

Est.
1841

YORK
ST JOHN
UNIVERSITY

Jowett, Gareth E., Hill, Andrew P. ORCID:
<https://orcid.org/0000-0001-6370-8901>, Forsdyke, Dale ORCID:
<https://orcid.org/0000-0003-4283-4356> and Gledhill, Adam (2018)
Perfectionism and coping with injury in marathon runners: A test of
the 2×2 model of perfectionism. *Psychology of Sport and Exercise*,
37. pp. 26-32.

Downloaded from: <http://ray.yorks.ac.uk/id/eprint/3004/>

The version presented here may differ from the published version or version of record. If
you intend to cite from the work you are advised to consult the publisher's version:
<https://doi.org/10.1016/j.psychsport.2018.04.003>

Research at York St John (RaY) is an institutional repository. It supports the principles of
open access by making the research outputs of the University available in digital form.
Copyright of the items stored in RaY reside with the authors and/or other copyright
owners. Users may access full text items free of charge, and may download a copy for
private study or non-commercial research. For further reuse terms, see licence terms
governing individual outputs. [Institutional Repository Policy Statement](#)

RaY

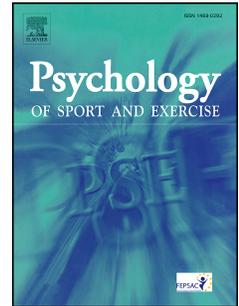
Research at the University of York St John

For more information please contact RaY at ray@yorks.ac.uk

Accepted Manuscript

Perfectionism and coping with injury in marathon runners: A test of the 2×2 model of perfectionism

Gareth E. Jowett, Andrew P. Hill, Dale Forsdyke, Adam Gledhill



PII: S1469-0292(17)30706-9

DOI: [10.1016/j.psychsport.2018.04.003](https://doi.org/10.1016/j.psychsport.2018.04.003)

Reference: PSYSPO 1348

To appear in: *Psychology of Sport & Exercise*

Received Date: 23 October 2017

Revised Date: 10 April 2018

Accepted Date: 11 April 2018

Please cite this article as: Jowett, G.E., Hill, A.P., Forsdyke, D., Gledhill, A., Perfectionism and coping with injury in marathon runners: A test of the 2×2 model of perfectionism, *Psychology of Sport & Exercise* (2018), doi: 10.1016/j.psychsport.2018.04.003.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Perfectionism and Coping with Injury in Marathon Runners: A Test of the 2×2 Model of
Perfectionism

Gareth E. Jowett¹, Andrew, P. Hill², Dale Forsdyke², & Adam Gledhill¹

Leeds Beckett University¹, York St. John University²

Correspondence should be addressed to:

Gareth E. Jowett

202 Fairfax Hall

School of Sport

Headingley Campus

Leeds Beckett University

Leeds, United Kingdom

LS6 3QS

Phone: +44 (0) 113 81 22056

E-mail: g.e.jowett@leedsbeckett.ac.uk

Abstract

Previous research has found perfectionism dimensions to predict coping strategies in sport when dealing with various stressors. We aimed to extend previous research by examining the interactive effects of perfectionism dimensions on strategies employed by marathon runners to cope with injury. This involved testing the hypotheses of the 2×2 model of perfectionism in marathon runners. Marathon runners ($n = 224$, female $n = 81$, M age = 39.77 years, $SD = 9.50$ years) completed measures capturing four subtypes of perfectionism (pure self-oriented perfectionism, pure socially prescribed perfectionism, mixed perfectionism, and non-perfectionism) and strategies for coping with injury (problem-focused coping, emotion-focused coping, and avoidance coping). Moderated regression analyses provided support for all four hypotheses of the 2×2 model for problem-focused coping, one hypothesis for emotion-focused coping, and none for avoidance-coping. Problem-focused coping was highest for pure self-oriented perfectionism and lowest for pure socially prescribed perfectionism. Emotion-focused coping was higher for pure self-oriented perfectionism compared to non-perfectionism. Finally, avoidance coping was similar across all subtypes. The results provide initial evidence that the 2×2 model of perfectionism explains differences in the use of coping strategies in context of marathon running injury.

Keywords: 2×2 perfectionism; coping; marathon runners; injury

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Perfectionism and Coping with Injury in Marathon Runners: A Test of the 2×2 Model of
Perfectionism

1 Abstract

2 Previous research has found perfectionism dimensions to predict coping strategies in sport
3 when dealing with various stressors. We aimed to extend previous research by examining the
4 interactive effects of perfectionism dimensions on strategies employed by marathon runners
5 to cope with injury. This involved testing the hypotheses of the 2×2 model of perfectionism
6 in marathon runners. Marathon runners (n = 224, female n = 81, *M* age = 39.77 years, *SD* =
7 9.50 years) completed measures capturing four subtypes of perfectionism (pure self-oriented
8 perfectionism, pure socially prescribed perfectionism, mixed perfectionism, and non-
9 perfectionism) and strategies for coping with injury (problem-focused coping, emotion-
10 focused coping, and avoidance coping). Moderated regression analyses provided support for
11 all four hypotheses of the 2×2 model for problem-focused coping, one hypothesis for
12 emotion-focused coping, and none for avoidance-coping. Problem-focused coping was
13 highest for pure self-oriented perfectionism and lowest for pure socially prescribed
14 perfectionism. Emotion-focused coping was higher for pure self-oriented perfectionism
15 compared to non-perfectionism. Finally, avoidance coping was similar across all subtypes.
16 The results provide initial evidence that the 2×2 model of perfectionism explains differences
17 in the use of coping strategies in context of marathon running injury.

18 Keywords: 2×2 perfectionism; coping; marathon runners; injury

19

20

21

22

23

24

1 Perfectionism and Coping with Injury in Marathon Runners: A Test of the 2×2 Model of
2 Perfectionism

3 Running regularly can have considerable physical and psychological benefits (e.g.
4 improved fitness and mental well-being; Stevinson & Hickson, 2014). However, running also
5 carries a substantial risk of injury. Estimates suggest that anywhere between 26% and 92% of
6 long distance runners will encounter an injury at some point (van Gent et al., 2007). Such
7 injuries can have a negative psychological impact; for example, athletes can report a sense of
8 loss, helplessness, shock, and depression in the initial phase following injury (Carson &
9 Polman, 2008). If not managed effectively, these initial emotional experiences can also lead
10 to additional, more enduring, negative consequences such as burnout and dropout of sport
11 altogether (Kiliç et al., 2018).

12 How runners cope with injury will partly determine the consequences of injury.
13 Examining coping processes is therefore an important focus for sport psychology researchers.
14 Coping is any effortful cognition or behaviour employed to manage constantly changing
15 adaptation challenges (Crocker, Tamminen, & Gaudreau, 2015). Athletes' personal accounts
16 highlight the importance of coping with injury effectively (e.g. Mosewich, Crocker, &
17 Kowalski, 2014). Such accounts suggest that maintaining positive thoughts, accessing social
18 support, and adopting goal setting in recovery plans aid injury recovery. By contrast, low
19 competence, pressure to return to sport from support personnel, and self-criticism undermine
20 the injury recovery process.

21 While informative, athletes' personal accounts allude to only a fraction of the
22 complexity of coping in this context. There are hundreds of different coping strategies (see
23 Skinner, Edge, Altman, & Sherwood, 2003), many of which could be employed by runners to
24 cope with injury. To manage this complexity, researchers have distinguished between broad
25 coping dimensions based on similarity in the functions of coping strategies (Carver &

1 Connor-Smith, 2010). The most commonly studied broad coping dimensions in sport
2 research are problem-focused coping, emotion-focused coping, and avoidance coping
3 (Nicholls & Thelwell, 2010). Problem-focused coping involves practical management of the
4 stressful situation, including planning, active coping, and seeking instrumental support
5 (Carver & Connor-Smith, 2010). Emotion-focused coping, involves managing the emotions
6 of the situation, for example, seeking emotional support, humour, venting, and self-blame
7 (Carver & Connor-Smith, 2010). Finally, avoidance coping includes strategies which
8 function to provide emotional or physical escape from the threatening situation (Nicholls,
9 Taylor, Carroll, & Perry, 2016), such as behavioural disengagement, self-distraction, and
10 denial.

11 Like all coping strategies, the three broad dimensions of coping are neither
12 universally effective nor ineffective in all situations. Coping effectiveness is determined by a
13 fit between the specific circumstances and the adaptational consequences of the coping used
14 (Nicholls, 2010). When athletes appraise a situation as controllable, problem-focused
15 strategies may be effective. When athletes appraise a situation as uncontrollable, emotion-
16 focused or avoidance strategies may be effective (Nicholls, 2010). However, this complexity
17 aside, research suggests that when employed regularly, problem-focused coping is typically
18 more effective than emotion-focused coping or avoidance coping (e.g. Smith, Ntoumanis,
19 Duda, & Vansteenkiste, 2011).

20 In context of injury response models (e.g., Wiese-Bjornstal, 2010), problem-focused
21 coping is considered useful for injury recovery because it facilitates better planning for
22 rehabilitation and adherence to recovery programmes. Emotion-focused coping is considered
23 equivocal because of the range of emotional management strategies that this dimension
24 encompasses, which may be relatively effective (e.g. seeking emotional support), or
25 ineffective (e.g. self-blame). Avoidance coping is considered to exacerbate the stress

1 associated with injury, because it undermines the behaviours required for better rehabilitation
2 and recovery. In support of these models, researchers have found that problem-focused
3 coping positively correlates with stress-related growth in injured athletes (Salim, Wadey, &
4 Diss, 2015). Emotion-focused coping has been found to facilitate positive cognitive
5 reframing of injury responses (Wadey, Evans, Shanton, & Neil, 2012), but also compound the
6 negative impact of injury, particularly when self-blame is employed (Mosewich, et al., 2014).
7 Finally, avoidance coping has generally been found to be ineffective and potentially
8 damaging to the recovery process (Carson & Polman, 2010), with the notable exception of
9 dealing with the immediate emotional aftermath of injury, when it can allow the initial stress
10 of the situation to dissipate (Carson & Polman, 2010). Together these findings suggest that
11 problem-focused coping is typically more effective when dealing with the stress of injury,
12 whereas emotion-focused coping and avoidance coping are more inconsistent, sometimes
13 offering respite but mainly being ineffective or detrimental to the recovery process.

14 *Multidimensional perfectionism*

15 One factor that may influence coping with injury-related stress is perfectionism.
16 Perfectionism is a multidimensional personality trait characterised by striving for exceedingly
17 high standards accompanied by harsh self-criticism (Frost, Marten, Rosenblate, & Lahart,
18 1990). Researchers in sport and exercise have captured multidimensional perfectionism using
19 several different models (e.g. Gotwals & Dunn, 2009; Hewitt & Flett, 1991). Hewitt and Flett
20 (1991) have provided a popular model that emphasizes intrapersonal and interpersonal
21 dimensions of perfectionism. Within their model, self-oriented perfectionism (SOP), an
22 intrapersonal dimension, involves the self-imposed pursuit of exceedingly high standards and
23 harsh self-evaluation. By contrast, socially prescribed perfectionism (SPP), an interpersonal
24 dimension, involves the pursuit of exceedingly high standards imposed by significant others,
25 and the perception of harsh criticism when these standards are not met. These two dimensions

1 provide an interesting comparison in regards to studying perfectionism as something that is
2 internally imposed or (perceived to be) externally imposed.

3 Research examining these two dimensions in sport and exercise suggests that SPP is
4 typically positively related to maladaptive outcomes (e.g. athlete burnout; Hill et al., 2010),
5 and either inversely related to, or unrelated to, adaptive outcomes (e.g. relative autonomy,
6 intrinsic motivation; Longbottom, Grove, & Dimmock, 2012). By contrast, SOP is more
7 complex and ambiguous. Researchers have found SOP to be positively related to maladaptive
8 outcomes (e.g. introjected regulation; Longbottom et al., 2012), inversely related to
9 maladaptive outcomes (e.g. athlete burnout; Hill et al., 2010), or unrelated to maladaptive
10 outcomes (e.g. amotivation; Longbottom et al., 2012). Similarly, researchers have found SOP
11 to be positively related to adaptive outcomes (e.g. intrinsic motivation; Longbottom et al.,
12 2012), or unrelated to adaptive outcomes (e.g. positive affect; Gaudreau & Verner-Fillion,
13 2012).

14 *Multidimensional perfectionism and coping*

15 Hewitt and Flett (2002) proposed that both SOP and SPP serve to intensify the
16 negative impact of stress and underpin maladaptive coping. In the case of SPP, stressors
17 block the pursuit of other imposed standards, resulting in a lack of personal control and a
18 sense of worthlessness (Hewitt & Flett, 1991; Hewitt & Flett, 2002). Because of this lack of
19 control, SPP typically mobilises coping that offers short-term respite or escape from the
20 source of stress (i.e. emotion-focused coping and avoidance coping), to the detriment of
21 finding long-term solutions to the problem (i.e. problem-focused coping). It is likely that this
22 process will be applicable to the experience of sports injury, because when incapacitated
23 athletes can no longer demonstrate their value to others, and therefore lack the sense of
24 control or agency required to cope in a proactive manner. In these circumstances, it is likely
25 that athletes will prefer to avoid rather than confront the realities of their injury.

1 In the case of SOP, stressors thwart the pursuit of personally imposed standards. This
2 would obviously be the case following injury, particularly severe injury. On one hand, due to
3 the irrational importance of personal standards to SOP, rather than reappraise their
4 circumstances in an appropriate manner, athletes exhibiting SOP may view their inability to
5 pursue self-imposed standards as a personal failure (Flett & Hewitt, 2016). As a result,
6 coping strategies such as ruminative thoughts, self-blame, and overgeneralisation of failure
7 (i.e. emotion-focused coping) may ensue (Hewitt & Flett, 2002). However, on the other hand,
8 SOP may underpin adaptive problem-focused strategies in some circumstances. This could
9 occur because SOP includes a greater sense of agency and control over important standards
10 and this might be applied to aspects of injury recovery. If this were the case, in an injury
11 context, SOP may contribute to greater diligence and goal setting for rehabilitation.

12 Research examining the relationship between SOP, SPP, and coping in sport has
13 found some support for these propositions. For instance, Hill, Hall, and Appleton (2010)
14 examined the relationship between perfectionism and coping with stressful performance
15 situations in junior athletes. They found that SPP was unrelated to problem-focused coping
16 and was positively related to avoidance coping. By contrast, SOP was positively related to
17 problem-focused coping and inversely related to avoidance coping. In another study,
18 Gaudreau and Antl (2008) examined the relationship between perfectionism and coping used
19 by athletes during important competitions. They found that a composite of perfectionism
20 dimensions that included SPP was unrelated to problem-focused coping (“task-oriented
21 coping”) and was positively related to avoidance coping (“disengagement-oriented coping”).
22 By contrast, they found that a composite of perfectionism dimensions that included SOP was
23 positively related to problem-focused coping and unrelated to avoidance coping.

24 *The 2×2 model of perfectionism*

1 Researchers have recently argued that examining the interactive effects of different
2 perfectionism dimensions, including SOP and SPP, is required to provide further
3 understanding of the influence of multidimensional perfectionism on different psychological
4 outcomes (Hill, 2013). The 2×2 model of perfectionism offers a framework for examining
5 interactive effects (Gaudreau & Verner-Fillion, 2012; Gaudreau, 2016). The model includes
6 four within-person combinations, labelled as subtypes of multidimensional perfectionism.
7 The first subtype, *non-perfectionism*, reflects low levels of SOP and low levels of SPP. The
8 second subtype, *pure SOP*, reflects high levels of SOP and low levels of SPP. The third
9 subtype, *pure SPP* reflects low levels of SOP and high levels of SPP. The fourth subtype
10 *mixed perfectionism* reflects high levels of SOP and high levels of SPP.

11 The 2×2 model proposes four hypotheses based on these subtypes. Due to the
12 complex and ambiguous effects of SOP, Hypothesis 1 is split into three versions proposing
13 that pure SOP will be associated with better (Hypothesis 1a), worse (Hypothesis 1b), or
14 equivalent outcomes (Hypothesis 1c) when compared to non-perfectionism. However,
15 Hypothesis 1c is problematic because it encourages the interpretation of non-significant
16 findings as support, thereby departing from traditional null hypothesis significance testing
17 (Stoeber, 2012). Because of this critique, Gaudreau (2012) advocated that when researchers
18 find no difference between pure SOP and non-perfectionism, they should interpret the
19 findings as inconclusive, rather than interpreting them as support for Hypothesis 1c.
20 Hypothesis 2 suggests that pure SPP will be associated with worse outcomes than non-
21 perfectionism. Hypothesis 3 suggests that pure SPP will be associated with worse outcomes
22 than mixed perfectionism. This is because high SOP could act as a buffer against the
23 maladaptive effects of high SPP (Gaudreau, 2016). Due to the inclusion of SPP, Hypothesis 4
24 suggests that mixed perfectionism will be associated with worse outcomes than pure SOP
25 (Gaudreau, 2016).

1 Only one study to date has examined the 2×2 model of perfectionism and coping. In
2 this study, Crocker, Gaudreau, Mosewich and Kljajic (2014) examined coping with stress
3 associated with participating in a recent competition. Rather than using SOP and SPP, they
4 used personal standards (PS; i.e., setting and striving for exacting standards; Frost et al.,
5 1990) and concern over mistakes (CM; i.e., excessive self-criticality focused on the fear of
6 making mistakes; Frost et al., 1990) to constitute different subtypes of perfectionism (i.e.,
7 high PS and high CM signifying mixed perfectionism). Crocker et al. (2014) found support
8 for Hypotheses 2 and 4 in relation to avoidance coping, but no support for the 2×2 model in
9 relation to problem-focused coping or emotion-focused coping. Additional analyses
10 examined goal progress as a moderator of these relationships. This analysis suggested that
11 support for Hypothesis 2 was most pronounced when athletes perceived low goal progress. In
12 other words, in circumstances when goals were being blocked, high CM contributed to more
13 avoidance coping than when goal progress was satisfactory.

14 *The present study*

15 We sought to build on the study of Crocker et al. (2014) by examining the relationship
16 between perfectionism and coping in a context other than competition stress. Injury offered
17 an interesting next step in this regard because the demands posed by injury are different to
18 those posed by competition stress. Notably, injury has the potential to be more stressful than
19 competition, but recovery and rehabilitation offers greater opportunity for personal control
20 than competition. We also sought to extend the research by Crocker et al. (2014) by utilising
21 measures of SOP and SPP, rather than PS and CM. While there are some similarities between
22 the dimensions used by Crocker et al and the ones used here, they are not interchangeable
23 constructs (Gaudreau & Verner-Fillion, 2012). SOP, for example, includes a more
24 pronounced harsh self-critical component than PS, which may mean SOP is relatively more
25 problematic in the context of sport injury. SPP is also an interpersonal dimension of

1 perfectionism whereas CM is an intrapersonal dimension of perfectionism. With the notion
2 that intrapersonal and interpersonal dimensions of perfectionism may influence coping
3 differently in mind, this extension also provides a useful addition to existing work.

4 In accord, our aim was to examine the relationships between 2×2 perfectionism and
5 coping in the specific context of marathon running injuries. Based on the preceding
6 theoretical and empirical arguments, we hypothesised that in comparison to non-
7 perfectionism, pure SOP would be associated with higher levels of problem-focused coping
8 (Hypothesis 1a), and emotion-focused coping (Hypothesis 1b). Pure SPP would be associated
9 with higher levels of emotion-focused coping and avoidance coping when compared to non-
10 perfectionism (Hypothesis 2), and mixed perfectionism (Hypothesis 3). When compared to
11 pure SOP, mixed perfectionism would be associated with lower levels of problem-focused
12 coping and higher levels of emotion-focused coping and avoidance coping (Hypothesis 4).

13 Method

14 *Participants and procedure*

15 Participants were runners ($n = 224$, males $n = 143$, females $n = 81$, M age = 39.77
16 years, $SD = 9.50$ years) who had either run at least one marathon before ($n = 155$), or who
17 were preparing to run in their first marathon ($n = 69$). They reported their running level as
18 recreational ($n = 140$), club ($n = 78$), semi-professional ($n = 3$), or professional ($n = 2$, $n = 1$
19 non-respondent). Those who had completed at least one marathon reported an average
20 marathon personal best of 3 hours 54 minutes 24 seconds ($SD = 46$ minutes 1 second). To
21 place this in context, the World average marathon finishing time was recently reported as 4
22 hours 21 minutes 21 seconds (Andersen, 2015). There was large variability in the amount of
23 years that the participants had been running ($M = 9.30$ years, $SD = 9.26$ years), the number of
24 hours they spent running per week ($M = 7$ hours 18 minutes 36 seconds, $SD = 12$ hours 16
25 minutes 12 seconds), and the number of miles they ran per week ($M = 25.20$ miles, $SD =$

1 16.14 miles). The participants reported an average of 1.27 injuries ($SD = 1.11$) in the past 12
2 months, which equated to several lost training or competition days over that period ($M =$
3 21.53 days, $SD = 49.15$ days), and an average injury incidence of 4.47 ($SD = 4.49$) injuries
4 per 1000 hours of running exposure.

5 Following institutional ethical approval, we invited runners to participate in the study
6 at a UK based pre-marathon exhibition event, or using online communication (i.e. via a link
7 sent to gatekeepers by e-mail or a link posted on social media). For both in person and online
8 participants, the participant information sheet included the aims, voluntary nature of
9 participation, risks and benefits, and procedures for withdrawal. Runners either consented via
10 a signature on a hard copy consent form, or by checking appropriate boxes in the online
11 version of the consent form. Runners who consented, then completed either a hard copy
12 version ($n = 129$), or an online version ($n = 95$) of the study questionnaire. The hard copy and
13 online versions were identical in item content, order and measurement scale.

14 *Instruments*

15 *Multidimensional perfectionism*

16 The Multidimensional Perfectionism Scale Short Form (HMPS-SF; Cox, Enns, &
17 Clara, 2002) measured multidimensional perfectionism. The HMPS-SF is measured on a
18 seven-point Likert scale (1 = 'strongly disagree' to 7 = 'strongly agree'). It includes the five-
19 item SOP subscale (e.g., 'One of my goals is to be perfect in everything I do. '), and the five-
20 item SPP subscale (e.g., 'Anything that I do that is less than excellent will be seen as poor
21 performance by those around me. '). In line with previous studies using the HMPS-SF in sport
22 (e.g. Jowett, Hill, Hall, & Curran, 2016), the instrument was prefaced with the stem: 'In my
23 sport... ' to reflect the potential domain specificity of perfectionism (Gotwals & Dunn, 2009).
24 The SOP and SPP subscales of the HMPS-SF have demonstrated excellent psychometric
25 properties that compare favourably to the original scale (see Stoeber, in press). Versions of

1 the HMPS have demonstrated adequate internal consistency in studies examining
2 perfectionism in runners ($\alpha \geq .86$; Hall, Hill, Appleton, & Kozub, 2009).

3 *Coping with injury*

4 The Brief COPE (Carver, 1997), was used to measure coping with injury in the
5 present study. The Brief COPE consists of fourteen two-item subscales. The subscales
6 include strategies which can be categorised as problem-focused coping (active coping,
7 planning, seeking instrumental support), emotion-focused coping (acceptance, humour,
8 positive reframing, religion, seeking emotional support, self-blaming, venting), and
9 avoidance coping (behavioural disengagement, substance use, self-distraction and denial).

10 The instructions and stem ('When I am injured...') of the Brief COPE were adapted in order
11 to focus on coping with injury, rather than generic coping. The items were measured on a
12 four-point Likert scale (1 = 'I usually don't do this at all' to 4 = 'I usually do this a lot').

13 Subscales from the Brief COPE have demonstrated adequate internal consistency in sport and
14 exercise samples ($\alpha \geq .78$; Smith et al., 2011).

15 *Analytical strategy*

16 Preliminary analyses were conducted in line with Tabachnick and Fidell (2007). This
17 included screening for out of range values, outliers, normality and missing values, as well as
18 assessing multicollinearity and internal consistency (Cronbach's α). Following preliminary
19 analyses, descriptive statistics and Pearson's correlations were calculated to examine the
20 perfectionism-coping with injury relationships. The main analyses followed procedures for
21 testing the 2×2 perfectionism model (see Gaudreau, 2012), using Model 1 in the PROCESS
22 SPSS custom dialog box (Hayes, 2013).

23 More specifically, SOP and SPP perfectionism were mean centred and entered as
24 predictors, along with their interaction term. Following the framework proposed by Gaudreau
25 (2012), moderator analyses were used to assess the hypotheses of the 2×2 model. In the first

1 instance this involved examining main effects of SOP and SPP, and the interactive effect of
2 these dimensions on coping dimensions. Where interaction terms were non-significant,
3 multiple regression analyses were re-run without the interaction term, to increase parsimony
4 and ensure that the main effects of SOP and SPP were not conditioned to the mean value of
5 the non-significant interaction term (Gaudreau, 2012). Predicted values for each coping
6 dimensions at each subtype of perfectionism were calculated in line with Gaudreau (2012).¹

7 Results

8 *Preliminary analyses*

9 Out of range values were checked and amended where necessary to ensure that they
10 accurately reflected participant responses. No missing data were present. Twelve univariate
11 outliers outside the Z score range (± 3.29 , $p < .001$) were identified and removed. The
12 remaining data were considered approximately univariate normal (absolute skewness $M =$
13 0.63 , $SD = 0.58$, $SE = 0.17$; absolute kurtosis $M = 0.78$, $SD = 0.69$, $SE = 0.33$). No
14 multivariate outliers were identified based on Mahalanobis distance: $\chi^2(16) = 39.25$, ($p <$
15 $.001$). The internal consistencies (see Table 1) were $\alpha \geq .80$ for perfectionism and $\alpha \geq .60$ for
16 coping with injury.

17 *Descriptive statistics and bivariate correlations*

18 The descriptive statistics and bivariate correlations are reported in Table 1.
19 Participants reported moderate-to-high levels of SOP and problem-focused coping, and
20 moderate levels of emotion-focused coping. In addition, participants reported low-to-
21 moderate SPP and avoidance coping. There was a significant positive correlation between

¹ To examine the possibility that injury frequency moderated the perfectionism and coping with injury relationships, all analyses were repeated so to examine two-way and three-way interactions between the two perfectionism dimensions and number injuries per 1000 hours in relation to each coping dimension. None of these interactions were significant.

1 SOP and SPP. SOP was unrelated to problem-focused coping, and shared small significant
2 positive correlations with emotion-focused coping and avoidance coping. SPP shared a small
3 negative correlation with problem-focused coping, a non-significant correlation with
4 emotion-focused coping, and a small positive correlation with avoidance coping.

5 *Moderated regression analyses*

6 Moderated regression analyses indicated no significant interactions. Therefore,
7 multiple regressions were re-run for each coping with injury dimension to examine the main
8 effects of SOP and SPP, uncentered and in the absence of the interaction terms. Table 2
9 includes a summary of support for the 2×2 Hypotheses across the broad dimensions of
10 coping.

11 The first main effects only model was significant, $F(3, 209) = 5.39, p = .01$, and
12 explained 4.8% variance in problem-focused coping. SOP was a significant positive predictor
13 of problem-focused coping, $b = 0.07, SE = 0.03, 95\% CI [0.00, 0.14], \beta = 0.15, t = 2.09, p =$
14 $.04$. SPP was a significant negative predictor of problem-focused coping, $b = -0.10, SE =$
15 $0.03, 95\% CI [-0.16, -0.04], \beta = -0.23, t = -3.13, p < .01$. This pattern of effects provides
16 support for Hypotheses 1a, 2, 3 and 4. The predicted values for problem-focused coping
17 across low (-1 SD) and high (+1 SD) levels of SOP and SPP are displayed in Figure 1.

18 The second main effects only model was significant, $F(3, 209) = 3.82, p = .02$, and
19 explained 3.5% variance in emotion-focused coping. SOP was a significant positive predictor
20 of emotion-focused coping, $b = 0.08, SE = 0.04, 95\% CI [-0.00, 0.15], \beta = 0.15, t = 2.05, p =$
21 $.04$. SPP did not predict emotion-focused coping, $b = 0.03, SE = 0.03, 95\% CI [-0.04, 0.10], \beta$
22 $= 0.07, t = 0.88, p = .38$. This pattern of effects provides support for Hypotheses 1b, but not 2,
23 3 and 4. The predicted values for emotion-focused coping across low (-1 SD) and high (+1
24 SD) levels of SOP and SPP are displayed in Figure 2.

1 seek instrumental support, and actively manage their situation when injured, than runners
2 exhibiting, non-perfectionism, or mixed perfectionism. In addition, the findings suggest that
3 runners exhibiting pure SOP are more likely than those exhibiting non-perfectionism or
4 mixed perfectionism to employ problem-focused strategies. Therefore, in the context of
5 marathon running injury and problem-focused coping, our findings provide support for the
6 tenets of the 2×2 model and its differentiation between subtypes of perfectionism.

7 In comparing the findings of the current study to the only other study to examine the
8 2×2 model of perfectionism and problem-focused coping, there are some inconsistencies.
9 Notably, Crocker et al. (2014) found no difference between the subtypes of perfectionism for
10 problem-focused coping in relation to competition stress. In reconciling this difference, we
11 note that in a study also examining combinations of the same dimensions of perfectionism as
12 Crocker et al. (2014), Dunn, Causgrove Dunn, Gamache, and Holt (2014) found a similar
13 pattern of findings to our study relating to problem-focused coping strategies and
14 performance slumps (an unexplained drop in performance). One possible explanation for this
15 inconsistency is the different contexts being examined. Subtypes of perfectionism such as
16 pure SOP and pure SPP may contribute to respectively more and less problem-focused
17 coping in the contexts of an injury or a performance slump, as both represent scenarios that
18 can be “worked through”, thereby offering a greater sense of self-control. These are quite
19 different from competitive stress when athletes sometimes have much less control, meaning
20 that problem-focused coping might be ineffective (e.g. when faced with a superior opponent
21 during competition). The broader issue this finding raises is that subtypes of perfectionism
22 may relate to coping differently depending on the type of stressor encountered.

23 In relation to emotion-focused coping, our findings suggest that marathon runners
24 exhibiting pure SOP are more likely to cope with injury in an emotion-focused manner,
25 compared to those exhibiting non-perfectionism. Again, this is a finding not evident in

1 Crocker et al. (2014). Because emotion-focused coping includes a mix of relatively adaptive
2 (seeking emotional support) and maladaptive (self-blame) coping strategies, and findings are
3 equivocal regarding the role of emotion-focused coping in injury recovery generally
4 (Mosewich et al., 2014; Wadey et al., 2012), the precise implications of this finding are
5 unclear. On one hand, it may signal that those with pure SOP are more adept than athletes
6 with non-perfectionism at coping with injury. On the other hand, it may be that the use of this
7 dimension of coping signals the need to manage greater emotional fallout following injury.
8 This idea is consistent with Flett and Hewitt's (2016) notion of perfectionistic reactivity
9 whereby some athletes are more prone to react with intense emotions when faced with
10 stressful events such as injury. If this is the case, this difference in the findings between our
11 study and Crocker et al may be due to using different dimensions of perfectionism when
12 constituting subtypes. Subtypes of perfectionism that include SOP may confer greater
13 emotional difficulties and necessitate more emotion-focused coping than subtypes that
14 include other similar dimensions of perfectionism, such as PS.

15 Unlike for the other two dimensions of coping, our findings suggest that the 2×2
16 model has little utility in explaining the associations between perfectionism subtypes and
17 avoidance coping in context of injury. This finding again contrasts the findings of Crocker et
18 al. (2014) who found differences in a manner that suggested high levels of dimensions of
19 perfectionism similar to SPP (in their study CM) correspond with higher levels of avoidance
20 coping (Hypothesis 2 and Hypothesis 4 were supported in their study). Again, the use of
21 different dimensions of perfectionism to constitute subtypes or contextual differences
22 (competition stress versus injury) may explain why the findings differ. Regarding the former,
23 it may be that the presence or absence of high SPP does not influence the use of avoidance
24 coping but the presence or absence of high CM does. Alternatively, regarding the latter, it is
25 possible that avoidance coping is generally valued equally by athletes exhibiting any subtype

1 of perfectionism when dealing with injury (seemingly very little given the mean scores), and
2 this is not the case when dealing with competition stress. It may even be a function of both
3 (i.e., SPP does not relate to avoidance coping in context of injury but will do in context of
4 other stressors). Future research is required to help identify which of these explanations are
5 most likely.

6 *Limitations and Future Directions*

7 Notwithstanding that the present study was the first to examine the 2×2 model of
8 perfectionism and coping with injury in marathon runners, the findings presented should be
9 observed in light of their limitations. The effects observed in support of the 2×2 model were
10 small, and therefore questions might be raised regarding their practical significance. In
11 addition, we adopted a cross-sectional design and therefore could not establish temporal
12 precedence (i.e., coping preferences may influence perfectionism/perfectionistic behaviours
13 such as achievement striving). Longitudinal research is required in this respect. Longitudinal
14 research would also have the potential to capture the relationships in a more dynamic fashion.
15 This is important as the effectiveness of coping strategies varies across the injury
16 rehabilitation period (Podlog et al., 2013), something that is lost in our more static snapshot
17 of the relationships. We also relied on retrospective recall. While reports suggest reasonable
18 accuracy in recalling number of injuries over a 12-month period, there may be some recall
19 bias (Gabbe, Finch, Bennell, & Wajswelner, 2003). Finally, we used general measures of
20 perfectionism and coping that we adapted to sport and injury. This is common practice;
21 however, domain- and injury-specific instruments would be beneficial in regards to fully
22 contextualising the concepts. Future research that does so will help verify the current findings
23 and will likely evidence greater predictive ability and practical significance.

24 *Conclusion*

1 We examined the 2×2 model of perfectionism in relation to coping in the context of
2 injury in marathon runners. The findings highlight the relative importance of different
3 subtypes of perfectionism for broad dimensions of coping in injured marathon runners. In the
4 case of problem-focused coping, the model highlights the potential functional quality of pure
5 SOP and the relatively maladaptive nature of pure SPP in relation to other perfectionism
6 subtypes. However, the picture is less clear for emotion-focused coping where only a
7 distinction between pure SOP and non-perfectionism was evident, and for avoidance coping
8 where none of the 2×2 hypotheses were supported. In comparing the results to previous
9 research, it appears that the relationship between perfectionism and coping may depend on
10 the nature of the stressor and the specific dimensions of perfectionism examined.

References

1
2 Carson, F., & Polman, R. C. (2008). ACL injury rehabilitation: A psychological case
3 study of a professional rugby union player. *Journal of Clinical Sport Psychology*, 2(1), 71-90.

4 Carson, F., & Polman, R. C. (2010). The facilitative nature of avoidance coping
5 within sports injury rehabilitation. *Scandinavian Journal of Medicine & Science in*
6 *Sports*, 20(2), 235-240.

7 Carver, C. S. (1997). You want to measure coping but your protocol's too long:
8 Consider the brief cope. *International Journal of Behavioral Medicine*, 4(1), 92-100.

9 Carver, C. S., & Connor-Smith, J. (2010). Personality and coping. *Annual Review of*
10 *Psychology*, 61(1), 679-704.

11 Cox, B. J., Enns, M.W., & Clara, I.P. (2002). The multidimensional structure of
12 perfectionism in clinically distressed and college student samples. *Psychological Assessment*,
13 14(3), 365-373.

14 Crocker, P. R., Gaudreau, P., Mosewich, A. D., & Kljajic, K. (2014). Perfectionism
15 and the stress process in intercollegiate athletes: Examining the 2×2 model of perfectionism
16 in sport competition. *International Journal of Sport Psychology*, 45(4), 61-84.

17 Crocker, P. R., Tamminen, K. A., & Gaudreau, P. (2015). Coping in sport. In S.
18 Hanton & S. Mellalieu (Eds.), *Contemporary advances in sport psychology: A review* (pp.
19 28-67). New York: Routledge.

20 Dunn, J. G. H., Causgrove Dunn, J., Gamache, V., & Holt, N. L. (2014). A person-
21 oriented examination of perfectionism and slump-related coping in female intercollegiate
22 volleyball players. *International Journal of Sport Psychology*, 45(4), 298-324.

23 Flett, G. L., & Hewitt, P. L. (2016). Reflections on perfection and the pressure to be
24 perfect in athletes, dancers, and exercisers: A focus on perfectionistic reactivity in key

1 situations and life contexts. In A. P. Hill (Ed.), *The psychology of perfectionism in sport,*
2 *dance and exercise* (pp. 296-319). New York: Routledge.

3 Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of
4 perfectionism. *Cognitive Therapy and Research, 14*(5), 449-468.

5 Gabbe, B. J., Finch, C. F., Bennell, K. L., & Wajswelner, H. (2003). How valid is a
6 self-reported 12-month sports injury history? *British Journal of Sports Medicine, 37*(6), 545-
7 547.

8 Gaudreau, P. (2012). A methodological note on the interactive and main effects of
9 dualistic personality dimensions: An example using the 2×2 model of
10 perfectionism. *Personality and Individual Differences, 52*(1), 26-31.

11 Gaudreau, P. (2016). The 2×2 model of perfectionism in sport, dance, and exercise. In
12 A. P. Hill (Ed.), *The psychology of perfectionism in sport, dance and exercise* (pp. 174-200).
13 London: Routledge.

14 Gaudreau, P., & Antl, S. (2008). Athletes' broad dimensions of dispositional
15 perfectionism: Examining changes in life satisfaction and the mediating role of sport-related
16 motivation and coping. *Journal of Sport and Exercise Psychology, 30*(3), 356-382.

17 Gaudreau, P., & Verner-Filion, J. (2012). Dispositional perfectionism and well-being:
18 A test of the 2×2 model of perfectionism in the sport domain. *Sport, Exercise, and*
19 *Performance Psychology, 1*(1), 29-43.

20 Gotwals, J. K., & Dunn, J. G. (2009). A multi-method multi-analytic approach to
21 establishing internal construct validity evidence: The Sport Multidimensional Perfectionism
22 Scale 2. *Measurement in Physical Education and Exercise Science, 13*(2), 71-92.

23 Hall, H. K., Hill, A. P., Appleton, P. R., & Kozub, S. A. (2009). The mediating
24 influence of unconditional self-acceptance and labile self-esteem on the relationship between

1 multidimensional perfectionism and exercise dependence. *Psychology of Sport and*
2 *Exercise, 10(1)*, 35-44.

3 Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process*
4 *analysis: A regression-based approach*. New York: Guilford Press.

5 Hewitt, P.L., & Flett, G.L. (1991). Perfectionism in the self and social contexts:
6 Conceptualization, assessment, and association with psychopathology. *Journal of Personality*
7 *and Social Psychology, 60(3)*, 456-470.

8 Hewitt, P.L., & Flett, G.L. (2002). Perfectionism and stress in psychopathology. In G.
9 L. Flett & P. L. Hewitt (Eds.), *Perfectionism: Theory, research, and treatment* (pp. 255–284).
10 Washington, DC: American Psychological Association.

11 Hill, A. P. (2013). Perfectionism and burnout in junior soccer players: A test of the 2×
12 2 model of dispositional perfectionism. *Journal of Sport and Exercise Psychology, 35(1)*, 18-
13 29.

14 Hill, A. P., Hall, H. K., & Appleton, P. R. (2010). Perfectionism and athlete burnout
15 in junior elite athletes: The mediating role of coping tendencies. *Anxiety, Stress, &*
16 *Coping, 23(4)*, 415-430.

17 Jowett, G. E, Hill, A. P, Hall, H. K, & Curran, T. (2016). Perfectionism, burnout and
18 engagement in youth sport: The mediating role of basic psychological needs. *Psychology of*
19 *Sport and Exercise, 24(3)*, 18-26.

20 Kiliç, Ö., Aoki, H., Goedhart, E., Hägglund, M., Kerkhoffs, G. M. M. J., Kuijer, P. P.
21 F. M., Waldén, M, & Gouttebauge, V. (2018). Severe musculoskeletal time-loss injuries and
22 symptoms of common mental disorders in professional soccer: a longitudinal analysis of 12-
23 month follow-up data. *Knee Surgery, Sports Traumatology, Arthroscopy, 26(3)*, 946-954.

1 Longbottom, J. L., Grove, J. R., & Dimmock, J. A. (2012). Trait perfectionism, self-
2 determination, and self-presentation processes in relation to exercise behavior. *Psychology of*
3 *Sport and Exercise, 13*(2), 224-235.

4 Mosewich, A. D., Crocker, P. R., & Kowalski, K. C. (2014). Managing injury and
5 other setbacks in sport: Experiences of (and resources for) high-performance women athletes.
6 *Qualitative Research in Sport, Exercise and Health, 6*(2), 182-204.

7 Nicholls, A. R. (2010). Effective Versus Ineffective Coping in Sport. In A. R.
8 Nicholls (Ed.), *Coping in sport: Theory, methods and related constructs* (pp. 263-276). New
9 York: Nova Science Publishers.

10 Nicholls, A. R., Taylor, N. J., Carroll, S., & Perry, J. L. (2016). The development of a
11 new sport-specific classification of coping and a meta-analysis of the relationship between
12 different coping strategies and moderators on sporting outcomes. *Frontiers in*
13 *Psychology, 7*(3), 1674.

14 Nicholls, A., & Thelwell, R. (2010). Coping conceptualized and unraveled. In A. R.
15 Nicholls (Ed.), *Coping in sport: theory, methods and related constructs* (pp. 3-14). New
16 York: Nova Science Publishers.

17 Podlog, L., Wadey, R., Stark, A., Lochbaum, M., Hannon, J., & Newton, M. (2013).
18 An adolescent perspective on injury recovery and the return to sport. *Psychology of Sport and*
19 *Exercise, 14*(4), 437-446.

20 Salim, J., Wadey, R., & Diss, C. (2015). Examining the relationship between
21 hardiness and perceived stress-related growth in a sport injury context. *Psychology of Sport*
22 *and Exercise, 19*(4), 10-17.

23 Skinner, E. A., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the
24 structure of coping: a review and critique of category systems for classifying ways of
25 coping. *Psychological Bulletin, 129*(2), 216-269.

- 1 Smith, A., Ntoumanis, N., Duda, J. L., & Vansteenkiste, M. (2011). Goal striving,
2 coping, and well-being: A prospective investigation of the self-concordance model in sport.
3 *Journal of Sport and Exercise Psychology, 33*(1), 124-145.
- 4 Stevinson, C., & Hickson, M. (2014). Exploring the public health potential of a mass
5 community participation event. *Journal of Public Health, 36*(2), 268-274.
- 6 Stoeber, J. (2012). The 2 x 2 model of perfectionism: A critical comment and some
7 suggestions. *Personality and Individual Differences, 53*(5), 541-545.
- 8 Stoeber, J. (in press). Comparing Two Short Forms of the Hewitt–Flett
9 Multidimensional Perfectionism Scale. *Assessment*.
- 10 Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed).
11 Boston, MA: Allyn and Bacon.
- 12 van Gent, B. R., Siem, D. D., van Middelkoop, M., van Os, T. A., Bierma-Zeinstra, S.
13 S., & Koes, B. B. (2007). Incidence and determinants of lower extremity running injuries in
14 long distance runners: a systematic review. *British Journal of Sports Medicine, 41*(8), 469-
15 480.
- 16 Wadey, R., Evans, L., Hanton, S., & Neil, R. (2012). An examination of hardiness
17 throughout the sport injury process. *British Journal of Health Psychology, 17*(1), 103-128.
- 18 Wiese-Bjornstal, D. M. (2010). Psychology and socioculture affect injury risk,
19 response, and recovery in high-intensity athletes: a consensus statement. *Scandinavian*
20 *Journal of Medicine & Science in Sports, 20*(2), 103-111.

1 Table 1. Descriptive statistics, bivariate correlations and internal consistencies

	<i>M (SD)</i>	α	1.	2.	3.	4.	5.
1. SOP	5.17 (1.03)	.85	-				
2. SPP	2.96 (1.15)	.80	.40***	-			
3. Problem-focused coping	3.13 (0.48)	.74	.06	-.17*	-		
4. Emotion-focused coping	2.63 (0.53)	.68	.18**	.13	.22**	-	
5. Avoidance coping	1.65 (0.36)	.60	.14*	.26***	-.08	.32***	-

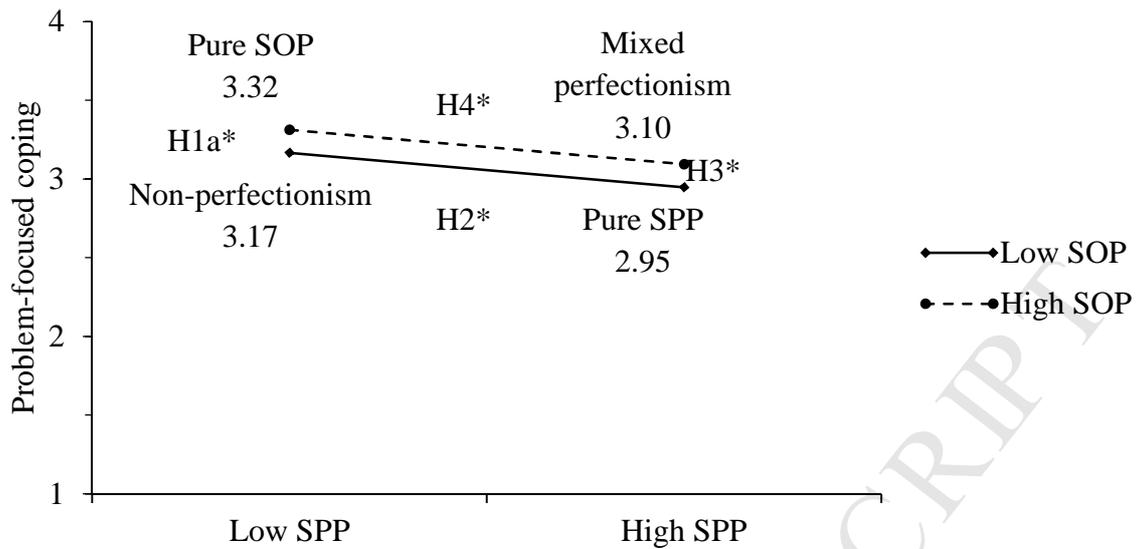
2 Note. $p < .05^*$, $p < .01^{**}$, $p < .001^{***}$. SOP = self-oriented perfectionism, SPP = socially

3 prescribed perfectionism.

1 Table 2. Summary of support for the 2 x 2 perfectionism hypotheses

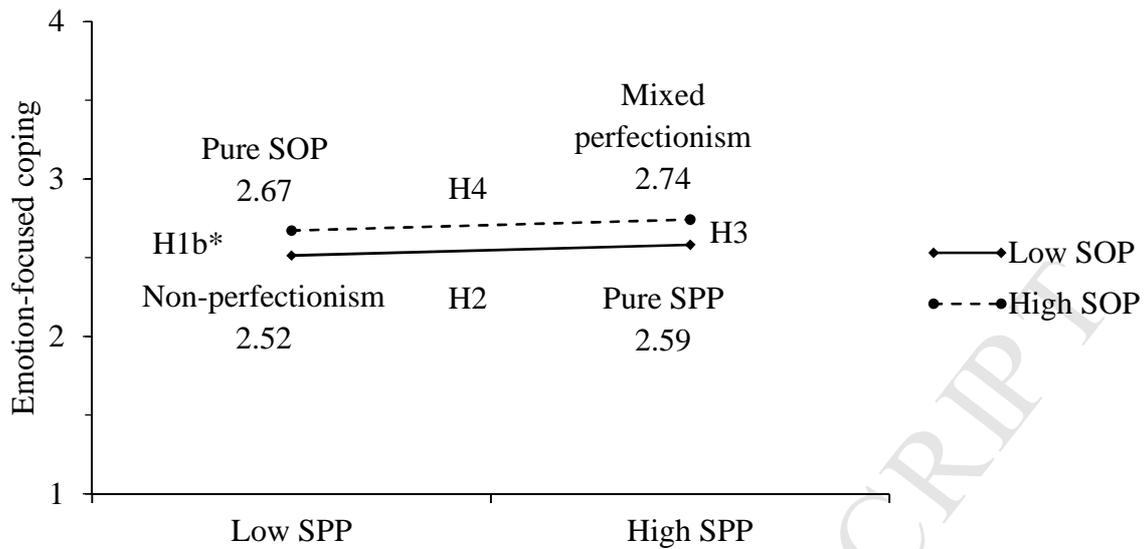
	Hypothesis 1	Hypothesis 2	Hypothesis 3	Hypothesis 4
	PSOP vs NP	PSPP vs NP	PSPP vs MP	PSOP vs MP
Problem-focused coping	a*	*	*	*
Emotion-focused coping	b*	ns	ns	ns
Avoidance coping	ns	ns	ns	ns

2 Note. *denotes support for the hypothesis. a, b = different versions of Hypothesis 1. ns = non-
3 significant difference between subtypes ($p > .05$). PSOP = pure self-oriented perfectionism.
4 PSPP = pure socially prescribed perfectionism. MP = mixed perfectionism, NP = non-
5 perfectionism.



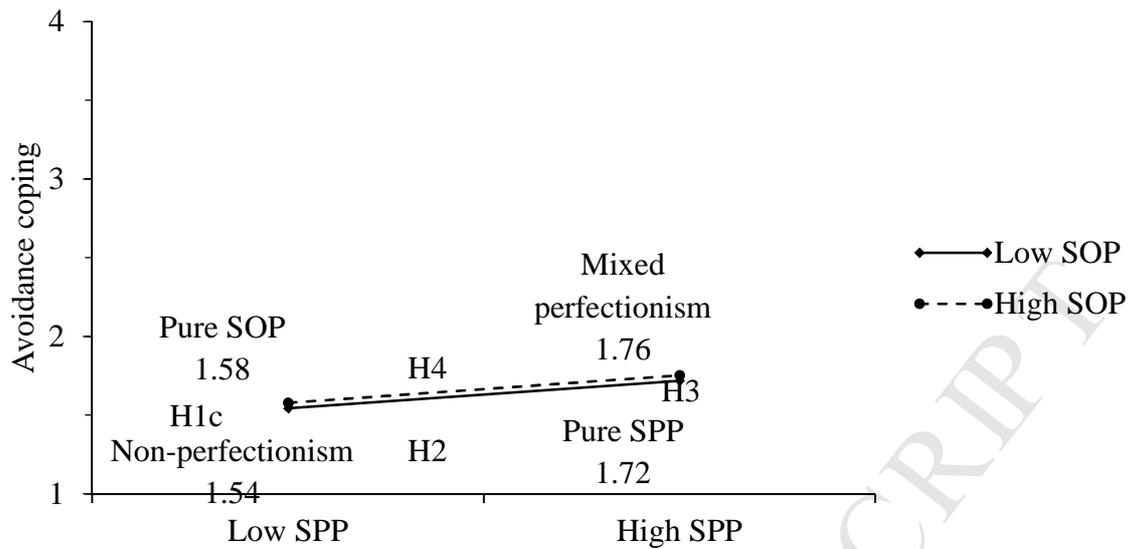
1

2 Figure 1. Predicted values of problem-focused coping across different subtypes of
 3 perfectionism. Note. SOP = self-oriented perfectionism; SPP = socially prescribed
 4 perfectionism. * denotes support for the corresponding 2×2 hypothesis.



1

2 Figure 2. Predicted values of emotion-focused coping across different subtypes of
 3 perfectionism. Note. SOP = self-oriented perfectionism; SPP = socially prescribed
 4 perfectionism. * denotes support for the corresponding 2×2 hypothesis.



1

2 Figure 3. Predicted values of avoidance coping across different subtypes of perfectionism.

3 Note. SOP = self-oriented perfectionism; SPP = socially prescribed perfectionism. H1c =

4 non-significant difference between pure SOP and non-perfectionism.

5

Highlights

- Perfectionism subtypes differentially associate with broad coping dimensions
- Pure SOP associated with higher levels of problem-focused coping
- Pure SPP associated with lower levels of problem-focused coping
- Pure SOP associated with higher levels of emotion-focused coping