED (total ED, withdrawal, continuance, reduction in
249 activities, and intention effects) mixed perfectionism led to higher levels than Pure
250 SOP(supporting H4), yet in contrast to H4 mixed perfectionism was similar to (and indeed
251 slightly lower) than Pure SOP for tolerance and time.

252 Somewhat similar to these findings, Deck et al. (2020) found mixed perfectionism
253 predicted the highest levels of SPA. It may be that, in exercise domains, the combination of both
254 types of perfectionism (pressure from oneself combined with pressure from others), leads to
255 more problematic outcomes, such as ED and SPA. This point is in accord with suggestions by
256 Hausenblas and Downs (2002b) that individuals at risk for ED are more likely to have a

257 combination of both SOP and SPP. Similarly, within academic settings, some studies have also
258 shown higher levels of mixed perfectionism for maladaptive behaviors such as anxiety (Vincent
259 et al., 2019). Vincent et al. (2019) suggest that certain outcomes associated with mixed
260 perfectionism may be caused by the influence of slightly higher levels of one type of
261 perfectionism (either Pure SOP or Pure SPP) and not the other. Indeed, previous work in the
262 exercise domain (Hill et al., 2018) suggests that SOP is problematic in this setting. Thus, in our
263 case, it may be that the high levels of SOP (which did have higher mean scores and a stronger
264 correlation with ED) had greater influence on the (maladaptive) outcomes of mixed
265 perfectionism. Further work disentangling these issues is warranted.

266 Deck et al. (2019; 2020) have suggested that the 2×2 MOP may be most relevant in high
267 achievement/goal-oriented settings. One reason we chose to investigate ED in the present study
268 was because research suggests that ED is more reflective of an achievement situation than
269 regular exercise (Hall et al., 2007; Lichtenstein et al., 2014). Nevertheless, the different within-
270 person combinations of SOP and SPP still failed to elicit the outcomes proposed by the model.
271 The hypotheses of the model have been strongly supported in achievement settings where an
272 emphasis is placed on social comparison processes and/or on surpassing others (e.g., sport).
273 While ED may be more achievement oriented than regular exercise, it still may not have the
274 sufficient properties necessary to fully support all the model's hypotheses.

275 In our study we also considered gender and intensity as possible covariates. Gender, but
276 not intensity, was found to be significant in all models, except for the continuance subscale
277 (referring to one continuing exercise despite a physical or psychological problem that is
278 aggravated by exercise). Similar to previous work (Weik & Hale, 2009), males had higher levels
279 of ED than females. Males also had higher levels on all subscales than females except for

280 withdrawal. It may be that men view exercise as more competitive or achievement oriented than
281 females, or that subscale items may be understood or interpreted differently by males and
282 females (Weik & Hale, 2009). Future research may wish to examine the reasons for gender
283 differences in ED

284 Another variable of interest to consider in future research is motivation for exercise. It is
285 well established that exercise motivation influences exercise behavior (Box et al., 2019; Lewis &
286 Sutton, 2011), and previous work has found significant associations between personality and
287 exercise motivations (Lewis & Sutton, 2011). Indeed, in regard to perfectionism, Costa et
288 al.(2016) found that psychological needs thwarting, , mediated the relationship between
289 perfectionistic concerns and ED. Using this work as a foundation, exploring the role of
290 motivation in relation to perfectionism and ED from the perspective of the 2×2 model would be
291 worthwhile. Recently, motivational messages to increase exercise behavior have been shown to
292 be successful when tailored to personality (de Vries et al., 2017), therefore we encourage future
293 researchers to consider motivation as a factor that may affect the relationship between
294 personality and exercise behavior.

295 Our study is strengthened by a large sample size, although we acknowledge that we used
296 a convenience sample. A more purposeful (pre-screened for ED) sample of exercisers should be
297 investigated in the future. The work is also limited by the cross-sectional design, and reliance on
298 self-assessment of physical activity engagement by participants. Researchers should consider
299 using objective measures of exercise to capture exercise behavior, as well as a repeated measures
300 design to capture a complete representation of perfectionism and behavior. Future work of this
301 manner will help further the understanding of how the different within-person combinations of
302 perfectionism may be associated with different outcomes in exercise settings.

303 The results of the present study contribute to the critical testing and extension (Valentine
304 et al., 2011) of the 2×2 MOP, and the notion that the model may not be as well suited for the
305 exercise domain, even in situations with some form of more achievement orientation (e.g., ED).
306 Nevertheless, our study results do support the use of the model more broadly and the importance
307 of considering different within-person combinations of perfectionism and their relationship to
308 different behaviors. We believe researchers should continue to explore the model within the
309 exercise domain, in order to understand how the different combinations of perfectionism may
310 influence positive exercise behaviors as this is useful for health care providers when prescribing
311 exercise or intervening to prevent exercise dependent behaviours.

312 References

- 313 Box, A. G., Feito, Y., Brown, C., & Petruzzello, S. J. (2019). Individual differences influence
314 exercise behavior: how personality, motivation, and behavioral regulation vary among
315 exercise mode preferences. *Heliyon*, 5(4), e01459.
- 316 Cashmore, E. (2008). *Sport and exercise psychology: The key concepts*. Routledge.
- 317 Centers for Disease Control and Prevention (CDC, 2020). *Physical Activity: Benefits of Physical*
318 *Activity*. <https://www.cdc.gov/physicalactivity/basics/pa-health/index.htm>
- 319 Costa, S., Coppolino, P., & Oliva, P. (2016). Exercise dependence and maladaptive
320 perfectionism: The mediating role of basic psychological needs. *International Journal of*
321 *Mental Health and Addiction*, 14(3), 241-256.
- 322 Crocker, P. R., Gaudreau, P., Mosewich, A. D., & Kljajic, K. (2014). Perfectionism and the
323 stress process in intercollegiate athletes: Examining the 2×2 model of perfectionism in
324 sport competition. *International Journal of Sport Psychology*, 45(4), 325-348.
- 325 de Vries, R. A., Truong, K. P., Zaga, C., Li, J., & Evers, V. (2017). A word of advice: how to
326 tailor motivational text messages based on behavior change theory to personality and
327 gender. *Personal and Ubiquitous Computing*, 21(4), 675-687.
328 <https://doi.org/10.1007/s00779-017-1025-1>
- 329 Downs, D. S., Hausenblas, H. A., & Nigg, C. R. (2004). Factorial validity and psychometric
330 examination of the Exercise Dependence Scale-Revised. *Measurement in physical*
331 *education and exercise science*, 8(4), 183-201.
332 https://doi.org/10.1207/s15327841mpee0804_1
- 333 Flett, G. L., & Hewitt, P. L. (2005). The perils of perfectionism in sports and exercise. *Current*

- 334 *directions in psychological science*, 14(1), 14-18. <https://doi.org/10.1111/j.0963->
335 7214.2005.00326.x
- 336 Gaudreau, P., Louvet, B., & Kljajic, K. (2019). The performance trajectory of physical education
337 students differs across subtypes of perfectionism: A piecewise growth curve model of the
338 2×2 model of perfectionism. *Sport, Exercise, and Performance Psychology*, 8(2), 223.
- 339 Gaudreau, P. (2016). The 2x2 model of perfectionism in sport, dance, and exercise. In A. P.
340 Hill (Ed.), *The Psychology of Perfectionism in Sport, Dance and Exercise* (pp. 174-200).
341 London: Routledge.
- 342 Gaudreau, P. (2012) A methodological note on the interactive and main effects of dualistic
343 personality dimensions: An example using the 2x2 model of perfection. *Personality and*
344 *Individual Differences*, 52, 26-31. doi: 10.1016/j.paid.2012.04.029
- 345 Gaudreau, P., & Verner-Filion, J. (2012). Dispositional Perfectionism and Well-Being: A Test of
346 the 2 x 2 Model of Perfectionism in the Sport Domain. *Sport, Exercise, and Performance*
347 *Psychology*, 1(1), 29. <https://doi.org/10.1037/a0025747>
- 348 Gaudreau, P., & Thompson, A. (2010). Testing a 2×2 model of dispositional
349 perfectionism. *Personality and Individual Differences*, 48(5), 532-537.
350 <https://doi.org/10.1016/j.paid.2009.11.031>
- 351 Godin, G., & Shephard, R.J. (1985). A simple method to assess exercise behaviour in the
352 community. *Canadian Journal of Applied Sport Sciences*, 10, 141-146.
- 353 Gotwals, J. K., Dunn, J. G., & Wayment, H. A. (2003). Self-Esteem in Intercollegiate
354 Athletes. *Journal of Sport Behavior*, 26(1).
- 355 Gotwals, J. K., Stoeber, J., Dunn, J. G., & Stoll, O. (2012). Are perfectionistic strivings in sport

- 356 adaptive? A systematic review of confirmatory, contradictory, and mixed
357 evidence. *Canadian Psychology/Psychologie canadienne*, 53(4), 263.
- 358 Hagan, A. L., & Hausenblas, H. A. (2003). The relationship between exercise dependence
359 symptoms and perfectionism. *American Journal of Health Studies*, 18, 133. ISSN:
360 1090-0500
- 361 Hausenblas, H. A., & Downs, D. S. (2002a). How much is too much? The development and
362 validation of the exercise dependence scale. *Psychology and Health*, 17(4), 387-404.
363 <https://doi.org/10.1080/0887044022000004894>
- 364 Hausenblas, H. A., & Downs, D. S. (2002b). Exercise dependence: A systematic
365 review. *Psychology of Sport and Exercise*, 3(2), 89-123.
366 [https://doi.org/10.1016/S1469-0292\(00\)00015-7](https://doi.org/10.1016/S1469-0292(00)00015-7)
- 367 Hall, H. K., Hill, A. P., Appleton, P. R., & Kozub, S. A. (2009). The mediating influence of
368 unconditional self-acceptance and labile self-esteem on the relationship between
369 multidimensional perfectionism and exercise dependence. *Psychology of Sport and*
370 *Exercise*, 10(1), 35-44. <https://doi.org/10.1016/j.psychsport.2008.05.003>
- 371 Hall, H. K., Kerr, A. W., Kozub, S. A., & Finnie, S. B. (2007). Motivational antecedents of
372 obligatory exercise: The influence of achievement goals and multidimensional
373 perfectionism. *Psychology of Sport and Exercise*, 8(3), 297-316.
374 <https://doi.org/10.1016/j.psychsport.2006.04.007>
- 375 Hewitt, P. L., & Flett, G. L. (1989). The Multidimensional Perfectionism Scale: Development and
376 validation. *Canadian Psychology*, 30, 339
- 377 Hewitt, P. L., Flett, G. L., Turnbull-Donovan, W., & Mikail, S. F. (1991). The

- 378 Multidimensional Perfectionism Scale: Reliability, validity, and psychometric properties
379 in psychiatric samples. *Psychological Assessment: A Journal of Consulting and Clinical*
380 *Psychology*, 3(3), 464. <https://doi.org/10.1037/1040-3590.3.3.464>
- 381 Hibbard, D. R., & Walton, G. E. (2014). Exploring the development of perfectionism: The
382 influence of parenting style and gender. *Social Behavior and Personality: an*
383 *international journal*, 42(2), 269-278. <https://doi.org/10.2224/sbp.2014.42.2.269>
- 384 Hill, A. P. (2013). Perfectionism and burnout in junior soccer players: A test of the 2× 2 model
385 of dispositional perfectionism. *Journal of Sport and Exercise Psychology*, 35I(1), 18-29.
386 <http://doi.org/10.1123/jsep.35.1.18>
- 387 Hill, A., Robson, S., & Stamp, G. (2015). The predictive ability of perfectionistic traits and self
388 presentational styles in relation to exercise dependence. *Personality and Individual*
389 *Differences*, 86, 176–183. <https://doi.org/10.1016/j.paid.2015.06.015>
- 390 Hill, A. P., & Madigan, D. J. (2017). A short review of perfectionism in sport, dance and
391 exercise: out with the old, in with the 2 x 2. *Current Opinion in Psychology*, 16, 72-77.
392 doi: 10.1016/j.copsyc.2017.04.021
- 393 Lewis, M., & Sutton, A. (2011). Understanding Exercise Behaviour: Examining the Interaction
394 of Exercise Motivation and Personality in Predicting Exercise Frequency. *Journal of*
395 *Sport Behavior*, 34(1). [https://www.lib.uwo.ca/cgi-](https://www.lib.uwo.ca/cgi-bin/ezpauthn.cgi?url=http://search.proquest.com/scholarly-journals/understanding-exercise-behaviour-examining/docview/853642879/se-2?accountid=15115)
396 [bin/ezpauthn.cgi?url=http://search.proquest.com/scholarly-journals/understanding-](https://www.lib.uwo.ca/cgi-bin/ezpauthn.cgi?url=http://search.proquest.com/scholarly-journals/understanding-exercise-behaviour-examining/docview/853642879/se-2?accountid=15115)
397 [exercise-behaviour-examining/docview/853642879/se-2?accountid=15115](https://www.lib.uwo.ca/cgi-bin/ezpauthn.cgi?url=http://search.proquest.com/scholarly-journals/understanding-exercise-behaviour-examining/docview/853642879/se-2?accountid=15115)
- 398 Lichtenstein, M. B., Christiansen, E., Elklit, A., Bilenberg, N., & Støving, R. K. (2014). Exercise

- 399 addiction: a study of eating disorder symptoms, quality of life, personality traits and
400 attachment styles. *Psychiatry research*, 215(2), 410-416.
401 DOI: 10.1016/j.psychres.2013.11.010
- 402 Miller, K. J., & Mesagno, C. (2014). Personality traits and exercise dependence: Exploring the
403 role of narcissism and perfectionism. *International Journal of Sport and Exercise
404 Psychology*, 12(4), 368-381. DOI: 10.1080/1612197X.2014.932821
- 405 Nordin-Bates, S. M., Raedeke, T. D., & Madigan, D. J. (2017). Perfectionism, burnout, and
406 motivation in dance: A replication and test of the 2×2 model of perfectionism. *Journal of
407 Dance Medicine & Science*, 21(3), 115-122. [https://doi.org/10.12678/1089-
408 313X.21.3.115](https://doi.org/10.12678/1089-313X.21.3.115)
- 409 Sagar, S. S., & Stoeber, J. (2009). Perfectionism, fear of failure, and affective responses to
410 success and failure: The central role of fear of experiencing shame and
411 embarrassment. *Journal of Sport and Exercise Psychology*, 31(5), 602-627.
- 412 Shanmugam, V., & Davies, B. (2015). Clinical perfectionism and eating psychopathology in
413 athletes: The role of gender. *Personality and individual differences*, 74, 99-105.
414 <https://doi.org/10.1016/j.paid.2014.09.047>
- 415 Tabachnick, B., & Fidell, L. (2001). *Using Multivariate Statistics* (5th ed.). Boston, MA:
416 Pearson/Allyn & Bacon.
- 417 Vicent, M., González, C., Sanmartín, R., Fernández-Sogorb, A., Cargua-García, N. I., &
418 García-Fernández, J. M. (2019). Perfectionism and school anxiety: More evidence about
419 the 2×2 model of perfectionism in an Ecuadorian population. *School Psychology
420 International*, 40(5), 474-492.
421

- 422 Weik, M., & Hale, B. D. (2009). Contrasting gender differences on two measures of exercise
423 dependence. *British Journal of Sports Medicine*, 43(3), 204-207.