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1 A test of perfectionistic vulnerability following competitive failure among college
2 athletes

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Abstract

Perfectionism purportedly bestows vulnerability to distress via an interaction with achievement and interpersonal stress. We test this by assessing athletes' perfectionism and subsequent self-conscious emotion following repeated competitive failure. Sixty college athletes undertook three 4-minute competitive sprint trials on a cycle ergometer and were instructed that they had performed the worst of all competitors on each occasion. Measures of perfectionism (self-oriented and socially prescribed) were taken at baseline and measures of pride, guilt, and shame were taken at baseline and three times following each successive failure. Across the successive failures, self-oriented perfectionism predicted within-person trajectories of decreasing pride and increasing guilt. Socially prescribed perfectionism predicted within-person trajectories of increasing shame and guilt. Furthermore, a combination of high self-oriented and high socially prescribed perfectionism predicted the steepest within-person increases in shame and guilt. Findings support an achievement specific vulnerability hypothesis whereby those higher in perfectionism experience pronounced distress following competitive failure.

1 Whether it's losing to a close rival, making a critical mistake, or experiencing an injury,
2 stressful events are common in sport. Research shows these events can contribute to several
3 psychological difficulties for athletes, depending on how vulnerable they are to stress (e.g.,
4 Crocker & Graham, 1995; Scanlan & Lewthwaite, 1984; Scanlan & Passer, 1979). One factor
5 that may increase stress vulnerability is perfectionism. This idea is formalized in the notion of
6 general and specific diathesis-stress models wherein perfectionism serves as a vulnerability
7 factor that interacts with the experience of negative life events to predict distress (Hewitt & Flett,
8 1993). However, to date, few studies have examined these models in sport (Flett & Hewitt,
9 2016). In the current study, we address this limitation by testing an achievement-specific
10 vulnerability hypothesis, which states that dimensions of perfectionism predict pronounced
11 distress following competitive failure in sport. To do so, we experimentally induced successive
12 competitive failure on a cycle ergometer sprint task and observed the emotional consequences.

13 **Multidimensional perfectionism**

14 Perfectionism is a personality trait characterized by the setting of excessively stringent
15 standards and tendencies for overly critical self-evaluation (Frost, Marten, Lahart, & Rosenblate,
16 1990). According to Hewitt and Flett, trait perfectionism has distinct personal and interpersonal
17 dimensions. The personal dimension, self-oriented perfectionism, entails rigid self-expectations
18 and an irrational desire for perfect performances in combination with punitive self-evaluation.
19 There are two interpersonal dimensions, socially prescribed perfectionism and other-oriented
20 perfectionism. Socially-prescribed perfectionism is a perceived need for others approval, intense
21 interpersonal sensitivity, and a belief that significant others and the wider environment are
22 imposing unrealistic expectations. Other-oriented perfectionism is the tendency to impose
23 unrealistic standards on others and evaluate them critically. As other-oriented perfectionism

1 focuses primarily on interpersonal relations, rather than personal vulnerability, we focus on the
2 first two dimensions in the current study.

3 In research adopting Hewitt and Flett's (1991a) approach in sport, socially prescribed
4 perfectionism has emerged as maladaptive because it positively correlates with an array of
5 negative outcomes for athletes. These outcomes include (among others) poorer coping, lower
6 subjective well-being, and higher burnout (e.g., Gaudreau & Verner-Filion, 2012; Hill, Hall,
7 Appleton, & Kozub, 2008; Hill, Hall, & Appleton, 2010). The effects of self-oriented
8 perfectionism, however, have emerged as more complex. On the one hand, self-oriented
9 perfectionism is seemingly adaptive as it positively correlates with approach goals, autonomous
10 forms of motivation, and positive emotions (e.g., Appleton & Hill, 2012; Jowett, Hill, Hall, &
11 Curran, 2013; Kaye, Conroy, & Fifer, 2008, see also Hill, Mallinson-Howard, & Jowett, in press,
12 for a review). On the other hand, self-oriented perfectionism also positively correlates with
13 avoidance goals, controlling forms of motivation, and negative emotions (e.g., Dunn, Gotwals,
14 Causegrove Dunn, Syrotuik, 2006; Curran, Hill, Jowett, & Mallinson, 2014; Stoeber, Stoll,
15 Salmi, & Tiikkaja, 2009). While the effects of socially prescribed perfectionism are widely
16 understood as maladaptive in sport, then, the effects of self-oriented perfectionism are equivocal.

17 **The stress vulnerability perfectionism**

18 One limitation of current research is that it has typically examined the correlates and
19 consequences of perfectionism with little consideration for the context in which the relationships
20 are being examined (Hill, 2016). This is important because Flett and Hewitt (2016) have noted
21 that the effects of self-oriented and socially prescribed perfectionism are likely to depend heavily
22 on whether situational cues activate inherent vulnerabilities associated with the two dimensions.
23 This idea has been formalized in a general diathesis-stress model (or general-vulnerability

1 hypothesis) wherein perfectionism is a vulnerability factor for distress (historically depression)
2 via its interaction with general negative life events of any kind (Flett, Hewitt, & Dyck, 1989).
3 Later, the general diathesis-model was followed by a specific diathesis-model (or specific-
4 vulnerability hypothesis) for self-oriented and socially prescribed perfectionism with particular
5 stressful events rather than general stressful events in mind as triggers for distress (Hewitt &
6 Flett, 1993)

7 Regarding the specific-vulnerability hypothesis, for self-oriented perfectionism, specific
8 stressors are achievement related events that disrupt personal attainment. For socially prescribed
9 perfectionism, by contrast, specific stressors are social or interpersonal related events that disrupt
10 the need for approval and exacerbate fears of negative social evaluation. The difference in the
11 nature of these specific vulnerabilities can be understood in terms of the different introjected
12 roots of the two dimensions of perfectionism (Hewitt, Flett, & Mikail, 2017). For self-oriented
13 perfectionism, excessive self-expectations and punitive self-evaluation are thought to arise
14 predominantly from self-worth contingencies in the achievement domain (i.e., personal
15 competence). For socially prescribed perfectionism, excessive need for approval and relational
16 sensitivity are thought to arise predominantly from self-worth contingencies in the interpersonal
17 domain (i.e., approval of others; Hewitt, Flett, & Ediger, 1996). In accord, it follows that self-
18 oriented and socially prescribed perfectionism are expected to contribute to distress only
19 following events that are aligned to their particular contingencies of self-worth.

20 Studies have typically found support for the general vulnerability hypothesis. For
21 example, general life stress has been found to interact with both self-oriented and socially
22 prescribed perfectionism to predict depression and suicide ideation (e.g., Blankstein, Lumley, &
23 Crawford, 2007; Dunkley, Blankstein, Halsall, & Williams, 2000; Flett, Hewitt, Blankstein, &

1 Moshier, 1995). Support for the specific-vulnerability hypothesis is more mixed. In support of
2 the specific-vulnerability hypothesis, most studies indicate that self-oriented perfectionism
3 interacts with achievement stress, but not interpersonal stress, to predict distress (e.g., Hewitt &
4 Flett, 1993; Hewitt et al., 1996; Enns & Cox, 2005). However, contrary to the specific
5 vulnerability hypothesis, socially prescribed perfectionism appears to interact with *both*
6 achievement and interpersonal stress to predict distress (e.g., Flett, Nepon, Hewitt, Fitzgerald,
7 2016; Hewitt & Flett, 1993; Sherry, Hewitt, Flett, & Harvey, 2003). Notably, the same findings
8 are evident in experimental studies. For example, negative achievement feedback on cognitive
9 tasks has been found to elicit higher rumination, dissatisfaction, and negative affect for those
10 high in self-oriented perfectionism (Besser, Flett, & Hewitt, 2004) and higher anxiety for those
11 high in self-oriented and socially prescribed perfectionism (Besser, Flett, Hewitt, & Guez, 2008).
12 Based on research to date, socially prescribed perfectionism appears to confer vulnerability in the
13 context of both achievement and interpersonal stress whereas self-oriented perfectionism confers
14 vulnerability in the context of achievement stress only.

15 **Perfectionistic vulnerability in sport**

16 As a context replete with achievement and interpersonal stressors, sport is arguably an
17 ideal setting to test the vulnerability hypotheses of perfectionism. To date, though, only a handful
18 of studies have investigated perfectionistic vulnerability among athletes (e.g., Crocker,
19 Gaudreau, Mosewich, & Kljajic, 2014; Hill, Hall, Duda, & Appleton, 2011; Lizmore, Dunn, &
20 Dunn, 2017). For example, Sagar and Stoeber (2009) found that concern over mistakes (a
21 dimension of perfectionism similar to socially-prescribed perfectionism) positively predicted
22 negative affect after imagined failure in college athletes but personal standards (a dimension of
23 perfectionism similar to self-oriented perfectionism) did not. Likewise, Anshel and Mansouri

1 (2005) found that college athletes high in personal standards and concern over mistakes
2 displayed elevated negative affect and decreased performance following failure feedback on a
3 stabilometer (balancing) task. Finally, Hill and colleagues (Hill et al., 2011) found that, in
4 response to two manipulated personal goal failures on a muscular endurance cycling task, college
5 athletes high in self-oriented perfectionism reported heightened threat appraisal, lower effort, and
6 more frequent thoughts of escape than athletes low in self-oriented perfectionism. These findings
7 remained after controlling for socially prescribed perfectionism. In line with research outside of
8 sport, these studies are consistent with the specific vulnerability hypothesis for self-oriented
9 perfectionism (i.e., vulnerability to distress following achievement stress only) and the general
10 vulnerability for socially prescribed perfectionism (i.e., vulnerability to distress following
11 general or both achievement and interpersonal stress).

12 **The achievement-specific vulnerability hypothesis**

13 In considering research findings inside and outside of sport, we believe current research
14 provides support for an achievement-specific vulnerability hypothesis. That is, self-oriented and
15 socially prescribed perfectionism are both especially vulnerable to distress following
16 achievement-related stressful events (e.g., competitive failure). Alongside the aforementioned
17 research, we consider studies examining the relationship between dimensions of perfectionism
18 and contingencies of self-worth to be suggestive of this possibility. Specifically, among
19 undergraduate students, Hill, Hall, and Appleton (2011) found that both self-oriented
20 perfectionism and socially prescribed perfectionism positively correlated with achievement-
21 related self-worth contingencies (the desire to outperform others). And, more recently, Curran (in
22 press) found the same among adolescent athletes. With this in mind, we argue that competitive
23 achievement outcomes are sources of vulnerability for both self-oriented and socially prescribed

1 perfectionism because success or failure can signal either personal inadequacy (self-oriented
2 perfectionism) or interpersonal inferiority (socially prescribed perfectionism).

3 One interesting consequence of the achievement-specific vulnerability hypothesis is a
4 theoretical extension not provided by either the specific vulnerability hypothesis or the general
5 vulnerability hypothesis. According to the achievement-specific vulnerability hypothesis,
6 athletes with high levels of both self-oriented and socially-prescribed perfectionism are
7 hypothetically most vulnerable to distress. This is because competitive failure signals *both*
8 personal inadequacy and interpersonal inferiority. There is good evidence that examining
9 combinations of perfectionism dimensions can provide additional insight into the consequences
10 of perfectionism (e.g., Gaudreau, 2012; Hill, 2013; Powers, Koestner, Zuroff, Milyavskaya, &
11 Gorin, 2011). When doing so, athletes low in self-oriented perfectionism and high in socially
12 prescribed perfectionism (i.e., not high in both) are typically regarded as most at risk of
13 experiencing psychological difficulties (Gaudreau, 2016)¹. The work of Gaudreau and
14 colleagues, therefore, provides an interesting counterpoint to which the achievement specific
15 vulnerability hypothesis can be tested.

16 **Self-conscious emotion**

¹ We note that recently Gaudreau, Franche, Kljajic, and Martinelli (2017) have proposed a differential susceptibility hypothesis stating that pure self-oriented perfectionism relates to positive and negative outcomes (compared to non-perfectionism) depending on whether this is examined in a supportive environment (normal level of stress) or adverse environment (distressful level of stress). This is in keeping with the notion of a stress-diathesis model but pertains to the comparison of pure self-oriented perfectionism to non-perfectionism, rather than what we propose here that pertains to a comparison of mixed perfectionism to pure socially prescribed perfectionism.

1 In tests of the achievement-specific vulnerability hypothesis, self-conscious emotions are
2 likely to be informative. This is because self-conscious emotions are activated by threats to self-
3 worth in the achievement and interpersonal contexts and are core affective features of anxiety
4 and depression (Kim, Thibodeau, & Jorgensen, 2011). Three self-conscious emotions are
5 especially notable here, namely, pride, guilt, and shame (Flett, Russo, & Hewitt, 1994; Sturman,
6 Flett, Hewitt, & Rudolph, 2009). Pride reflects self-affirming emotions about one's
7 characteristics (e.g., skills, abilities, talents) following achievement, whereas guilt and shame are
8 emotions about defective performance (guilt) or self (shame) following mistakes or failure
9 (Tangney & Tracy, 2011). These three emotions are examined regularly in the context of how
10 individuals respond to achievement outcomes in sport (see Sabiston & Castonguay, 2014). They
11 are also considered central to understanding the emotional consequences of success and failure
12 (e.g., Brown & Dutton, 1995; McGregor & Elliot, 2005; Stoeber, Kempe, & Keogh, 2008).

13 Self-conscious emotions are highly salient to perfectionism (Tangney, 2002). Much
14 research shows that shame and guilt are positively associated with socially-prescribed
15 perfectionism (e.g., Tangney, 2002). Likewise, there is evidence that self-oriented perfectionism
16 predicts increased guilt, worry, and rumination about one's performances (Hewitt & Flett,
17 1991a). Germane to this study, experimental work suggests that dimensions of perfectionism are
18 related to lower pride, and higher guilt and shame, in response to achievement stress. For
19 example, Stoeber et al (2009) found socially prescribed perfectionism and self-oriented
20 perfectionism to be positively related to shame after failure and socially prescribed perfectionism
21 to be related to negatively related to pride after failure. In a subsequent study, Stoeber and Yang
22 (2010) also found that responses to achievement outcomes depended on the combination of self-
23 oriented and socially prescribed perfectionism, with the presence of high or low socially

1 prescribed perfectionism determining levels of pride after success. As such, these studies
2 illustrate nicely how self-conscious emotions are useful indicators of perfectionistic
3 vulnerability.

4 **The present study**

5 The aim of the current study was to provide an initial test of an achievement-specific
6 vulnerability hypothesis of perfectionism. To this end, we studied successive competitive failure
7 in college athletes on a cycle ergometer task and measured emotional consequences. In line with
8 the achievement-specific vulnerability hypothesis, it was anticipated that the negative response to
9 competitive failure (declines in pride and increases in guilt and shame) would be correlated with
10 high self-oriented perfectionism and high socially-prescribed perfectionism separately. In
11 addition, the negative response would be greatest at high levels of both self-oriented and socially
12 prescribed perfectionism combined.

13 **Method**

14 **Participants and Procedure**

15 Sixty college athletes in the North of England were the participants of this study ($M_{age} =$
16 20.78 , $SD = 3.57$, Female $N = 7$). The sample size was based on requirements of the statistical
17 analysis (multilevel modeling), which require a minimum of 50 Level-2 observations (Maas &
18 Hox, 2005). Ethical approval was granted by the research ethics committees from the institution
19 to which the authors were affiliated prior to conducting the investigation. In gender-matched
20 groups of three ($k = 8$) or four ($k = 9$), participants arrived at the laboratory and completed a
21 standardized informed consent form and two health screening instruments (ASCM risk factor
22 assessment and university maximal exercise questionnaire). All participants were categorized as
23 low-risk on these screening instruments and were thus permitted to take part in the study.

1 Following completion of the two screening instruments, participants completed a sub-maximal
2 test to identify heart rate at varying workloads and predict participants' maximal VO₂ workload
3 (see American College of Sports Medicine, 2006). The sub-maximal test was used to set cycle
4 ergometers to 35% of the participants estimated VO₂ maximal level when at 60 revolutions per
5 minute. This was done to ensure comparability in terms of effort in the three trials. Once the sub-
6 maximal test was complete, participants were isolated from the other participants and instructed
7 not to communicate with them for the duration of the study. All participants were given name
8 tags that identified them as athlete 1, 2, 3 (for the eight groups of three) or 1, 2, 3, or 4 (for the
9 nine groups of four).

10 Prior to each competitive bout, participants received the following recorded instructions:

11

12 You are about to take part in the [first, second, third] competitive trial. The duration of
13 the trial is 4-minutes. One of the researchers will indicate when the trial starts and when
14 the trial is over. Your aim is to outperform the other competitors. At the end of the trial,
15 all competitors will be informed of who came first and who came last. Because we've
16 controlled for initial fitness levels, the outcome of this trial will be determined by effort,
17 technical ability, and strategy². This is a muscular endurance task. It is highly unlikely
18 that you will complete each trail if you sprint. Success will be a consequence of strategy
19 and pacing.

20

21 Following these instructions participants completed baseline measures of multidimensional
22 perfectionism and state shame, guilt, and pride. They then undertook the first of three 4-minute

² These instructions were given to place emphasis on performance being a consequence of athletes' behavior (rather than the behavior of opponents).

1 competitive trials on a cycle ergometer (Lode™ Examiner). During the trial, the participants
2 were provided with no indication of their performance (e.g., RPM and distance covered). This
3 was to avoid personal goal setting during the competitive bouts. The only instructions
4 participants received during each bout was that 1 minute and 30 seconds remained. Cycle
5 ergometers were perpendicular to each other and were approximately 1 meter apart to minimize
6 opportunities for direct comparison.

7 After the first competitive bout, participants were once again isolated from each other and
8 received false written feedback regarding performance within the group. All participants
9 received written feedback on their questionnaire that stated that they had come last ('last place
10 was...Athlete 1...etc.') and were also instructed which of the other athletes came first in the
11 same manner. The athlete identified as the winner was selected based on actual performance (i.e.,
12 the athlete who cycled the most distance or, in the case of returning failure feedback to the
13 athlete who cycled the most distance, the athlete who cycled the second most distance).
14 Participants then completed post-performance measures of state shame, guilt, and pride during a
15 compulsory 15-minute rest period. This procedure was repeated for two subsequent competitive
16 bouts (three competitive bouts in total). Following completion of all bouts, participants were
17 given a standardized debrief that included the aim of the investigation and the nature of the
18 manipulation. Participants were also permitted to see their own performance data.

19 **Instruments**

20 **Multidimensional perfectionism.** Self-oriented perfectionism and socially prescribed
21 perfectionism were measured using Hewitt and Flett's (1991a) Multidimensional Perfectionism
22 Scale (HMPS). The two subscales of the MPS contain 15-items and are measured on a seven-
23 point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). The self-oriented perfectionism

1 subscale encapsulates items tapping a desire for perfection and intolerance of inferior
2 performance (e.g., “I must always be successful in activities that are important to me.”). The
3 socially prescribed perfectionism subscale encapsulates items that tap the perception that others
4 hold lofty standards and that their acceptance is based on the attainment of those standards (e.g.,
5 “The people around me expect me to succeed at everything I do.”). Research supports the
6 validity and reliability of the scale (Hewitt & Flett, 1991a). This includes acceptable levels of
7 internal consistency (α = self-oriented perfectionism .89 and socially prescribed perfectionism
8 .86) and test-retest reliability (r = self-oriented perfectionism .88 and socially prescribed
9 perfectionism .75; Hewitt & Flett, 1991a). In the current study, both self-oriented perfectionism
10 and socially prescribed perfectionism were considered to have acceptable levels of internal
11 consistency (α = self-oriented perfectionism .87 and socially prescribed perfectionism .77).

12 **Shame, guilt, and pride.** The 15-item State Shame and Guilt Scale (SSGS; Marschall,
13 Sanftner, & Tangney, 1995) was used to measure state shame, guilt, and pride. The three sub-
14 scales of the SSGS each contain 5-items and are measured on a 5-point Likert scale (1 = *not*
15 *feeling this way at all* to 7 = *feeling this way strongly*). Participants were instructed to rate their
16 response on the scale based on how they were feeling in the moment. The shame items tap
17 feelings of embarrassment, humiliation, and escape (e.g., “I want to sink to the floor,
18 disappear”). The guilt items tap feelings of remorse, regret, and sorrow (e.g., “I feel remorse,
19 regret). The pride items tap feelings of worth, efficacy, and accomplishment (e.g., “I feel
20 worthwhile, valuable”). The SSGS is a reliable and valid instrument of state shame, guilt, and
21 pride (Marschall et al., 1995). In the current study, internal consistency for the sub-scales of the
22 SSGS was very good (shame: α s = 0.88–0.93, guilt: 0.86–0.95, pride: α s = 0.77–0.94).

23 **Data analysis**

1 Our experimental protocol produced data with a hierarchical structure in which repeated
2 measures of pride, shame, and guilt (Level 1) are nested within participants (Level 2). We,
3 therefore, tested our hypotheses using multilevel modeling in SPSS (version 23). Multilevel
4 modeling permits simultaneous estimation of within- and between-person main effects, in
5 addition to the prediction of variance components in both intercepts and slopes. Data were
6 modeled using a variance components matrix, and models were tested with full maximum
7 likelihood estimation (Snijders & Bosker, 2012).

8 Three Level 1 variables were individually modeled: pride, shame, and guilt. Multilevel
9 models predicting these outcomes were built using an iterative process. First, for each outcome,
10 an intercept-only model was tested, and the intra-class correlation was computed (Model 1).
11 Next, as the mean-level growth trajectories for pride, guilt, and shame showed a curvature
12 (Figure 1), we entered both the linear and quadratic effects of time to the intercept-only model
13 and allowed the intercept, linear time slope, and quadratic time slope to vary randomly (Model
14 2). All Level 1 variables had significant variance components for the intercept and linear time
15 slope, but not the quadratic time slope. Hence, only intercepts and linear time slopes were
16 permitted to randomly vary in subsequent models. A negative linear time slope of pride and a
17 positive linear time slope of guilt and shame would indicate achievement stress. However, the
18 main goal of this study – how achievement stress and perfectionism interact – required testing
19 between-person differences at Level 2.

20 To examine achievement stress vulnerability as a function of self-oriented perfectionism
21 and socially prescribed perfectionism independently, we tested cross-level interactions between
22 time at Level 1 and the perfectionism dimensions at Level 2 (Model 3). Significant interaction
23 effects would indicate that within-person differences in the linear time slopes of pride, guilt, and

1 shame were conditional upon levels of self-oriented perfectionism or socially prescribed
2 perfectionism (i.e., two-way conditional mean linear time slopes). Finally, to examine
3 achievement stress vulnerability as a function of combined self-oriented perfectionism and
4 socially prescribed perfectionism, we entered the time x self-oriented perfectionism x socially
5 prescribed perfectionism interaction term alongside all other fixed effects in our models of pride,
6 shame, and guilt (Model 4). The way we computed this three-way interaction term meant that a
7 significant effect would be interpreted as within-person differences in the linear time slopes of
8 pride, guilt, and shame due to levels of self-oriented perfectionism being conditional on levels of
9 socially prescribed perfectionism (i.e., three-way conditional mean linear time slopes).
10 Conditional means of the linear time slopes for cross-level interactions were calculated and
11 plotted using procedures outlined by Preacher, Curran, and Bauer (2006). In all analyses, time
12 was centered at baseline (i.e., the initial time point) and perfectionism scores were centered at the
13 grand mean.

14 **Results**

15 **Descriptive results**

16 Descriptive statistics and mean-level inter-correlations for the study variables are shown
17 in Table 1. All scales exhibited acceptable levels of internal consistency (Cronbach $\alpha > .70$;
18 Tabachnick & Fidell, 2007). Furthermore, the correlations were informative. Self-oriented
19 perfectionism positively correlated with pride at baseline, but this correlation was negative after
20 the first trial and increased in magnitude with each subsequent failure. The opposite pattern was
21 observed for self-oriented perfectionism's relationship with shame and guilt. For socially
22 prescribed perfectionism, the strength of its negative correlation with pride increased across trials
23 as did the strength of its positive correlation with shame and guilt. Together, these trends of

1 increasing correlation magnitude across trials provide initial support for our achievement
2 vulnerability hypothesis.

3 Intra-class correlations were calculated based on intercept-only models. This was to
4 determine whether the Level 1 outcomes showed substantial within-person trial variation (Model
5 1). The magnitude of the intra-class correlation indicates the proportion of variance explained in
6 the repeated measure at the between-persons level: pride = 0.25; shame = 0.42; guilt = 0.47.

7 Over half of the variance in each outcome was attributable to within-person differences, which is
8 indicative of significant trial-to-trial variation (Snijders & Bosker, 2012).

9 **Achievement stress reactivity**

10 Results for the multilevel models predicting pride, shame, and guilt are presented in
11 Table 2. As the mean-level trajectories for these variables indicated a curvature (see Figure 1),
12 we entered both the quadratic and linear time variables as fixed effects to ascertain achievement
13 stress (Model 2). Findings show our experimental induction was successful. Across the three
14 trails, participants' pride significantly decreased whereas their guilt and shame significantly
15 increased from baseline. Justifying the inclusion of the quadratic term as a fixed effect, we also
16 found that there was a significant deceleration in these growth trajectories. Although there was
17 significant between-person variance in the trajectories of the linear slopes, no differences
18 emerged across participants for trajectories of the quadratic slopes. As such, only intercepts and
19 linear slopes were permitted to vary randomly in tests of independent and combined
20 perfectionistic vulnerability to achievement stress.

21 **Independent perfectionistic vulnerability to achievement stress**

22 A significant time x perfectionism interaction would provide evidence of greater
23 achievement stress vulnerability (i.e., steeper trajectory slopes) for higher self-oriented

1 perfectionism or higher socially prescribed perfectionism (i.e., independent perfectionistic
2 vulnerability to achievement stress). One or both two-way interactions were significant in each
3 of our multilevel models (Model 3). For pride, time interacted with self-oriented perfectionism
4 but not socially prescribed perfectionism. The negative sign of this interaction is consistent with
5 the interpretation that higher self-oriented perfectionism is associated with steeper decline
6 trajectory slopes in pride following competitive failure. For shame, on the other hand, time
7 interacted with socially prescribed perfectionism but not self-oriented perfectionism. The
8 positive sign of this interaction is consistent with the interpretation that higher socially
9 prescribed perfectionism is associated with steeper incline trajectory slopes in shame following
10 competitive failure. Finally, for guilt, time interacted with both self-oriented perfectionism and
11 socially prescribed perfectionism. The positive signs of these interactions are consistent with the
12 interpretation that higher self-oriented perfectionism and higher socially prescribed
13 perfectionism are independently associated with steeper incline trajectory slopes in guilt
14 following competitive failure.

15 **Combined perfectionistic vulnerability to achievement stress**

16 A significant time x self-oriented perfectionism x socially prescribed perfectionism
17 interaction would provide evidence of greater achievement stress vulnerability (i.e., steeper
18 trajectory slopes) for combined levels of high self-oriented perfectionism and high socially
19 prescribed perfectionism (i.e., more pronounced distress following failure). This three-way
20 interaction was significant in our multilevel models of shame and guilt, but not pride (Model 4).
21 The positive sign of these interactions is consistent with the interpretation that high self-oriented
22 perfectionism and high socially prescribed perfectionism is associated with steeper incline
23 trajectory slopes in shame and guilt following competitive failure. To probe these interactions,

1 Table 3 shows the conditional mean of the trajectory slopes for shame and guilt across various
2 combinations of high (i.e., 1 SD above mean) and low (i.e., 1 SD below mean) self-oriented
3 perfectionism and socially prescribed perfectionism.

4 For shame, although significant across the range of combinations, the conditional mean
5 of the trajectory slopes was greatest at combined values of high self-oriented perfectionism and
6 high socially prescribed perfectionism and weakest at combined values of low self-oriented
7 perfectionism and low socially prescribed perfectionism. To illustrate this interaction, we plotted
8 the conditional mean of the trajectory slopes and 95% confidence bands for shame across the
9 range of self-oriented perfectionism values at high and low socially prescribed perfectionism
10 (Figure 2). At low socially prescribed perfectionism, the conditional mean of the trajectory
11 slopes for shame was significant across self-oriented perfectionism (i.e., confidence bands
12 excluded zero). At high socially prescribed perfectionism, self-oriented perfectionism had no
13 influence on the trajectory slopes for shame up to -1.23 on the grand-mean centered self-oriented
14 perfectionism scale. After this point, there was a significant positive trajectory slope for shame,
15 which strengthened as self-oriented perfectionism increased.

16 Unlike shame, the conditional mean of the trajectory slopes for guilt was significant at
17 combined values of high self-oriented perfectionism and high socially prescribed perfectionism,
18 but not significant for any other combination. To illustrate this interaction, we plotted the
19 conditional mean of the trajectory slopes and 95% confidence bands for guilt across the range of
20 self-oriented perfectionism values at high and low socially prescribed perfectionism (Figure 3).
21 At low socially prescribed perfectionism, the conditional mean of the trajectory slopes for guilt
22 was non-significant across self-oriented perfectionism (i.e., confidence bands included zero).
23 However, at high socially prescribed perfectionism, self-oriented perfectionism similarly had no

1 influence on the trajectory slopes for guilt, but only up to -0.09 on the grand-mean centered self-
2 oriented perfectionism scale. After this point, there was a significant positive trajectory slope for
3 guilt, which strengthened as self-oriented perfectionism increased.

4 **Discussion**

5 The aim of the current study was to test an achievement-specific vulnerability hypothesis
6 of perfectionism. In line with this hypothesis, it was anticipated that the negative response to
7 competitive failure (declines in pride and increases in guilt and shame) would correlate with high
8 self-oriented perfectionism and high socially-prescribed perfectionism separately. In addition,
9 the negative response would be greatest at high levels of both self-oriented and socially
10 prescribed perfectionism combined. The achievement-specific vulnerability hypothesis was
11 supported. Self-oriented perfectionism predicted declines in pride and increases in guilt
12 following competitive failure. Likewise, socially prescribed perfectionism predicted increases in
13 shame and guilt following competitive failure. Tests of combined effects showed that high levels
14 of both self-oriented and socially prescribed perfectionism predicted the greatest increase in
15 shame and was the only combination of perfectionism dimensions to predict increases in guilt.

16 **Self-oriented perfectionism**

17 Following competitive failure, self-oriented perfectionism predicted declines in pride and
18 increases in guilt. This finding is consistent with an achievement-specific vulnerability
19 hypothesis. In this case, failure appears to be interpreted as a signal of personal deficiency and a
20 trigger of remorse for inadequate performance (Tangney & Tracy, 2011). This is a particularly
21 important finding in regard to self-oriented perfectionism as it is a dimension of perfectionism
22 that often displays a pattern of correlations that are ambiguous or in some cases adaptive. When
23 reflecting on findings indicative of self-oriented perfectionism being adaptive, Hewitt and Flett

1 (see Hewitt et al., 2017) have argued that this is misleading insomuch as such findings belie
2 latent vulnerability inherent to self-oriented perfectionism. The current study supports their
3 arguments. In addition, the findings also build on the one other previous study to find evidence
4 of vulnerability for self-oriented perfectionism among college athletes (Hill et al., 2011). It does
5 so by highlighting how vulnerability following achievement stress extends to interpersonal
6 competition (not just to failure to attain personal goals) and for an array of self-conscious
7 emotions (not just perceived threat).

8 We also found that, following competitive failure, self-oriented perfectionism did not
9 predict changes in shame. The absence of shame after failure – but the presence of lower pride
10 and elevated guilt – suggests that self-oriented perfectionism may contribute to the interpretation
11 of failure as an indication of deficiencies in their actions rather than deficiencies in their self.
12 Such a finding is consistent with work showing that self-oriented perfectionism is positively
13 correlated with self-criticism focused on self-correction rather than self-punishment (Thompson
14 & Zuroff, 2004). One implication of this is that, in the absence of increasing shame, increasing
15 guilt may prompt restorative action devoid of self-castigation (e.g., downward goal calibration;
16 Tangney & Tracy, 2011). In the short-term this would be adaptive and might partly explain the
17 motivated behavior associated with self-oriented perfectionism. However, if restorative action is
18 not successful or possible, and rigid standards remain unadjusted, as is more likely, guilt may
19 prompt avoidance behaviors and distress in the long-term (Scott & Cervone, 2002). This is
20 evident in previous research via an association between self-oriented perfectionism and
21 avoidance goals and self-handicapping behaviors (e.g., Doebler, Schnick, Beck, & Astor-Stetson,
22 2000). Overall, results for self-oriented perfectionism underscore vulnerability to distress

1 following competitive failure and highlight the importance of the context when considering its
2 ostensibly adaptive effects.

3 **Socially prescribed perfectionism**

4 Turning to socially prescribed perfectionism, our analyses revealed that this dimension
5 predicted increased guilt and shame following competitive failure. Again, this is consistent with
6 an achievement-specific vulnerability hypothesis. Of especial note here, the presence of shame
7 with guilt appears to distinguish socially prescribed perfectionism from self-oriented
8 perfectionism. Together, experiences of guilt and shame signal perceptions that one's
9 performances are defective (guilt) and that such defectiveness has revealed a flawed, inadequate,
10 and worthless self to others (shame). Humiliation with the exposure of inner weakness is the
11 reason shame is considered to be at the center of the "socially prescribed perfectionist's
12 emotional world" (Hewitt et al., 2017, p. 110) and is why socially prescribed perfectionism is
13 especially damaging for psychological well-being (Dearing & Tangney, 2011). The theoretical
14 implication is that socially prescribed perfectionism is not only a vulnerability to distress
15 following interpersonal stress, but also specifically following achievement stress because
16 comparative failure speaks directly to public exposure of personal weakness and inferiority.

17 No effects of socially prescribed perfectionism on pride following failure were observed.
18 As such, socially prescribed perfectionism may not prompt achievement-related emotions that
19 affirm personal characteristics (i.e., pride) after failure. Instead, as we have seen, concerns with
20 how a failed performance and self appears to others (i.e., guilt and shame) are more immediate
21 and relevant concerns (e.g., Tangney, 2002). Pride, then, is perhaps not central to the emotional
22 experiences associated with socially prescribed perfectionism. However, it is noteworthy that on
23 at least one occasion other research has found socially prescribed perfectionism to be associated

1 with decreased pride following personal failure on a cognitive task (Stoeber et al., 2008). This
2 relationship may, therefore, need further consideration. It is possible, for example, that the
3 relationship is only evident under some circumstances such as in the absence of other
4 competitors and when success and failure are adjudged to be solely due to one's own efforts or
5 abilities. This issue aside, we again consider the results regarding socially prescribed
6 perfectionism to substantiate the need to include contextual factors when considering its likely
7 effects.

8 **Combined perfectionistic vulnerability to achievement stress**

9 Independent effects of self-oriented and socially prescribed perfectionism were qualified
10 by their combined effects. Here, mixed perfectionism (i.e., high self-oriented and high socially
11 prescribed perfectionism) yielded the greatest increases in shame and was the only combination
12 of perfectionism to yield increases in guilt following competitive failure. This finding provides
13 further support for the achievement-specific vulnerability hypothesis. It appears that deficient
14 performance in relation to others simultaneously activates achievement self-worth contingencies
15 of self-oriented perfectionism and the interpersonal self-worth contingencies of socially
16 prescribed perfectionism. Accordingly, we contend that athletes with high levels of both
17 perfectionism dimensions are likely to be most vulnerable to distress following competitive
18 failure.

19 This particular finding has especially important implications for current understanding of
20 perfectionism. Based on current approaches to examining combinations of perfectionism, the
21 most problematic combination is thought to be low self-oriented perfectionism and high socially
22 prescribed perfectionism (Gaudreau, 2016). This is because the presence of aspects of
23 perfectionistic strivings (viz. self-oriented perfectionism) is thought to buffer the negative impact

1 of socially prescribed perfectionism. Yet our findings suggest that this is not the case in the
2 context of competitive failure. With the theoretical underpinnings of the achievement specific
3 vulnerability hypothesis in mind, and the findings here, it seems more likely that the presence of
4 high self-oriented perfectionism would confer additional vulnerability, not protection, from
5 socially prescribed perfectionism. Additional tests of the specific-vulnerability hypothesis are
6 required to ascertain if this is the case for other types of emotions, behavioral outcomes (e.g.,
7 performance), and in real-world contexts (actual rather than contrived failure).

8 **Applied implications**

9 As a setting in which competitive failure is routine, evidence of achievement-specific
10 vulnerability for perfectionism is important for practitioners in sport. Our results suggest that
11 athletes with high levels of self-oriented and socially prescribed perfectionism are especially
12 vulnerable to negative emotional reactions following failure. These athletes are likely to require
13 additional support managing such emotional difficulties. Better still, perfectionism can be
14 targeted directly by practitioners. In a clinical context, there is substantial evidence that
15 perfectionism can be reduced (see Lloyd, Schmidt, Khondoker, & Tchanturia, 2014). However,
16 there is very little research that has examined how best to work with perfectionism in sport. Early
17 indications are promising though and suggest that the techniques based on the principles of those
18 used in a clinical context (e.g., cognitive-behavior therapy) may also be effective prior to clinical
19 issues for athletes (e.g., Mosewich, Crocker, Kowalski, & DeLongis, 2013). Hewitt et al. (2017)
20 and Egan, Wade, Shafran, and Antony (2014) provide detailed accounts of how to manage and
21 treat perfectionism. These books are excellent resources for practitioners in the sports context.

22 **Limitations and other future research**

1 Several limitations of this study need to be addressed in subsequent work. We used
2 subjective, questionnaire-based, measures of self-conscious affect instead of objective markers of
3 stress. Although there is ample evidence that subjective measures are sensitive to the detection of
4 stress (see Simons, Angell, Monroe, & Thase, 1993), researchers should seek to replicate our
5 findings with more objective biomarkers of stress (e.g., salivary cortisol). Second, the data were
6 collected from college athletes on a contrived cycling task. The generalizability of the findings to
7 other groups and task needs to be examined. More work is also needed to understand whether the
8 pronounced distress to competitive failure reported here is evident in other domains such as
9 school and work.

10 Though a strength of our design, the manipulation of failure is not without drawbacks.
11 We told athletes that they finished last of all competitors irrespective of actual performance. The
12 reality is that in sporting competition outcomes are far more complex (e.g., finishing second,
13 third or performing one's best). The various ways in which perfectionistic athletes respond to
14 minor versus major setbacks and in real-world contexts, then, are important avenues for future
15 research. Finally, in addition to emotional responses, it would be interesting to investigate the
16 behavioral responses of perfectionistic athletes to failure. Theory and research indicate that
17 perfectionists compensate for setbacks by recalibrating their goals upwards (Hewitt et al., 2017),
18 which raises the possibility that perfectionism may motivate higher performance after failure – at
19 least in the short term. Such a possibility should be tested in subsequent work on this topic.

20 **Conclusion**

21 In this study, we have provided initial support for an achievement-specific vulnerability
22 hypothesis of perfectionism. Over repeated competitive failures on cycle sprint task, self-
23 oriented and socially prescribed perfectionism were found to predict pronounced negative

1 emotional responses. In addition, athletes with a combination of high self-oriented and high
2 socially prescribed perfectionism also reported the most pronounced negative emotional
3 response.

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Table 1.

Descriptive statistics, scale reliabilities, and zero-order correlations for the study variables.

	<i>M</i>	<i>SD</i>	<i>α</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. SOP	4.82	.87	.87														
2. SPP	3.53	.68	.77	.48**													
3. Baseline pride	3.71	.78	.83	.30*	-.07												
4. Baseline shame	1.27	.56	.90	-.02	.26*	-.44**											
5. Baseline guilt	1.44	.72	.86	-.07	.11	-.28*	.72**										
6. Post-trial 1 pride	2.63	.98	.77	-.03	-.09	.42**	-.05	-.03									
7. Post-trial 1 shame	1.92	1.00	.88	.26*	.34**	-.24	.47**	.41**	-.49**								
8. Post-trial 1 guilt	1.84	.96	.95	.25	.41**	-.22	.46**	.61**	-.40**	.84**							
9. Post-trial 2 pride	2.51	1.23	.94	-.11	-.19	.51**	-.12	-.15	.68**	-.55**	-.52**						
10. Post-trial 2 shame	1.89	1.08	.89	.31*	.49**	-.23	.33*	.39**	-.42**	.78**	.79**	-.63**					
11. Post-trial 2 guilt	1.82	1.06	.90	.30*	.49**	-.17	.31*	.48**	.38**	.74**	.83**	-.61**	.95**				
12. Post-trial 3 pride	2.46	1.23	.81	-.24	-.28*	.45**	-.15	-.09	.61**	-.50**	-.43**	.89**	-.54**	-.51**			
13. Post-trial 3 shame	1.96	1.78	.93	-.28*	.43**	-.20	.17	.23	-.50**	.67**	.63**	-.63**	.81**	.81**	-.58**		
14. Post-trial 3 guilt	1.96	1.27	.90	.26*	.43**	-.21	.19	.34**	-.48**	.65**	.69**	-.62**	.83**	.88**	.53**	.95**	

Notes. SOP = self-oriented perfectionism; SPP = socially prescribed perfectionism; M = Mean; SD = Standard deviation.

** $p < .01$, * $p < .05$

Table 2.
Fixed effects, variance components, and fit indices for all multilevel models.

Parameter	Pride				Shame				Guilt			
	M 1	M 2	M 3	M 4	M 1	M 2	M 3	M 4	M 1	M 2	M 3	M 4
<i>Fixed effects</i>												
Intercept (μ_a)	2.83**	3.67**	3.67**	3.68**	1.76**	1.31**	1.31**	1.31**	1.77**	1.47**	1.47**	1.41**
Slope ($\mu_{\beta 1}$)		-1.17**	-1.17**	-1.14**		0.64**	0.64**	0.58**		0.35**	0.34**	0.28*
Curvature ($\mu_{\beta 2}$)		0.26**	0.26**	0.26**		-0.14**	-0.14**	-0.14**		-0.07*	-0.07	-0.07
<i>Intercept-as-outcome</i>												
SOP (γ_1)			0.33*	0.32**			-0.04	-0.04			-0.07	-0.03
SPP (γ_2)			-0.25*	-0.24*			0.32**	0.32*			0.28*	0.19
<i>Slope-as-outcome</i>												
SOP*SPP (γ_3)				-0.05				-0.003				0.24
Slope*SOP (γ_4)			-0.18*	-0.20**			0.07	0.11*			0.08*	0.12*
Slope*SPP (γ_5)			-0.03	0.02			0.15*	0.07			0.18**	0.10
Slope*SOP*SPP (γ_6)				-0.12				0.22*				0.24**
<i>Variance components</i>												
Residual variance (σ^2)	0.75**	0.30**	0.29**	0.29**	0.53**	0.26**	0.26**	0.26**	0.43**	0.17**	0.18**	0.18**
Intercept variance (τ_{00})	0.52**	0.39**	0.38**	0.38**	0.51**	0.27**	0.21**	0.21**	0.64**	0.43**	0.39**	0.36**
Slope variance (τ_{11})		0.08**	0.06**	0.06**		0.11**	0.09**	0.08**		0.13**	0.10*	0.08**
Curvature variance (τ_{22})		0.000				0.000				0.000		
<i>Fit indices</i>												
-2LL	692.54	559.66	544.29	542.29	622.70	535.73	518.14	512.71	594.53	503.31	495.60	478.49
AIC	698.54	573.66	564.29	566.29	628.70	549.73	540.14	538.71	600.53	517.31	513.60	502.49
<i>Effect size</i>												
Pseudo R^2			.25	.02			.18	.11			.23	.20

Notes. All estimates are unstandardized. SOP = self-oriented perfectionism; SPP = socially prescribed perfectionism; M = Model; -2LL = -2 Restricted Log Likelihood; AIC = Akaike’s Information Criterion; BIC = Schwartz’s Bayesian Criterion. The quadratic term (curvature) did not significantly vary across individuals and therefore was not a random component in Models 3 and 4. The statistical significance of fixed effects in each model were based on the t-ratio with standard errors derived from 5,000 bootstrap iterations. ** $p \leq .01$, * $p \leq .05$

Table 3.

Conditional mean of the trajectory slopes for the regression of shame and guilt on time at values of self-oriented perfectionism and socially-prescribed perfectionism.

Values of perfectionism	Shame				Guilt			
	$\mu_{\beta 1} + \gamma_4\chi_1 + \gamma_5\chi_2 + \gamma_6\chi_1\chi_2$	SE	95% CI	z	$\mu_{\beta 1} + \gamma_4\chi_1 + \gamma_5\chi_2 + \gamma_6\chi_1\chi_2$	SE	95% CI	z
High SOP and high SPP	0.84**	.15	0.54-1.14	14.33	0.58**	.15	0.28-0.88	3.96
High SOP and low SPP	0.58**	.16	0.26-0.90	7.47	0.28	.16	-0.04-0.60	1.69
Low SOP and high SPP	0.59**	.17	0.25-0.93	6.73	0.30	.17	-0.04-0.64	1.80
Low SOP and low SPP	0.55**	.14	0.27-0.83	16.70	0.24	.14	-0.04-0.52	1.76

Notes. SOP = self-oriented perfectionism; SPP = socially prescribed perfectionism. Conditional mean trajectory slope values are calculated by $\mu_{\beta 1} + \gamma_4\chi_1 + \gamma_5\chi_2 + \gamma_6\chi_1\chi_2$, where $\mu_{\beta 1}$ is the time (trajectory) slope, γ_4 is the two-way interaction effect for time on self-oriented perfectionism, γ_5 is the two-way interaction effect for time on socially prescribed perfectionism, and γ_6 is the three-way interaction of time, self-oriented perfectionism, and socially prescribed perfectionism. χ_1 and χ_2 are the conditional values of self-oriented perfectionism and socially prescribed perfectionism. We selected conditional values that are one standard deviation above the mean of self-oriented perfectionism and socially prescribed perfectionism (high) and one standard deviation below the mean of self-oriented perfectionism and socially prescribed perfectionism (low).

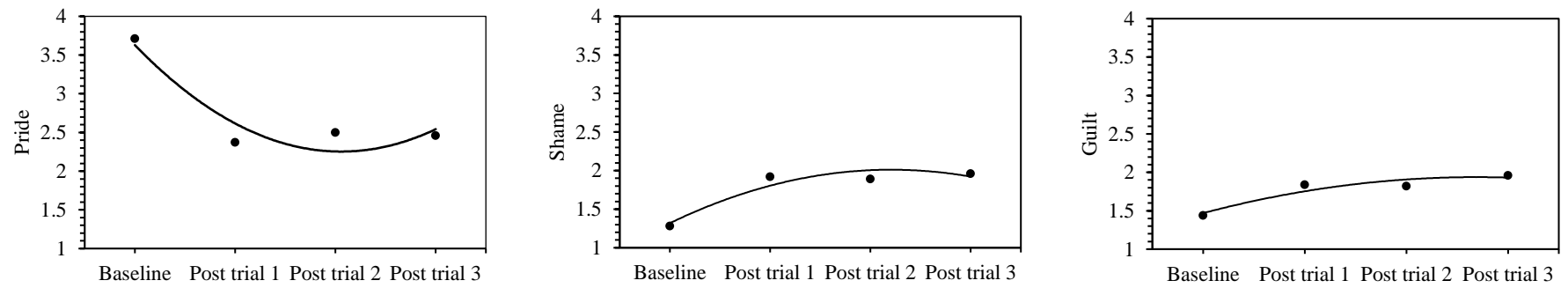


Figure 1. Mean-level growth trajectories of pride, guilt, and shame following repeated failure ($N = 60$).

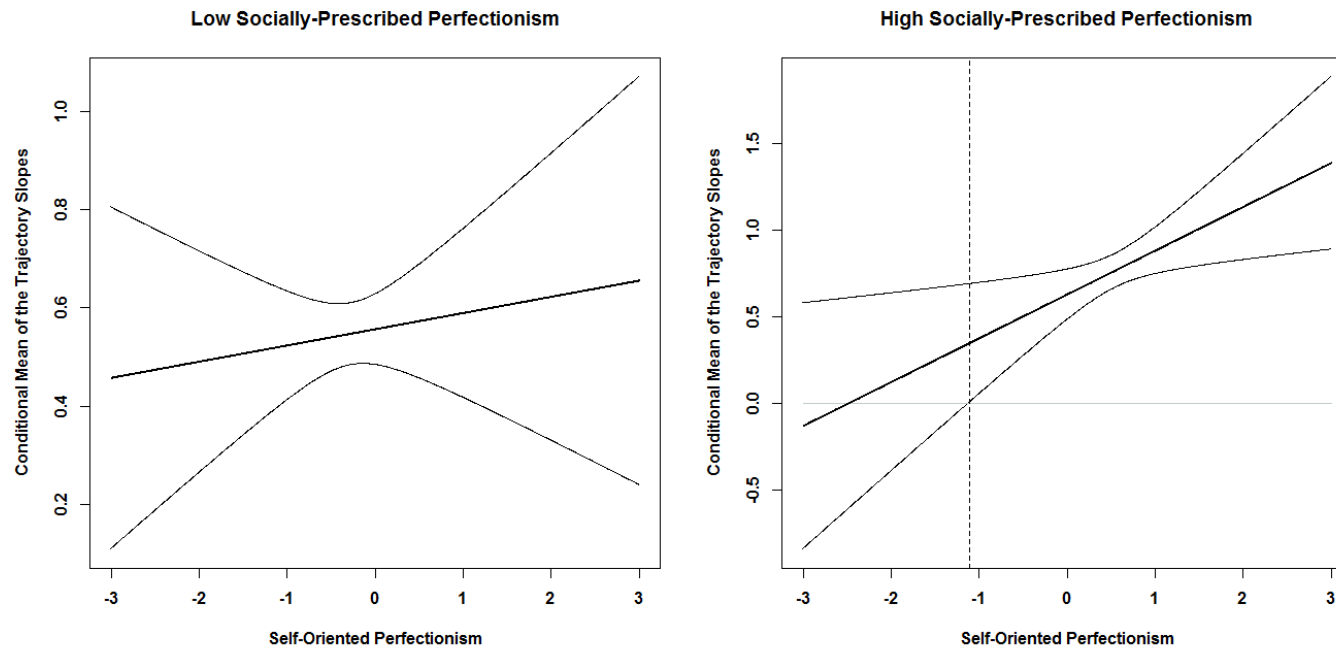


Figure 2. The conditional mean of the trajectory slopes for shame across the range of self-oriented perfectionism by low (1 *SD* below mean) and high (1 *SD* above mean) socially prescribed perfectionism. Lines either side of the conditional mean represent non-simultaneous 95% confidence bands. The vertical dashed line demarcates the point at which the confidence bands cross zero (i.e., the region of significance). No vertical dashed line is present in the low socially prescribed perfectionism plot as the conditional mean of the trajectory slopes was significant across the range of self-oriented perfectionism.

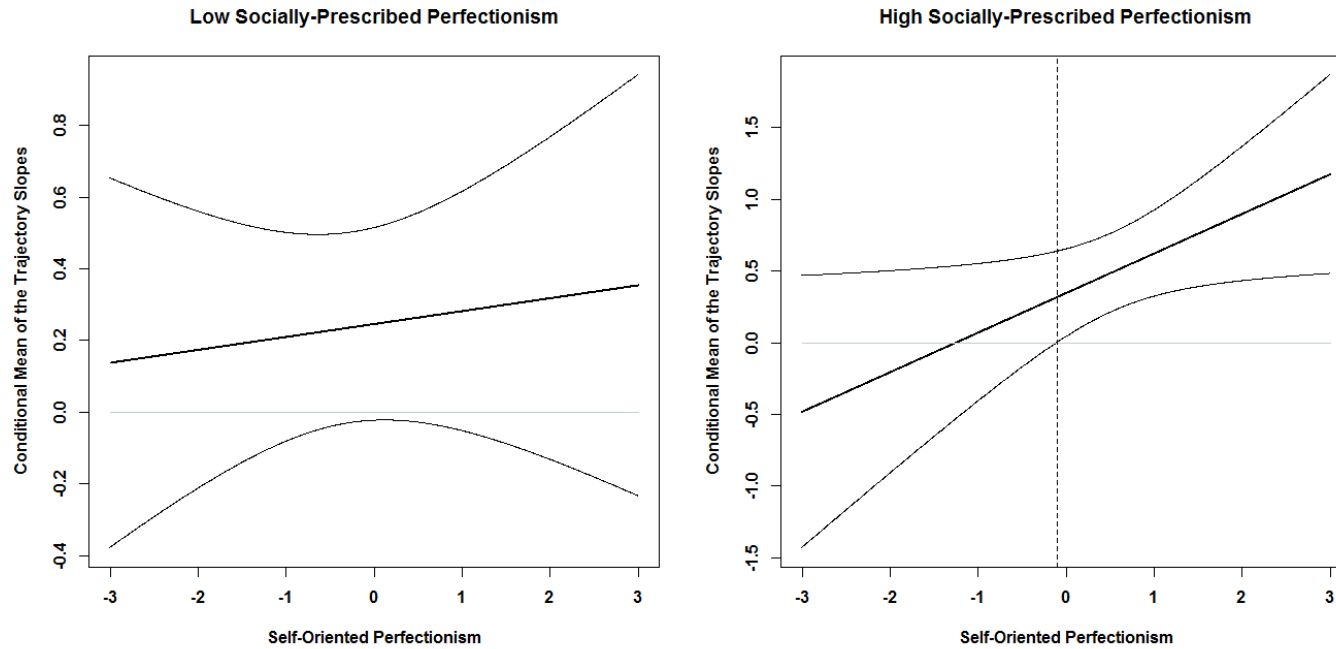


Figure 3. The conditional mean of the trajectory slopes for guilt across the range of self-oriented perfectionism by low (1 SD below mean) and high (1 SD above mean) socially prescribed perfectionism. Lines either side of the conditional mean represent non-simultaneous 95% confidence bands. The vertical dashed line demarcates the point at which the confidence bands cross zero (i.e., the region of significance). No vertical dashed line is present in the low socially prescribed perfectionism plot as the conditional mean of the trajectory slopes was non-significant across the range of self-oriented perfectionism.