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8 Perfectionistic strivings and the perils of partialling

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1 **Abstract**

2 Two recent reviews of research examining the effects of perfectionism in athletes concluded  
3 that perfectionistic strivings are adaptive when perfectionistic concerns are controlled or  
4 partialled. This study aims to provide a caveat to the conclusions of these reviews by  
5 highlighting the perils of partialling and illustrating how it is possible for the conceptual  
6 meaning of perfectionistic strivings to change following partialling. In order to do so, 283  
7 athletes (age  $M = 20.65$ ,  $s = 3.68$ , range 18-43) completed measures of two commonly used  
8 sub-dimensions of perfectionistic strivings and perfectionistic concerns (personal standards  
9 and concern over mistakes) along with a number of constructs from their nomological  
10 network. A comparison of the observed relationships before (raw scores) and after  
11 (residualised scores) partialling indicated a reasonably high degree of overall similarity.  
12 However, closer examination revealed 14 of 18 individual relationships changed in  
13 magnitude, direction or statistical significance and 4 of the changes were indicative of  
14 suppression (i.e., an increase in the relationship with the criterion variable). The results  
15 exemplify the impact of partialling on perfectionistic strivings and question the conceptual  
16 meaning of residualised perfectionistic strivings and its relevance when understanding the  
17 effects of perfectionism.

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19 *Keywords:* Motivation; Achievement; Sport

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## 1 Perfectionistic strivings and the perils of partialling

2 The effects of perfectionism for athletes are currently being debated. While there is  
3 little disagreement that perfectionistic concerns are likely to be problematic, the proposed  
4 consequences of perfectionistic strivings are more controversial. Some researchers have  
5 argued that perfectionistic strivings lead to motivational and psychological deficits (e.g.,  
6 Hewitt & Flett, 2005). In contrast, others have argued they may contribute to positive  
7 outcomes (e.g., Stoeber & Otto, 2006). Two recent reviews of research examining this issue  
8 in sport have demonstrated that perfectionistic strivings are adaptive when perfectionistic  
9 concerns are controlled or partialled (Gotwals, Stoeber, Dunn, & Stoll, 2012; Stoeber, 2011).  
10 Here, a caveat to the conclusions of these reviews is offered in the form of Lynam, Hoyle and  
11 Newman's (2006) illustration of how, under some circumstances, the results of partialling can  
12 be misleading. The current study borrows heavily from their exposition to demonstrate the  
13 impact of partialling on a common sub-dimension of perfectionistic strivings (viz. personal  
14 standards). In doing so, the conclusion that perfectionistic strivings are likely to be adaptive  
15 following partialling is not being questioned. Rather, what is being questioned is whether  
16 what remains following partialling still captures what was originally intended (viz.  
17 *perfectionistic* strivings).

## 18 *Multidimensional perfectionism*

19 Perfectionism is a multidimensional personality trait that includes a constellation of  
20 self and other-related beliefs (Campbell & DiPaula, 2002). There are currently a number of  
21 approaches to the conceptualisation and measurement of perfectionism (see Enns & Cox,  
22 2002, for a review). However, research suggests that current models can be considered part of  
23 a higher-order model (e.g., Bieling, Israeli, & Antony, 2004; Cox, Enns, & Clara, 2002;  
24 Frost, Heimberg, Holt, Mattia, & Neubauer, 1993). From this perspective, trait perfectionism  
25 includes a range of sub-dimensions indicative of two broader dimensions. The first broad

1 dimension is perfectionistic strivings and has been described as “aspects of perfectionism  
2 associated with self-oriented striving for perfection and the setting of very high personal  
3 performance standards” (Gotwals et al., 2012, p.264). The second broad dimension is  
4 perfectionistic concerns and has been described as “aspects associated with concerns over  
5 making mistakes, fear of negative social evaluation, feelings of discrepancy between one’s  
6 expectations and performance, and negative reactions to imperfection” (Gotwals et al., 2012,  
7 p.264). These dimensions are typically measured using single or multiple sub-dimensions  
8 from available scales (e.g., Frost, Marten, Lahart, & Rosenblate, 1990; Hewitt & Flett, 1991;  
9 Slaney, Rice, Mobley, Trippi, & Ashby, 2001) and provide a common framework through  
10 which often disparate dimensions of perfectionism can be understood to be part of a unified  
11 model of perfectionism.

12         In tandem the two dimensions are thought to energise a pattern of “overstriving”  
13 which has pervasive and debilitating effects (e.g., Flett & Hewitt, 2006; Hall, 2006; Hall,  
14 Hill, & Appleton, 2012). In support of this possibility, research has found that a combination  
15 of higher levels of these two dimensions typically contribute to poorer psychological  
16 adjustment in athletes and may be a source of motivational vulnerability (e.g., Gaudreau &  
17 Fillon, 2011; Gotwals, 2011; Vallance, Dunn, & Causgrove, 2006). However, when  
18 considered independently a picture emerges from research whereby perfectionistic concerns  
19 are generally the source of various maladaptive outcomes but perfectionistic strivings are  
20 adaptive. On the basis of this research, perfectionistic strivings has been suggested to be part  
21 of a “healthy pursuit of excellence” for athletes (Stoeber, 2011). However, because the  
22 empirical evidence on which this assertion is based relies heavily on research that has  
23 controlled for perfectionistic concerns, the effects of partialling and the conceptual meaning  
24 of perfectionistic strivings once this has taken place require scrutiny. It is argued here that

1 partialling may change the conceptual meaning of perfectionistic striving so that it provides  
2 limited insight into the effects of perfectionism.

### 3 *The perils of partialling*

4 As discussed by Lynam et al. (2006), partialling is a useful and common technique in  
5 psychology. At a general level, this entails removing shared variance between variables so  
6 that independent effects can be isolated. In the context of multiple regression, partialling  
7 takes place amongst the predictor variables and results in the calculation of semipartial (or  
8 part-) correlation coefficients. This allows researchers to answer a number of interesting  
9 research questions that pertain to the combined, unique, and incremental predictive ability of  
10 a set of variables (e.g., determining how much variance dimensions of perfectionism explain  
11 in the criterion variable or whether one dimension predicts the criterion variable after  
12 accounting for the contribution of others). In this analysis the criterion variable remains  
13 unaffected but the predictor variables take the form of new residualized variables. Drawing  
14 on seminal work in the areas of sociology and psychology (e.g., Gordon, 1968; Meehl, 1975),  
15 Lynam et al. (2006) highlighted that one of the major perils of partialling is the interpretation  
16 of residualized variables. Specifically, removing the variance of one predictor variable from  
17 another can change the conceptual meaning of the original variable. Interpretational  
18 difficulties are avoided if the research question focuses on the combined, unique, or  
19 incremental predictive ability of variables within the model. However, when researchers wish  
20 to draw conclusions about the original variable and its nomological network (which is often  
21 the case), interpretation is potentially more problematic.

22 This issue has been discussed elsewhere in relation to other constructs (e.g.,  
23 proactive-reactive aggression and guilt-shame; Elison, 2005; Lynam et al., 2006) and has  
24 recently been raised by researchers in the area of perfectionism (e.g., Molnar, Sadava, Flett,  
25 & Colautti, 2012; Powers, Koestner, Zuroff, Milyavskaya & Gorin, 2011). The main

1 implications for researchers wishing to examine the effects of perfectionistic strivings is  
2 whether one can be confident that residualised perfectionistic strivings provides a reasonable  
3 basis for inferences about original perfectionistic strivings. The degree of confidence with  
4 which one can make inferences about the original variable is influenced by (1) the similarity  
5 between the original variable and residualized variable, (2) the reliability of the variable, and  
6 (3) the theoretical tightness of the variable (Lynam et al., 2006). Specifically, as the  
7 magnitude of the relationship between the variables to be partialled increases, the similarity  
8 between the initial variable and the residualized variable decreases. In addition, the less  
9 reliable the measurement associated with the original variable, the greater proportion of error  
10 variance that remains in the residualized variable relative to variance attributable to the  
11 intended construct and the more dissimilar the two variables become. Finally, when the  
12 variables to be partialled are theoretically loose (i.e., poorly-defined, broad, and vague), as  
13 opposed to theoretically tight (i.e., well-defined, narrow, and clear), interpretation is more  
14 difficult as it is less obvious what the new residualized variable represents.

15         Within Lynam et al's framework, an examination of perfectionism research in sport  
16 suggests that researchers should be wary of the changes that may arise following partialling  
17 and the conceptual meaning of residualised perfectionistic strivings. The two core dimensions  
18 of perfectionism are typically moderate-to-highly positively correlated. Gotwals et al. (2012),  
19 for example, reported an average correlation between sub-dimensions of perfectionistic  
20 strivings and perfectionistic concerns across 31 studies of  $r = .43$  ( $SD = .18$ ). It is also not  
21 uncommon for correlations between dimensions to be .60 and above (e.g., Hall et al., 1998;  
22 Lemyre, Hall, & Roberts, 2008; Stoeber, Uphill, & Hotham, 2009). As an example, when this  
23 is the case the correlation between the original and residualized scores is .80 and below,  
24 indicating at least some change in what is being measured. In addition, it is also true that  
25 whatever is being measured by the residualised scores is being done so less reliably. The

1 effective reliability of the residualised scores when the reliability of the raw scores is .70, and  
2 the correlation between dimensions of perfectionism is .60, is a worryingly low .53 (see  
3 Lynam et al., 2006). However, the most substantive issue is whether the intended construct  
4 remains conceptually intact following partialling. To address this issue one needs to consider  
5 the defining features of perfectionistic strivings.

6       Perfectionistic strivings is a term used to describe a number of sub-dimensions that  
7 capture a commitment to high personal standards (usually personal standards and self-  
8 oriented perfectionism). However, rather than including only striving elements, these sub-  
9 dimensions also typically include self-evaluative components that are, at least to some  
10 degree, shared with perfectionistic concerns. There are, for example, elements of contingent  
11 self-worth evident in Frost et al.'s (1990) personal standards construct (see DiBartolo, Frost,  
12 Chang, LaSota, & Grills, 2004). Similarly, Hewitt and Flett (2006) have on a number of  
13 occasions been at great pains to stress that self-oriented perfectionism extends beyond  
14 achievement striving and includes elements of self-criticism and conditional self-acceptance.  
15 The manner in which these features are intertwined with perfectionistic concerns is explained  
16 by Greenspon (2000, 2008) who highlights that the same beliefs that underpin perfectionistic  
17 concerns also give rise to perfectionistic strivings (viz. conditional self-acceptance).  
18 Consequently, when their shared variance is removed, these essential and defining features  
19 may be lost and perfectionistic strivings may become more conceptually distant from what  
20 was originally conceived and intended. What remains may be more akin to conscientious  
21 achievement striving, or some other form of striving, rather than the perfectionistic striving  
22 described by early theorists (e.g., Burns, 1980; Hollander, 1965; Pacht, 1984), and the result  
23 is unnecessary confusion at both conceptual and empirical levels.

24       The interpretational difficulties that can arise as a consequence of partialling are  
25 exemplified by the possibility of suppression. This is evident when the relationship between a



1 predictor variable and an outcome variable becomes larger following partialling (MacKinnon,  
2 Krull, & Lockwood, 2000). This occurs because criterion-irrelevant variance is removed by  
3 the suppressor variable from the predictor variable, enhancing the predictor variable's  
4 relationship with the criterion variable (Tzelgov & Henik, 1991). In terms of interpretation of  
5 residualised scores, this is the most problematic scenario. This is because as the relationship  
6 may not have existed prior to partialling, or at least not as strongly, it cannot be attributed to  
7 the original construct (Lynam et al., 2006). There are a number of examples of suppression in  
8 research examining perfectionism (e.g., Aldea & Rice, 2006; Wu & Wei, 2008; A.P. Hill,  
9 Hall, Appleton, Murray, 2010; R. W. Hill, Huelsman, & Arango, 2010). In these cases,  
10 following partialling, perfectionistic strivings manifests as more adaptive, as evidenced by a  
11 changed relationship with constructs such as unconditional self-acceptance, life satisfaction,  
12 personal growth, need for assurance, and athlete burnout symptoms. From the current  
13 theoretical perspective, these findings indicate that perfectionistic strivings may undergo  
14 substantive conceptual changes following partialling and may no longer capture what was  
15 originally intended.

16         With this in mind, the current study aims to illustrate the effect of partialling on  
17 perfectionistic strivings using data collected with athletes and exemplify the evidence on  
18 which the two recent reviews are based. To do so, the relationship between a sub-dimension  
19 of perfectionistic strivings, personal standards, with constructs that constitute part of the  
20 nomological network of perfectionism will be compared before and after controlling for its  
21 relationship with a sub-dimension of perfectionistic concerns, concerns over mistakes. These  
22 particular sub-dimensions were selected for a number of reasons. Firstly, the sub-dimensions  
23 have consistently been found to be key indicators of the broader dimensions of perfectionistic  
24 strivings and perfectionistic concerns (e.g., Bieling et al., 2004; Cox et al., 2002; Frost et al.,  
25 1993). Secondly, they have been commonly used in sport (e.g., 73 of 201 correlations

1 reported in the latest review article used these measures; Gotwals et al., 2012) and continue to  
 2 be the basis for domain-specific adaptations (e.g., Cumming & Duda, 2012; Gotwals, Dunn,  
 3 Causgrove Dunn, & Gamache, 2011). Thirdly, there have been instances in the literature  
 4 where the correlations between the two subscales have exceeded .60 (e.g., Hall et al., 1998;  
 5 Lemyre et al., 2008; Stoeber et al., 2009). Therefore, although not synonymous with the  
 6 broader dimensions, these subscales provide useful exemplars of perfectionistic strivings and  
 7 perfectionistic concerns in context of the aims of the current study.

8 The nomological network included constructs that describe the regulators of  
 9 perfectionism (motivation regulation, achievement goals, fear of failure, and contingent self-  
 10 worth) and cognitive processes associated with perfectionism (self-esteem instability,  
 11 ruminative self-focused attention, mental perseveration, and self-criticism). These variables  
 12 were selected because collectively they offer a means of differentiating between  
 13 perfectionistic strivings as adaptive, maladaptive, or neutral. These variables are also either  
 14 included in the review by Gotwals et al. (2012) or in other research that has compared sub-  
 15 dimensions of perfectionistic strivings with other forms of striving (e.g., conscientious  
 16 achievement striving; A. P. Hill, Hall, & Appleton, 2010). The results will be interpreted in  
 17 relation to the proposals of Lynam et al. (2006). In particular, the degree of similarity  
 18 between perfectionistic strivings as measured before (raw scores) and after (residualised  
 19 scores) partialling and the presence of suppression are assessed. The number of changes  
 20 where considered to reveal a greater impact of partialling and instances of suppression  
 21 indicative of more substantive changes to the construct being measured.

## 22 Method

### 23 Participants

24 Two-hundred and ninety-one athletes were recruited who regularly participated in  
 25 sport (age  $M = 20.65$ ,  $s = 3.68$ , range 18-43, males = 178, females = 100, non-respondents =

13). The athletes participated in a range of individual and team sports (e.g., football, netball, basketball, cricket, swimming, running, and kayaking) at a range of levels (recreational = 42, club = 139, sub-elite = 90, elite = 14). On average, the sample had competed in their sport for 10.03 years ( $s = 4.83$ ) and reported on a nine-point Likert scale that their participation in sport was considered very important in comparison to other activities ( $M = 7.26$ ,  $s = 1.53$ ; 1 = *not at all important* to 9 = *extremely important*). A multi-section questionnaire that was labelled the “Sport Motivation Questionnaire” was distributed to participants at training sessions and competitions. Participants were informed that questions focused on what people think and feel when participating in sport and that their views about their sporting experiences were being sought.

#### 11 **Instruments**

12 **Dimensions of perfectionism.** The personal standards (PS) and concern over mistakes (CM) subscales from the Multidimensional Perfectionism Scale (Frost et al., 1990) were used in the current study. The personal standards subscale includes 7-items that measure the tendency to set exceedingly high standards and their importance for self-evaluation (e.g., “I set higher goals than most people” and “If I do not set the highest standards for myself, I am likely to end up a second rate person.”). The concern over mistakes subscale includes 9-items that measure negative reactions to mistakes, a tendency to interpret mistakes as failure, and the belief that others will withdraw respect following failure (e.g., “People will probably think less of me if I make a mistake”). Participants responded to the items on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Initial examination of the psychometric properties of these subscales has provided evidence to support their validity and reliability. This includes factor structure (based on exploratory factor analysis) and internal reliability (PS  $\alpha = .83$ , CM  $\alpha = .88$ ; Frost et al., 1990).

1 **Achievement goals.** Achievement goals were assessed using the Achievement Goal  
 2 Questionnaire for Sport (Conroy, Elliot, & Hofer, 2003). This measures four achievement  
 3 goals that differ in terms of conceptualisation of competence (performance versus mastery)  
 4 and valance (approach versus avoidance). Within this framework, mastery-approach goals  
 5 represent striving for intrapersonal competence (e.g., “It is important to me to perform as well  
 6 as I possibly can”). Mastery-avoidance goals represent striving to avoid intrapersonal  
 7 incompetence (e.g., “I am often concerned that I may not perform as well as I can perform”).  
 8 Performance-approach goals represent striving for interpersonal competence (e.g., “It is  
 9 important to me to do well compared to others”). Performance-avoidance goals represent  
 10 striving to avoid interpersonal incompetence (e.g., “My goal is to avoid performing worse  
 11 than everyone else”). Each subscale has 3-items and participants respond on a seven-point  
 12 Likert scale (1 = *not at all like me* to 7 = *completely like me*). Conroy et al. (2003) have  
 13 provided evidence to support the validity and the reliability of the measurement associated  
 14 with these two subscales. This includes factor structure (based on confirmatory factor  
 15 analysis), internal consistency ( $\alpha = .70$  to  $.88$ ) and test–retest reliability ( $r = .45$  to  $.65$  over 21  
 16 days).

17 **Motivation regulation.** Motivation regulation was measured using the Sport Motivation  
 18 Scale (Pelletier et al., 1995). The scale includes seven subscales that assess different forms of  
 19 motivation regulation. Intrinsic motivation refers to engaging in activities for the pleasure and  
 20 satisfaction experienced when doing so. This is measured using three subscales: intrinsic  
 21 motivation to know (e.g., “For the pleasure it gives me to know more about the sport that I  
 22 practice”), intrinsic motivation to accomplish (e.g., “For the pleasure I feel while improving  
 23 some of my weak points”) and intrinsic motivation for stimulation (e.g., “For the pleasure I  
 24 feel in living exciting experiences”). External motivation refers to engaging in activities as a  
 25 means to an end or not for its own sake. This is measured using three subscales that reflect

1 participation for purely external reasons (extrinsic motivation, e.g., “Because it allows me to  
 2 be well regarded by people that I know”), to fulfil internal contingencies (introjected  
 3 motivation, e.g., “Because I must do sports to feel good about myself”) and because the  
 4 activity has some personal value (identified motivation, e.g., “Because it is one of the best  
 5 ways I have chosen to develop other aspects of myself”). The scale also includes amotivation  
 6 which reflects feelings of helplessness and incompetence (e.g., “It is not clear to me anymore;  
 7 I don't really think my place is in sport”). Participants respond to the items on a seven-point  
 8 Likert scale (1 = *does not correspond at all* to 5 = *corresponds exactly*). Pelletier et al. (1995)  
 9 have provided evidence for the validity and reliability of the measurement associated with the  
 10 scale. This includes factor structure (based on confirmatory factor analysis), internal  
 11 reliability ( $\alpha = .63$  to  $.80$ ), and test-retest reliability ( $r = .58$  to  $.84$  over 1 month).

12 **Fear of failure.** Fear of failure was measured using the short version of the Performance  
 13 Failure Appraisal Inventory (Conroy, Willow, & Metzler, 2002). The scale includes 5-items  
 14 which assess cognitive appraisals associated with the fear of failure (e.g., “When I am failing  
 15 I am afraid that I might not have enough talent”). Participants respond on a 5-point Likert  
 16 scale (1 = *do not believe at all* to 5 = *believe 100% of the time*). Examination of the  
 17 psychometric properties of the scale by Conroy et al. (2002; Conroy & Metzler, 2003)  
 18 supports the reliability and validity of scales, such as factor structure (based on confirmatory  
 19 factor analysis), internal reliability ( $\alpha = .72$ ), and test-retest reliability ( $r = .58$ , over 21 days).  
 20 The short-form of the scale is also highly correlated with the long-form of the scale ( $r = .92$ ;  
 21 Conroy et al., 2002).

22 **Contingent self-worth.** Contingent self-worth was measured using the competition subscale  
 23 from the Contingencies of Self-Worth Scale (Crocker, Luhtanen, Cooper, & Bouvrette,  
 24 2003). This includes 5-items which assess the extent to which individuals stake a sense of  
 25 self-worth on outperforming others (e.g., “My self-worth is affected by how well I do when

1 competing with others”). Participants respond on a seven-point Likert scale (1 = *strongly*  
 2 *disagree* to 7 = *strongly agree*). Crocker et al. (2003) have provided evidence to support the  
 3 validity and the reliability of the measurement associated with the scale. This includes factor  
 4 structure (based on confirmatory factor analysis), internal consistency ( $\alpha = .87$ ) and test–  
 5 retest reliability ( $r = .74$  over 3 months).

6 **Self-criticism, overgeneralization and mental perseveration.** Self-criticism,  
 7 overgeneralization and mental perseveration were measured using the Attitudes Toward Self  
 8 Scale (ATS; Carver, La Voie, Kuhl, Ganellen, 1988). The self-criticism (SC) subscale  
 9 includes 3-items that assess the tendency to make harsh judgements about oneself for failing  
 10 to attain desired standards (e.g., “When I don’t do as well as I hoped to, I often get upset with  
 11 myself”). The overgeneralisation of failure (OF) subscale includes 4-items that assess the  
 12 tendency to interpret specific failure as reflecting upon the totality of one’s self-worth (e.g.,  
 13 “If something goes wrong – not matter what it is – I see myself negatively”). The Mental  
 14 Perseveration (MP) subscale includes 5-items that assess the tendency to ruminate about  
 15 failures that had already been experienced and can not be readdressed. Participants respond to  
 16 the items on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Initial  
 17 examination of the psychometric properties of the subscale supported its validity and  
 18 reliability. This includes factor structure (based on confirmatory factor analysis) and internal  
 19 reliability (OF  $\alpha = .75$ , SC  $\alpha = .65$ , and MP  $\alpha = .85$ ; Carver et al., 1988).

20 **Rumination.** Rumination was measured using the Ruminative-Reflection Questionnaire  
 21 (Trapnell & Campbell, 1999). The rumination subscale includes 12-items that assess an  
 22 anxious form of self-focused attention motivated by perceived threats, losses, or injustices to  
 23 the self (e.g., “I always seem to be rehashing in my mind recent things I've said or done”).  
 24 Participants respond on a seven-point Likert scale (1 = *strongly disagree* to 7 = *strongly*  
 25 *disagree*). Trapnell and Campbell (1999) have provided evidence to support the validity and

1 the reliability of the measurement associated with this subscale. This includes factor structure  
2 (based on exploratory factor analysis) and internal reliability ( $\alpha = .90$ ).

3 **Labile self-esteem.** Labile self-esteem was measured using the Labile Self-Esteem Scale  
4 (Dykman, 1998). The scale includes 5-items that assess the extent to which individuals  
5 experience shifts in self-esteem (e.g., “How I feel about myself stays pretty much the same  
6 from day to day”). Dykman (1998) has provided evidence to support the validity and the  
7 reliability of the measurement associated with this scale, such as satisfactory internal  
8 reliability ( $\alpha = .84$ ).

## 9 **Results**

### 10 **Preliminary analysis**

11 Prior to the main analyses, missing value analysis was conducted on the data. Due to  
12 large amounts of missing data ( $> 5\%$ ), 8 participants were removed from the sample. After  
13 doing so, there were 241 complete cases and 42 cases with incomplete data. For those with  
14 incomplete data, the average number of missing values was the equivalent of less than 2  
15 items ( $M = 1.23$ ,  $SD = 0.54$ , range 1 to 3). An inspection of the pattern of missing data  
16 suggested a non-systematic mechanism for the missing data. Specifically, the missing data of  
17 the 42 participants were described by 35 unique patterns of missing data. Consequently, each  
18 missing item was replaced using the mean of the each case’s available non-missing items  
19 from the relevant subscale (Graham, Cumsille & Elek-Fisk, 2000). Internal reliability  
20 analysis (Cronbach’s alpha) indicated that all instruments demonstrated adequate internal  
21 consistency (displayed in table 1 along with descriptive statistics).

### 22 **Primary analyses**

23 In order to assess the impact of partialling on an indicator of perfectionistic strivings  
24 (viz. personal standards), the analytical approach of Lynam et al. (2006) was adopted.  
25 Specifically, the relationship between personal standards and constructs from its nomological

1 network were compared before (raw unstandardized coefficients) and after (residualised  
2 unstandardized coefficients) partialling. To index the similarity of the profile of relationships  
3 a double-entry intraclass correlation ( $ICC_{DE}$ ) was computed. This provides an indication of  
4 overall similarity (i.e., elevation, shape and scatter) between raw unstandardized coefficients  
5 and residualised unstandardized coefficients (see McCrae, 2008). Individual differences in  
6 raw unstandardized coefficients and residualised unstandardized coefficients were also  
7 examined. Changes were estimated by calculating the effect of the third variable (i.e.,  
8 concern over mistakes). This was achieved by dividing the difference between raw  
9 unstandardized and residualised unstandardized coefficients by the square root of the first-  
10 order Taylor series (Sobel, 1982)<sup>1</sup>. Further details and useful examples of this analysis are  
11 provided by MacKinnon, Krull, and Lockwood (2000). The results of the analyses are  
12 presented in table 1.

13       Personal standards and concern over mistakes were moderately positively correlated  
14 ( $r = .32, p < .01$ ). Examination of the intraclass correlation between the profile of raw  
15 unstandardized coefficients and residualised unstandardized coefficients for personal  
16 standards indicated a reasonably high level of similarity ( $r_{ICC} = .81$ ). However, examination  
17 of the individual relationships indicated that 14 of the 18 coefficients changed significantly  
18 following partialling ( $p < .05$ ). A significant decrease in the magnitude of the relationship was  
19 observed for 10 of those that changed and a significant increase was observed for the other 4  
20 (i.e., suppression). Two of the relationships remained non-significant (mastery avoidance and  
21 labile self-esteem), 5 ceased to be statistically significant (fear of failure, overgeneralisation  
22 of failure, mental perseveration, introjected regulation, and rumination), and 2 others became  
23 statistically significant (performance avoidance and amotivation). In regards to the proposals  
24 of Lynam et al. (2006), then, despite a reasonably high level of overall similarity, there was a



1 large amount of changes in the individual correlates of personal standards evident following  
 2 partialling, including evidence of suppression.

3 Although the focus of the research is on how partialling influences perfectionistic  
 4 strivings, analysis of the less controversial perfectionistic concerns provides a useful  
 5 counterpoint as well as information regarding what is lost from perfectionistic striving  
 6 following partialling. Examination of the intraclass correlation between the profile of raw  
 7 unstandardized coefficients and residualised unstandardized coefficients for concern over  
 8 mistaking indicated a high level of overall similarity ( $r_{ICC} = .91$ ). Although to a lesser  
 9 degree, a similar pattern of change was observed for concern over mistakes following  
 10 partialling. Ten of the 18 coefficients significantly changed following partialling ( $p < .05$ ). A  
 11 decrease in the magnitude of the relationship was observed for 5 of those that changed and an  
 12 increase was observed for the other 5. Two of the relationships remained non-significant  
 13 (intrinsic motivation to know and intrinsic motivation for stimulation) and 2 of the  
 14 relationships became statistically significant (mastery-approach and intrinsic motivation to  
 15 accomplish). Again, in regards to the proposals of Lynam et al. (2006), there was a high level  
 16 of overall similarity but a large amount of changes in the individual correlates of concerns  
 17 over mistakes following partialling, including evidence of suppression.

## 18 Discussion

19 The aim of this study was to illustrate the effect of partialling on perfectionistic  
 20 strivings using data collected with athletes and exemplify the evidence on which the two  
 21 recent reviews are based. To do so, the relationship between a sub-dimension of  
 22 perfectionistic strivings, personal standards, and constructs from its nomological network  
 23 were compared before and after controlling for its relationship with a sub-dimension of  
 24 perfectionistic concerns, concern over mistakes. The results indicated a reasonably high  
 25 degree of overall similarity in the pattern of raw and residualized relationships. However,

1 closer examination revealed that 14 of the 18 individual relationships changed in magnitude,  
2 direction, or statistical significance. Four of the relationships also changed in a manner  
3 indicative of suppression (mastery-approach, performance-avoidance, intrinsic motivation to  
4 accomplish, and amotivation). The findings therefore allude to substantive changes to the  
5 construct captured by personal standards as a result of partialling.

6 A comparison of the correlates of personal standards before and after partialling  
7 provides a sense of the difference between the construct captured by the raw scores and  
8 residual scores. Prior to partialling personal standards was associated with a mixture of  
9 adaptive and maladaptive regulators of achievement striving. This included approach  
10 achievement goals (performance and mastery), a combination of intrinsic, introjected, and  
11 extrinsic motivation, as well as contingent self-worth and a fear of failure. It was also  
12 associated with a number of cognitive markers of a preoccupation with the attainment of  
13 perfection in the form of self-criticism, mental perseveration, and rumination. Seemingly the  
14 construct captured by the raw scores resembles perfectionistic strivings as described by Flett  
15 and Hewitt (2006); that is, a complex and compulsive pattern of achievement behaviour and  
16 self-evaluation.

17 A more adaptive pattern of regulation and self-evaluation was evident following  
18 partialling. Notably, the relationships between personal standards and both contingent self-  
19 worth and self-criticism were reduced and relationships with introjected motivation, fear of  
20 failure, over-generalisation of failure, mental perserveration, and rumination were eliminated.  
21 The reduction in the relationship between personal standards and these maladaptive  
22 constructs suggests that these relationships are in some cases partly (e.g., contingent self-  
23 worth, self-criticism, and extrinsic motivation), and in other cases fully (e.g., fear of failure  
24 and introjected motivation), accounted for by the association between personal standards and  
25 concern over mistakes. This pattern of findings serves to highlight two important issues. The

1 first, as highlighted by the two recent reviews, is that in its residualised form personal  
2 standards captures a more adaptive form of achievement striving. The second, however, is  
3 that the overlap between personal standards and concern over mistakes is central to both the  
4 regulation and cognitive manifestations of perfectionistic strivings (Frost et al., 1990). In  
5 other words, constructs that have the potential to provide insight into the achievement  
6 behaviour that arises from perfectionistic strivings (e.g., fear of failure and introjected  
7 motivation) are lost following partialling.

8         As examples of suppression, the significant increase in the magnitude of the  
9 relationship between personal standards and other parts of the nomological network (mastery-  
10 approach, performance-avoidance, intrinsic motivation, and amotivation) attest to more  
11 complex conceptual changes that follow partialling. As described earlier, it is difficult to  
12 attribute these relationships to the original construct as they did not exist prior to partialling  
13 (Lynam et al., 2006). What the new residualised personal standards construct captures is not  
14 precisely clear however there are a number of possibilities. DiBartelo et al. (2004) have  
15 described “pure personal standards” which reflects the pursuit of personal standards in the  
16 absence of contingent self-worth. Similarly, Gaudreau and Thompson (2010) have described  
17 “pure personal standards perfectionism” which reflects a uniquely personally oriented focus  
18 on setting and pursuing perfectionistic standards. Both are constructs that appear to be  
19 distinct from the sub-dimensions of perfectionistic striving as described by Frost et al (1990)  
20 and Hewitt and Flett (1991).

21         Further insight into the nature of residualised personal standards is provided though  
22 examination of the more robust zero-order correlations exhibited by concern over mistakes.  
23 In particular, concern over mistakes encapsulates a strong defensive avoidance orientation  
24 exemplified by a fear of failure. This is a powerful regulator of the behaviour associated with  
25 perfectionism that, prior to partialling, is evident within personal standards. However,

1 following partialling, personal standards are left devoid of this feature. When this feature is  
2 muted, it is easy to see how perfectionistic strivings could be considered a positive  
3 motivational force but also why some researchers have argued that what remains is more  
4 likely to capture a general form of achievement striving or conscientiousness (Flett & Hewitt,  
5 2006). If this is the case, in the absence of more distinctive features, residualised  
6 perfectionistic striving may have limited value in explaining the effects of perfectionism  
7 (Flett & Hewitt, 2006; Greenspon, 2000; Hall et al., 2012).

8         It is perhaps important to acknowledge the possibility that some researchers may  
9 consider the illustrated effects to support the opposite conclusion. That is, perfectionistic  
10 strivings minus perfectionistic concerns more closely represents the intended construct. In  
11 considering this riposte, researchers must decide whether the residual scores or raw scores  
12 more closely approximate the construct of interest. In regards to the concept of personal  
13 standards, Frost et al. (1990) described it as “reflecting high personal standards of  
14 performance and the tendency to evaluate oneself based on performance” (p.54). As  
15 evidenced by the results here, the latter evaluative component is largely absent following  
16 partialling. Similar observations have been made for other sub-dimensions of perfectionistic  
17 strivings. For example, Powers et al. (2011) argued “...removing self-criticism from self-  
18 oriented perfectionism conceptually changes what Hewitt and Flett (1991) intend to be the  
19 meaning of self-oriented perfectionism, and perhaps perfectionistic strivings more generally.  
20 This is to suggest that the residual variance left by partialling is essentially high standard  
21 setting alone, which is not the construct of self-oriented perfectionism as formulated by  
22 Hewitt and Flett” (p. 972). Therefore, while ‘cleaner’ constructs may emerge following  
23 partialling, as the loss of non-trivial features of sub-dimensions of perfectionistic strivings  
24 increases the new construct becomes increasingly disparate from what was originally  
25 conceived and intended.

1           These issues are indicative of a need for greater conceptual clarity and precision in  
2 this area. In particular, the difference between perfectionistic strivings and other forms of  
3 achievement striving need to be articulated clearly. On this issue, some researchers in this  
4 area have argued that perfectionism (or perfectionistic) is a term that may be best reserved for  
5 a more rigid pursuit of exceptionally high standards with an irrational importance attached to  
6 their attainment (Flett & Hewitt, 2006). This alludes to the more distinctive meaning given to  
7 achievement behaviour associated with perfectionism which is encapsulated in the constant  
8 need to affirm a sense of self-worth and gain acceptance from self and others through the  
9 attainment of perfection (Flett & Hewitt, 2006; Greenspon, 2000; Hall, 2006). From this  
10 perspective, while perfectionistic strivings and perfectionistic concerns can be separated  
11 statistically, this creates interpretational difficulties at conceptual and empirical levels as the  
12 meaning of residualised perfectionistic strivings becomes ambiguous.

### 13 *Recommendations*

14           Readers are encouraged to consult Lynam et al.'s (2006) original article for details of  
15 ways to avoid the perils of partialling. Briefly, they call for the use of more reliable and  
16 homogenous measures, routine assessment of suppression, the development and ardent use of  
17 theory to explain observed effects, and ensuring that conclusions match the appropriate  
18 construct (viz. residualised or raw scores). With these suggestions in mind, researchers can  
19 generally be encouraged by progress and current practice in this area. Considerable work  
20 continues to take place in order to improve the quality of instruments available (e.g. Gotwals  
21 et al., 2011); researchers have begun to pay closer attention to the effects of suppression (e.g.,  
22 R. W. Hill et al., 2010); researchers in this area (including those of the two recent reviews)  
23 have typically been judicious when interpreting analyses that involve partialling; also a recent  
24 focus on the interaction between dimensions of perfectionism offers theoretical and empirical  
25 advances unhindered by the perils associated with independent effects (e.g., Gaudreau &

1 Verner-Filion, 2012; Gotwals, 2011; A. P. Hill, 2013). However, as discussed earlier, it is  
2 apparent that there is still need for greater conceptual precision in this area. In particular, the  
3 exact nature of residualised perfectionistic strivings and how it differs from general  
4 achievement strivings has yet to be fully resolved. Until this is the case, we must be mindful  
5 of the possibility that there may be little that is perfectionistic about perfectionistic strivings  
6 after partialling perfectionistic concerns.

### 7 **Limitations and future directions**

8         Perfectionistic strivings and perfectionistic concerns were measured in the current  
9 study using personal standards and concern over mistakes. It should not be assumed that the  
10 effects illustrated here generalise to other sub-dimensions. Replication studies are necessary  
11 in order to assess the influence of partialling on different measures, especially domain-  
12 specific scales that provide more sensitive means of capturing perfectionism (e.g., Gotwals et  
13 al., 2011). This would help verify the effects of partialling observed here. That said, it is  
14 noteworthy that other sub-dimensions of the two broad dimensions of perfectionism are also  
15 typically positively correlated to moderate and high degrees. Stoeber and colleagues (Stoeber  
16 et al., 2007), for example, reported correlations between perfectionistic strivings and negative  
17 reactions to imperfection that ranged from .35 to .63 across four sport-based samples ( $M =$   
18  $.53$ ,  $SD = .12$ ). In addition, from comparing the partial correlations with the bivariate  
19 correlations documented by Gotwals et al (2012) it is apparent that there is evidence of  
20 suppression in a large number of studies in this area, including research using other sub-  
21 dimensions (e.g., A. P. Hill, Hall, Appleton, & Murray, 2010). Consequently, it is likely that  
22 the issues described here apply to other instruments.

23         Despite the changes observed in the individual relationships following partialling, the  
24 overall changes in the nomological network of personal standards was modest. This is likely  
25 to be due to the moderate correlation between personal standards and concern over mistakes.

1 As discussed earlier, instances of much larger correlations between personal standards and  
2 concern over mistakes are common in this area (e.g., Lemyre et al., 2008; Stoeber, et al.,  
3 2009; Hall et al., 1998). More pronounced changes in nomological networks can be expected  
4 when this is the case. In addition, it is likely that as the number of constructs assessed as part  
5 of the nomological network increases, so would the discrepancy in profile similarity. The  
6 findings should, therefore, be considered relatively conservative in terms of the potential  
7 differences between the construct measured by raw and residualised scores of personal  
8 standards.

### 9 **Conclusion**

10 Research that has utilised partialling in this area has provided a number of conceptual  
11 and empirical advances in our understanding of perfectionism and will continue to do so. It is  
12 hoped, however, that this study provides a timely reminder of the perils of partialling and  
13 how they might influence our understanding of perfectionistic strivings. In particular,  
14 partialling has the potential to conceptually change the construct of interest in a manner that  
15 means it may no longer capture what is intended. Therefore, although it is clear that  
16 following partialling perfectionistic striving may be adaptive for athletes, it is currently not  
17 clear what residualised scores of perfectionistic strivings measures, if it differs from general  
18 achievement strivings, or warrants the label *perfectionistic* strivings. In light of these  
19 uncertainties, arguably, research has yet to demonstrate that *perfectionistic* strivings is  
20 healthy for athletes.

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### Footnotes

<sup>1</sup> The first-order Taylor series is  $\sigma_{\alpha}^2\beta^2 + \sigma_{\beta}^2\alpha^2$  (Sobel, 1982), where  $\beta$  and  $\alpha$  are unstandardized regression coefficients for the two predictor variables (e.g. personal standards and concern over mistakes) and  $\sigma_{\beta}$  and  $\sigma_{\alpha}$  are their standard errors. Details of how to obtain these values are provided by Mackinnon et al. (2000).



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1 *Table 1* Relations between perfectionism dimensions and external variables before (raw) and after (residual) partialling

	Mean	<i>s</i>	$\alpha$	Personal standards (PS)			Concerns over mistakes (CM)		
				Raw	Residual	z-value	Raw	Residual	z-value
Personal standards	3.26	0.67	.81						
Concern over mistakes	2.36	0.67	.82						
Performance approach	4.99	1.29	.84	.51** (.27)	.45** (.23)	1.80	.37** (.19)	.22** (.12)	3.15**
Performance avoidance	4.05	1.60	.84	-.15 (-.06)	-.37* (-.16)	3.74**	.60** (.25)	.72** (.30)	-2.34*
Mastery approach	5.89	0.84	.73	.44** (.35)	.50** (.40)	-2.27*	-.02 (-.02)	-.18* (-.15)	4.31**
Mastery avoidance	4.79	1.28	.85	.15 (.08)	-.03 (-.02)	3.80**	.58** (.30)	.59** (.31)	-0.27
IM: to know	4.85	1.11	.82	.57** (.35)	.58** (.35)	-0.43	.14 (.09)	-.04 (-.03)	4.06**
IM: to accomplish	5.21	1.02	.81	.54** (.36)	.59** (.39)	-2.25*	-.02 (-.03)	-.22* (-.15)	4.29**
IM: stimulation	5.12	1.00	.77	.50** (.32)	.54** (.36)	-1.58	.03 (.02)	-.15 (-.10)	4.13**
Identified motivation	4.57	1.17	.75	.19 (.11)	.20 (.12)	-0.57	.00 (.00)	-.06 (-.04)	1.75
Introjected motivation	4.17	1.23	.74	.35** (.19)	.18 (.10)	3.84**	.63** (.34)	.57** (.31)	1.54
Extrinsic motivation	4.05	1.24	.74	.49** (.26)	.32** (.18)	3.87**	.68** (.37)	.57** (.31)	2.67**
Amotivation	2.13	1.19	.84	-.04 (-.02)	-.25* (-.14)	4.31**	.62** (.35)	.70** (.39)	-2.22*

Fear of failure	2.50	0.83	.82	.23** (.19)	-.00 (-.00)	5.09**	.75** (.60)	.75** (.61)	-0.05
Contingent self-worth	3.49	0.73	.86	.31** (.28)	.19** (.17)	4.05**	.42** (.39)	.36** (.34)	2.63**
Overgen. of failure	2.62	0.82	.84	.17* (.14)	-.02 (-.02)	4.79**	.60** (.50)	.61** (.50)	-0.33
Mental perseveration	3.08	0.88	.90	.30** (.23)	.12 (.09)	4.62**	.63** (.48)	.59** (.45)	1.58
Self-criticism	3.61	0.86	.79	.39** (.30)	.25** (.20)	4.08**	.51** (.40)	.43** (.34)	2.95**
Labile self-esteem	2.57	0.77	.66	.12 (.10)	-.03 (-.02)	4.24**	.43** (.37)	.44** (.38)	-0.38
Rumination	2.83	0.51	.76	.12** (.16)	.01 (.02)	4.62**	.35** (.46)	.35** (.45)	0.26

1 Note: Unstandardized coefficients (raw scores) are displayed with standardized coefficients in parentheses.

2 \*\*  $p < .01$ . \*  $p < .05$