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Abstract

A growing literature on how perfectionism relates to self-reported physical health has rarely considered the role of negative affect or contextual factors. We addressed this by examining how Perfectionistic Concerns (PC) and Perfectionistic Strivings (PS) were associated with self-rated health across thirteen samples (total *N* = 4,991) before and after controlling for negative affect, and meta-analysed the effects. PC was associated with poor self-rated health, whereas PS was associated with good self-rated health. The associations were attenuated after adjusting for negative affect, but remained on average significant. The effects for PC were moderated by sample type, perfectionism measure, and sex. Findings suggest that the associations of perfectionism with subjective health are not solely due to biases associated with negative affect.

Keywords: Perfectionism; self-rated health; negative affect;

Introduction

Commonly conceptualized as consisting of two super-ordinate dimensions (Stoeber & Otto, 2006), perfectionism is a personality trait that has received much attention from health researchers in recent years. This growing body of research has brought to the forefront an ongoing debate regarding when and how perfectionism may or may not be healthy. Characterized by extreme self-scrutiny, excessive concerns with mistakes and the perception that others demand perfection, Perfectionistic Concerns (PC) is generally considered to reflect the unhealthier aspects of perfectionism in part because of its associations with higher levels of negative affect (Molnar, Reker, Culp, Sadava, & DeCourville, 2006). In contrast, Perfectionistic Strivings (PS) is comprised of setting and compulsively striving to reach excessively high standards, and has mixed associations with negative affect (Flett, Blankstein, & Hewitt, 2009; Molnar et al., 2006), and health outcomes (Fry & Debats, 2009; Molnar, Sadava, Flett, & Colautti, 2012).

Both PC and PS have been examined in relation to a range of outcomes related to physical health including stress (e.g., Dunkley, Mandel, & Ma, 2014; Molnar et al., 2012), health behaviours (e.g., Sirois, 2016; Williams & Cropley, 2014), and physical symptoms (e.g., Flett, Panico, & Hewitt, 2011; Molnar et al., 2006). Yet research directed at understanding the reasons for these linkages, or the lack thereof, is scant (Molnar, Sirois, Flett, Janssen, & Hewitt, In press), and has often not considered the role of factors well-known to bias the reporting of physical health outcomes, such as negative affect (Watson & Pennebaker, 1989). Moreover, researchers have largely ignored associations with self-rated health, an important and robust predictor of a wide-range of consequential physical health outcomes (Jylhä, 2009) with reliable associations to broader personality traits (Löckenhoff, Sutin, Ferrucci, & Costa Jr, 2008; Löckenhoff, Terracciano, Ferrucci, & Costa, 2012).

The aim of the current research is to address this gap in the literature by examining how PC and PS are associated with self-rated health across multiple and diverse samples, and by testing the contribution of negative affect in these linkages.

Personality and Self-Rated Health

Described as “a summary statement about the way in which numerous aspects of health, both subjective and objective, are combined within the perceptual framework of the individual respondent” (Tissue, 1972, p. 92), self-rated health is a widely used and robust predictor of important health outcomes that theory indicates is necessarily influenced by personality. For example, self-rated health reliably predicts objective health outcomes in the form of health behaviours, cortisol responses to stress, morbidity, and mortality (Jylhä, 2009; Kristenson, Olsson, & Kucinskiene, 2005; Mora, Orsak, DiBonaventura, & Leventhal, 2013; Tamayo-Fonseca et al., 2013). Current theory posits that, unlike other measures of health, self-rated health arises from an active cognitive process of self-assessment and reflection that is necessarily evaluated within the context of the individual’s socio-cultural and individual differences (Jylhä, 2009). According to this Cognitive Process Model of self-rated health (Jylhä, 2009), the evaluation of health status is a multi-stage process that first involves a consideration of the relevant cultural and personal-historical information that can determine one’s health including any existing medical diagnoses and functional status, symptoms experienced, genetic risk factors, and biological sex. This initial conceptualization of health is then evaluated and summarized within the context of individual differences in positive and negative dispositions, depression, health experiences, and expectations. Factors such as current age, previous health status, and perceptions of one’s health relative to others also contribute to the experiences and expectations that inform the evaluation of current health status. The information from these processes is then considered in terms of the way in which the rating of health is presented, to arrive at an overall self-rating of health (Jylhä, 2009).

From the perspective of the Cognitive Process Model, personality plays a central role in shaping the appraisals that result in the subjective rating of health. For example, individuals with personality traits that are characterized by a high degree of negative affect and/or that are linked to depression may perceive and evaluate the factors relevant for health, such as physical symptoms, as being worse in comparison to someone scoring low on such traits. This proposition is consistent with both the classic (Watson & Pennebaker, 1989), and updated symptom perception hypotheses (Howren & Suls, 2011), which posit that negative affect can inflate reports of physical symptoms because of a greater attention to internal somatic symptoms and changes, regardless of whether these changes reflect symptoms of actual illness. This perceptual bias can also inflate retrospective recall of past physical symptoms (Howren & Suls, 2011), and the subsequent evaluation of past health status, and how it factors into judgements of current health. Finally, high levels of negative affect can influence the relative assessment of one's health in relation to others, and result in lower subjective ratings of health (Löckenhoff et al., 2012). Consequently, it is prudent to control for negative affect when understanding how personality traits may relate to self-reports of physical health.

Research examining the links between personality and self-rated health has focused almost exclusively on the five factor model of personality. Collectively this research has noted that high Conscientiousness and Extraversion, along with low Neuroticism, are the three higher order personality factors with the most consistent associations with good self-rated health (Löckenhoff, Duberstein, Friedman, & Costa, 2011; Löckenhoff et al., 2008; Löckenhoff et al., 2012; Sirois, 2015). Although this research has not explicitly viewed these associations from the lens of the Cognitive Process Model, the findings are nonetheless in line with what might be expected given that all three traits have links to negative affect and health behaviours (Hampson, Goldberg, Vogt, & Dubanoski, 2007; Lemos-Giraldez & Fidalgo-Aliste, 1997; McCrae & Costa, 1991; Sirois & Hirsch, 2015).

Perfectionism, Self-Rated Health, and Negative Affect

The Cognitive Process Model of self-rated health (Jylhä, 2009) provides a useful and comprehensive framework for understanding how perfectionism may be related to self-rated health. Current evidence suggests differential associations of PC and PS with negative affect, with weaker and more inconsistent associations for PS. For example, some studies have found that PC is associated with higher levels, and PS associated with lower levels of negative affect, (e.g., Damian, Stoeber, Negru, & Băban, 2014; Gaudreau & Thompson, 2010; Molnar et al., 2006). In contrast, other studies have found that PC, but not PS, is related to state negative affect (e.g., Flett et al., 2009). Still other research has noted that both perfectionism dimensions are associated with negative affect when it is conceptualized as a state (Sirois, 2016), such as depression, anxiety, and anger (e.g., Hewitt & Flett, 2004; Stoeber, Schneider, Hussain, & Matthews, 2014), or as chronic negative emotionality (Shanmugasegaram et al., 2014). However, the associations with negative affect for PC are often stronger than those for PS (e.g., Hewitt & Flett, 2004; Sirois, 2016; Stoeber et al., 2014).

When viewed from the lens of the Cognitive Process Model (Jylhä, 2009), current evidence suggests that negative affect may contribute to the differential associations of PC and PS to self-rated health. Consequently, it is critical to account for the effects of negative affect when assessing how perfectionism is linked to self-rated health given that differential associations between perfectionism dimensions and self-rated health may be an artifact of negative affect. It is also important to consider that PC and PS are linked to self-rated health because of actual differences in physical health status. For example, using a physical illness self-report checklist previously shown to be unrelated to negative affect (Sirois, Melia-Gordon, & Pychyl, 2003), one study found that PC, but not PS, was consistently, yet weakly (average r = .13), linked to more self-reported acute health problems such as colds and headaches, across seven samples (total n = 2,150) of community adults and students (Sirois, 2013). We therefore expect that the hypothesized associations between PC and poor self-rated health will remain after controlling for negative affect.

The Present Research

In this research we took a theory-driven approach to examine how perfectionism dimensions are related to self-rated health, using the Cognitive Process Model (Jylhä, 2009) of self-rated health as a guiding conceptual framework. Figure 1 presents an operational model of the Cognitive Process Model that outlines the role of contextual factors in self-rated health, and highlights those examined in the current research. Building on this theory, and the evidence presented, we hypothesized that PC would be associated with poor self-rated health, whereas PS would be associated with good self-rated health. Because PC and PS share some overlap, it is recommended that this overlap be accounted for when examining their relations to adjustment outcomes to better understand the unique contribution of each higher order perfectionism dimension to the outcome of interest (Stoeber & Gaudreau, 2017; Stoeber & Otto, 2006). Accordingly, we also examined the associations of each perfectionism dimension in relation to self-rated health after partialling out the contribution of the other dimension, with the expectation that the associations would become stronger, as proposed by some researchers (Stoeber & Gaudreau, 2017; Stoeber & Otto, 2006). To better understand the unique associations of PC and PS to self-related health beyond the potential biasing effects of negative affect, we then partialled out the contribution of negative affect from both perfectionism and self-rated health. Given past research suggesting a consistent association between PC and poor health (Sirois & Molnar, 2016), even with measures of physical health that are unrelated to negative affect (Sirois, 2013), we expected that the association between PC and poor self-rated health would remain after statistically controlling for the contributions of both PS and negative affect.

We examined the above hypotheses across a set of thirteen unpublished data sets from our labs that included participants with a diverse range of health statuses, and then statistically meta-analyzed the associations to estimate the magnitude of these effects. This approach is consistent with Cummings (2014) recommendations for improving psychological research, and building cumulative research in an area that is understudied. This was especially important as a scan of the available literature revealed there were few, if any, studies that included all the measures of interest to analyze. Taking this approach, rather than conducting a traditional meta-analysis of all published work, also permitted us to probe the contextual factors suggested by the Cognitive Process Model (Jylhä, 2009) that might attenuate or amplify the magnitude of these associations across different studies. Because both theory and research indicate that the associations between personality and self-rated health can vary as a function of health status (Goodwin & Engstrom, 2002; Jylhä, 2009), we examined the potential moderating effects of sample type on the hypothesized effects. Specifically, we examined whether the effects would vary between samples of relatively healthy students, community adults, and individuals medically diagnosed with a chronic illness. Because perfectionism may be more deleterious for health for individuals with existing health problems (Molnar & Sirois, 2015; Sirois & Molnar, 2014), we expected that the effects garnered from chronic illness samples would be the largest relative to the adult and student samples. We also examined the effect of sex and age on the associations with self-rated health as both have been found to moderate the link between personality and health (Jylhä, 2009; Stephan, Demulier, & Terracciano, 2012).

Finally, we tested whether the hypothesized effects would vary as a function of the way in which PC and PS were measured. At present there are key differences with respect to how researchers conceptualize and measure PC and PS, with researchers typically relying on one or more of the following three measures to assess each: The Frost Multidimensional Perfectionism Scale (MPS-F; Frost, Marten, Lahart, & Rosenblate, 1990), the

Multidimensional Perfectionism Scale (MPS-HF; Hewitt & Flett, 1991), and the Almost Perfect Scale-Revised (APSR; Slaney, Rice, Mobley, Trippi, & Ashby, 2001). However, we cannot assume that measures that appear highly related to each other are equivalent, especially with respect to health. Indeed, there are several differences among these measures of trait perfectionism such that each of these scales tap different facets of perfectionism and were developed from different theoretical perspectives (see Sirois & Molnar, 2016 and Enns & Cox, 2002 for greater detail). In the current research we focus on the APSR and the MPS-HF, as these are the measures used most often to assess PC and PS (Stoeber & Otto, 2006). Evidence indicates that PC as measured by the APSR may have items that tap negative affect and dissatisfaction rather than pure discrepancy (Flett, Mara, Hewitt, Sirois, & Molnar, 2016). Further, Blasberg, Hewitt, Flett, Sherry, and Chang (2016) found that PS as assessed by the APSR may reflect conscientious achievement striving rather than perfectionism per se. In light of evidence supporting robust links between conscientiousness and health (Roberts, Walton, & Bogg, 2005), and between negative affect and health (Suls & Bunde, 2005), we expect PS and PC as measured by the APSR to be more strongly related to self-rated health than when PS and PC are measured by the MPS-HF.

Methods

The present paper reports the findings from all relevant studies from the authors' labs at the time of analysis. No studies that included measures of PC, PS, and negative affect were excluded. Data from thirteen independent samples (four undergraduate student, five community adult, and four chronic illness samples, total N = 4,991) collected over a six year period from 2007 to 2016 as part of a larger research program focused on personality and health were included in the current analyses. Samples 3, 4, 5, and 8 consisted of community-dwelling adults recruited from online and community sources, and samples 6, 7, 9, and 10 consisted of undergraduate student samples collected from two different post-secondary institutions. Sample 1 consisted of individuals with chronic fatigue syndrome, Sample 2 consisted of individuals with fibromyalgia, and Sample 11 and 12 were mixed chronic illness samples. Ethical clearance for the data collection was obtained through the respective Institutional Review Boards. For all samples, any cases missing data for any of the key variables were removed using a listwise deletion prior to analyses.

Table 1 summarizes the demographic characteristics for each of the thirteen samples. For the community samples, four of the five community samples (Samples 3, 4, 8 and 13) completed an online survey and Samples 5 and completed a survey returned by mail. Samples 1 through 5 were given a chance to win gift cards of varying values as a participation incentive. Sample 8 was given a $20 gift card and sample 10 was paid $15 for completing the survey. All four of the chronic illness samples completed the survey online. Two of the student samples completed the survey in a lab setting (Samples 6 and 7) and two samples completed the survey online, hosted on a secure University server. All four student samples participated for course or research credit. Samples 11, 12, and 13 did not receive participation incentives. For all samples, consent to participate was given by signing a consent form for those who participated in the lab, or implied through the return of the online or mail survey.

Measures

Participants completed standard demographic questions about age, gender, and education level (except for Samples 3 and 13), and participants in Samples 1 through 9 reported ethnicity. Two different measures of perfectionism were used across the thirteen samples. Samples 1 to 5 completed the APSR (Slaney et al., 2001), and Samples 6 to 13 completed the MPS-HF (Hewitt & Flett, 1991). The means, standard deviations, and Cronbach alphas for all the scales appear in Table 2.

The Revised Almost Perfect Scale (APSR; Slaney et al., 2001). Five samples completed this 23-item scale which includes three subscales, standards, discrepancy, and order. For the current study only the standards (STD; 7 items) and discrepancy (DISC; 12 items) subscales were examined, as each is considered a widely accepted measure of Perfectionistic Strivings and Perfectionistic Concerns, respectively. Standards items (e.g., "I set very high standards for myself") assess the striving towards high personal standards, and discrepancy items (e.g., "My best just never seems to be good enough for me") assess the perceived discrepancy between one's standards and actual performance, and reflects a maladaptive dimension of perfectionism. Items are rated on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Both subscales have demonstrated good internal consistency in previous work with alpha coefficients of .87 (standards), and .92 (discrepancy) (Rice & Slaney, 2002).

Multidimensional Perfectionism Scale (MPS; Hewitt & Flett, 1991)**.** Seven samples completed the MPS-HF, a 45-item measure that assesses levels of three dimensions of trait perfectionism: SOP (e.g., "One of my goals is to be perfect in everything I do"); OOP (e.g., "If I ask someone to do something, I expect it to be done flawlessly"); and SPP (e.g., "The better I do, the better I am expected to do"). Only the SOP and the SPP subscales were examined as measures of PS and PC, respectively. Each subscale consists of 15 items, which are scored according to a Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Higher scores on the MPS-HF indicate higher levels of trait perfectionism. Considerable research has shown that the MPS-HF is a multidimensional measure with good psychometric properties in both student and clinical samples (Hewitt & Flett, 1991; Stoll, Lau, & Stoeber, 2008).

Self-rated health. The global health rating item from the Medical Outcomes Survey 36 item short form (SF-36) health questionnaire (Ware & Sherbourne, 1992) was used to current self-rated health. The full SF-36 is a widely used, well-validated, and reliable measure of subjective health and overall physical well-being. The global health item asks participants to rate their overall current health on a 5-point scale ranging from 1 (Excellent) to 5 (Poor); the item was reverse scored so that higher values reflected better current self-rated health. The global health item has good criterion related validity, and is a predictor of several health-related outcomes including, cortisol responses to stress, morbidity, and mortality (Jylhä, 2009; Kristenson et al., 2005; Tamayo-Fonseca et al., 2013).

Negative affect. Twelve of the thirteen samples completed one of two measures of negative affect. Eleven of the thirteen samples completed a version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to assess state negative affect. Samples 3, 10, 11, 12, 13 completed the original 20 item PANAS which consists of 20 mood adjectives, 10 items each for state positive and state negative affect, which are rated on a 5-point Likert scale ranging from 1 for (*very slightly or not at all)* to 5 for (*extremely).* Samples 8 and 9 completed the expanded 36-item PANAS X scale, which included the original PANAS items plus additional positive and negative affect adjectives. For consistency, only the items from the original 10 item negative affect scale were used to calculate a state negative affect score in these samples. Sample 4 completed a 10 item abbreviated version of the PANAS presented as a visual analogue scale with responses ranging from 1 (*very slightly or not at all)* to 8 for (*extremely).* Samples 6 and 7 completed a visual analogue, 10-item version of the PANAS via a paper survey in which they indicated how much they were currently experiencing each emotion by ticking a visual line of 150 mm in length. Scores were computed by measuring where they ticked the line. Psychometric properties for the PANAS subscales include good discriminate and internal reliability (alpha = .88)(Crawford & Henry, 2004)

Two samples (Samples 1 and 2) completed a 10-item measure of the Big Five inventory (Rammstedt & John, 2007) to assess trait negative affect in the form of Neuroticism. Each of the five factors (openness, agreeableness, neuroticism, extroversion, and conscientiousness) is assessed with 2 items, with response options ranging from 1 (*strongly disagree)* to 5 for (*strongly agree).* The Neuroticism subscale has demonstrated good convergent and discriminant validity (Rammstedt & John, 2007).

Analytic Strategy

We took a multi-step approach to examining the associations of each perfectionism dimension with self-rated health. First, we estimated the average unadjusted effect size of Perfectionistic Concerns and Perfectionistic Strivings with self-rated health, using a random effects model meta-analysis conducted with Comprehensive Meta-Analysis (CMA), Version 2 software (Borenstein, Hedges, Higgins, & Rothstein, 2005). CMA first transforms the individual correlation coefficients into Fisher's *z* scores before meta-analyzing these effects. Then to understand the unique contribution of each perfectionism dimension to self-rated health, we calculated the partial correlations for the associations of each perfectionism dimension with self-rated health, statistically controlling for the other dimension, as suggested by Stoeber & Gaudreau (2017). This yielded two additional sets of partly adjusted effects to meta-analyze. To understand the contribution of negative affect, whether state or trait, to the relationship between perfectionism and self-reported health, we also calculated the correlations of negative affect to each perfectionism dimension and self-rated health, and meta-analyzed these effects. Finally, to understand the unique contributions of PS and PC to self-rated health over and above any potential mood-related reporting bias, we calculated the fully adjusted effects of each perfectionism dimension on self-rated health by partialling out the contribution of both PC and PS, as appropriate, and negative affect, and meta-analyzed these effects. The fully adjusted correlations were calculated for all samples except Sample 5 which did not include a measure of negative affect.

Variability in effect sizes between samples 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. First, we used the heterogeneity statistic, *Q*, to assess the degree of variability among the pool of effects sizes (Card, 2012). Moderator analysis is warranted if this statistic is associated with a large confidence interval. Second, we used the I^2 statistic to estimate the proportion of variability present that is not due to sampling error within studies (Higgins & Thompson, 2002). As a general rule, I^2 values of 25 percent reflect low heterogeneity, 50 percent reflect moderate heterogeneity, and 75 percent or more reflect high heterogeneity (Card, 2012).

Moderator analyses were planned to test the role of perfectionism measure (APSR vs. MPS-HF), sample type (community vs. chronic illness vs. student), age, and sex, on the unadjusted, partly adjusted, and fully adjusted effects for each perfectionism dimension. However, these analyses were only conducted if there were three or more studies in each subgroup 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 with 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. Age was recorded as a continuous variable, and sex recorded as the percentage of the sample that was female. A mixed effects meta-regression (method of moments) analysis was therefore used to assess the potential moderating effects of these variables.

Results

The meta-analysis results for the unadjusted, partly adjusted, and fully adjusted effects for PC and PS in relation to self-rated health, and the associations of negative affect to both perfectionism dimensions and self-rated health, are presented in Table 3.

Negative Affect, Perfectionism and Self-Rated Health

Across the twelve samples that included a measure of state or trait negative affect, the meta-analyses revealed that both PC and PS were significantly associated with higher levels of negative affect (see Table 3). However the average effect size for PC was medium sized, whereas the average effect size for PS was small. Negative affect, in turn, was significantly associated with poorer self-rated health, with a small to medium average effect size.

Perfectionistic Concerns and Self-Rated Health

The meta-analysis of the thirteen samples revealed that PC was significantly associated with lower self-rated health when not accounting for the contributions of PS or negative affect. The tests of heterogeneity revealed there was a significant amount of unexplained variability among the unadjusted effect sizes (Q (12) = 48.8, $p < .0001$; I^2= 75.41 %), indicating that the planned moderator analyses were warranted. The meta-analysis of the partly adjusted effects of PC and self-rated health, after accounting for the contribution of PS, remained negative and significant. The tests of heterogeneity of these effects indicated significant variability, (Q (12) = 55.1, $p < .0001$; I^2= 78.22 %). After additionally controlling for the effects of negative affect, PC remained significantly associated with lower self-rated health. However, the magnitude of the effect was much smaller. The tests of heterogeneity were also significant, (Q (11) = 43.8, $p < .0001$; I^2= 74.91 %), supporting the need for moderator analyses.

The first set of moderator analyses focused on the potential role of the scale used to measure perfectionism (APSR vs. MPSHF) in explaining the heterogeneity in the average effect sizes found with self-rated health. Consistent with our hypothesis, the moderator analysis for PC and self-rated health, unadjusted, was significant, Q (1) = 12.6, $p < .0001$, and revealed that the effects obtained with the APSR discrepancy scale were on average more than twice as large as those obtained with the MPSHF SPP scale (see Figure 2, panel A). The test of whether the partly adjusted effects varied as a function of perfectionism scale was also significant, Q (1) = 11.76, $p < .001$, with the effects from the APSR discrepancy subscale being more than double those of obtained using the MPSHF SPP scale (see Figure 2, panel B). However, for the fully adjusted effects, the moderator analysis was no longer significant Q (1) = 3.33, $p = .07$ (see Figure 2, panel C).

The next set of moderator analyses focused on whether sample type explained the heterogeneity in the obtained effects. The test of the hypothesis that the unadjusted effects of PC with self-rated health would differ across samples was supported, Q (2) = 7.42, $p < .05$. The effects garnered from community samples were significantly larger than those garnered from the chronic illness and student samples (see Figure 3, panel A). When the effects were compared across sample types after partialling out the effects of PS, the results remained essentially the same, with the largest effects found in community samples compared to student and chronic illness samples, Q (2) = 6.55, $p < .05$ (see Figure 3, panel B). The moderator analysis of the role of sample type for the fully adjusted effects, accounting for the contributions of both PS and negative affect, was, however, non-significant, Q (2) = 1.31, $p = .52$ (see Figure 3, panel C).

The next set of moderator analyses focused on the role of age. The meta-regression testing the potential influence of participant age on the effects for PC and self-rated health was non-significant for the unadjusted correlations, $b = 0.00$ [-.01, .01], Q_{model} (1) = 0.18, $p = .67$, $Q_{residual}$ (11) = 13.76, $p = .25$, the partly adjusted correlations, $b = 0.00$ [-.01, .01], Q_{model} (1) = 0.25, $p = .62$, $Q_{residual}$ (11) = 13.16, $p = .28$, and the fully adjusted correlations, $b = 0.00$ [-.01, .01], Q_{model} (1) = 1.30, $p = .25$, $Q_{residual}$ (10) = 11.86, $p = .28$.

The final set of moderator analyses examined the influence of sex on the associations of PC with self-rated health. The results of the meta-regression indicated that as the percentage of females in the samples decreased, the association between PC and self-rated health became stronger for the unadjusted correlations, $b = 0.57$ [.13, 1.02], Q_{model} (1) = 6.37,

p = .01, $Q_{residual}$ (11) = 13.28, p = .28, the partly adjusted correlations, b = 0.59 [.11, 1.06], Q_{model} (1) = 5.93, p = .01, $Q_{residual}$ (11) = 13.20, p = .28, and the fully adjusted correlations b = 0.54 [.15, .93], Q_{model} (1) = 7.31, p = .006, $Q_{residual}$ (10) = 12.22, p = .27. Thus, the negative association between PC and self-rated health was stronger for men than for women (see Figure 4).

Perfectionistic Strivings and Self-Rated Health

The meta-analysis of the unadjusted effects revealed that PS was not significantly associated with self-rated health (see Table 3). The tests of heterogeneity of the effects were also non-significant (Q (12) = 16.35, p = .18; I^2 = 26.6 %), indicating a low degree of variability in the effects across the thirteen samples. Moderator analyses were therefore not conducted. The meta-analysis of the partly adjusted effects was significant, with PS associated with good self-rated health. The tests of heterogeneity of the effects were, however, non-significant, (Q (12) = 20.72, p = .06; I^2 = 42.1 %). The meta-analysis of the effects remained significant after accounting for the contribution of negative affect in addition to the contribution of PC. However, the variability among the effects was non-significant (Q (11) = 15.07, p = .18; I^2 = 27.0 %), indicating that moderator analyses were not warranted.

Discussion

Across thirteen samples comprised of community adults, students and individuals with chronic illness, we found evidence for differential relations of PC and PS to self-rated health. Overall, PC was associated with poor self-rated health whether or not the contributions of PS were accounted for in the analyses. In contrast, PS was modestly and significantly associated with good self-rated health only after accounting for the contribution of PC. Consistent with our hypotheses, the differential associations of PC and PS with self-rated health remained significant after accounting for the potential reporting bias associated with negative affect. The meta-analyses of these effects revealed that the set of unadjusted and adjusted associations of PC with self-rated health varied significantly across the sample types, perfectionism measures used, and the sex of the participants. The effects for PS did not vary significantly across the sets of associations.

Our findings build on and extend emerging theory and research on perfectionism and health in several important ways. A significant limitation within current research on perfectionism and health is that, aside from a few noteworthy exceptions (e.g., Molnar et al., In press; Sirois, 2016), research has been largely atheoretical. By applying the Cognitive Process Model of self-rated health (Jylhä, 2009), the current research makes an important contribution to better understanding the socio-cultural and affective contextual factors that contour how perfectionistic concerns and striving are linked to subjective ratings of physical health. This is also the first study that we are aware of to demonstrate differential associations of PC and PS with self-rated health, and to replicate and meta-analyze these finding across multiple samples. With the exception of Molnar and colleagues (2012), previous work has focused on physical health symptoms without routinely accounting for the potential contribution of negative affect. Therefore, it was not clear the extent to which the associations of PC and PS with physical symptoms were an artefact arising from inherent reporting biases associated with high negative affect, or were reflective of more objective differences in physical health. The findings from the current research indicate that negative affect does indeed contribute to the linkage between perfectionism and perceptions of subjective health, but also that the differential associations of PC and PS to self-rated health are not solely due to negative affect.

The Cognitive Process Model (Jylhä, 2009) posits that the practice of health protective and risk behaviours are considered when an individual evaluates their current health status. Although research on perfectionism and health behaviours is less abundant than for other health outcomes, the prevailing evidence indicates that PC is associated with less frequent practice of health-promoting behaviors (Chang, Ivezaj, Downey, Kashima, & Morady, 2008; Harrison & Craddock, 2016; Molnar et al., 2012; Sirois, 2016; Williams & Cropley, 2014), whereas PS is sometimes related to better practice of health-promoting behaviours (Harrison & Craddock, 2016; Williams & Cropley, 2014), and sometimes not (Chang et al., 2008; Harrison & Craddock, 2016; Molnar et al., 2012; Sirois, 2016). To the extent that those high in PC acknowledge their poor performance of health behaviours and the risks for health that this lack of behavior implies, the differential findings of PC and PS with self-rated health beyond negative affect could also be due in part to evaluations of health informed by current practice of health behaviours.

Overall, the moderator analyses highlighted several key issues when assessing the linkages between perfectionism and ratings of physical health. First, there was no evidence to support moderation of the associations between PS and self-rated health. In light of the work by Blasberg et al. (2016) demonstrating that the Standards dimension of the APSR may better gauge conscientious achievement striving than perfectionism per se, and work supporting positive links between conscientiousness and health (Roberts et al., 2005), we expected the association between PS and self-rated health to be positive and stronger when PS was assessed by the APSR rather than the MPSHF. However, the findings did not support this. It may be that the scale differences found by Blasberg et al. (2016) when examining the relationship of PS to psychopathology and well-being are not as relevant to physical health per se. However, another explanation may be a lack of power in the current study given the small number of groups for the subgroup moderator analyses. Future research is needed to more fully examine whether the perfectionism scale used matters when assessing the nature of the association between PS and health.

Second, the unadjusted results supported the notion that there are salient differences in how perfectionism is conceptualized and measured with respect to health outcomes, such that the relationships between PC and self-rated health were much stronger when PC was assessed via discrepancy from the APS-R versus socially prescribed perfectionism from the MPS-HF. However, these differences disappeared once PS and negative affect were taken into account in the analyses. These results indicate that because both PC and self-rated health are associated with negative affect, links between these constructs are overestimated when the contribution of negative affect to both is not considered. These findings are consistent with the Cognitive Process model of self-rated health (Jylhä, 2009), which posits that assessments of health are summarized within the context of individual differences in negative affect, among other factors, which can influence the extent to which physical symptoms are attended to (Watson & Pennebaker, 1989). Similarly, the overlapping variance with negative affect also appears to account for the initial differences in the link between PC and self-rated health as a result of perfectionism scale. That is, the significant negative affect component tapped by discrepancy (Flett et al., 2016) may have accounted for its initial stronger association with self-rated health compared to socially prescribed perfectionism, which is associated with negative affect, but does not tap negative affect directly per se.

Sample type also moderated the link between PC and self-rated health before the effects of PS and negative affect were taken into account, such that PC was more strongly associated with poorer self-rated health in community samples than in chronically ill or student samples. However, once negative affect and PS were taken into account in the analyses these differences were no longer significant. These results were unexpected, as we hypothesized these associations to be strongest in the chronically ill samples rather than in the student and community samples given indications that perfectionism may be more harmful for health for individuals with existing health problems (Molnar & Sirois, 2015; Sirois & Molnar, 2014). Our results again suggest that negative affect accounted for differences in the relationship between PC and self-rated health.

Finally, there were significant sex-related differences in the association between PC and self-rated health such that the association was stronger for men than for women, even after the effects of PS and negative affect were accounted for in the analyses (see Figure 4). Sex-related differences have largely been ignored when assessing links between perfectionism and health. However, when considered in context of research indicating that the links between self-rated health and objective health tend to be stronger for men than for women (Jylhä, 2009), the current findings are concerning. Because very little research has been directed at understanding sex-related differences with respect to perfectionism and health, and in light of the predominantly female samples used for the moderator analyses in the current research, this is an important consideration for future research.

Limitations and Strengths

Our findings have a number of important implications for theory and research on perfectionism and health, but nonetheless should be considered in light of certain limitations and strengths. The moderator subgroup analyses relied upon a small number of studies in each group, indicating that such results should be interpreted with caution. Future research with at least 10-12 studies per subgroup would increase confidence in the robustness of the results found in the current research (Card, 2012).

The current research focused on PC and PS in relation to self-rated health, and therefore it is unknown whether the current findings would hold for other conceptualizations of perfectionism. Consistent with research linking rumination to high negative affect (Moberly & Watkins, 2008), and health problems (Key, Campbell, Bacon, & Gerin, 2008), perfectionistic automatic thoughts may show similar associations to trait PC with regard to physical health ratings. Flett, Molnar, Nepon, and Hewitt (2012), for example, demonstrated in a sample of students that perfectionistic automatic thoughts were positively associated with psychosomatic symptoms.

These limitations aside, the current research has several strengths worth noting. In addition to helping build a cumulative knowledge base in an under-studied area within perfectionism research (Cumming, 2014), testing the associations of PC and PS to self-rated health across multiple and diverse samples increases confidence that the results will replicate.

Conclusions

Overall, our findings provide compelling evidence that PC is associated with poorer self-rated health, whereas PS is associated with good self-rated health, even after accounting for the biasing effects of negative affect. The identification of several important moderators of these effects, including the way in which perfectionism was measured, the respondent's sex, and the type of sample, highlights the need to address the question of whether perfectionism may or may not be healthy from a more sophisticated perspective, and to consider the contribution of contextual factors. Indeed, the current research suggests that estimations of links between perfectionism and subjective health may be inaccurate when the contribution of negative affect is not considered. In this respect, our findings also contribute to a growing body of research highlighting the importance of controlling for negative affect when assessing outcomes related to perfectionism (Smith et al., 2016), and propose that doing so is especially important when assessing health-related outcomes.

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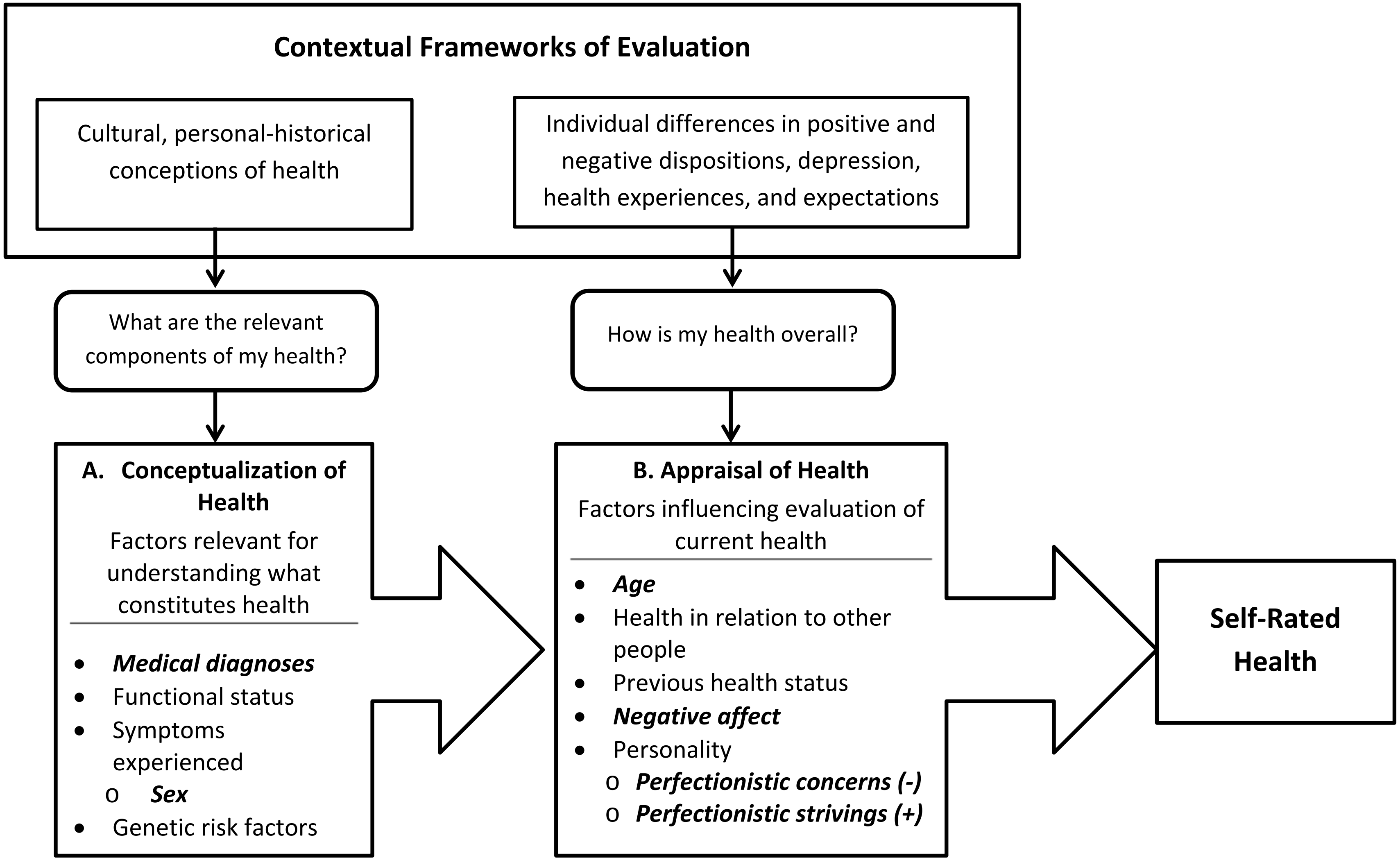
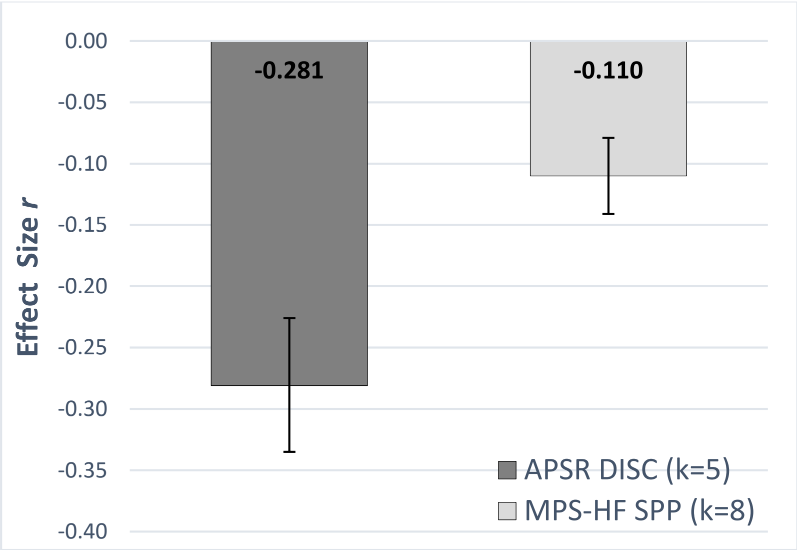
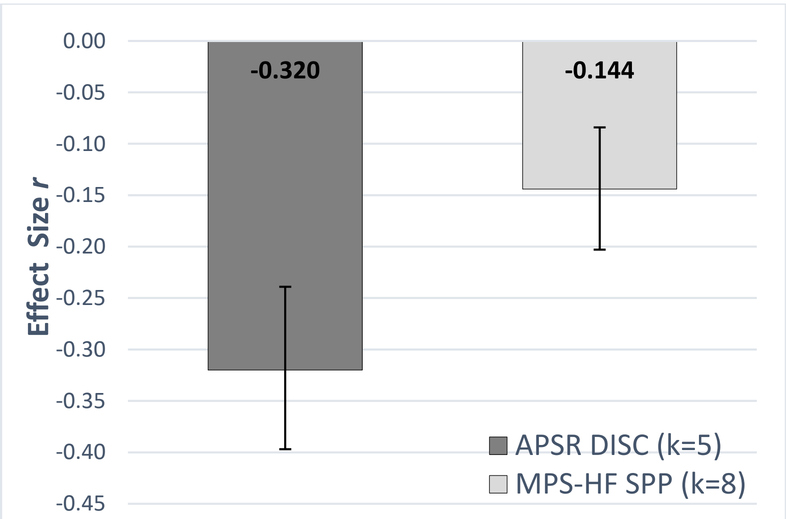

Contextual Frameworks of Evaluation
Cultural, personal-historical conceptions of health
Individual differences in positive and negative dispositions, depression, health experiences, and expectations
What are the relevant components of my health?
How is my health overall?
A. Conceptualization of Health
Factors relevant for understanding what constitutes health
Medical diagnoses
Functional status
Symptoms experienced
Sex
Genetic risk factors
B. Appraisal of Health
Factors influencing evaluation of current health
Age
Health in relation to other people
Previous health status
Negative affect
Personality
Perfectionistic concerns (-)
Perfectionistic strivings (+)
Self-Rated Health

Figure 1. Operational model of the role of contextual factors in self-rated health as suggested by the Cognitive Process Model of self-rated health (Jylhä, 2009). Boxed arrows represent the steps in the process of individual health evaluation rather than causal pathways. Bolded italic factors are those tested in relation to self-rated health in the current study.

Panel A



Panel B



Panel C

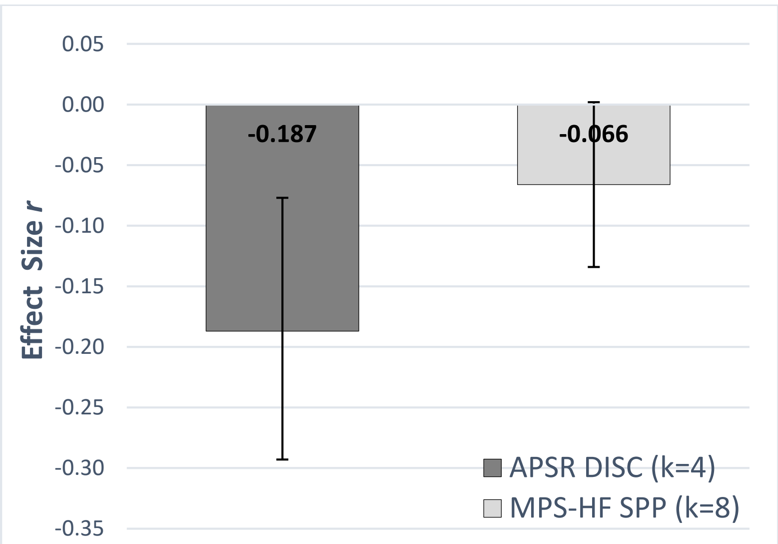
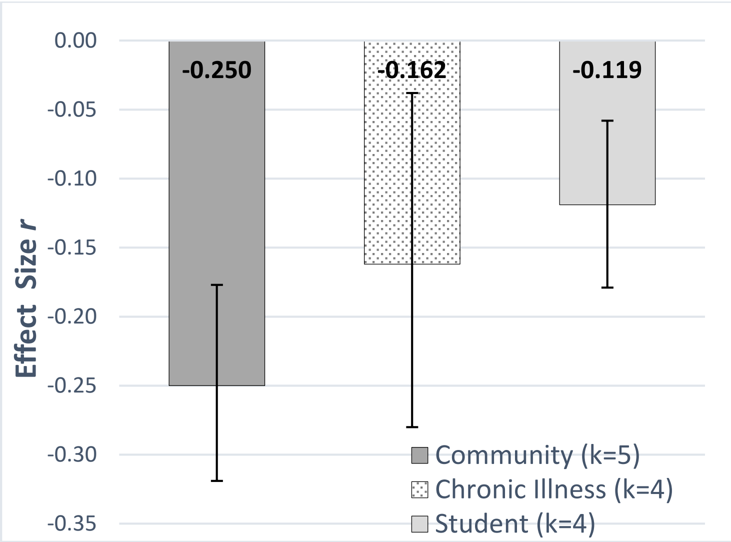
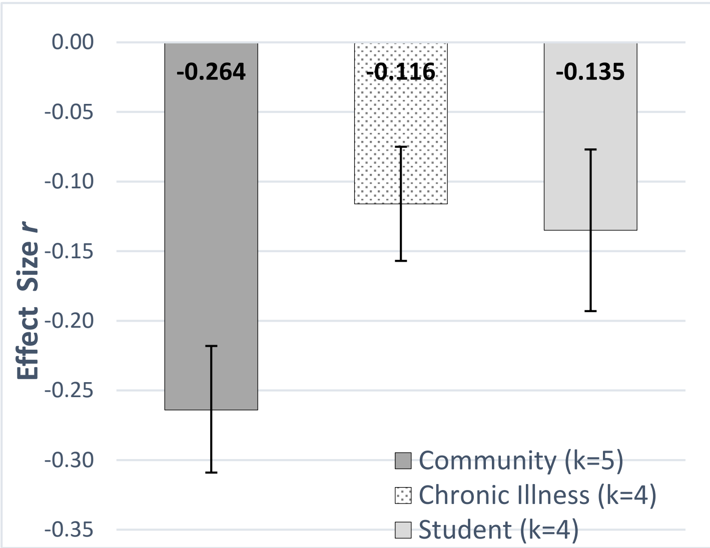


Figure 2: Average unadjusted (Panel A), partly adjusted (Panel B), and fully adjusted (Panel C) associations between perfectionistic concerns and self-rated health as a function of perfectionism scale (Panel A and B: APSR Discrepancy (DISC), *n* = 1,112; MPS-HF socially prescribed perfectionism (SPP), *n* = 3,879; Panel C: APSR Discrepancy, *n* = 1,001). The partly adjusted effects account for perfectionistic strivings, and the fully adjusted effects account for perfectionistic strivings and negative affect.

Panel A



Panel B



Panel C

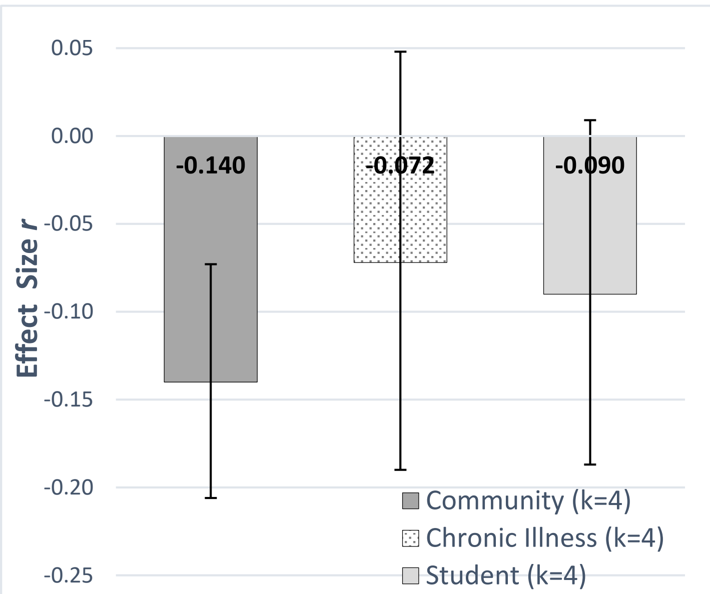
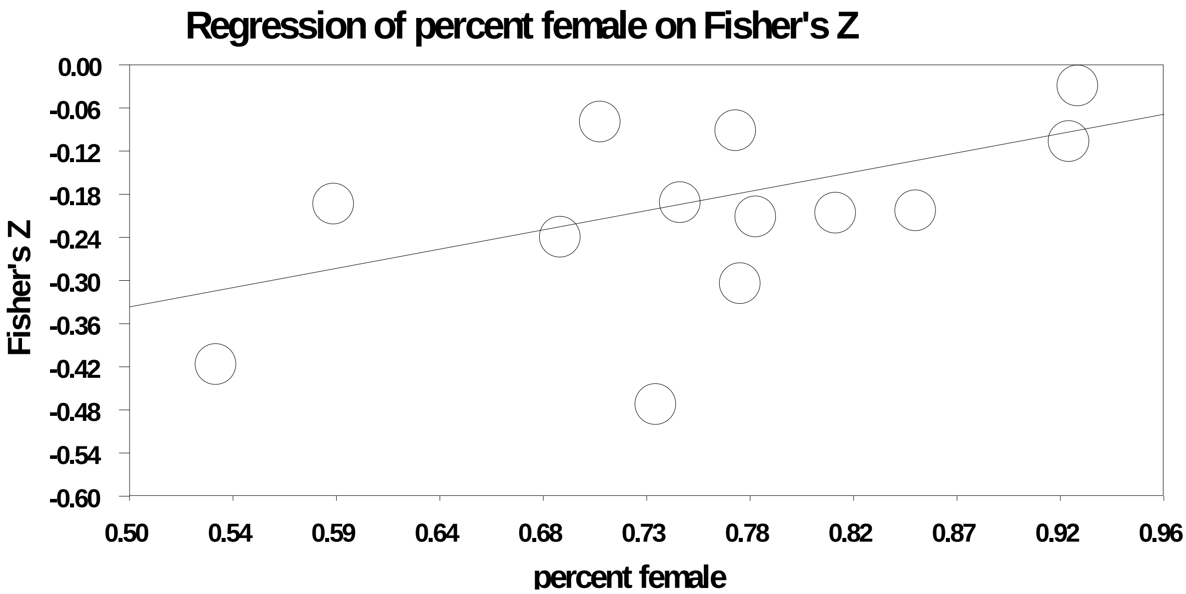
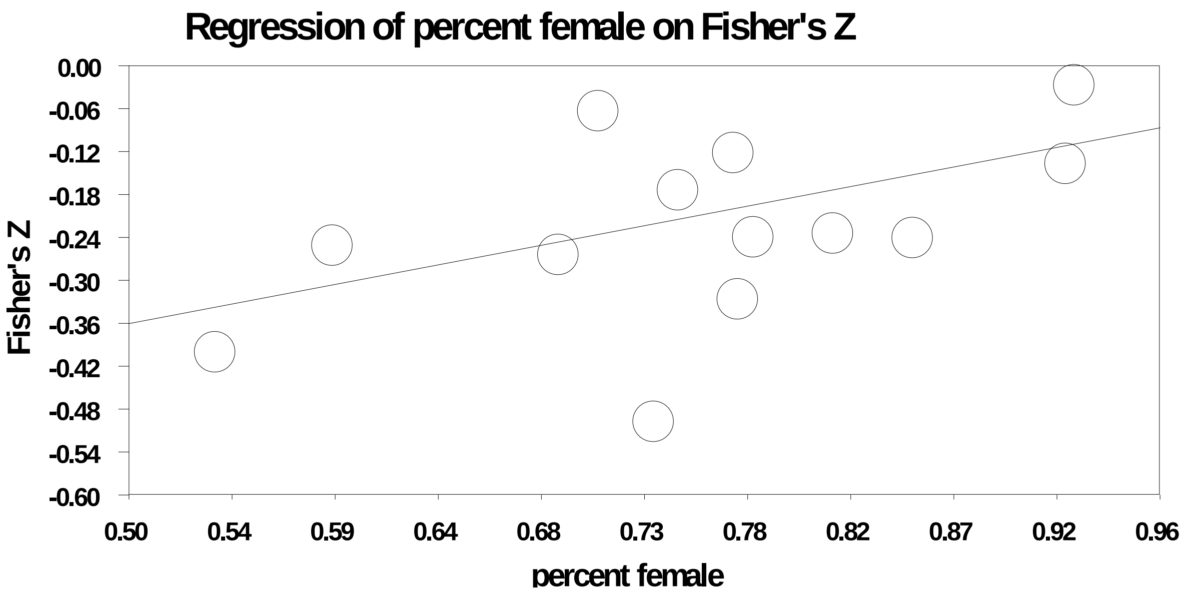


Figure 3: Average unadjusted (Panel A), partly adjusted (Panel B), and fully adjusted (Panel C) associations between perfectionistic concerns and self-rated health as a function of sample type (Panel A and B: Community, *n* = 1,639; Chronic Illness, *n* = 2,242; Student, *n* = 1,110; Panel C: Community, *n* = 1,528). The partly adjusted effects account for perfectionistic strivings, and the fully adjusted effects account for perfectionistic strivings and negative affect.

Panel A:



Panel B:



Panel C:

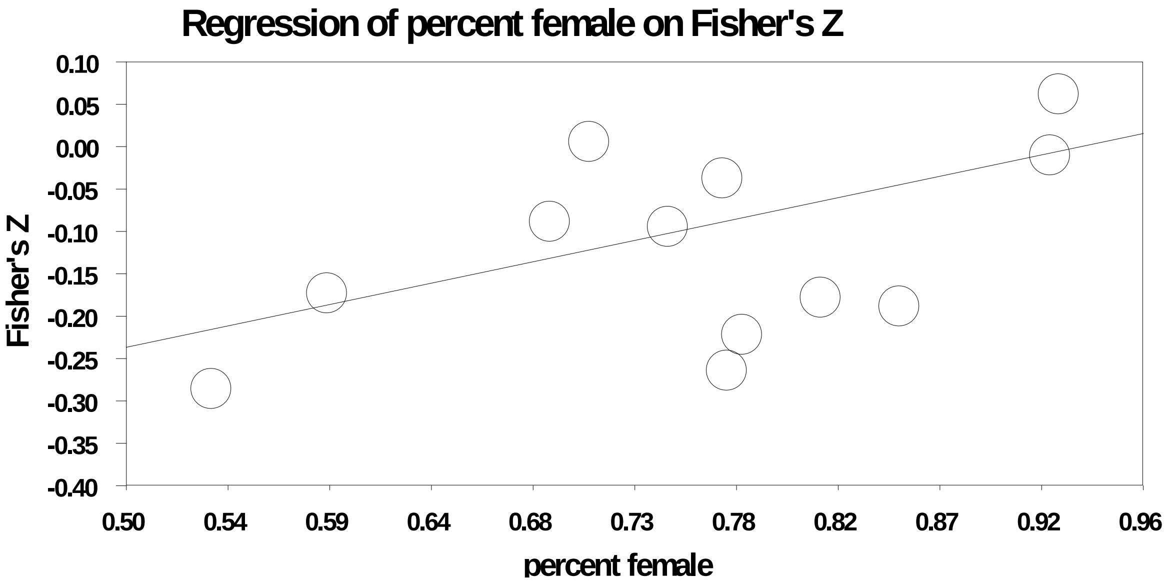

Regression of percent female on Fisher's Z
Fisher's Z
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
-0.40
0.50
0.54
0.59
0.64
0.68
0.73
0.78
0.82
0.87
0.92
0.96
percent female

Figure 4: Meta-regressions of the average unadjusted (Panel A), partly adjusted (Panel B), and fully adjusted (Panel C) associations between perfectionistic concerns and self-rated health as a function of the percent female in the sample. The partly adjusted effects account for perfectionistic strivings, and the fully adjusted effects account for perfectionistic strivings and negative affect.

Table 1.

Demographic Characteristics of the Thirteen Samples

				Age (years)		Education level (%)		
Sample	*N*	Percent female	Percent white	*M*	*SD*	High school	College/ university	Graduate school
1	81	85.2	93.6	35.27	15.0	12.3	60.5	27.2
2	135	53.7	86.9	40.63	13.9	19.0	63.5	17.5
3	140	77.3	89.8	29.94	13.5	---	---	---
4	645	69.2	86.5	30.58	12.3	8.4	51.5	40.1
5	111	73.5	90.2	31.16	16.7	7.1	78.8	14.2
6	161	78.0	82.9	22.18	5.6	0.0	100.0	0.0
7	127	81.6	83.5	21.40	5.5	0.0	100.0	0.0
8	180	74.6	96.7	33.57	17.5	12.2	80.1	7.7
9	290	71.0	92.3	21.07	4.4	0.0	100.0	0.0
10	532	77.1	----	21.62	.88	0.0	100.0	0.0
11	1225	92.1	----	44.72	10.93	15.6	69.2	84.8
12	801	92.5	----	48.80	10.93	12.4	71.0	16.6
13	563	59.0	----	30.70	3.08	---	---	---

Table 2

Summary of the Characteristics of the Study Variables for the Thirteen Independent Samples

	Perfectionistic Concerns			Perfectionistic Strivings			Negative Affect			Self-Rated Health	
Sample (N)	*M*	*(SD)*	α	*M*	*(SD)*	α	*M*	*(SD)*	α	*M*	*(SD)*
1 (81)	55.65	(17.42)	.96	39.74	(6.99)	.89	3.36	(1.10)	.75	1.92	(.96)
2 (135)	53.65	(17.55)	.95	37.90	(7.33)	.84	3.57	(1.04)	.60	2.02	(.86)
3 (140)	47.43	(15.84)	.94	35.46	(7.26)	.82	16.19	(6.85)	.93	3.31	(.98)
4 (645)	49.23	(17.52)	.96	39.54	(6.59)	.87	14.70	(7.41)	.84	3.59	(.91)
5 (111)	43.82	(19.27)	.96	40.61	(6.27)	.83	---	---	---	3.89	(.71)
6 (161)	54.36	(14.31)	.85	69.53	(16.72)	.91	36.93	(22.06)	.77	3.75	(.86)
7 (127)	54.04	(14.87)	.88	67.06	(14.10)	.87	36.85	(25.80)	.86	3.62	(.82)
8 (180)	52.10	(11.98)	.82	65.28	(15.68)	.89	18.77	(7.88)	.90	3.62	(.88)
9 (290)	54.41	(19.31)	.85	68.38	(17.51)	.90	19.26	(7.17)	.87	3.78	(.78)
10 (532)	53.69	(13.07)	.85	69.74	(15.33)	.91	22.58	(6.45)	.87	3.86	(.83)
11 (1225)	57.73	(16.88)	.88	67.00	(18.87)	.91	27.63	(8.33)	.90	2.11	(1.02)
12 (801)	53.74	(16.72)	.88	66.44	(19.12)	.92	25.75	(8.16)	.91	1.90	(.85)
13 (563)	49.88	(13.59)	.83	68.15	(16.48)	.89	18.81	(5.88)	.89	2.96	(.74)

Note: Samples 1 through 5 used the Revised Almost Perfect *Scale* (APSR; Slaney et al., 2001) to measure perfectionism (7-point scale), and Samples 6 through 13 used the Multidimensional Perfectionism Scale (MPS; Hewitt & Flett, 1991) to measure perfectionism (7-point scale). In Samples 1 and 2 negative affect was assessed with 2 items from the 10 item (5-point scale) big five inventory (Rammstedt & John, 2007). Samples 6 and 7 used a 10 item Visual Analogue version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988); for the remaining samples the 10-item PANAS negative affect subscale (5-point scale) assessed negative affect.

Table 3.

Meta-Analyzed Effect Sizes Among Perfectionistic Concerns (PC), Perfectionistic Strivings (PS) and Self-Rated Health (SRH), Controlling for Negative Affect Across 13 Samples (Total N = 4,491).

Sample	*N*	Perfect measure	PC-PS *r*	PC-SRH *r*	PC-SRH pr_{PS}	PS-SRH *r*	PS-SRH pr_{PC}	PC-NA *r*	PS-NA *r*	NA-SRH *r*	PC-SRH $pr_{NA,PS}$	PS-SRH $pr_{NA,PC}$
1. Chronic fatigue syndrome[a]	81	APSR	.433	-.200	-.236	.029	.131	.524	.109	-.147	-.186	.125
2. Fibromyalgia[a]	135	APSR	.298	-.394	-.380	-.113	.005	.521	.232	-.322	-.278	.019
3. Community[a]	140	APSR	.053	-.295	-.315	.216	.243	.332	.015	-.228	-.258	.245
4. Community[a]	645	APSR	.224	-.235	-.258	.070	.130	.544	-.053	-.334	-.088	.080
5. Community[b]	111	APSR	.231	-.440	-.460	.044	.155	---	---	---	---	---
6. Student[b]	161	MPS	.518	-.208	-.235	-.013	.113	.221	.190	-.148	-.218	.124
7. Student[a]	127	MPS	.337	-.203	-.230	.039	.114	.246	-.007	-.247	-.176	.099
8. Community[b]	180	MPS	.365	-.189	-.172	-.080	-.012	.413	.266	-.258	-.094	.016
9. Student[b]	290	MPS	.644	-.079	-.063	-.048	.004	.226	.081	-.302	.006	-.023
10. Student[b]	532	MPS	.362	-.091	-.121	.062	.102	.408	.092	-.211	-.037	.091
11. Chronic Illness[a]	1225	MPS	.525	-.106	-.136	.019	.089	.416	.189	-.327	-.010	.081
12. Chronic Illness[a]	801	MPS	.505	-.029	-.027	-.012	.003	.437	.275	-.242	.062	.028
13. Community[b]	563	MPS	.410	-.191	-.246	.080	.177	.351	.069	-.252	-.171	.164
Meta-analysis results	4,991		.393 [.31, .47]	-.189 [-.25, -.13]	-.209 [-.27, -.15]	.026 [-.01, .06]	.092 [.05, .13]	.395 [.34, .45]	.124 [.05, .19]	-.269 [-.30, -.23]	-.102 [-.16, -.04]	.081 [.05, .12]

Note: [a] = unpublished conference papers, theses/dissertations and data sets; [b] = data from previously published studies that did not report the perfectionism-self-rated health association; MPS-HF = Hewitt-Flett Multidimensional perfectionism scale (Hewitt & Flett, 1991); APSR = the Almost Perfect scale, revised (Slaney, Rice, Mobley, Trippi, & Ashby, 2001).