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A Meta-Analytic and Conceptual Update on the Associations Between Procrastination and Multidimensional Perfectionism

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Abstract

The equivocal and debated findings from a 2007 meta-analysis, which viewed perfectionism as a unidimensional construct, suggested that perfectionism was unrelated to procrastination. The present meta-analysis aimed to provide a conceptual update and re-analysis of the procrastination-perfectionism association guided by both a multi-dimensional view of perfectionism and self-regulation theory. The random effects meta-analyses revealed a small-to-medium, positive average effect size (r = .23; k = 43, N = 10,000; 95% confidence interval (95% CI) [0.19, 0.27]) for trait procrastination and perfectionistic concerns, and a small-to-medium, negative average effect size (r = -.22; k = 38, N = 9,544; 95% CI: [-0.26, -0.18]) for procrastination and perfectionistic strivings. The average correlations remained significant after statistically accounting for the joint variance between the two perfectionism dimensions via semi-partial correlations. For perfectionistic concerns, but not perfectionistic strivings, the effects depended on the perfectionism measure used. All effects did not vary by the trait procrastination measure used or the respondent's sex. Our findings confirm that from a multi-dimensional perspective, trait procrastination is both positively and negatively associated with higher order perfectionism dimensions, and further highlight the value of a self-regulation perspective for understanding the cognitive, affective, and behavioural dynamics that characterise these traits.

Procrastination is a common form of self-regulation failure that involves failing to start or complete important intended tasks despite knowing that such delay will result in negative consequences (Lay, 1986; Sirois & Pychyl, 2013). Contributing factors to procrastination, both in specific instances and as a more chronic behavioural tendency, include fear of failure and having an avoidant coping style (Haghbin, McCaffrey, & Pychyl, 2012; Sirois & Kitner, 2015), coupled with tasks that are aversive or that challenge self-worth (Blunt & Pychyl, 2000; Flett, Blankstein, & Martin, 1995). However, when the perceived failure involves not meeting excessively high standards or not doing something perfectly, traits other than procrastination may be implicated. In such instances certain forms of perfectionism may play a central role in the maintenance of the self-regulation failure we recognize as chronic procrastination.

Current understanding of whether or not procrastination and perfectionism are related is largely based on a 2007 meta-analysis (Steel, 2007). However, several methodological and conceptual issues regarding the way in which both perfectionism and procrastination were construed in the 2007 meta-analysis have fuelled an ongoing debate among researchers regarding the veracity of the findings. For example, researchers who view perfectionism as a multidimensional construct (i.e., comprised of perfectionistic concerns and perfectionistic strivings), tend to find significant, albeit differential, associations between dimensions of perfectionism and trait procrastination (e.g., Flett, Blankstein, Hewitt, & Koledin, 1992). However, researchers who consider perfectionism from a unidimensional view and do not differentiate between procrastination as a trait or as behaviour, maintain that perfectionism tends to be negatively, if at all, related to procrastination (Steel, 2010b). We argue that understanding the nature of the procrastination-perfectionism relationship has important theoretical and practical implications that deserve further clarification and investigation.

In this paper we take a multidimensional view of perfectionism to address the

procrastination-perfectionism debate, and meta-analyse the available research on whether and how procrastination and perfectionism are related. Importantly, we examine the procrastination-perfectionism link by focusing solely on trait or chronic procrastination, and using current theory and research on self-regulation as a guiding conceptual framework. Apart from gaining insight into the dynamics of both procrastination and perfectionism, and expanding their respective nomological networks, addressing this debate has a number of important theoretical and practical implications. From a theoretical perspective, discerning the potential convergent and divergent associations of trait procrastination and multidimensional perfectionism can expand current theory on the cognitive, affective, and behavioural self-regulation issues that characterise each trait. From a practical perspective, understanding the extent to which procrastination and perfectionism are related can provide insights into how to address the toll of each on mental and physical health and well-being, which current evidence suggests can be substantial (Sirois & Molnar, 2016b; Sirois & Pychyl, 2016b).

Perfectionism as a Multidimensional Construct

According to the multidimensional view of perfectionism, two higher-order dimensions of trait perfectionism are commonly identified from the most frequently used and well-validated measures in the field (e.g., the Multidimensional Perfectionism Scale, MPS-HF, (P. L. Hewitt & Flett, 1991); the Multidimensional Perfectionism Scale, FMPS, (Frost, Marten, Lahart, & Rosenblate, 1990); and the Almost Perfect Scale, APSR, (Slaney, Rice, Mobley, Trippi, & Ashby, 2001). Perfectionistic concerns appear to capture the most maladaptive aspects of perfectionism (e.g., Chang, Watkins, & Hudson Banks, 2004), as it is characterized by critical and negative self-evaluations, excessive preoccupations with others' evaluations, expectations, and criticism, and an inability to experience satisfaction from even successful performance (Sirois & Molnar, 2016a). In contrast, perfectionistic strivings is

characterized by setting and striving for excessively high personal standards, and demanding nothing less than perfection from the self (Sirois & Molnar, 2016a). Importantly, relative to perfectionistic concerns, most researchers agree that perfectionistic strivings encompasses the less maladaptive features of perfectionism, with some researchers contending that in certain circumstances perfectionistic strivings may be potentially adaptive (e.g., Stoeber & Corr, 2016; Stoeber & Otto, 2006).

When taking a clinical perspective, trait perfectionism is often viewed as a unidimensional construct consisting only of perfectionistic strivings (Shafran, Cooper, & Fairburn, 2002, 2003). However, a multidimensional model of perfectionism (Frost et al., 1990; P. L. Hewitt & Flett, 1991; Stoeber & Otto, 2006) is most often used in research because the different dimensions of perfectionism often show different and opposing associations with key outcomes. Indeed, Hewitt and Flett (1991) along with Hewitt, Flett, Besser, Sherry, and McGee (2003) have provided a strong theoretical foundation and direct empirical evidence to support a multidimensional conceptualization of perfectionism that includes both intra and interpersonal dimensions of perfectionism.

Consistent support for a multidimensional model of trait perfectionism has been garnered not only from behaviour genetics research with a sample of 1,022 twin pairs (Tozzi et al., 2004), but also from studies which have established that the different dimensions of perfectionism are differentially related to a wide range of consequential outcomes. For example, research has demonstrated that the effects of perfectionistic concerns and perfectionistic strivings can be distinguished in outcomes such as psychopathology (Burgess & DiBartolo, 2016), distress (Dunkley, Mandel, & Ma, 2014), therapeutic alliance (Hewitt et al., 2003), well-being (Chang, 2006), health behaviours (Sirois, 2015b), physical health (Fry & Debats, 2009; Molnar, Reker, Culp, Sadava, & DeCourville, 2006), adjustment to chronic health conditions (Kempke et al., 2011; Sirois & Molnar, 2014), burnout (A. P. Hill &

Curran, 2015), athletic performance (Stoeber, Stoll, Pescheck, & Otto, 2008), and academic achievement (Rice, Richardson, & Ray, 2016). Thus, recognizing the multidimensional nature of perfectionism is a key consideration in the current meta-analysis of perfectionism and procrastination because it not only allows a more nuanced understanding of the complex and potentially differential associations between the dimensions of perfectionism and procrastination, but it is also in line with contemporary conceptual models of perfectionism.

Previous Meta-Analysis of the Procrastination-Perfectionism Relationship

In 2007, Steel conducted the first meta-analysis on the topic of procrastination, which included a sub-analysis of the relations of procrastination and perfectionism. This work provided an important and much needed integration of the current knowledge on procrastination, and has accordingly become one of the most cited papers in the field on the overall topic of procrastination. Steel (2007) concluded that the associations between procrastination and perfectionism were weak at best: "…procrastinators are actually less likely, not more, to be perfectionists" (p. 81), an assertion that has sparked debate within both the procrastination and perfectionism research communities. This assertion was based on a meta-analysis of 24 published and unpublished studies, including 3,884 participants that were available at the time, which found an overall average association between procrastination and perfectionism of $r = -.03$, $p < .0001$. In addition, Steel (2010b) has presented the argument that perfectionism cannot logically be presumed to be a source of procrastination because of the differential relations of each with the higher-order personality factor conscientiousness. From this perspective, procrastination is known to be negatively related to conscientiousness (Steel, 2007; Van Eerde, 2003), whereas, perfectionism can be viewed as being positively related to conscientiousness given its characteristic tendencies towards being organized (Steel, 2010b).

There are several conceptual and methodological issues in the 2007 meta-analysis that

limit the conclusions that were drawn. Most importantly, the Steel (2007) meta-analysis examined perfectionism as a unidimensional construct. In the meta-analysis, perfectionism was operationally defined as a unidimensional construct consisting of self-oriented perfectionism and other-oriented perfectionism from the MPS-HF (Hewitt & Flett, 1991), and thus the meta-analysis of perfectionism and procrastination included only studies that assessed perfectionism with these two subscales (k = 24). In addition, this unidimensional construal of perfectionism only included one accepted measure of what would commonly be viewed as perfectionistic strivings. Other-oriented perfectionism is not considered to reflect either perfectionistic strivings or perfectionistic concerns, but is rather a distinct dimension of perfectionism linked to the dark triad (Stoeber, 2014).

More importantly, studies that used the socially prescribed perfectionism subscale of the MPSHF (an accepted measure of perfectionistic concerns) were not operationally defined as measuring perfectionism in the 2007 meta-analysis. Instead, such studies were categorized as reflecting the construct *fear of failure* and grouped with studies using measures of evaluation anxiety, self-consciousness, and fear of failure (k = 57; Steel, 2007). Although it was noted that socially prescribed perfectionism on its own was weakly related to procrastination (r = .18), the inclusion of this sole subscale under the construct of fear of failure rather than as a specific and distinct dimension of perfectionism is problematic from a theoretical perspective. Both the fear of failure construct and the perfectionism construct created for analytic purposes were presented as being conceptually nested within a set of irrational beliefs that were analysed together, thus obscuring the known conceptual distinctions between the MPS-HF perfectionism subscales. The conclusion that procrastination is negatively, if at all, related to perfectionism (Steel, 2007; 2010b), was based on the average negative correlation reported for perfectionism as assessed by self-oriented and other-oriented perfectionism (r = -.03), suggesting that socially prescribed

perfectionism (or perfectionistic concerns as the higher order dimension) was not conceptualised as part of the perfectionism construct that was analysed.

This unidimensional conceptualization of the perfectionism construct is at odds with current multidimensional conceptualizations of perfectionism. As noted previously, the two key dimensions of perfectionism (i.e., perfectionistic concerns and perfectionistic strivings), are generally viewed as separate, yet related factors that are often divergent with respect to consequential outcomes. It is important that perfectionism be examined as a multidimensional construct in relation to procrastination because the associations of each dimension with key outcomes are often in opposing directions, and could therefore yield attenuated or nonsignificant associations if perfectionism is viewed as a unidimensional construct. For these reasons, the previous meta-analysis does not address the associations between multidimensional perfectionism and procrastination, making an update both prudent and necessary.

Conceptualisations of Procrastination

An additionally important issue for understanding how procrastination and perfectionism are related involves the way procrastination is conceptualised. Procrastination can be viewed along a spectrum ranging from a chronic pattern of behaviour that is akin to a relatively enduring personality-like trait that manifests across a range of life domains at one end, to a domain specific phenomena that manifests as unnecessary delay in specific contexts, such as academic life at the other end (Sirois, 2016a). At the trait end, procrastination is viewed as reflecting a generally consistent pattern of chronic avoidance with respect to aversive tasks, which may be maintained by the short-term mood repair that avoiding such tasks affords (Sirois & Pychyl, 2013). Indeed, there is some evidence that when measured as a trait, procrastination shows good long-term stability, with a 10-year test-retest correlation of .77 (Steel, 2007).

In the original meta-analysis of procrastination and perfectionism (Steel, 2007) studies using measures of *trait* and *situational* procrastination were analysed together. Although the situational-trait distinction may appear arbitrary given that trait procrastination is positively associated with procrastinatory behaviour (Lay, 1986), from a theoretical perspective it is an important distinction to make. Accurately estimating the shared variance that reflects the convergent and divergent intra-personal processes underpinning trait procrastination and perfectionism can be difficult if trait measures are not distinguished from situational or domain-specific measures of procrastination.

Some researchers view procrastination as a representation of impulsiveness (Ferrari, 1993; Steel, 2007, 2010a), because ostensibly, procrastination often involves a spontaneous abandonment of long term goals in favour of immediate rewards. Indeed, in behaviour genetics research with over 300 same-sex twin pairs, procrastination and impulsivity were indistinguishable at the genetic level, suggesting a shared evolutionary development of the two traits (Gustavson et al., 2014). However, this same research found that procrastination is distinct from impulsivity at the phenotypic level, and that failure to manage goals largely accounted for the overlap between the two traits. This evidence indicates that, as a trait, procrastination involves some degree of impulsiveness, but that the needless delay of intended actions that defines the expressed trait of procrastination cannot be wholly attributed to impulsivity.

Procrastination and Perfectionism: Convergence and Divergence in Self-Regulation Failure

In light of theory and evidence indicating that procrastination is a form of self-regulation failure (Sirois & Pychyl, 2013; Steel, 2007), and evidence suggesting that perfectionistic concerns and strivings are differentially related to self-regulation (Powers, Koestner, & Topciu, 2005; Sirois, 2015b), we argue that taking a self-regulation view of the

procrastination-perfectionism relationship is both appropriate and useful. For example, situating procrastination and perfectionism dimensions within a nomological network of other constructs relevant for self-regulation can provide further insights into how and why their relations may converge or diverge. Table 1 provides an illustrative summary of how trait procrastination and perfectionistic concerns share commonalities with respect to constructs related to self-regulation, whereas trait procrastination and perfectionistic strivings show divergent relations. According to Cybernetic Big Five theory (DeYoung, 2014, 2015), the higher order personality factors, conscientiousness and (low) neuroticism, are two of three superordinate traits key for successful self-regulation, being subsumed under the meta-trait stability that is essential for shielding goals from the disruptive influence of impulses. Both procrastination and perfectionistic concerns are consistently associated with low conscientiousness and high neuroticism, whereas perfectionistic strivings show the reverse pattern of associations (Dunkley, Blankstein, & Berg, 2012; Van Eerde, 2003).

A differential pattern of associations for procrastination and perfectionism dimensions also emerges for constructs negatively related to behavioural control (avoidant coping, goal disengagement, and impulsiveness), a key dimension of self-regulation (Vohs & Baumeister, 2011). Coping is a key self-regulatory task aimed at coordinating thoughts, feelings, and behaviour towards the goal of reducing immediate stress (Lazarus & Folkman, 1984). Successful coping involves removing the stressor or reducing its impact in a lasting manner, whereas maladaptive coping tends to provide temporary relief from the stressor, often with additional costs to well-being (Taylor & Sirois, 2014). Both procrastination and perfectionistic concerns are consistently linked to more maladaptive forms of coping such as disengagement and avoidance, which favor immediate needs over behaviour for meeting long-term goals (see Table 1).

Self-regulation can also be disrupted by cognitive and affective tendencies that

contribute to, or maintain, negative affective states, as such states interfere with goal monitoring and goal-directed action, and can contribute to goal abandonment (see Wagner & Heatherton, 2015, for a review). As outlined in Table 1, procrastination and perfectionistic concerns show consistent links to self-regulation constructs associated with negative affect, whereas perfectionistic strivings has a more inconsistent and negative pattern of associations with these constructs. For example, self-blame, and self-criticism reflect negative self-evaluations known to interfere with goal progress (Powers, Koestner, Zuroff, Milyavskaya, & Gorin, 2011), whereas fear of failure is a negative state concerned with receiving negative evaluations from oneself and others that can have a paralyzing effect on taking goal-directed action (Haghbin et al., 2012). As a repetitive and uncontrollable response style that involves focusing on and maintaining negative states (Moberly & Watkins, 2008), rumination reflects poor cognitive self-regulation that may also be detrimental for the effective self-regulation of behaviour (Sirois & Bean, 2016).

In addition to the relatively clear differential patterns of association with markers of poor self-regulation, procrastination, perfectionistic concerns and perfectionistic strivings also demonstrate differential linkages with indicators of effective self-regulation (See Table 1). Both mindfulness and self-compassion are trait-like qualities that are associated with effective self-regulation, as demonstrated by their links to healthy emotional regulation and low negative affect (Neff, 2003b), and successful regulation of behaviour (Evans, Baer, & Segerstrom, 2009; Sirois, Kitner, & Hirsch, 2014). Specifically, research has demonstrated that self-compassion, through its focus on self-kindness and mindful acceptance in response to personal failures (Neff, 2003a), plays a role in self-regulation by down-regulating negative mood (Diedrich, Grant, Hofmann, Hiller, & Berking, 2014), which in turn can promote healthy motivation to reach goals (Breines & Chen, 2012). Similarly, mindfulness, which involves a non-reactive self-awareness and acceptance of thoughts and feelings as they occur

(Baer & Allen, 2004), can be beneficial for self-regulation because it decreases negative responses to challenges and thereby increases task persistence (Evans, Baer, & Segerstrom, 2009). Mindfulness also increases self-awareness, a key quality necessary to detect discrepancies between current and desired states, and motivate corrective behaviour (Carver & Scheier, 1982). Both self-compassion and mindfulness show negative links with procrastination and perfectionistic concerns (Neff, 2003b; Sirois, 2014; Sirois & Tosti, 2012; Wimberley, Mintz, & Suh, 2016), and positive or no links with perfectionistic strivings (Neff, 2003a; Wimberley et al., 2016). With respect to health behaviours, arguably the prototypical self-regulation task (Baumeister, Heatherton, & Tice, 1994), procrastination and perfectionistic concerns have demonstrated consistent negative associations (Molnar, Sirois, Flett, Janssen, & Hewitt, In press; Sirois, 2015a; Sirois, Melia-Gordon, & Pychyl, 2003), whereas perfectionistic strivings are positively or not significantly related to the practice of health behaviours (see Molnar et al., In press, for a review).

When viewed from the lens of self-regulation, collectively the evidence is suggestive of shared cognitive, affective, and behavioural issues reflecting poor self-regulation linking trait procrastination and perfectionistic concerns. In contrast, perfectionistic strivings, for the most part, tends to be more closely aligned with effective self-regulation rather than self-regulation failure. Nonetheless this evidence is primarily descriptive and does not provide clear insights into the self-regulatory mechanisms that might explain the potential convergent and divergent relations between procrastination and perfectionism.

A Control Theory View of the Procrastination-Perfectionism Relationship

Moving from the descriptive to the explanatory, we propose that self-regulation theory provides a useful framework for understanding the common underlying mechanisms that explain the procrastination-perfectionism relationship. The *cybernetic* or control theory of self-regulation (Carver & Scheier, 1982) is a widely accepted model of self-regulation, which

posits that the process of self-regulation involves four components organized in a linear, negative feedback loop designed to reduce a perceived discrepancy between the present state and the desired goal (see Figure 1). The process of self-regulation begins with setting a reference point, such as a standard or goal that is internally or externally generated (e.g, "I want to get a good grade on the test"), which serves as the impetus for self-regulatory efforts. Next, the present condition with respect to the reference is perceived (input function). The comparator mechanism of the cybernetic process involves comparing the present condition against the reference to detect whether there is a discrepancy. If a discrepancy is detected, behavior is performed as an output function to create change in the environment, and thus reduce the discrepancy by altering the perception of the present state in relation to the reference point (Carver & Scheier, 1982). In addition to approach-oriented goals, some goals can be avoidance-oriented (e.g., "I don't want to fail the test"), in which case the goal-directed action focuses on increasing the gap between present state and the undesired state in a positive feedback loop.

Within the self-regulation feedback loop, there are several key processes which can determine whether or not control is exerted over behavior to reduce (or widen) the perceived discrepancy and effect successful self-regulation. Of particular relevance for understanding the procrastination-perfectionism relationship is the *expectancy-assessment process* (Carver & Scheier, 1982). According to Carver and Scheier (1982), prior to or during discrepancy reduction efforts (e.g., taking action to reach goals), an assessment of the expectancy of being able to successfully reduce the perceived discrepancy is made. As noted in Figure 1, this assessment is derived from information integrated from a number of sources including perceptions of physical or social constraints on behavior, and of available internal and external resources. If the expectancy is that the discrepancy can be reduced, then goal-directed action to reduce the discrepancy is taken. However, if the expectancy is that the

discrepancy cannot be reduced given current constraints and resources, then an impulse to withdraw effort or disengage from the goal is activated, resulting in task delay or even abandonment (Carver & Scheier, 1982).

Given the subjective nature of perceptions and expectancies, individual differences should play a pivotal role in both the assessment of resources, and subsequent expectancies for being able to reduce (or increase) the discrepancy between the current and desired states. Indeed, Carver & Scheier (1982) in outlining their cybernetic model noted the potential for individual differences to moderate the outcome expectancy assessment process. Accordingly, we posit that differences in self-evaluations, including self-efficacy, can influence whether outcome expectancies are assessed as being favourable or unfavourable. To the extent that negative self-evaluations can bias the expectancy-assessment process towards judging that one is not capable of reducing the perceived discrepancy between the desired and current states, such thoughts may contribute to poor self-regulation. The proposed processes driving the convergent and divergent relations between procrastination and perfectionism are outlined in Figured 1. The shared associations of perfectionistic concerns and trait procrastination with negative self-evaluations (e.g., self-criticism), are posited to incline people high on these traits to have unfavourable expectancies about being able to reduce discrepancy, which will result in disengaging from or abandoning their goal. Conversely, the associations of perfectionistic striving with positive self-evaluations, such as self-efficacy, are proposed to incline people high in perfectionistic strivings to have favourable expectancies for addressing goal discrepancy, and thus be more likely to persist in their self-regulation efforts.

Current evidence generally supports this proposition, as both trait procrastination and perfectionistic concerns are associated with fewer perceived resources for self-regulation and negative self-evaluations, whereas perfectionistic strivings is associated with greater perceived resources, and high self-efficacy. Negative self-evaluations are a central feature of

both trait procrastination and perfectionistic concerns, as each are associated with self-criticism (Flett et al., 1995; Sherry, Stoeber, & Ramasubbu, 2016; Sirois, 2014), self-blame (Sirois, 2015a; Stoeber & Janssen, 2011), and self-deprecating thoughts (McCown et al., 2012; Sirois et al., 2010). In contrast, perfectionistic strivings is negatively related to self-criticism (Powers et al., 2011; Powers, Milyavskaya, & Koestner, 2012), and self-blame (Sirois & Molnar, 2014; Stoeber & Janssen, 2011). Trait procrastination is also consistently associated with lower self-efficacy (Ferrari, 1992; T. R. Martin, Flett, Hewitt, Krames, & Szanto, 1996; Sirois, 2004b). Evidence indicates that perfectionistic concerns is associated with perceiving limited possibilities for improvement after noting a discrepancy between current and desired performance (Sirois, Monforton, & Simpson, 2010), and weaker beliefs in being able to meet the standards they aim towards (Eddington, 2013; Stoeber, Hutchfield, & Wood, 2008). In contrast, perfectionistic strivings is associated with stronger beliefs for success. For example, in one study perfectionistic concerns was associated with lower self-efficacy prior to task performance and decreases in self-efficacy after failure feedback, whereas perfectionistic strivings were positively associated with self-efficacy (Stoeber, Hutchfield, et al., 2008). Similar differential relations have been noted with goal-related optimism, with perfectionistic concerns linked to less optimism about goal success, whereas perfectionistic strivings was linked to greater optimism about goal success (Eddington, 2013).

An alternate explanation for the associations of procrastination to perfectionism that can be derived from the cybernetic model (Carver & Scheier, 1982) is that individuals with higher levels of perfectionistic concerns may differ from those who are higher in perfectionistic strivings with respect to their reference points, in this case their standards or goals. Ostensibly it may be reasonable to assume that people high in perfectionistic concerns may set goals that are more unrealistic and less attainable than those high in perfectionistic strivings, and that the larger discrepancy created by these differences in goals is what

contributes to unfavourable expectancy assessments, and subsequent goal withdrawal or abandonment. However, there is little research into the potential differences in standards between perfectionistic concerns and perfectionistic strivings, and what research there is tends to not support this position. For example, person-centered analyses employing the APSR (Slaney et al., 2001), have consistently revealed three groups of perfectionists - adaptive perfectionists, maladaptive perfectionists and nonperfectionists – that do not differ with respect to their standards (e.g., Gilman & Ashby, 2003; Grzegorek, Slaney, Franze, & Rice, 2004). Clearly further research is needed to gain a more comprehensive understanding of this issue. However, the current evidence suggests that perfectionistic concerns and perfectionistic strivings perfectionists do not differ with respect to their referent points. Rather, we argue that it is differences in the way that the perceived discrepancy from the referent point is responded to that differentiates perfectionistic concerns from perfectionistic strivings with respect to self-regulation.

Moderators of the Procrastination-Perfectionism Association

In addition to providing an updated view of how procrastination and perfectionism dimensions may be related, which is necessary for areas where that has been a substantial growth in research (Cumming, 2014), meta-analysis also offers the opportunity to probe the factors that may constrain or subvert these associations through moderation analyses.

There are several factors that could moderate the associations of procrastination with perfectionism dimensions, and which were not investigated in the previous meta-analysis by Steel (2007). First concerns the way in which each trait is measured. Although perfectionistic concerns and perfectionistic strivings are generally accepted as the two overarching dimensions of perfectionism (Sirois & Molnar, 2016a), the way in which each is conceptualized and measured can vary considerably across different measures. For example, the FMPS (Frost et al., 1990) assesses perfectionistic concerns with 4 subscales, concern over

mistakes, doubts about actions, parental criticism, and high parental expectations (Frost, Heimberg, Holt, Mattia, & Neubauer, 1993). Although some researchers argue that the parental criticism and parental expectations subscales of the FMPS are not core characteristics of perfectionistic concerns (Stoeber & Otto, 2006), factor analytic work indicates that both of these subscales have high loadings onto the perfectionistic concerns factor (Frost et al., 1993).

In contrast, the MPS-HF (P. L. Hewitt & Flett, 1991) and the APSR (Slaney et al., 2001), revised, each assesses perfectionistic concerns with one subscale, socially-prescribed perfectionism (SPP) for the MPS-HF, and discrepancy, for the APSR. However, recent psychometric tests of the APSR suggests that the discrepancy subscale includes items which tap negative affectivity, a key defining feature of trait procrastination (Sirois & Pychyl, 2013). It is possible, therefore, that the magnitude of the associations between procrastination and perfectionistic concerns will be larger when measured by the APSR compared to other perfectionism measures. In addition, the discrepancy subscale of the APSR taps more directly into the self-regulation expectancy-assessment proposed to link trait procrastination and perfectionistic concerns.

With respect to perfectionistic strivings, there appears to be more agreement across different measures. For example, both the MPS-HF and the APSR appear to adequately assess perfectionistic strivings (R. W. Hill, McIntire, & Bacharach, 1997; Molnar, Sadava, Flett, & Colautti, 2012). Moreover, the conceptualizations of perfectionistic strivings across each of the three most commonly used scales – the FMPS, MPS-HF, and the APSR – generally converge in describing perfectionistic strivings as setting and striving for high personal standards (FMPS, APSR). Consequently, there is no reason to expect that the procrastination-perfectionistic strivings association will differ in its strength across different measures of perfectionism.

There is less empirical evidence regarding the equivalencies of different measures of chronic or trait procrastination. This may be due partly to the current unidimensional conceptualization of trait procrastination. Each of the three most commonly measures - the GPS (Lay, 1986), the Tuckman Procrastination Scale (TPS; Tuckman, 1991), and the Aitken Procrastination Inventory (API; Aitken, 1982) – claim to assess procrastination as a chronic or trait-like tendency. However, the latter two were specifically developed and designed to test procrastination as a characteristic way of behaving in academic settings, and have been used most frequently with student populations. Lay's (1986) General Procrastination scale focuses on procrastination as a tendency across a wider range of settings. Nonetheless, we argue that conceptually, the consistent tendency to procrastinate, whether in academic or other settings, is the critical commonality across these measures. Therefore, it is not expected that the associations between procrastination and either of the perfectionism dimensions will differ significantly as a function of the measure of chronic procrastination used.

With respect to respondent's sex and the sample type (student versus community), there is little theoretical or empirical reasons to expect that the associations between chronic procrastination and perfectionistic strivings or concerns will vary as a function of these factors. Despite the fact that current procrastination research is often criticized for focusing primarily on university student samples (Beutel et al., 2016; Sirois & Pychyl, 2016a), research on the correlates of procrastination have tended to demonstrate that the effects found in community adult samples tend to be quite similar to those found in student samples (e.g., Sirois, 2016b). Regarding respondent sex, only one study has found sex-related differences concerning the associations between procrastination and perfectionism such that, the association between procrastination and perfectionistic concerns was stronger for men than it was for women (Flett et al., 1992). However, without any strong theoretical rationale to explain this sole finding, respondent sex is not expected to be a significant moderator of the

link between procrastination and perfectionism.

Overview of the Present Research

The aim of this study was to provide a conceptual and meta-analytic update of the research examining the relations between procrastination and perfectionism guided by both a multidimensional view of perfectionism and self-regulation theory. Research on procrastination, perfectionism and their correlates has burgeoned in recent years indicating that such an update is both timely and important to gain current insights into the nomological networks of each (Cumming, 2014). More importantly, the previous meta-analysis did not take a multidimensional view of perfectionism (Steel, 2007), making it difficult to draw accurate conclusions about the ways in which trait procrastination is related to widely-accepted major dimensions of perfectionism. In addition, by applying the theoretical framework of self-regulation, the current meta-analysis provides an opportunity for new insights into understanding the underlying processes that might distinguish perfectionistic concerns from perfectionistic strivings in relation to trait procrastination. Finally, the current meta-analysis tests moderators of the procrastination-perfectionism association, as these were not examined in the previous meta-analysis.

We also assess linkages between each dimension of perfectionism and procrastination using semi-partial correlations. We include tests using semi-partial correlations as well as raw correlations in light of recent evidence indicating that the associations between different dimensions of perfectionism and various outcomes differ depending on whether the raw or the semi-partial correlation is used (A. P. Hill & Curran, 2015; Stoeber & Otto, 2006). These differing findings are likely due to the often considerable amount of overlapping variance between perfectionistic strivings and perfectionistic concerns that is accounted for when using semi-partial correlations, but is left unattended when using raw correlations (Enns & Cox, 2002; Stoeber & Otto, 2006). This is a particularly salient issue when examining

correlates and outcomes of perfectionistic strivings in which raw correlations often illustrate mixed findings whereas semi-partial correlations often reveal relatively more positive aspects of perfectionistic strivings (Stoeber & Otto, 2006).

Indeed, the lack of agreement between the raw and the partialled findings have led some researchers to question the validity of the partialled results on both conceptual and empirical grounds. For example, Hill (2014, in press) along with Molnar and Sirois (2016) have questioned whether partialling the effects of perfectionistic concerns from perfectionistic strivings alters the "conceptual meaning" of perfectionistic strivings, such that partialled perfectionistic strivings is more akin to hyper-conscientiousness rather than perfectionism per se. However, others have argued that this is not a valid concern because the overlapping variance between perfectionistic strivings and perfectionistic concerns is not central to defining perfectionistic strivings (i.e., not every individual who is high on perfectionistic strivings is high on perfectionistic concerns), and because perfectionistic concerns only accounts for 36% of the variance in perfectionistic strivings at best (Stoeber & Gaudreau, 2017). Thus, Stoeber and Gaudreau (2017) advocate for researchers to use partialling techniques to assess how "pure" perfectionistic strivings is associated with key outcomes of interest. Given that this issue is yet to be resolved in the field we present both the raw and the semipartial effects to provide a more comprehensive set of findings.

Consistent with the conceptual and empirical distinctions between perfectionistic concerns and perfectionistic strivings, and a self-regulation account of their convergent and divergent associations with trait procrastination, we expected that perfectionistic concerns would be positively associated with trait procrastination, whereas perfectionistic strivings would be negatively associated with trait procrastination. We also expected that the associations between perfectionistic concerns and trait procrastination would vary according across perfectionism scales, and would be largest for those studies that use the APSR

discrepancy to measure perfectionistic concerns. However, for perfectionistic strivings, we expected the negative associations with trait procrastination would be equivalent across the different perfectionism scales. Finally, we expected that the effects of trait procrastination with perfectionistic concerns and perfectionistic strivings would hold across different procrastination measures, sample types, and for women and men. We further anticipated that the results obtained from the analyses of the semi-partial correlations would follow those obtained with the raw correlations, and that similar to other research (A. P. Hill & Curran, 2015), the associations with trait procrastination after statistically accounting for the contributions of perfectionistic concerns to perfectionistic strivings, and of perfectionistic strivings to perfectionistic concerns, would be larger in magnitude.

Methods

Literature search. Formal literature searching was conducted using online databases (PsycINFO and PsycARTICLES, 1985- December 2015) to identify suitable empirical studies on procrastination and perfectionism to include in the meta-analysis. The keyword "procrastinat"* was combined with "perfection"*. Because the initial scan of the literature revealed that there were very few published eligible studies, informal channels were also searched extensively. These included Google Scholar, and emails sent to procrastination researchers from a recent procrastination research conference mailing list, and perfectionism researchers via the Perfectionism Research Network mailing list. Data sets from the researchers' own labs that included associations of procrastination and perfectionism were also included for screening, regardless of whether or not the effects were statistically significant.

Relevant studies identified from the initial search of formal and informal channels were forward and backward searched to identify any additional relevant literature to include, and duplicate papers and data sets were then removed. A final scan of the literature from January

1 to June 30, 2016 was also conducted to retrieve any recent work. Together these search strategies yielded a total of 586 studies to be screened and from this set 88 studies were assessed for eligibility according to the inclusion criteria described in the next section. After excluding 44 studies for various reasons, including studies not assessing procrastination as a chronic tendency, unusable effect sizes, and non-response from requests for effect size information from authors, 44 studies were retained for the meta-analysis.

Inclusion criteria and article coding. Papers were judged as acceptable to include in the meta-analyses if they 1) reported usable effect size information, that is quantitative rather than qualitative data; 2) included effects of trait or chronic procrastination with multidimensional trait measures of either perfectionism dimension (perfectionistic concerns or perfectionistic strivings); 3) reported unique effects not reported in other published papers, reports, conference paper, theses, or data provided directly from the author; in such cases the effect from the most recent and complete source was used; 4) were in English; 5) reported findings with adult human populations; and 6) provided effects that could be obtained by contacting the author if not reported directly in the paper or thesis.

Implementing this criteria yielded 44 studies with effects of trait procrastination reported for either of the two perfectionism dimensions (perfectionistic concerns and perfectionistic strivings). For perfectionistic concerns, 43 studies were garnered, including 14 published papers, and 13 theses, and 16 unpublished studies/data sets. However, 7 of the unpublished studies/data sets and theses were from previously published studies that did not report the associations of procrastination and perfectionism. Of these, only 1 study did not report findings for either procrastination or perfectionism. For the 6 studies based on previously published data, the research design and methods for the data collections had been subjected to formal peer-review, but were nonetheless coded as unpublished work.

For procrastination and perfectionistic strivings, a total of 38 studies were located,

including 11 published papers, 11 theses, and 16 unpublished studies/data sets. As with the studies garnered for perfectionistic concerns, a total of 7 of the unpublished studies/data sets and theses were from previously published studies that did not report the associations of procrastination and perfectionism, and only one did not report findings for either procrastination or perfectionism.

Essential information for the meta-analyses (effect and sample sizes) and planned moderator analysis was recorded for each of the eligible studies retrieved in a coding sheet. We chose the zero-order correlation (*r*) as the effect size metric because it was the statistic reported across all of the studies. For longitudinal studies that reported multiple effects sizes across different time points, the first effect size in the time series was recorded as we were interested in how trait procrastination and perfectionism were related, rather than assuming any causal or directional relationship between the two. For studies that reported dependent effect sizes, that is effects for more than one procrastination scale or perfectionism scale within the same dimension (i.e. perfectionistic concerns or perfectionistic strivings), the effect sizes were averaged into a single effect size to maintain independence of the effects sizes included in the meta-analysis, as recommended by Card (2012). Moderator information recorded for each study included the scales used to measure procrastination and perfectionism, the sample population (community adults versus student samples), the percent female participants in the sample, and the publication status of the study.

We used current theory and research on the dimensionality of perfectionism (Bieling, Israeli, & Antony, 2004; Sirois & Molnar, 2016a; Stoeber & Otto, 2006), and the forms of procrastination (Sirois & Pychyl, 2016b), to guide the measures chosen as indicators of perfectionistic concerns, perfectionistic strivings, and trait procrastination. Studies that measured perfectionism with the discrepancy subscale of the APSR (Slaney et al., 2001), the socially-prescribed perfectionism (SPP) subscale of the MPS-HF (P. L. Hewitt & Flett,

1991), the concerns over mistakes, doubts about actions, parental criticism, and parental expectations subscales of the FMPS (Frost et al., 1990), and the negative perfectionism subscale of the Positive and Negative Perfectionism Scale (PNPS; Terry-Short, Owens, Slade, & Dewey, 1995), were coded as indicators of perfectionistic concerns. For perfectionistic strivings, studies that used the personal standards subscale of the APSR (Slaney et al., 2001), the self-oriented perfectionism (SOP) subscale of the MPS-HF (P. L. Hewitt & Flett, 1991), the personal standards and organization subscales of the FMPS (Frost et al., 1990), and the positive perfectionism subscale of the PNPS (Terry-Short et al., 1995), were coded as indicators of perfectionistic strivings.

Only studies that measured procrastination as a chronic behavioural tendency or trait-like quality were included in the meta-analysis. Scales deemed as valid and acceptable measures of trait procrastination included Lay's General Procrastination Scale (Lay, 1986), the Tuckman Procrastination Scale (TPS; Tuckman, 1991), the Aitken Procrastination Inventory (Aitken, 1982), the Irrational Procrastination Scale (Steel, 2010a).

All coding of effects was performed independently by two of the authors who conduct research regularly on procrastination and/or perfectionism. The agreement rate from the double coding was high (98 percent), with only one discrepancy, which was settled through discussion.

Analyses

All retrieved studies reported the effect sizes as a Pearson's *r* value. According to Cohen's (1992) guidelines, effects of $r = .10$ are considered to be small, $r = .30$ to be medium, and $r = .50$ to be large. These guidelines were used to assess the magnitude of the effects.

To understand the unique contribution of each perfectionism dimension to trait procrastination, semi-partial correlations were calculated using the formula from (Cohen,

Cohen, West, & Aiken, 2003). This yielded two additional sets of effects to meta-analyze. Because the semi-partial correlation requires partialling out the shared variance between perfectionistic concerns and perfectionistic strivings from perfectionistic concerns or perfectionistic strivings before calculating the association with procrastination, semi-partial correlations were only calculated for studies that reported the correlations between perfectionistic concerns and perfectionistic strivings.

The average effect size between each of the two perfectionism dimensions (perfectionistic concerns and perfectionistic strivings) and procrastination, and the semi-partial effect sizes of each perfectionism dimension and procrastination were estimated with four separate random effects meta-analyses with the CMA software (Borenstein, Hedges, Higgins, & Rothstein, 2005). CMA first transforms the individual correlation coefficients into Fisher's *z* scores, and weights the effects before meta-analyzing them. Seven of the studies reported correlations from multiple subscales or scales of perfectionistic concerns or perfectionistic strivings (e.g., with the FMPS). For each of these studies, the multiple raw effect sizes were averaged to form a single effect size, as this is a common approach for handling this issue (Card, 2012). To calculate the semi-partials for each of these studies, the averaged study effects for perfectionistic concerns and perfectionistic strivings were used to yield an overall average semi-partial for each perfectionism dimension in the study.

Between-studies variability in effect sizes was evaluated with two approaches to determine whether the planned subgroup moderator analyses were warranted, regardless of whether the overall effects size was significant or not. The heterogeneity statistic, Q, assesses the degree of variability among the pool of effects sizes (Card, 2012), and moderator analysis is warranted if this statistic is associated with a large confidence interval. The I^2 statistic estimated the proportion of variability present that is not due to sampling error within studies (Slosar, 2009). In general, I^2 values of 25 percent reflect low heterogeneity, 50 percent reflect

moderate heterogeneity, and 75 percent or more reflect high heterogeneity. (Viechtbauer, 2010).

Analyses that warranted moderator analyses were only conducted if there were three or more studies in each subgroup. This decision was made in line with Card's (2102) caution regarding the reduction of statistical power and difficulties in detecting meaningful group differences when there are too few studies in a subgroup. Moderator analyses were conducted using a mixed effects approach where the combined subgroups were first analyzed with a random effects model to further assess heterogeneity within each subgroup, and then combined using a fixed effects model to assess the heterogeneity between subgroups. Gender was recorded as a continuous variable (percent female), and therefore a mixed effects meta-regression (method of moments) analysis was used to assess the potential moderating effects of this variable.

We followed Card's (2012) recommendation to take a multi-pronged approach for assessing publication bias, that is, to assess the extent to which the "file drawer" problem - that is the absence of unfound studies - may bias the meta-analysis results. Given that there were more unpublished studies than published studies retrieved, this analysis was primarily focused on determining the extent to which there may be other unpublished studies that were not retrieved, and the potential effects of their inclusion on the results. This is in contrast to the more routine purpose of publications bias tests which have as an underlying assumption that studies which find significant results tend to be published whereas those with non-significant findings do not (Card, 2012). First, publication type subgroup analyses (i.e., published versus unpublished studies) were conducted to determine the extent to which the published effect sizes differed from the unpublished effect sizes as a further indicator of publication bias. Second, a fail-safe *N* was also calculated for each effect size using the Rosenthal (1979) method. This statistic provides an estimate of the number of studies with

non-significant results ($p > .05$) that would need to be included in the meta-analysis to threaten the conclusion of a significant association (Rosenthal, 1979). Accordingly, the fail-safe *N* was only calculated for those effects that reached statistical significance ($p < .05$). Rosenthal (1979) suggests that as a guideline, an adequately high fail-safe *N* should be greater than $5k + 10$, where k = the number of studies included. Third, we examined the funnel plots for each meta-analysis as an additional strategy, as these scatterplots provide a graphical representation of publication bias. If a visual inspection reveals asymmetry in the funnel plot shape from the expected triangular configuration, then there is a possibility of publication bias (Card, 2012). As a quantitative estimate of potential scatterplot asymmetry and therefore publication bias, we used Duval and Tweedie's (2000) "trim and fill" approach which first "trims" any studies contributing to funnel plot asymmetry, and then reinstates the trimmed studies and imputes values to "fill" in the funnel plot so that symmetry is achieved. These filled results are then compared to the original estimates, and if discrepant this would suggest publication bias. If comparable, then the original results are considered robust to publication bias, or more accurately for the purposes of the current study, to any biases from not including other unfound unpublished studies (Card, 2012). Fourth, we used Egger's regression test (Egger, Smith, Schneider, & Minder, 1997) to assess the asymmetry of the funnel plots. In this test, the intercept reflects publication bias, with a significant test suggesting the presence of publication bias. When used in tandem and there is consensus among the results, these multiple approaches can help reduce Type 1 error in assessing publication bias (Card, 2012; Ferguson & Brannick, 2012).

Results

Meta-analysis of Procrastination and Perfectionism Dimensions

Table 2 presents the correlations and semi-partial correlations, study coding, and results for the meta-analyses of trait procrastination with each of the two perfectionism

dimensions, and the semi-partial correlations for each dimension. The meta-analysis revealed a significant small-to-medium positive association between trait procrastination and perfectionistic concerns. After statistically accounting for the joint variance between perfectionistic concerns and perfectionistic strivings (i.e., semi-partial correlations), the average effect size remained positive and significant, and was larger by .025. The meta-analysis of the raw correlations of procrastination with perfectionistic strivings revealed a significant small-to-medium average effect size that was negative. Statistically accounting for the overlapping variance between perfectionistic concerns and perfectionistic strivings, the average effect with procrastination remained negative and significant, and was larger by .017.

The tests of heterogeneity of the effect sizes were significant for both perfectionistic concerns, $Q_{total}(42) = 198.08$, $p < .001$; $I^2 = 78.80\%$, and perfectionistic strivings, $Q_{total}(36) = 161.65$, $p < .001$; $I^2 = 76.49\%$. Tests of heterogeneity of the semi-partial correlations for perfectionistic concerns, $Q_{total}(31) = 159.25$, $p < .001$; $I^2 = 80.53\%$, and perfectionistic strivings, $Q_{total}(31) = 81.83$, $p < .001$; $I^2 = 62.12\ \%$, were also significant. Because the I^2 values were above the 75% threshold for all four meta-analyses, moderator analyses were conducted to probe the source of heterogeneity among the effect sizes.

Moderator Analyses of Procrastination and Perfectionistic Concerns

In our assessment of the moderating role of perfectionism scale, we included only studies that used the MPS-HF, the APSR, or the FMPS as these were the three most commonly used scales across the studies, and they were the scales for which there were a minimum of three studies per subgroup. Studies which assessed perfectionistic concerns using a composite index derived from more than one perfectionism scale were not included in the moderator analysis for the effects of perfectionism scale to ensure a meaningful assessment of this moderator. A similar strategy was adopted for the moderator analyses of the effects of the procrastination scale used. The GPS, TPS, and API were the most

commonly used measures of trait procrastination, and those that had sufficiently sized subgroups to permit moderator analyses. Accordingly, only studies reporting effects using these measures of trait procrastination were included in the procrastination scale moderation analyses.

The results of the subgroup moderation analyses for perfectionistic concerns are presented in Table 3. As expected, the effects sizes of procrastination with perfectionistic concerns varied significantly across the three different perfectionism measures, with studies that assessed perfectionistic concerns using the APSR having the largest effect sizes in comparison to studies that used FMPS or MPS-HF. For the moderator analysis of the semi-partial correlations of perfectionistic concerns, there were only sufficient subgroup sizes to compare the effects from APSR to the MPS-HF. This analysis also revealed that the effects sizes using the APSR were significantly larger, and nearly double in magnitude, compared to those using the MPS-HF. The hypothesis that the effect sizes would be equivalent across the different procrastination scales used was supported for both the subgroup analysis of the raw correlations, and the semi-partial correlations of perfectionistic concerns. However, the hypothesis that the effects with perfectionistic concerns would be consistent across samples was not supported, as the effects in the studies using community samples were significantly larger than those garnered from student samples. When the effects were compared after partialling out the effects of perfectionistic strivings from perfectionistic concerns, there was no longer a significant difference. As expected, the meta-regression revealed that the associations between perfectionistic concerns and procrastination were consistent across respondent sex for the raw correlations, $b = .206$ [-.09, .51], Q_{model} (1) = 1.82, $p = .18$, $Q_{residual}$ (41) = 34.98, $p = .73$, and the semi-partial correlations, $b = .306$ [-.02, .63], Q_{model} (1) = 3.38, $p = .07$, $Q_{residual}$ (30) = 31.29, $p = .40$.

Moderator Analyses of Procrastination and Perfectionistic Strivings

The same strategies used for assessing associations between procrastination and perfectionistic concerns, were adopted for perfectionistic strivings for both the raw and semi-partial correlations. Table 4 presents the results of the moderator analyses for perfectionistic strivings. Consistent with our hypotheses, the subgroup analyses revealed that the associations between procrastination and perfectionistic strivings were equivalent across different measures of perfectionistic strivings, procrastination scale, or sample type (community versus student). The results of the subgroup analyses for the semi-partial correlations were consistent with those found for the raw correlations. There were also no sex-related differences concerning associations between perfectionistic strivings and procrastination, b = .118 [-.17, .41], Q_{model} (1) = 0.64, p = .43, $Q_{residual}$ (37) = 47.73, p = .11, or semi-partial correlations, b = .063 [-.17, .30], Q_{model} (1) = 0.28, p = .60, $Q_{residual}$ (30) = 35.41, p = .23.

Publication Bias Tests

For procrastination and perfectionistic concerns, the tests were unanimous in suggesting the absence of publication bias. The fail-safe N analysis revealed that an additional 5,566 studies with null results would need to be included in the meta-analysis to reduce the p value below .05. This was well above the threshold value of 225. The funnel plot (see supplemental Figure 1) showed no signs of asymmetry and the trim and fill test resulted in no studies being trimmed, and thus identical values for the obtained and imputed effects, r = .232 [.19, .27]. Egger's test of the intercept was also non-significant, b_0 = -1.24 [-3.17, .69], t (41) = 1.29, p = .20, further supporting a lack of publication bias.

The fail-safe N for perfectionistic strivings was 4,211, which exceeded the threshold of 205. The funnel plot inspection indicated little visual evidence of asymmetry (see supplemental Figure 2), and the trim and fill analysis revealed that the obtained effects, r = -.218 [-.26, -.18], differed slightly from those imputed after trimming 4 studies, r = -.240 [-

.28, -.20]. These results converged with the result of Egger's regression test, which was also not significant, b_0 = 0.68 [-1.32, 2.67], t (37) = 0.69, p = .50

Supplemental Analyses

In addition to the main analyses, we also conducted a series of supplemental analyses to address several potential concerns in the main analyses. First, we tested whether the effects garnered from studies conducted in the authors' labs differed significantly from the other published and unpublished studies. This was an important consideration given the large number of studies originating from the authors' labs. The moderator analyses were non-significant for both the overall and semi-partial associations of trait procrastination and perfectionistic strivings (see supplemental Table 1). For perfectionistic concerns, the moderator analysis was significant at p = .04 for the raw correlations, with the effects from the authors' labs being significantly larger than those from other studies. However, for the adjusted, semi-partial correlations, the moderation analysis was non-significant, indicating that once the contribution of perfectionistic strivings were accounted for, the effects from studies in the authors' labs were no longer different from those from other studies (see supplemental Table 1).

Next, because some researchers have raised concerns about the validity of the Positive and Negative Perfectionism Scale (PNPS; Terry-Short et al., 1995) for assessing perfectionistic strivings and concerns (Egan, Piek, Dyck, & Kane, 2011), we ran additional analyses excluding the three studies (Burns, Dittmann, Nguyen, & Mitchelson, 2000; Trezza, n.d.) that used the PNPS to assess perfectionism. The overall meta-analyses of the raw and semi-partial correlations for perfectionistic concerns and perfectionistic strivings remained essentially unchanged. The results of the subgroup moderation analyses excluding the three studies also remained essentially unchanged (see supplemental Tables 2, 3, and 4 for full results).

There is some debate regarding whether the parental expectations and parental criticism subscales of the FMPS (Frost et al., 1990) provide an accurate reflection of perfectionistic concerns. Indeed, some researchers have argued that these two subscales reflect the developmental antecedents of perfectionistic concerns, rather than its core characteristics (Stoeber & Otto, 2006). In addition, an alternative explanation for why trait procrastination may be associated with each perfectionism dimension involves method variance. To the extent that self-report measures of perfectionism and procrastination include items with overlapping content, associations between these constructs may be artificially inflated. To address this issue two of the authors reviewed the items in all perfectionism scales included in the meta-analysis to identify any with content clearly reflecting delay, and all the procrastination items for content related to perfectionism or getting things right. Two items from the doubts about actions subscale of the FMPS (Frost et al., 1990) were independently identified and agreed upon by both authors as including content related to time and/or delay: "I tend to get behind in my work because I repeat things over and over" and "It takes me a long time to do something right". No items within the procrastination measures were identified as including content reflecting perfectionism. To address each of these issues, we ran a supplemental analysis excluding any studies which used doubts about actions, the parental expectations or parental criticism subscales of the FMPS and compared these results to those including the full FMPS to examine whether and how the findings had changed (see supplemental Tables 5, 6, and 7; results reported below).

Three studies (Blackler, 2011; McCabe-Bennett, n.d.; Soya & Weiss, 2014) that used a composite measure of perfectionism that included the parental expectations, parental criticism, and doubts about actions subscales of the FMPS were removed for the supplemental analyses regarding the measurement of perfectionistic concerns, and method variance. In addition, the remaining five studies using the FMPS (Essau, Ederer,

O'Callaghan, & Aschemann, 2008; Pierro, Giacomantonio, Pica, Kruglanski, & Higgins, 2011; Sherry et al., 2016; Stoeber, 1998; Stojiljkovic, n.d.) were recoded to use only effects for the concern over mistakes subscale. Results of the supplemental analyses are presented in supplemental Tables 5, 6, and 7. Overall, the results remained essentially the same for the overall meta-analysis of the perfectionistic concerns and procrastination raw correlations, the semi-partial correlations, and the perfectionistic strivings and procrastination semi-partial correlations. There were also no significant changes in the results for the moderating effect of procrastination scale, perfectionism scale, sample type, publication status, or participant sex in the new analyses, when using only the concern over mistakes subscale of the FMPS to assess perfectionistic concerns.

Discussion

This study provides the most comprehensive meta-analysis to date on the association between procrastination and multidimensional perfectionism, and further situates their associations within the conceptual framework of self-regulation to understand the convergent and divergent relations of procrastination with the higher-order perfectionism dimensions, perfectionistic strivings and perfectionistic concerns. In line with our hypotheses, we found evidence indicating that trait procrastination and perfectionistic concerns have a small-to-medium positive association, whereas trait procrastination and perfectionistic strivings have a small negative association (Cohen, 1992). These effects remained after accounting for the joint variance between perfectionistic concerns and perfectionistic strivings through semi-partial correlations.

The results from the moderator analysis for perfectionism measure were consistent with our hypothesis. Although some researchers contend that the APSR (Slaney et al., 2001) includes item wording that reflects conscientious striving, and thus does not adequately assesses perfectionistic concerns (Blasberg, Hewitt, Flett, Sherry, & Chen, 2016), the

moderator analysis for perfectionistic strivings revealed no significant differences in the associations with trait procrastination as a function of perfectionism scale. The effects with respect to perfectionistic concerns varied significantly according to the measure of perfectionism used, with studies using the discrepancy subscale of the APSR (Slaney et al., 2001) demonstrating effects that were almost twice the magnitude of those found with the socially prescribed perfectionism subscale of the MPS-HF (P. L. Hewitt & Flett, 1991), and two and half times the magnitude of those found with the perfectionistic concerns subscales of the FMPS (Frost et al., 1990). These findings further highlight the issues with the discrepancy-assessment process that may strengthen the linkages between procrastination and perfectionistic concerns. For example, when goals are routinely set too high, this creates a greater discrepancy between current and desired states, which, when coupled with enduring tendencies to view success as being less likely, can contribute to goal withdrawal (Carver & Scheier, 1982). Overall, the current findings are consistent with a Control Theory (Carver & Scheier, 1982) view of procrastination and perfectionism.

These results, and those from the supplemental analyses, also clearly support examining the individual facets of perfectionistic concerns (i.e., concerns over mistakes, discrepancy, and socially prescribed perfectionism) in relation to procrastination. This would not only provide a more nuanced theoretical understanding of the link between trait perfectionism and procrastination, but would allow more specific interventions and preventative strategies to be implemented. For example, our results indicate that clinicians would be well served to address perceived discrepancies that perfectionists are experiencing when addressing their tendencies to procrastinate rather than their concerns over making a mistake or their perceived pressure from others to be perfect.

There was also evidence that the effects with perfectionistic concerns varied according to sample type, with community samples yielding effects that were larger than

those obtained from student samples. However, this difference was no longer evident once the overlapping variance between perfectionistic standards and concerns was accounted for in the analyses. Moderator analysis further confirmed that the effects of trait procrastination with perfectionistic concerns and perfectionistic strivings were robust to the measure of trait procrastination used and the respondent's sex, and there was no evidence of publication bias.

Overall, our findings are in striking contrast to those obtained in the first meta-analysis conducted by Steel (2007), but are nonetheless in keeping with current theory and research on the multi-dimensional nature of perfectionism, and Control Theory (Carver & Scheier, 1982). There are several reasons why the current results differ from the 2007 meta-analysis. Taking a multi-dimensional view of perfectionism provided a more accurate assessment of the differential associations of trait procrastination with perfectionistic concerns and perfectionistic strivings, associations which were likely obscured in the previous meta-analysis. In the 2007 meta-analysis perfectionism (defined as a unidimensional construct comprised of self-oriented and other-oriented perfectionism) was only modestly and negatively associated with procrastination (measured as both state and trait combined). As well, the 2007 meta-analysis did not consider perfectionism measures other than the MPS-HF. The current meta-analysis included a more comprehensive range of perfectionism measures that assessed each of the two broad perfectionism dimensions in relation to trait procrastination alone. We also examined a much larger sample of studies than the Steel (2007) meta-analysis, including 44 studies (N = 10,454) for trait procrastination, compared to 24 studies (N = 3,884) in the 2007 meta-analysis. These increased numbers reflect the growth in research into perfectionism and procrastination since the meta-analysis conducted in 2007.

The Procrastination-Perfectionism Association from a Self-Regulation Perspective

Situating the procrastination-perfectionism relationship within the framework of self-regulation theory, and Control theory (Carver & Scheier, 1982) more specifically, provides

novel insights into the convergent and divergent cognitive, affective, and behavioral tendencies that underlie these traits. The differential associations of procrastination with perfectionistic concerns and perfectionistic strivings found in the current meta-analysis are consistent with this self-regulation perspective, and the proposed role of self-evaluations in the expectancy-assessment process and subsequent goal-directed action. As noted previously, both trait procrastination and perfectionistic concerns are associated with tendencies to perceive oneself as being less capable of reducing the discrepancy between desired and current states that is central to taking timely, goal-directed action. According to Control Theory (Carver & Scheier, 1982), this can result in avoidance or withdrawal from the goal, which may or may not be resumed at a later time, or continued effort, albeit with less enthusiasm or intensity, and thus less chance of success. For perfectionistic strivings, more optimistic views of one's ability to reduce this discrepancy during the expectancy-assessment process will result in continued effort (Eddington, 2013; Stoeber, Hutchfield, et al., 2008), and thus greater chance of successful goal regulation. In short, it is differences in the way that the perceived discrepancy is responded to that differentiates perfectionistic concerns from perfectionistic strivings with respect to self-regulation.

We have also proposed that negative self-evaluations, which tend to plague both chronic procrastinators and those high in perfectionistic concerns (Flett et al., 1995; McCown et al., 2012; Sherry et al., 2016), may present an additional vulnerability for poor self-regulation by biasing perceptions during the expectancy-assessment process towards a lack of resources for coping with the goal discrepancy, rather than towards internal and external resources that might be instrumental in reaching goals. Rather than a one-off effect, it is possible that negative self-evaluations contribute to self-regulation difficulties on an ongoing basis. For individuals prone to negative self-evaluations (i.e., those who chronically procrastinate or who are high in perfectionistic concerns), perceiving that one is unable to

reduce the gap between desired and current states may feedback into negative self-evaluations and amplify any associated negative mood states in a dynamic and cyclically reinforcing manner. This could potentially have a detrimental spillover effect on other key aspects of self-regulation, such as accurately monitoring one's goal progress, which is known to be disrupted by high levels of negative affect (Wagner & Heatherton, 2015).

This account of the role of negative self-evaluations in the expectancy-assessment process and subsequent self-regulation failure dovetails with the emotion regulation models of procrastination (Pychyl & Sirois, 2016; Sirois & Pychyl, 2013), and with the proposed associations between negative affect and end-state thinking in perfectionistic concerns (Flett, Hewitt, Blankstein, & Gray, 1998; Sirois et al., 2010). For the chronic procrastinator, activation of negative self-evaluations that increase negative affect can also trigger avoidant responses to the goal as a means of reducing mood and protecting self-esteem (Pychyl & Sirois, 2016; Sirois, 2004a; Sirois & Pychyl, 2013). For individuals high in perfectionistic concerns, negative affect arising from the expectancy-assessment process may activate ruminative brooding and end-state thinking that shifts focus to the negative feelings surrounding the goal rather than to ways of taking instrumental action to attain the goal (Flett et al., 1998; Flett, Hewitt, & Nepon, 2016; L. L. Martin & Tesser, 1989). In this respect, both trait procrastination and perfectionistic concerns can compromise self-regulation because attending to emotional needs via goal avoidant responses takes precedence over instrumental action towards reaching goals. Research examining the interplay of negative emotions, negative self-evaluations, and expectancy assessments in the procrastination-perfectionism relationship is needed to verify the complex relations proposed here, as well as provide further insights into this self-regulation view of procrastination and perfectionism.

From this self-regulation perspective, the findings from the current meta-analysis indicate that perfectionistic concerns can be detrimental for achieving goals, whereas

perfectionistic strivings may have some benefits. Consequently, the current findings contribute to the debate about perfectionism in the extant literature, which suggests that some forms and foci of perfectionism (perfectionistic strivings) may be beneficial (e.g., Stoeber & Corr, 2016), whereas other manifestations (perfectionistic concerns) are generally deleterious (e.g., Sirois & Molnar, 2016a).

Alternative Views of the Procrastination-Perfectionism Association

We have argued that a self-regulation framework is one way to view and understand the differential relations of trait procrastination to perfectionistic concerns and perfectionistic strivings. However, it is also possible that the convergent and divergent relations with the chronic self-regulation failure we know as trait procrastination may also be indicative of commonalities and differences in broad action tendencies or other personality traits associated with procrastination and perfectionism. For example, trait procrastination demonstrates moderate-sized associations with avoidant coping, (Sirois & Kitner, 2015), and perfectionistic concerns and perfectionistic strivings have been differentially associated with approach and avoidance behavior. Evidence suggests that perfectionistic strivings is linked with performance satisfaction and propelled by approach behaviour, whereas perfectionistic concerns is related to a lack of performance satisfaction and driven by avoidance behaviour (Slade & Owens, 1998). Put differently, according to this 'dual process model' of perfectionism (Slade & Owens, 1998), individuals with high levels of perfectionistic strivings are driven by the pursuit of success, whereas individuals with high levels of perfectionistic concerns are motivated by a fear of failure. Similarly, research has noted that perfectionistic concerns differs from perfectionistic strivings in terms of their associations with the Behavioural Approach System (BAS) and the Behavioural Inhibition System (BIS). Although perfectionistic strivings was consistently related to all components of reward sensitivity (BAS), it was also associated with the BIS, whereas perfectionistic concerns was

linked to the BIS, and the impulsivity component of the BAS (Stoeber & Corr, 2015). Taken together, these findings indicate that underlying intra-personal processes that characterize how perfectionistic concerns and perfectionistic strivings converge and diverge, respectively, with trait procrastination may be more nuanced and complex than what can be explained through an approach and avoidance framework.

Our Control Theory (Carver & Scheier, 1982) account of the commonalities and distinctions between trait procrastination and perfectionism highlight the potential roles of other enduring tendencies that create vulnerability for the expectancy-assessment process, and therefore task disengagement. One possible explanation is that the differential linkages of procrastination to perfectionistic concerns and perfectionistic strivings are due to broader traits, such as neuroticism, which has both empirical and conceptual overlap with perfectionistic concerns (Smith et al., 2016), and is one of the two big five traits most consistently associated with procrastination (Van Eerde, 2003). However, we would argue that because negative affect is a central feature of neuroticism, and that negative affect is considered one of the "seven deadly threats to self-regulation" (Wagner & Heatherton, 2015), that the potential role of neuroticism in explaining the differential relations between procrastination and perfectionism can also be understood from a self-regulation framework.

It is also possible that the differential links between procrastination and multidimensional perfectionism are due to differences in levels of traits such as impulsivity. Given the known associations between trait procrastination and impulsivity (Gustavson et al., 2014), and between perfectionistic concerns and impulsivity (Boone, Claes, & Luyten, 2014), an alternative explanation is that the procrastination-perfectionism relationship is due to shared variation with impulsivity. However, in their behavioural genetics analysis of procrastination and impulsivity, Gustavson and colleagues (2014) found that there was little shared variation between procrastination and impulsivity at the phenotypic and gentotypic

levels that was due to perfectionistic concerns (as measured by the concerns over mistakes and the parental criticisms subscales of the FMPS; (Frost et al., 1990), and concluded that perfectionism did not account for the procrastination-impulsivity relationship. Extrapolating from this finding, it is reasonable to expect that impulsivity does not explain a substantive degree of the variance in the procrastination-perfectionism relationship. Nonetheless, accounting for the role of impulsivity when examining the procrastination relationship would help shed light on this question. However, of the 44 studies included in the current meta-analysis, none also assessed impulsivity, highlighting this as an important gap for future research to address.

Clearly further research is needed to more accurately assess the degree to which the procrastination-perfectionism association can be attributed to common traits, such as neuroticism, and impulsivity. However, we argue that situating these potential explanatory traits within the overarching framework of self-regulation theory provides a useful way to better understand *why* and *how* such traits may operate with respect to differentiating perfectionistic concerns from perfectionistic strivings in relation to trait procrastination.

Implications of the Procrastination-Perfectionism Associations

Having provided strong support for the differential linkages of perfectionistic concerns and perfectionistic strivings to trait procrastination, research is needed to test and explore the processes and implications of these associations for domains in which perfectionism and procrastination may be relevant. Trait procrastination and perfectionism are each known to have consequences for academic performance (e.g., Rice, Richardson, & Ray, 2016; Solomon & Rothblum, 1984). Yet there are few investigations that examine how both traits may interact in the academic domain, as studies have focused primarily on academic procrastination as an occasional behaviour rather than as a more enduring tendency (e.g., Burns et al., 2000; Onwuegbuzie, 2000).

The interaction of perfectionism and procrastination within the health domain is also understudied, despite the fact that each is well-known to have consequences for health and well-being (e.g., Sirois & Molnar, 2016b; Sirois & Pychyl, 2016b). The combination of trying to meet unrealistically high goals coupled with a tendency to hold low expectancies for success might be particularly problematic for the performance of important health-related behaviours (e.g., eating healthy and regular exercise), which are prototypical self-regulation tasks that can be difficult to initiate and maintain (Baumeister et al., 1994). Both procrastination and perfectionistic concerns are also linked to increased stress in response to self-regulation failures (Dunkley, Solomon-Krakus, & Moroz, 2016; Sirois, 2016b), which can further compromise health. Self-regulation failure via problems in managing setbacks and failures (i.e., the discrepancy between current and desired states) have been linked to perfectionism and procrastination individually within other domains (e.g., Pychyl & Sirois, 2016; Sagar & Stoeber, 2009; Sirois et al., 2010), and may therefore also be relevant for understanding how perfectionistic concerns and perfectionistic strivings relate to procrastination within the health domain.

Although research considering perfectionism dimensions in terms of their self-regulation strengths and weaknesses is somewhat limited, our findings indicate that this is a fruitful area of inquiry that deserves further attention. For example, investigating how and when perfectionistic concerns may create vulnerabilities for poor self-regulation, and the extent to which these can be explained by self-regulation processes shared with trait procrastination, could provide important insights for addressing the behavioural issues that arise from the expectancy-assessment process. Interventions aimed at increasing mindfulness and self-compassion may be particularly beneficial for improving self-regulation via reducing negative self-evaluations in individuals who have high levels of both trait procrastination and perfectionistic concerns, given that both traits are associated with low levels of these two

qualities (Sirois & Pascual-Leone, 2013; Sirois & Tosti, 2012; Wimberley, Mintz, & Suh, 2016). Evidence also indicates that chronic procrastinators tend to use less adaptive coping strategies (Sirois & Kitner, 2015), and individuals high in perfectionistic concerns appear to benefit from using positive reframing coping following personal goal failure (Stoeber & Janssen, 2011). Interventions aimed at modifying coping strategies and improving coping efficacy could facilitate favorable expectancy assessments during discrepancy reduction and thereby increase self-regulation capacity among chronic procrastinators and those high in perfectionistic concerns.

Limitations

Several limitations and strengths should be considered when interpreting the findings of the current study. The research included in the current meta-analysis viewed perfectionism as a broad, multidimensional personality trait. However, there are other views of perfectionism that focus on cognitive tendencies and social dynamics. For example, perfectionism can also be viewed as the frequency with which automatic perfectionistic thoughts are experienced (e.g., Perfectionistic Cognitions Inventory (PCI); Flett, Hewitt, Blankstein & Gray, 1998), and as a self-presentation style characterized by defensive self-concealment (e.g., Perfectionistic Self-Presentation Scale (PSPS); Hewitt et al., 2003). Similarly, researchers have proposed cognitive construals of procrastination, such as procrastinatory cognitions, which reflect automatic negative thoughts related to procrastination that are important for understanding the cognitive-behavioral aspects of procrastination (Flett, Stainton, Hewitt, Sherry, & Lay, 2012; Stainton, Lay, & Flett, 2000). Research examining how alternative conceptualizations of perfectionism and procrastination relate is scarce, suggesting that further research is needed to understand whether the current findings extend to a broader spectrum of perfectionism and procrastination constructs.

The reduced number of studies for the moderator analyses of the semi-partial

correlations meant that only two of the three subgroups of perfectionistic concerns measures could be compared. However, given that the effects for the FMPS were the lowest for the subgroup analysis of the raw correlations (r = .140), it is unlikely that the results would change significantly had there been enough studies to run a subgroup analysis for the semi-partial correlations. Despite the threshold of 3 studies for conducting subgroup analyses, several of the moderator analyses included small subgroups of 3 or 5 studies. Given this, the lack of significant effects for the moderators tested in these analyses should be interpreted with caution.

Although the current meta-analysis accounted for the contributions of other perfectionism dimensions when assessing the procrastination-perfectionism relationship, it is also possible that other traits may explain some of the shared variance. As previously noted, the differential associations of procrastination to multi-dimensional perfectionism may also be due to underlying levels of self-efficacy and impulsivity, traits that may moderate the expectancy-assessment process during self-self-regulation (Carver & Scheier, 1982). Currently, however, self-efficacy and impulsivity are rarely included in research examining the procrastination-perfectionism relationship, and so it was not possible to formally test the contribution of these traits.

The findings should also be considered in light of the large number of unpublished studies and data sets included in the meta-analysis. Although this is somewhat unusual, it is reasonable considering that we contacted researchers via the two largest networks of perfectionism and procrastination researchers, and had contacted several of these researchers in person about the meta-analysis at a recent international procrastination research conference. Moreover, the authors of this meta-analysis have been actively engaged in research involving both procrastination and perfectionism for several years. Despite the fact that several researchers did answer our call for studies for the current meta-analysis, it is

likely that many did not, raising the possibility that there may be a number of unfound studies that were not included. Indeed, the large number of unpublished works that were garnered through the literature search and announcements to researchers suggests that these are only a subset of a larger population of unpublished studies on procrastination and perfectionism. From this perspective, conducting tests of publication bias were important and relevant, as they helped determine the extent to which the unfound studies, if included, would alter the significance of the effects found (Card, 2012). That there was no evidence of publication bias across any of the meta-analyses lends confidence to our findings, and indicates that the significance of the procrastination-perfectionism associations found were robust to the absence of other studies not retrieved.

The inclusion of a number of unpublished studies also raises potential concerns about other biases in study selection (Ferguson & Brannick, 2012). For example, the inclusion of unpublished studies in a meta-analysis suggests that the research has not been peer-reviewed and may therefore be of lesser quality than the published studies (Ferguson & Brannick, 2012). However, of the 16 unpublished data sets included in the current meta-analysis, 7 were data from studies that had been peer reviewed and published, but did not report the associations between perfectionism and procrastination. Only 9 had not been previously subjected to peer review, and of these, 7 were in preparation for submission for peer-review. Importantly, all of the data from the unpublished studies was collected from cross-sectional studies or taken from the cross-sectional, pre-experimental baseline component of a study, and used well-validated and accepted measures of the key constructs.

The fact that many of the unpublished studies were from the authors' own research labs introduces another potential source of selection bias into the meta-analysis. The overrepresentation of the authors' own studies in the unpublished studies retrieved is not an uncommon issue in meta-analysis (see Ferguson & Brannick, 2012). However, it is a concern

that has led some to suggest that searching for unpublished studies "may increase rather than decrease some sources of bias" (Ferguson & Brannick, 2012). Other researchers have rebutted this assertion, and argued that unpublished studies should be assessed on the merit of their quality rather than their source (Rothstein & Bushman, 2012). In the context of this controversy, the fact the remains that the authors are among a very small group of researchers who actively and regularly research on both procrastination and perfectionism, and therefore it would be expected that a larger number of unpublished data sets would be obtained from their labs. From this perspective, *not* including these studies in the meta-analysis would introduce another type of selection bias, as well as reduce the number of studies included and therefore threaten the viability of several of the moderator analyses that were conducted. The supplementary moderator analysis helped address this issue, and confirmed that, for the most part, the results obtained from the authors' labs were highly similar to those obtained from other labs. Accordingly, we argue that trading one selection bias for another may be necessary and desirable to more fully answer the issue of how procrastination and perfectionism are related.

Conclusions

The current meta-analysis confirms that trait procrastination is differentially associated with higher order perfectionism dimensions, such that there is a small sized positive association with perfectionistic concerns, and a small sized negative association with perfectionistic strivings. When viewed from the perspective of Control theory (Carver & Scheier, 1982), these findings indicate that trait procrastination and perfectionistic concerns may be characterized by similar negative self-evaluation tendencies that interfere with effective self-regulation and goal achievement, whereas perfectionistic strivings may have some benefits for timely goal achievement. Accordingly, we propose that future research consider taking a self-regulation perspective to extend current conceptual understandings of

perfectionism, and more fully examine the distinctions in self-regulation capabilities proposed to underscore the differences between perfectionistic concerns and perfectionistic strivings. Such research would also provide insights into the processes and implications of the procrastination-perfectionism association, and increase understanding of the ways to address the toll of both procrastination and perfectionistic concerns for relevant domains, such as academic achievement, health, and well-being.

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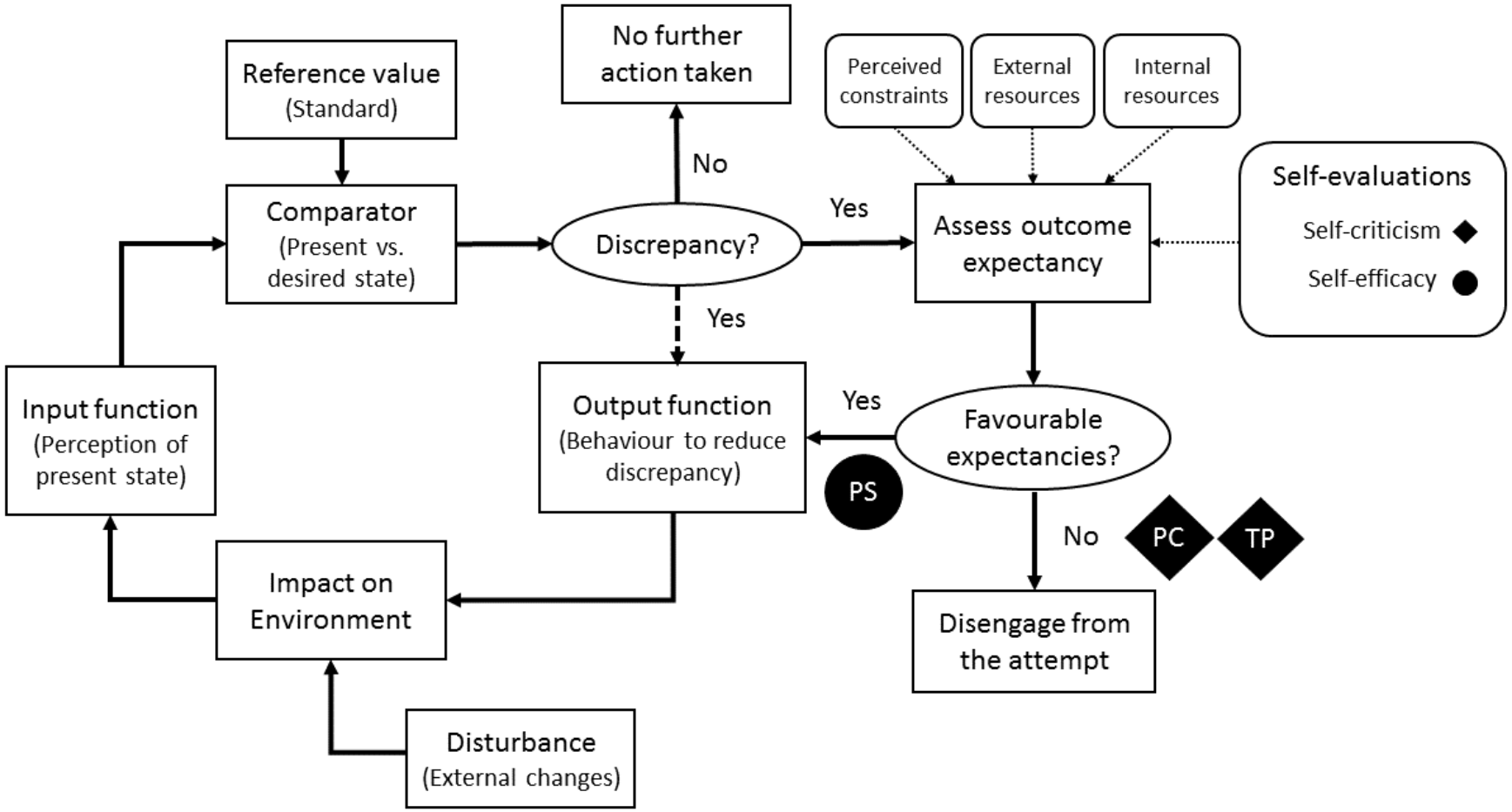

Reference value
(Standard)
No further
action taken
Perceived
constraints
External
resources
Internal
resources
No
Comparator
(Present vs.
desired state)
Discrepancy?
Yes
Assess outcome
expectancy
Self-evaluations
Self-criticism
Self-efficacy
Yes
Input function
(Perception of
present state)
Output function
(Behaviour to reduce
discrepancy)
Yes
Favourable
expectancies?
PS
No
PC
TP
Impact on
Environment
Disengage from
the attempt
Disturbance
(External changes)

Figure 1. Expanded cybernetic model of control (Carver & Scheier, 1998) outlining the convergent and divergent associations of trait procrastination (TP) with perfectionistic concerns (PC) and perfectionistic strivings (PS) in the self-regulation process. The self-evaluations that contribute to the assessment of expectancy outcomes, and subsequent goal-directed behaviour or goal disengagement are shown in relation to the traits. For the sake of clarity, only the negative feedback loop related to achieving approach-oriented goals is portrayed.

Table 1.

Summary of the associations of trait procrastination and higher order perfectionism dimensions with variables linked to self-regulation and self-regulation failure. References are illustrative, not exhaustive.

Self-regulation variables		Trait procrastination		Perfectionistic concerns		Perfectionistic strivings
Cybernetic traits						
Neuroticism	(+)	(**Van Eerde, 2003)	(+)	(R. W. Hill et al., 1997)	(-)	(R. W. Hill et al., 1997)
Conscientiousness	(-)	(**Van Eerde, 2003)	(-)	(Andrews et al., 2014; R. W. Hill et al., 1997; Molnar et al., 2012; Stoeber, 2013).	(+)	(Andrews et al., 2014; R. W. Hill et al., 1997; Molnar et al., 2012; Stoeber, 2013).
Behavioural control						
Avoidant coping	(+)	(**Sirois & Kitner, 2015)	(+)	(Dunkley et al., 2014; Weiner & Carton, 2012)	(-)	(Dunkley et al., 2014)
Goal disengagement	(+)	(**Sirois & Kitner, 2015)	(+)	(Stoeber & Corr, 2015)	(-)	(Eddington, 2013; Stoeber & Corr, 2015)
Impulsiveness	(+)	(Gustavson et al., 2014)	(+)	(Boone et al., 2014; Stoeber & Corr, 2015)	ns	(Boone et al., 2014)
Cognitive-affective control						
Fear of failure	(+)	(Haghbin et al., 2012)	(+)	(Elison & Partridge, 2012; Kaye et al., 2008; Sagar & Stoeber, 2009)	(-)/ns	(Conroy et al., 2007; Flett et al., 1992; Sagar & Stoeber, 2009)

Rumination	(+)	(Stainton et al., 2000)	(+)	(Flett, Nepon, et al., 2016; Sirois et al., 2010)	(-)/ns	(Flett, Nepon, et al., 2016; Sirois et al., 2010)
Self-blame	(+)	(Sirois, 2015a; Sirois & Stout, 2011)	(+)	(Sirois & Molnar, 2014; Stoeber & Janssen, 2011)	(-)	(Sirois & Molnar, 2014; Stoeber & Janssen, 2011)
Self-criticism	(+)	(Flett et al., 1995; McCown et al., 2012)	(+)	(Grzegorek et al., 2004; Sherry et al., 2016)	(+)/ns	(Grzegorek et al., 2004; Powers et al., 2011)
Effective self-regulation						
Self-compassion	(-)	(Sirois, 2014)	(-)	(Neff, 2003a; **Sirois & Pascual-Leone, 2013)	(+)	(Neff, 2003a; **Sirois & Pascual-Leone, 2013)
Mindfulness	(-)	(Sirois & Tosti, 2012)	(-)	(Wimberley et al., 2016)	(+)/ns	(Wimberley et al., 2016)
Health behaviours	(-)	(*Sirois, 2016b)	(-)	(Chang et al., 2008; Sirois, 2015b)	(+)/ns	(Chang et al., 2008; Sirois, 2015b; Williams & Cropley, 2014)

*Review paper; **Meta-analysis

Table 2.

Meta-Analyzed Effect Sizes Between Trait Procrastination (TP), Perfectionistic Concerns (PC), and Perfectionistic Strivings (PS) Across 44 Studies (Total N = 10,554).

Study	N	Sample	Procrast. measure	Perfect. measure	PC-PS *r*	PC-TP *r*	PC-TP *sr*	PS-TP *r*	PS-TP *sr*
1. Beadman (2014) [a]	88	Community	GPS	MPS-HF	.427	-.087	.231	-.673	-.632
2. Blackler (2011) [a]	167	Student	GPS	Index	.48	-.030	.172	-.370	-.353
3. Burns et al. (2000)	157	Student	TPS	PNPS	.090	.260	.259	.010	-.014
4. Campbell (2015) [a]	123	Community	GPS	APSR	.307	.347	.381	-.106	-.218
5. Canter (2008) [a]	155	Student	API	APSR	-.158	.305	.250	-.342	-.293
6. Dewa, Sirois, & Mask (n.d.) [b]	84	Student	GPS	MPS-HF	.327	.184	.250	-.191	-.255
7. Eren (2010) [a, c]	189	Student	GPS	APSR	.049	.349	.362	-.267	-.284
8. Essau et al. (2008) [a]	480	Student	GPS	FMPS	---	.061	---	-.393	---
9. Fee & Tagney (2000)	86	Student	Index	MPS-HF	---	.140	---	.010	---
10. Flett et al. (1992)	131	Student	GPS	Index	---	.285	---	-.020	---
11. Grunshel et al. (2013)	554	Student	TPS	FMPS	---	---	---	-.290	---
12. Harrison (2014) [a]	84	Student	API	APSR	---	.190	---	-.420	---
13. Kilbert et al (2005)	475	Student	TPS	MPS-HF	.440	.050	.187	-.280	-.305
14. Kljajic et al. (n.d.) [b]	470	Student	IPS	Index	.490	.140	.236	-.170	-.245

15. Kljajic & Gaudreau (n.d.) [b]	218	Student	IPS	MPS-HF	.470	.200	.245	-.080	-.187
16. Martin et al. (1996)	179	Student	GPS	MPS-HF	.490	.210	.294	-.150	-.268
17. McCabe-Bennett (2014) [b]	116	Student	TPS	Index	---	.207	---	-.146	---
18. Montgomery (2013) [b]	273	Student	TPS	APSR	.050	.370	.377	-.140	-.159
19. Mushsquash & Sherry (2012)	317	Student	TPS	Index	.289	.275	.260	-.035	-.047
20. Ozer et al. (2014)	402	Student	GPS	APSR	.200	.200	.253	-.260	-.301
21. Pierro et al. (2011)	121	Student	TPS	FMPS	.375	.145	.214	-.170	-.229
22. Rice et al. (2011)	37	Community	GPS	APSR	---	.080	---	----	---
23. Saddler & Sacks (1993)	150	Student	API	MPS-HF	.465	.227	.199	.053	-.066
24. Sherry et al. (2016)	524	Students	TPS	Index	---	.258	---	---	---
25. Simpson (2004) [a,c]	208	Student	GPS	APSR	.029	.193	.201	-.274	-.280
26. Sirois (n.d.-a) [b]	162	Student	GPS	MPS-HF	.513	-.008	.118	-.210	-.205
27. Sirois (n.d.-b) [c]	979	Community	GPS	APSR	.028	.414	.422	-.275	-.287
28. Sirois (n.d.-c) [b]	704	Community	GPS-9	APSR	.212	.303	.343	-.183	-.249
29. Sirois (n.d.-d) [b]	140	Community	GPS-9	APSR	.019	.381	.388	-.379	-.386
30. Sirois (n.d.-e) [b]	81	Chronic illness	GPS-9	APSR	.433	.456	.434	.045	-.174
31. Sirois (n.d.-f) [b]	138	Chronic illness	GPS-9	APSR	.299	.411	.415	-.012	-.141
32. Sirois (n.d.-g) [c]	195	Community	GPS	MPS-HF	.355	.291	.356	-.172	.283

33. Sirois (n.d.-h) [c]	313	Student	GPS	MPS-HF	.506	.064	.224	-.272	-.310
34. Sirois (n.d.-i) [c]	145	Student	GPS	APSR	-.142	.453	.391	-.432	-.367
35. Sirois & Hirsch (n.d.) [b]	407	Student	GPS-9	APSR	.119	.408	.416	-.067	-.116
36. Soya & Weis (2014)	206	Student	TPS	FMPS	---	.170	---	---	---
37. Stoeber (1998)	184	Student	TPS	FMPS	---	.232	---	-.248	---
38. Stojiljkovic (n.d.) [b]	150	Student	GPS	FMPS	.119	.173	.198	-.211	-.232
39. Sudler (2013) [a]	150	Student	GPS	MPS-HF	---	.250	---	---	---
40. Tosti (2010) [a,c]	338	Student	GPS	APSR	.098	.290	.320	-.303	-.332
41. Towers (2000) [a]	213	Student	API	MPS-HF	.330	.080	.181	-.290	-.318
42. Trezza, Study 1 (n.d.) [a]	79	Student	TPS	PNPS	.220	.190	.262	-.320	-.363
43. Trezza, Study 2 (n.d.) [a]	89	Student	TPS	PNPS	.310	.020	.088	-.210	-.217
44. Walsh & Ugumba-Agwunobi (2002)	93	Student	API	MPS-HF	---	.400	---	---	---
Meta-analysis results				Average *r (k)*		.231 (43)	.256 (32)	-.218 (38)	-.235 (32)
				95 % CI		[.19, .27]	[.21, .30]	[-.26, -.18]	[-.29, -.22]
				N		10,000	7,909	9,554	7,909

Note: [a] = Theses/dissertations; [b] = unpublished conference papers and data sets; [c] = data from previously published studies that did not report the procrastination-perfectionism association; GPS = General Procrastination Scale (Lay, 1986); GPS-9 = 9-item short form version of the GPS; API = Aitken

Procrastination Inventory (Aitken, 1982); TPS = Tuckman Procrastination Scale (Tuckman, 1991); IPS = Irrational Procrastination Scale (Steel, 2010a); MPS-HF = Hewitt-Flett Multidimensional perfectionism scale (P. L. Hewitt & Flett, 1991); APSR = the Almost Perfect scale, revised (Slaney et al., 2001); FMPS = Frost Multidimensional Perfectionism Scale (Frost et al., 1990); PNPS = Positive and Negative Perfectionism Scale (Terry-Short et al., 1995); INDEX = measure of procrastination or perfectionism reported by the authors using more than one scale.

Table 3.

Subgroup Analyses of the Associations of Trait Procrastination with Perfectionistic Concerns (PC)

	PC						Semi-partial PC					
Moderator	*k*	*n*	*r*	95% CI	Q_{model}	I^2	*k*	*n*	*sr*	95% CI	Q_{model}	I^2
Perfectionism scale	36	8,737	.243	[.21, .28]	28.40**	80.49	26	7,146	.314	[.28, .35]	16.41**	78.45
MPS-HF	16	3,193	.172	[.10, .24]			14	2,864	.187	[.11, .26]		
APSR	15	4,403	.333	[.29, .38]			12	4,282	.354	[.32, .39]		
FMPS	5	1,141	.140	[.07, .21]			---	---	---	---		
Procrastination scale	40	9,226	.235	[.19, .28]	0.28	79.52	30	7,221	.243	[.17, .27]	1.19	81.57
GPS	24	5,990	.245	[.18, .31]			20	5,192	.268	[.20, .34]		
TPS	11	2,541	.218	[.14, .30]			7	1,511	.246	[.18, .31]		
API	5	695	.235	[.12, .34]			3	518	.207	[.12, .29]		
Sample	43	10,000	.233	[.19, .27]	4.53*	78.80	32	7,909	.252	[.21, .30]	3.26	80.53
Community	9	2,485	.314	[.23, .39]			8	2,448	.235	[.24, .42]		
Student	34	7,515	.212	[.17, .26]			24	5,461	.231	[.18, .28]		
Publication status	43	10,000	.229	[.19, .27]	0.07	78.80	32	7,909	.243	[.21, .28]	0.43	80.53
Published	14	3,062	.224	[.17, .28]			7	1,801	.235	[.19, .28]		
Unpublished	29	6,938	.235	[.18, .29]			25	6,108	.260	[.20, .32]		

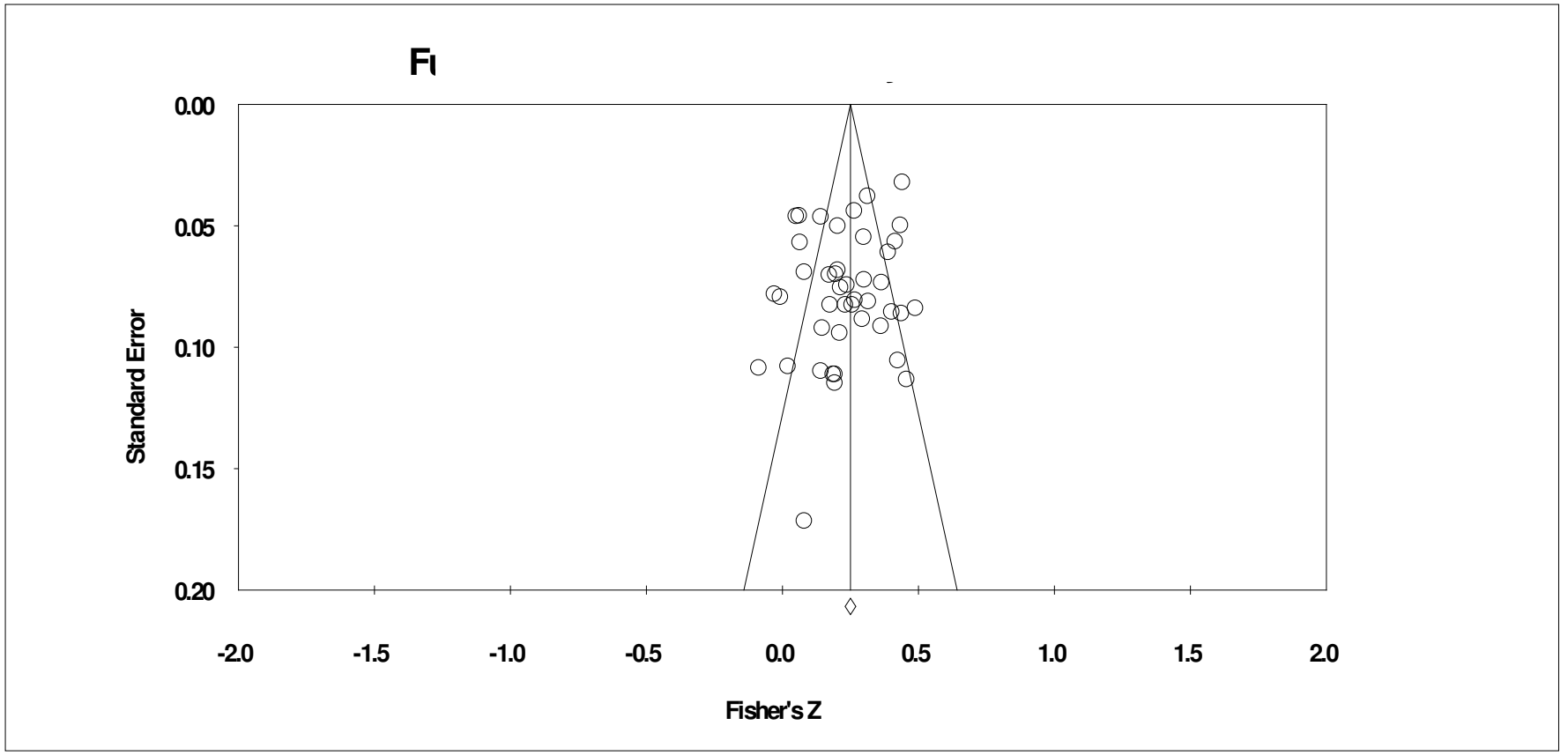
* $p < .05$; ** $p < .01$; GPS = General Procrastination Scale (Lay, 1986); API = Aitken Procrastination Inventory (Aitken, 1982); TPS = Tuckman Procrastination Scale (Tuckman, 1991); MPS-HF = Hewitt-Flett Multidimensional Perfectionism Scale (Hewitt & Flett, 1991); APSR = the Almost Perfect Scale, Revised (Slaney, Rice, Mobley, Trippi, & Ashby, 2001); FMPS = Frost Multidimensional Perfectionism Scale (Frost et al., 1990).

Table 3.

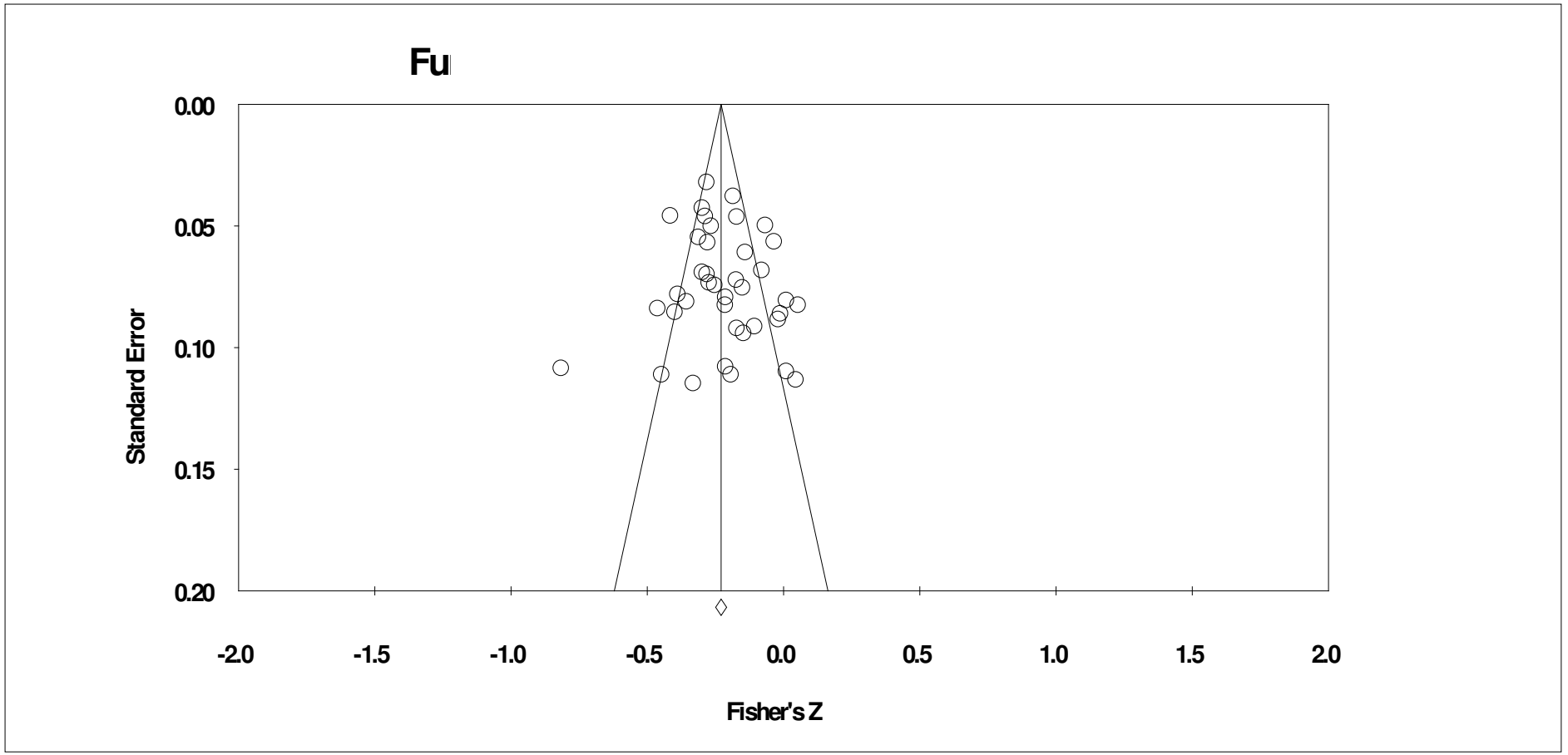
Subgroup Analyses of the Associations of Trait Procrastination (TP) with Perfectionistic Strivings (PS)

	PS						Semi-partial PS					
Moderator	*k*	*n*	*r*	95% CI	Q_{model}	I^2	*k*	*n*	*sr*	95% CI	Q_{model}	I^2
Perfectionism scale	33	8,737	-.236	[-.28, -.20]	2.22	77.35	26	7,146	-.258	[-.29, -.22]	0.00	63.86
MPS-HF	13	3,193	-.195	[-.28, -.11]			12	2,864	-.259	[-.33, -.19]		
APSR	15	4,366	-.232	[-.29, -.17]			14	4,282	-.258	[-.30, -.22]		
FMPS	5	1,178	-.282	[-.36, -.20]			---	---	---	---		
Procrastination scale	37	9,226	-.223	[-.27, -.18]	1.69	76.65	30	7,221	-.265	[-.30, -.23]	3.34	64.07
GPS	22	5,990	-.244	[-.30, -.19]			20	5,192	-.282	[-.32, -.24]		
TPS	10	2,541	-.185	[-.26, -.11]			7	1,511	-.186	[-.28, -.08]		
API	5	695	-.252	[-.43, -.05]			3	518	-.232	[-.38, -.08]		
Sample	39	9,544	-.217	[-.26, -.18]	0.09	76.49	32	7,909	-.251	[-.29, -.22]	1.52	62.12
Community	8	2,448	-.233	[-.35, -.11]			8	2,448	-.296	[-.37, -.22]		
Student	31	7,096	-.214	[-.26, -.17]			24	5,461	-.240	[-.28, -.20]		
Publication status	39	9,544	-.219	[-.26, -.18]	5.19*	76.49	32	7,909	-.261	[-.29, -.23]	2.71	62.12
Published	11	2,756	-.140	[-.22, -.06]			7	1,801	-.183	[-.28, -.03]		
Unpublished	28	6,788	-.248	[-.30, -.20]			25	6,108	-.271	[-.31, -.24]		

* $p < .05$; ** $p < .01$; GPS = General Procrastination Scale (Lay, 1986); API = Aitken Procrastination Inventory (Aitken, 1982); TPS = Tuckman Procrastination Scale (Tuckman, 1991); MPS-HF = Hewitt-Flett Multidimensional Perfectionism Scale (Hewitt & Flett, 1991); APSR = the Almost Perfect Scale, Revised (Slaney, Rice, Mobley, Trippi, & Ashby, 2001); FMPS = Frost Multidimensional Perfectionism Scale (Frost et al., 1990).



Supplemental Figure 1: Funnel plot of the effects of trait procrastination and perfectionistic concerns.



Supplemental Figure 2: Funnel plot of the effects of trait procrastination and perfectionistic strivings.

Supplemental Table 1.

Subgroup Analyses of the Associations of Trait Procrastination (TP) with Perfectionistic Concerns (PC), as a Function of Lab Origin.

	k	*n*	*r*	95% CI	Q_{model}	I^2	*k*	*n*	*sr*	95% CI	Q_{model}	I^2
			PC						Semi-partial PC			
Overall	43	10,000	.221	[.18, .26]	4.39*	78.80	32	7,909	.243	[.20, .29]	3.24	80.53
Studies from authors' lab	16	4,294	.314	[.29, .34]			16	4,294	.298	[.22, .37]		
Other studies	27	5,706	.192	[.17, .22]			16	3,615	.215	[.16, .27]		
			PS						Semi-partial PS			
Overall	39	9,544	-.217	[-.26, -.27]	0.90	76.49	32	7,909	-.253	[-.29, -.22]	2.25	62.12
Studies from authors' lab	16	4,294	-.242	[-.31, -.17]			16	4,294	-.280	[-.33, -.23]		
Other studies	23	5,250	-.200	[-.25, -.15]			16	3,615	-.226	[-.28, -.17]		

* $p < .05$.

Supplemental Table 2.

Subgroup Analyses of the Associations of Trait Procrastination with Perfectionistic Concerns (PC), Excluding Studies That Used the PNPS.

	PC						Semi-partial PC					
Moderator	*k*	*n*	*r*	95% CI	Q_{model}	I^2	*k*	*n*	*sr*	95% CI	Q_{model}	I^2
Overall	40	9,675	.236	[.19, .28]	193.18**	79.81	29	7,584	.260	[.21, .31]	155.46**	81.99
Procrastination scale	37	8,901	.240	[.19, .29]	0.06	80.56	27	6,896	.247	[.20, .29]	1.32	83.06
GPS	24	5,990	.245	[.18, .31]			20	5,192	.268	[.23, .29]		
TPS	8	2,216	.233	[.14, .32]			4	1,186	.261	[.17, .35]		
API	5	695	.235	[.12, .34]			3	518	.207	[.12, .29]		
Sample	40	9,675	.238	[.20, .28]	4.14*	79.81	29	7,584	.257	[.21, .30]	3.00	81.99
Community	9	2,485	.314	[.23, .39]			8	2,448	.333	[.24, .42]		
Student	31	7,190	.215	[.17, .26]			21	5,136	.234	[.18, .29]		
Publication status	40	9,675	.232	[.19, .27]	0.25	79.81	29	7,584	.243	[.21, .28]	0.69	81.99
Published	13	2,905	.221	[.16, .28]			6	1,644	.232	[.19, .28]		
Unpublished	27	6,770	.242	[.18, .30]			23	5,940	.266	[.20, .33]		

* $p < .05$; ** $p < .01$; GPS = General Procrastination scale (Lay, 1986); API = Aitken Procrastination Inventory (Aitken, 1982); TPS = Tuckman Procrastination Scale (Tuckman, 1991).

Supplemental Table 3.

Subgroup Analyses of the Associations of Trait Procrastination with Perfectionistic Strivings (PS), Excluding Studies That Used the PNPS.

	PS						Semi-partial PS					
Moderator	*k*	*n*	*r*	95% CI	Q_{model}	I^2	*k*	*n*	*sr*	95% CI	Q_{model}	I^2
Overall	36	9,219	-.221	[-.26, -.18]	151.92**	76.96	29	7,584	-.258	[-.29, -.22]	71.24**	60.70
Procrastination scale	33	8,445	-.228	[-.27, -.18]	1.08	77.07	27	6,896	-.269	[-.31, -.23]	2.33	62.83
GPS	22	5,803	-.244	[-.30, -.19]			20	5,192	-.282	[-32, -.24]		
TPS	7	2,040	-.194	[-.27, -.11]			4	1,186	-.186	[-.31, -.06]		
API	4	602	-.252	[-.43, -.05]			3	518	-.232	[-.38, -.08]		
Sample	36	9,219	-.221	[-.26, -.18]	0.05	76.96	29	7,584	-.255	[-.29, -.22]	1.22	60.70
Community	8	2,448	-.233	[-.35, -.11]			8	2,448	-.296	[-.37, -.22]		
Student	28	6,771	-.219	[-.26, -.17]			21	5,136	-.246	[-.29, -.21]		
Publication status	36	9,219	-.221	[-.26, -.18]	3.68	76.96	29	7,584	-.263	[-.30, -.23]	1.33	60.70
Published	10	2,599	-.155	[-.24, -.07]			6	1,644	-.209	[-.31, -.11]		
Unpublished	26	6,620	-.248	[-.30, -.20]			23	5,940	-.271	[-.31, -.21]		

* $p < .05$; ** $p < .01$; GPS = General Procrastination scale (Lay, 1986); API = Aitken Procrastination Inventory (Aitken, 1982); TPS = Tuckman Procrastination Scale (Tuckman, 1991).

Supplemental Table 4.

Meta-Regression of Participant Sex on the Associations of Trait Procrastination with Perfectionistic Concerns (PC) and Perfectionistic Strivings (PS), Excluding Studies That Used the PNPS.

Effect	*b*	95% CI	Q_{model}	*df*	*p*	$Q_{residual}$	*df*	*p*
TP - PC	.19	[-.12, .50]	1.40	1	0.24	33.10	38	0.70
TP – PC *sr*	.30	[-.04, .65]	2.99	1	0.08	29.55	27	0.33
TP - PS	.15	[-.15, .44]	0.97	1	0.32	45.08	34	0.10
TP – PS *sr*	.10	[-.13, .34]	0.70	1	0.40	31.83	27	0.24

Supplemental Table 5.

Subgroup Analyses of the Associations of Trait Procrastination (TP) with Perfectionistic Concerns (PC), Excluding Studies That Used the FMPS the Parental Criticisms, Parental Concerns, and Doubts About Actions Subscales.

	PC						Semi-partial PC					
Moderator	*k*	*n*	*r*	95% CI	Q_{model}	I^2	*k*	*n*	*sr*	95% CI	Q_{model}	I^2
Overall	40	9,511	.237	[.19, .28]	198.27**	80.33	32	7,926	.273	[.23, .32]	124.31**	75.06
Perfectionism scale	35	8,531	.268	[.23, .31]	19.80**	80.49	29	7,601	.310	[.28, .34]	16.94**	76.64
MPS-HF	15	3,193	.172	[.10, .24]			12	2,864	.187	[.11, .26]		
APSR	16	4,403	.333	[.29, .38]			14	4,282	.354	[.32, .39]		
FMPS	4	935	.122	[-.02, .26]			3	455	.269	[.15, .38]		
Procrastination scale	37	8737	.241	[.19, .29]	0.43	81.06	30	7,238	.260	[.22, .30]	2.51	76.15
GPS	23	5,823	.254	[.19, .32]			19	5,025	.291	[.23, .35]		
TPS	9	2,219	.216	[.12, .31]			8	1,695	.262	[.20, .33]		
API	5	695	.235	[.12, .34]			3	518	.207	[.12, .29]		
Sample	40	9,511	.240	[.20, .28]	3.97*	80.33	32	7,926	.266	[.23, .30]	2.12	75.06
Community	9	2,485	.314	[.23, .39]			8	2,448	.333	[.24, .42]		
Student	31	7,026	.216	[.17, .26]			24	5,478	.254	[.21, .30]		
Publication status	40	9,511	.234	[.19, .28]	0.19	80.33	32	7,926	.259	[.23, .29]	0.76	75.06
Published	13	2,856	.223	[.16, .29]			8	1,985	.248	[.21, .29]		

Unpublished	27	6,655	.243	[.18, .30]		24	5,941	.278	[.22, .33]

* $p < .05$; ** $p < .01$; GPS = General Procrastination scale (Lay, 1986); API = Aitken Procrastination Inventory (Aitken, 1982); TPS = Tuckman Procrastination Scale (Tuckman, 1991); MPS-HF = Hewitt-Flett Multidimensional perfectionism scale (Hewitt & Flett, 1991); APSR = the Almost Perfect scale, revised (Slaney, Rice, Mobley, Trippi, & Ashby, 2001); FMPS = Frost Multidimensional Perfectionism Scale (Frost, Marten, Lahart, & Rosenblate, 1990).

Supplemental Table 6.

Subgroup Analyses of the Semi-Partial Associations of Trait with Perfectionistic Strivings (PS), Including Only Studies in Which PC as Assessed by the FMPS Used the Concern Over Mistakes Subscale.

	Semi-partial PS					
Moderator	*k*	*n*	*r*	95% CI	Q_{model}	I^2
Overall	32	7,926	-.250	[-.29, -.21]	80.97**	61.72
Perfectionism scale	29	7,601	-.255	[-.29, -.22]	0.18	63.31
MPS-HF	12	2,864	-.259	[-.33, -.19]		
APSR	14	4,282	-.258	[-.30, -.22]		
FMPS	3	455	-.238	[-.32, -.15]		
Procrastination scale	30	7,238	-.260	[-.30, -.23]	2.40	63.73
GPS	19	5,025	-.277	[-.32, -.24]		
TPS	8	1,695	-.194	[-.28, -.10]		
API	3	518	-.232	[-.38, -.08]		
Sample	32	7,926	-.247	[-.28, -.21]	1.77	61.72
Community	8	2,448	-.296	[-.37, -.22]		
Student	24	5,478	-.235	[-.27, -.20]		
Publication status	32	7,926	-.256	[-.29, -.22]	2.39	61.72
Published	8	1,985	-.192	[-.28, -.10]		
Unpublished	24	5,941	-.268	[-.30, -.23]		

* $p < .05$; ** $p < .01$; GPS = General Procrastination scale (Lay, 1986); API = Aitken Procrastination Inventory (Aitken, 1982); TPS = Tuckman Procrastination Scale (Tuckman, 1991); MPS-HF = Hewitt-Flett Multidimensional perfectionism scale (Hewitt & Flett, 1991); APSR = the Almost Perfect scale, revised (Slaney, Rice, Mobley, Trippi, & Ashby, 2001); FMPS = Frost Multidimensional Perfectionism Scale (Frost, Marten, Lahart, & Rosenblate, 1990).

Supplemental Table 7.

Meta-Regression of Participant Sex on the Associations of Trait Procrastination with Perfectionistic Concerns (PC) and Perfectionistic Strivings (PS), Including Only Studies in Which PC as Assessed by the FMPS Used the Concern Over Mistakes Subscale.

Effect	*b*	95% CI	Q_{model}	*df*	*p*	$Q_{residual}$	*df*	*p*
TP - PC	.05	[-.34, .44]	0.06	1	0.80	36.31	38	0.80
TP – PC *sr*	-.05	[-.42, .32]	0.06	1	0.80	36.79	30	0.18
TP – PS *sr*	-.02	[-.34, .30]	0.01	1	0.90	34.85	30	0.25

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