Why does perfectionism confer risk for depressive symptoms? A meta-analytic test of the mediating role of stress and social disconnection

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ABSTRACT

The stress generation model posits perfectionistic concerns and perfectionistic strivings generate stress and, in turn, depression. Alternatively, the Perfectionism Social Disconnection Model (PSDM) maintains perfectionistic concerns and perfectionistic strivings confer risk for depression through social disconnection. However, inconsistent findings, underpowered studies, and overreliance on cross-sectional designs have obscured understanding of the mediating role of stress and social disconnection in the perfectionism–depression link. We addressed this by conducting the first meta-analytic test of the stress generation model and PSDM. Our search yielded 18 longitudinal studies (N = 5,568) involving community adults, undergraduates, medical students, and psychiatric patients. Results revealed perfectionistic concerns predicted increased depression through social disconnection and stress, whereas perfectionistic strivings predicted increased depression through social disconnection, but not stress.

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1. Introduction

Depressive symptoms are a common mental health problem characterized by guilt, anxiety, anhedonia, amotivation, suicidal thinking, and sleep and appetite problems (American Psychiatric Association, 2013). Worldwide, 300 million people suffer from depressive symptoms, and the prevalence of depressive symptoms is increasing (Vos et al., 2017; World Health Organization, 2017). Depressive symptoms also lead to reduced quality of life, poorer work performance, and increased risk of mortality (Lépine & Briley, 2011; Lerner & Henke, 2008). Hence, testing explanatory models of depressive symptoms to pinpoint contributing factors is important as such models support prevention, assessment, and treatment efforts. Likewise, though depressive symptoms derive from a complex interplay of biological, psychological, and social factors (Slavich & Irwin, 2014), personality traits play a crucial role (Bolger & Zuckerman, 1995). One such trait is perfectionism.

Hewitt and Flett's (2002) stress generation model asserts perfectionism leads people to think, feel, and behave in ways that generate stress; and that this stress brings about depressive symptoms. Alternatively, Hewitt, Flett, Sherry, and Caelian's (2006) Perfectionism Social Disconnection Model (PSDM) asserts perfectionism makes it difficult for people to benefit from and participate in close relationships and that this social disconnection, in turn, engenders depressive symptoms. However, inconsistent findings, underpowered studies, and an overreliance on cross-sectional designs have limited understanding of these important models. We addressed this by conducting the first meta-analytic test of the mediating role of stress and social disconnection in the longitudinal relationship between perfectionism and depressive symptoms. Our rigorous and comprehensive review also allowed us to examine the moderating effect of time lag, gender, age, sample size, percentage attrition, perfectionism scale used, depression scale used, social disconnection scale used, stress scale used, sample type, and the year of data collection on observed relationships.

1.1. Perfectionistic concerns, perfectionistic strivings, and depressive symptoms

Two factors underlie several perfectionism dimensions: perfectionistic concerns and perfectionistic strivings (Dunkley, Zuroff, & Blankstein, 2003; Stoeber & Otto, 2006). Perfectionistic concerns encompass *socially prescribed perfectionism* (perceptions of others

as demanding perfection; Hewitt & Flett, 1991), *concern over mistakes* (extreme reactions to perceived errors; Frost, Marten, Lahart, & Rosenblate, 1990), *doubts about actions* (uncertainties about performance abilities; Frost et al., 1990), *discrepancy* (a gap between how one is and how one wants to be; Slaney, Rice, Mobley, Trippi, & Ashby, 2001), *perfectionistic attitudes* (cognitive distortions and social difficulties with perfectionistic themes; Imber et al., 1990), and *self-criticism* (harsh self-rebuke; Blatt, D'Afflitti, & Quinlan, 1976). Perfectionistic strivings encompass *self-oriented perfectionism* (demanding perfection of the self; Hewitt & Flett, 1991), *personal standards* (striving for perfection; Frost et al., 1990), and *high standards* (striving for excellence; Blasberg, Hewitt, Flett, Sherry, & Chen, 2016; Slaney et al., 2001).

Both perfectionistic concerns and perfectionistic strivings display small-to-moderate positive relationships with depressive symptoms across clinical and non-clinical samples (see Limburg, Watson, Hagger, & Egan, 2017 for review). Similarly, both perfectionistic concerns and perfectionistic strivings predict longitudinal increases in depressive symptoms–even after controlling for covariates such as neuroticism (Smith et al., 2016b). However, though perfectionistic concerns and strivings are tied to depressive symptoms, our understanding of *why* perfectionistic concerns and strivings predict depressive symptoms is comparatively limited.

2. Mediating role of stress

Initially, researchers tested the relationship between stress and depressive symptoms through the lens of the stress exposure model. The stress exposure model views people as having little to no influence over the occurrence of stressful events leading to depressive symptoms (Liu & Alloy, 2010). However, investigators have increasingly moved away from the stress exposure model in favor of the stress generation model. The stress generation model asserts personality traits confer risk for depressive symptoms by predisposing people to elicit and to experience more stressful events (Bolger & Zuckerman, 1995). More recently, Hewitt and Flett (2002) expanded and adapted the stress generation model to perfectionism.

According to the stress generation model of perfectionism, people high in perfectionism are prone to interpreting minor setbacks as major stressors and tend to anticipate future events as stressful (Hewitt & Flett, 2002). Similarly, the stress generation model contends that people high in perfectionism set unrealistically lofty goals and encounter more stress by actively pursuing stress-inducing circumstances (e.g., trying to be the best at everything; Hewitt & Flett, 1991, 2002). And Hewitt and Flett (2002) maintain the stress generated by perfectionism contributes to depressive symptoms. Even so, supporting evidence is mixed.

Congruent with the stress generation model, Olson and Kwon (2008) reported socially prescribed perfectionism, a facet of perfectionistic concerns, and self-oriented perfectionism, a facet of perfectionistic strivings, predicted increased depressive symptoms one-month later, through stress, among undergraduates. In contrast, *Cox, Clara, and Enns (2009) studied community members and found socially prescribed perfectionism predicted increased depressive symptoms one-year later through stress in women, but not men. And *Mandel, Dunkley, and Moroz (2015) studied community members and reported stress was not a significant mediator of the effect of perfectionistic concerns and strivings on depressive symptoms four-years later.

2.1. Mediating role of social disconnection

We spend roughly 80% of our waking life with other people, and close relationships are a fundamental human need (Baumeister & Leary, 1995; Cacioppo, Fowler, & Christakis, 2009). However, some people have personality traits that make participating in and benefiting from close relationships difficult. According to Hewitt et al.'s (2006) PSDM, perfectionism is one such trait. Indeed, people high in perfectionistic concerns see others as being perpetually disappointed with, and overly critical of, their performance which leads to maladaptive social cognitions, hostile interactions, and feelings of isolation and alienation—feelings that are depressogenic. Likewise, people high in perfectionistic strivings rigidly pursue agentic goals, typically at the expense of communal goals, and often adopt a win-at-all-cost interpersonal style, in which being the absolute best is paramount (Flett, Hewitt, Blankstein, & Gray, 1998; Sherry, Hewitt, Flett, Lee-Baggley, & Hall, 2007; Sherry, Mackinnon, & Gautreau, 2016). As such, people high in perfectionistic strivings regularly miss or ignore opportunities for close connections, which can contribute to depressive symptoms (Hewitt, Flett, & Mikail, 2017; Sherry et al., 2016).

Consistent with the PSDM, evidence supports the mediating role of social disconnection in the perfectionistic concerns–depressive symptom link (Rice, Leever, Christopher, & Porter, 2006; Sherry et al., 2013; Smith et al., 2017). However, unlike perfectionistic concerns, perfectionistic strivings relevance to the PSDM is unclear. On the one hand, Rice et al. (2006) studied undergraduates over two months and found social disconnection did not mediate the relationship between high standards, a facet of perfectionistic strivings, and depressive symptoms. Similarly, Sherry et al. (2013) studied undergraduates over one month and reported interpersonal discrepancies, feelings that one has fallen short of other people's standards, did not mediate the perfectionistic strivings-depressive symptoms link. And Stoeber, Noland, Mawenu, Henderson, and Kent (2017, p. 112) conducted a cross-sectional study of three undergraduate samples and concluded that people high in self-oriented perfectionism "may feel socially connected and show no higher hostility than non-perfectionists." On the other hand, Blankstein, Dunkley, and Wilson (2008) and Sherry and Hall (2009) found female undergraduates with high perfectionistic strivings tended to report greater experiences of social disconnection. Moreover, Smith et al. (2017) studied female undergraduates and found social disconnection mediated the effect of perfectionistic strivings on follow-up depressive symptoms one month later.

2.2. Advancing research on why perfectionism confers risk for depressive symptoms

Notable inconsistencies in findings (e.g., Olson & Kwon, 2008; *Mandel et al., 2015; Sherry et al., 2013) have clouded our understanding of the role of stress and social disconnection in the effect of perfectionistic concerns and strivings on depressive symptoms. A meta-analysis would address these inconsistencies and allow an overall conclusion to be reached.

Furthermore, Monte Carlo simulations indicate correlations stabilize only when sample sizes>250 are used (Schönbrodt & Perugini, 2013). As such, a sizeable portion of the literature on perfectionism and depressive symptoms is underpowered (see Table 1). However, a meta-analysis would overcome distorting artifacts arising from small sample sizes (Borenstein, Hedges, Higgins, & Rothstein, 2011).

Lastly, meta-analyses involving perfectionism (e.g., Limburg et al., 2017; Sirois, Molnar, & Hirsch, 2017; Smith et al., 2016a; Smith et al., 2016b; Smith et al., 2018) used bivariate meta-analytic techniques. Though it is possible to create a pooled correlation matrix by meta-analyzing correlations one by one, the results are misleading unless all predictors are uncorrelated (Cheung & Hong, 2017). Moreover, bivariate meta-analytic techniques do not provide estimates of indirect effects, and as such, are incapable of testing mediation (Shrout & Bolger, 2002). How-

ever, the use of two-stage meta-analytic structural equation modeling (TS-MASEM; Cheung, 2015a) would address these limitations (Cheung & Cheung, 2016; Cheung, 2015b; Landis, 2013) and represent a methodological advancement to not only research on perfectionism and depressive symptoms but the entire perfectionism literature.

2.3. Present study

Against this background, we used TS-MASEM to test the stress generation model and the PSDM. Building on theory and evidence (Rice et al., 2006; Sherry et al., 2013; Smith et al., 2017), and congruent with the PSDM, we hypothesized perfectionistic concerns would predict depressive symptoms through social disconnection. In contrast, due to inconsistencies in findings, we considered the following questions to be exploratory: Does stress mediate the perfectionistic strivings–depressive symptoms link? Does stress mediate the perfectionistic concerns–depressive symptoms link? And does social disconnection mediate the perfectionistic strivings–depressive symptoms link?

Furthermore, to catalyze a search for moderators that may resolve heterogeneity, we used traditional bivariate meta-regressions to evaluate the moderating effect of time lag, age, gender, percentage attrition, sample size, and the year of data collection on observed relationships. Year of data collection was included as a covariate in meta-regressions given evidence that certain dimensions of perfectionistic concerns and strivings have increased linearly over the past three decades (Curran & Hill, 2019; Smith et al., 2019). Additionally, we conducted categorical moderation to evaluate whether observed relationships differed depending on the perfectionism scale used, depression scale used, social disconnection scale used, stress scale used, and sample type.

3. Method

3.1. Selection of studies

We searched eight databases (PsycINFO, PubMed, Scopus, SPORTDiscus, Web of Science, ERIC, Embase, and ProQuest Dissertations and Theses) using keywords and Boolean operators: *perfection** AND (*depress** OR *MDD* OR *dysthymia* OR *dysthymic disorder* OR *mood* OR *dysphor** OR *bipolar* OR *affective* OR *cyclothymic* OR *mania*) AND (*longitudinal* OR *repeated measure* OR *serial measure* OR *prospective* OR *multi-wave* OR *over time*). This search yielded 507 studies. The third author and a trained research assistant evaluated studies for inclusion using pre-determined inclusion criteria: (a) the study used a longitudinal design, (b) depressive symptoms were assessed on two or more measurement occasions, (c) perfectionism was assessed alongside depressive symptoms on one measurement occasion preceding the final assessment of depressive symptoms, and (d) stress and/or social disconnection were measured on at least one measurement occasion following the initial assessment of depressive symptoms and perfectionism. On July 6, 2017, we terminated search strategies and started data reduction and analysis. Interrater agreement on inclusion was 95%, with discrepancies being discussed by the authors until a consensus of 100% was reached. The final set of included studies comprised 18 studies with 20 samples (see Table 1 and Fig. 1 for PRISMA diagram); 133 studies were excluded (see Supplemental Material A). Individual effects are in Supplemental Material B.

3.2. Coding of studies

The third author and a trained research assistant coded studies on 11 variables: sample size at baseline, sample type, mean age,

time lag between first and last measurement occasion, percentage attrition, percentage female participants, percentage ethnic minority, publication status, measure used to assess perfectionism, measure used to assess depressive symptoms, measure used to assess stress, and measure used to assess social disconnection (see Table 1).

3.3. Bivariate meta-analysis

We used Comprehensive Meta-Analysis (Borenstein, Hedges, Higgins, & Rothstein, 2005) to calculate overall bivariate effects using random-effect models. To guard against overrepresentation of studies with multiple effects, when more than one correlation was reported for the same construct, correlations were converted to Z-scores, averaged, and then transformed back into a correlation (Card, 2012). For studies with two measurement occasions, we extracted baseline perfectionism and baseline depressive symptoms from the first measurement occasion and extracted follow-up depressive symptoms, stress, and/or social disconnection from the second measurement occasion. For studies with three or more time points, we used the common, albeit conservative, strategy of selecting the greatest possible time lag (e.g., Smith et al., 2016).

To estimate mean effect sizes and variance in observed scores after accounting for sampling error, Hunter and Schmidt (1990) guidelines were followed. Effects were interpreted using Gignac and Szodorai (2016) guidelines for small, moderate, and strong effect sizes ($r = .10, .20,$ and $.30$). To assess homogeneity, the total heterogeneity of weighted mean effects (Q_T) and the total variation across studies attributable to heterogeneity (I^2) was calculated. When Q_T was significant, random-effect meta-regressions with maximum likelihood estimation were used to test the moderating effect of time lag (mean number of months between baseline and follow-up), gender (mean percentage of females), age (mean age), attrition (mean percentage of participants not completing follow-up), sample size, and the year of data collection (the year of publication minus two) on observed relationships. Seven models were tested for each relationship: a model with time lag as a predictor, a model with gender as a predictor, a model with age as a predictor, a model with the year of data collection as a predictor, a model with attrition as a predictor, a model with sample size as a predictor, and a model with time lag, gender, age, the year of data collection, attrition, and sample size entered simultaneously as predictors (see Supplemental Material C). When moderators were significant, corresponding scatter plots were provided in Supplemental Material D.

When Q_T was significant, we also stipulated a categorical structure to the data and calculated the heterogeneity explained by the categorization (Q_B). A significant Q_B indicates differences in effect sizes between categories (Borenstein et al., 2011) and provides a firm basis for moderation. Thus, in the presence of a significant Q_B, as well as adequate content coverage (i.e., three or more studies per subgroup; Card, 2012), we investigated differences in the magnitude of effects between studies grouped by perfectionism measure, depression measure, social disconnection measure, stress measure, and sample type by performing a series of all possible two-group comparisons to test which group(s) differed significantly (see Supplemental Material E). For each group comparison, the resultant Q_B was tested using a χ^2 test with one *df*. To ensure findings were meaningful, studies assessing perfectionism using composite scores were excluded from tests of the moderating effects of perfectionism subscale. Lastly, publication bias was tested by inspecting funnel plots with observed and imputed studies (see Supplemental Material F), and computing Egger's test of regression to the intercept (Egger, Smith, Schneider, & Minder, 1997; see Table 2).

Table 1
Characteristics of longitudinal studies included in the meta-analysis.

	Sample							Measures			
	N	Sample type	Mean age	Time lag	Attrition %	Female %	Status	Perfectionism	Depression	Stress	Social disconnection
*Cox et al. (2009), women	359	community[a]	43.7	12.0	21.7	100.0	article	FMPS-COM FMPS-DAA MPS-SPP	BDI-SF	LEI-PD	—
*Cox et al. (2009), men	364	community[a]	43.7	12.0	25.6	0.0	article	FMPS-COM FMPS-DAA MPS-SPP	BDI	LEI-PD	—
*Dittner et al. (2011)	436	university[b]	20.4	4.0	52.8	70.6	article	MPS-SPP	CES-D	PSS	—
*Enns et al. (2005)	206	medical students	24.0	5.0	32.5	44.2	article	FMPS-COM FMPS-DAA MPS-SOP MPS-SPP	BDI	LEI-AC	LEI-IP
*Enns & Cox (2005)	267	psychiatric[c]	41.1	12.0	38.6	63.7	article	MPS-SOP MPS-SPP	BDI	LEI-AC	—
*Hewitt et al. (1996)	121	psychiatric[c]	46.1	4.0	14.9	69.4	article	MPS-SOP MPS-SPP	BDI	LEI-AC	LEI-IP
*Joiner & Schmidt (1995)	174	university[b]	19.8	0.8	NR	62.6	article	EDI-P-SOP EDI-P-SPP	BDI	NLE-A	NLE-I
*Lambert et al. (2014)	585	community[a]	12.8	24.0	15.9	46.7	article	CAPS-SPP	BHIF-DEP	—	RALES
*Mackinnon et al. (2011)	200	university[b]	19.9	0.8	5.5	100.0	article	FMPS-COM FMPS-PS	POM-DEP	—	SSES-IE RDEQ-ID
*Mackinnon et al. (2012), women	226	community[a]	21.7	1.0	NR	100.0	article	FMPS-COM[d] MPS-SPP	CES-D	—	IQS RIB
*Mackinnon et al. (2012), men	226	community[a]	21.7	1.0	NR	0.0	article	FMPS-COM[d] MPS-SPP[d]	CES-D	—	IQS RIB
*Mackinnon, Sherry, Pratt, and Smith (2014)	127	university[b]	18.3	4.3	9.5	75.5	article	MPS-SOP MPS-SPP	CES-D POM-DEP	—	FI
*Mandel et al. (2015)	150	community[a]	41.0	48.0	NR	70.0	article	FMPS-COM MPS-SPP APS-R-DIS DAS-SC DEQ-SC	MASQ-AD MASQ-GD	SA	—
O'Connor et al. (2010)	737	community[a]	15.2	6.0	30.1	49.8	article	CAPS-SOP CAPS-SPP	HADS-DEP	ALS	—
Oddo-Sommerfeld et al. (2016)	297	community[a]	32.4	4.5	10.4	100.0	article	MPS-COM[e] MPS-DAA[e]	BDI-V EPDS	—	PBQ
Olson & Kwon (2008)	388	university[b]	18.6	1.0	21.4	74.4	article	MPS-SOP MPS-SPP	BDI-II	ICSLE	—

Table 1 (continued)

	Sample							Measures			
	N	Sample type	Mean age	Time lag	Attrition %	Female %	Status	Perfectionism	Depression	Stress	Social disconnection
Rice et al. (2006)	181	university[b]	NR	2.5	55.1	56.0	article	APS-R-HS APS-R-DIS	CES-D	PSS	SCS
Sherry et al. (2013)	240	university[b]	20.0	1.0	3.3	83.3	article	FMPS-COM FMPS-DAA FMPS-PS	DASS-DEP POM-DEP SCL-DEP	—	RDEQ-ID MDI-ID APS-R-ID
Smith et al. (2017)	218	university[b]	20.0	0.8	0.5	100.0	article	MPS-SOP MPS-SPP	CESD-D	—	SSES-IE
Triesch (2001)	66	psychiatric[c]	38.7	3.0	31.8	67.0	disseration	MPS-SPP	IDD	—	TPC TPE

Note. Time lag in months. **NR** = not reported; **MPS** = Hewitt and Flett's (1991) Multidimensional Perfectionism Scale; **SOP** = self-oriented perfectionism; **OOP** = other-oriented perfectionism; **SPP** = socially prescribed perfectionism; **FMPS** = Frost et al.'s (1990) Multidimensional Perfectionism Scale; **COM** = concern over mistakes; **DAA** = doubts about actions; **PS** = personal standards; **DEQ** = Blatt, D'Afflitti, and Quinlan's (1976) Depressive Experiences Questionnaire; **RDEQ** = Bagby, Parker, Joffe, and Buis's (1994) DEQ; **DAS** = Weissman and Beck's (1978) Dysfunctional Attitudes Scale; **SC** = self-criticism; **CAPS** = Flett et al.'s (2016) Child and Adolescent Perfectionism Scale; **EDI-P** = Joiner and Schmidts's (1995) modified version of Garner, Olmsted, and Polivy's (1983) Eating Disorder Inventory; **APS-R** = Slaney et al.'s (2001) Almost Perfect Scale–Revised; **Dis** = discrepancy; **BDI-SF** = Cox et al.'s (2009) modified short-form of Beck, Rush, Shaw, and Emery's (1979) Beck Depression Inventory; **BDI** = Beck et al.'s (1979) Beck Depression Inventory; **CES-D** = Radloff's (1987) Center for Epidemiologic Studies Depression Scale; **BHIF-DEP** = Ialongo, Kellam, and Poduska's (1999) Baltimore How I Feel depression subscale; **POM-DEP** = Bolger, Zuckerman, and Kessler's (2000) Profile of Mood States short form depression subscale; **MASQ** = Watson and Clark's (1991) Mood and Anxiety Symptom Questionnaire; **AD** = anhedonic depressive symptoms; **GD** = general distress depressive symptoms; **HADS-DEP** = Zigmond and Snaith's (1983) Hospital Anxiety and Depression Scale depression subscale; **BDI-V** = Schmitt, Altstötter-Gleich, Hinz, Maes, and Brähler's (2006) Simplified Beck Depression Inventory; **EPDS** = Cox, Holden, and Sagovsky's (1987) Edinburgh Postpartum Depression Scale; **BDI-II** = Beck, Steer, and Brown's (1996) Beck Depression Inventory, second edition; **DASS-DEP** = Lovibond and Lovibonds's (1995) Depression Anxiety Stress Scales depression subscale; **SCL** = (Derogatis's, 1994) Symptom Checklist-90-Revised depression subscale; **IDD** = Zimmerman and Coryell's (1987) Inventory to Diagnose Depression; **LEI** = Cochrane and Robertson's (1973) Life Events Inventory; **PD** = person dependent events; **AC** = achievement events; **PSS** = Cohen, Kamarack, and Mermelstein's (1983) Perceived Stress Scale; **NLE-A** = Saxe and Abramson's (1987) Negative Life Events Questionnaire achievement domain subscale; **SA** = Dunkley et al.'s (2003) Stress Appraisal Scale; **ALS** = O'Connor et al.'s (2010) Acute Life Stress Scale; **ICSLE** = Kohn, Lafreniere, and Gurevich's (1990) Inventory of College Students' Recent Life Experiences; **IP** = interpersonal life events; **NLE-I** = Saxe and Abramson's (1987) Negative Life Events Questionnaire, interpersonal domain subscale; **RaLES** = Harrell's (2000) Racism and Life Experiences Scales; **SSES-IE** = Heatherton and Polivy's (1991) State Self-Esteem Scale interpersonal esteem subscale; **ID** = interpersonal discrepancies; **IQS** = Oishi and Sullivan's (2006) Interpersonal Qualities Scale; **RIB** = Murray, Griffin, Rose, and Bellavia's (2002) Rejecting Interpersonal Behaviors scale; **FI** = *Mackinnon et al.'s (2014) Friendship Intimacy Scale; **PBQ** = Reck et al.'s (2006) German version of Brockington et al.'s (2001) Postpartum Bonding Questionnaire; **MDI-ID** = Flett and Hewitt's (2012) Multidimensional Discrepancies Inventory; **TPC** = Triesch's (2001) measure of family functioning; **TPE** = Triesch's (2001) Perceived Expectations Scale. **SCS** = Lee and Robbin's (1995) Social Connectedness Scale.

[a] Community-dwelling adults.
[b] University undergraduates.
[c] Psychiatric patients.
[d] Partner specific.
[e] German version of the MPS (Altstötter-Gleich & Bergemann, 2006).

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┌─────────────────────────────┐   ┌─────────────────────────────┐
│ Records identified through   │   │ Additional records identified│
│ database searching (n = 507) │   │ through other sources        │
│                              │   │ (n = 521)                    │
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               │                                │
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                │ Records after duplicates     │
                │ removed (n = 764)            │
                └─────────────────────────────┘
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                ┌─────────────────────────────┐        ┌──────────────────────┐
                │ Records screened (n = 764)   │───────▶│ Records excluded      │
                └─────────────────────────────┘        │ (n = 616)             │
                                │                       └──────────────────────┘
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                ┌─────────────────────────────┐
                │ Full-text articles assessed  │───────▶ [Full-text articles excluded]
                │ for eligibility (n = 149)    │
                └─────────────────────────────┘
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                ┌─────────────────────────────┐
                │ Studies included (n = 18)    │
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Full-text articles excluded
(n = 132)
Unsuitable design: 33
Insufficient data: 33
Treatment study: 31
No measure of stress/social disconnection: 21
Unsuitable measure of perfectionism: 6
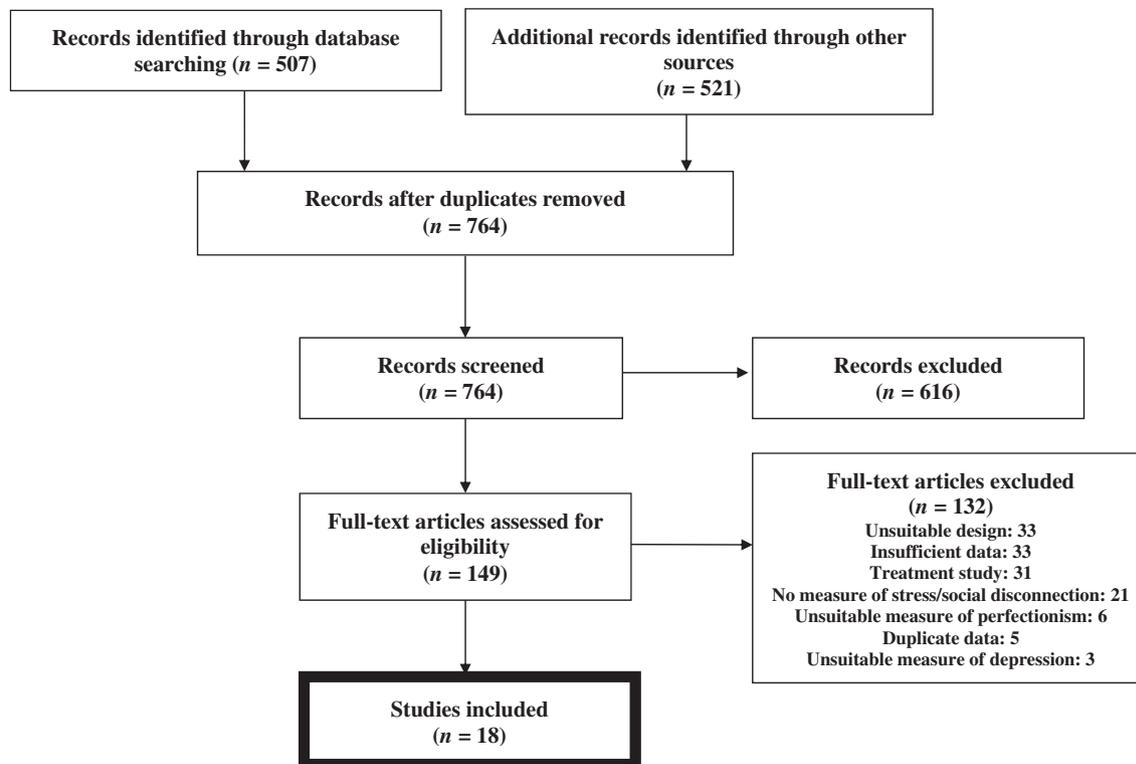Duplicate data: 5
Unsuitable measure of depression: 3

Fig. 1. Study selection procedure.

3.4. Two-stage meta-analytic structural equation modeling

To evaluate the stress generation model of perfectionism and the PSDM, we conducted TS-MASEM (Cheung & Chan, 2005) using the *metaSEM* package for R (Cheung, 2015a, 2015b; see Supplemental Material G for syntax). The first stage in TS-MASEM uses multigroup confirmatory factor analysis to calculate a pooled correlation matrix and evaluates homogeneity via Q_T and I^2. The second stage in TS-MASEM uses weighted least squares estimation (WLS) to fit path models, estimate parameters, and estimate model fit. For Stage 1, we first used a fixed-effect model to obtain goodness-of-fit statistics and to inform if a fixed-effect or random effect model was most appropriate for Stage 2.

Across models, perfectionism (perfectionistic concerns or perfectionistic strivings) and baseline depressive symptoms were the predictors, stress or social disconnection were the mediators, and follow-up depressive symptoms were the outcome.[1] Chi-square difference tests (Δx^2) were used to select the most parsimonious solution with the best fit. When appropriate, an indirect effect with 95% confidence intervals was calculated using matrix algebra. When a 95% confidence interval for an indirect effect does not contain zero in its upper and lower bounds it suggests mediation (Shrout & Bolger, 2002). Following Hu and Bentler (1999), model fit was interpreted using the Comparative Fit Index (CFI; recommended cut off > 0.95), the Tucker-Lewis Index (TLI; recommended cut off > 0.95), the Standardized Root Mean Squared Error (SRMR; recommended cut off < 0.08), and the Root Mean Squared Error of Approximation (RMSEA; recommended cut off < 0.06).

3.5. Description of studies

Our search identified 18 longitudinal studies (17 journal articles and 1 dissertation) suitable for inclusion (Table 1). Included studies were published between 1995 and 2017, with a median year of 2009. Sample size varied considerably (range: 66 to 737; M = 278.4; SD = 163.4). The number of participants pooled across samples was 5568. There were eight community adult samples, eight university samples, three psychiatric samples, and one medical student sample. The mean age was 28.0 (SD = 11.7). The mean percentage of females was 61.7% (SD = 31.6). The mean time lag between baseline and follow-up was 7.4 months (range: 0.8 to 48.0; SD = 11.2); the average attrition rate was 23.4% (range: 3.3 to 55.1%; SD = 16.0%).

3.6. Perfectionism

Perfectionism was assessed using seven self-report measures (see Table 1). Guided by theory (Stoeber & Otto, 2006), and similar meta-analyses (e.g., Smith et al., 2016), we categorized socially prescribed perfectionism, concern over mistakes, doubts about actions, discrepancy, perfectionistic attitudes, and self-criticism as facets of perfectionistic concerns. Similarly, we categorized self-oriented perfectionism, personal standards, and high standards as facets of perfectionistic strivings. Consistent with Kehayes, Smith, Sherry, Vidovic, and Saklofske (2019) we categorized *Joiner and Schimidt's (1995) modified socially prescribed perfectionism subscale and modified self-oriented perfectionism subscale as facets of perfectionistic concerns and strivings, respectively.

3.7. Depressive symptoms, stress, and social disconnection

Depressive symptoms were measured using ten self-report measures, stress was measured using six self-report measures, and social disconnection was measured using 14 self-report mea-

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[1] Alternative models with perfectionism (perfectionistic concerns or perfectionistic strivings) and baseline depressive symptoms as predictors, follow-up depressive symptoms as the mediator, and stress or social disconnection as the outcome are in Supplemental Material H (see Supplemental Material I for syntax).

Table 2
Summary of overall bivariate effect sizes for the relationships between perfectionism, baseline depressive symptoms, social disconnection, stress, and follow-up depressive symptoms.

Variable	k	N	r^+	95% CI	Q_T	I^2 (%)	Egger's intercept	95% CI	k^{TF}	"Trim and fill" estimates r^+ [95% CI]
Baseline depression										
Perfectionistic concerns	20	7,870	.36***	[.30; .42]	157.68***	87.95	-0.40	[-4.39; 3.58]	2	.34 [.28; .40]
Socially prescribed perfectionism	15	4,500	.30***	[.23; .35]	66.30***	78.88	-2.37	[-6.50; 1.77]	3	.29 [.26; .20]
Concern over mistakes	6	1,581	.33***	[.24; .41]	18.26**	72.62	2.75	[-15.48; 20.98]	0	.33 [.24; .41]
Doubts about actions	3	929	.49***	[.44; .54]	1.67	0.00	2.00	[-68.77; 72.77]	0	.49 [.44; .54]
Discrepancy	1	181	.50***	[.38; .60]	0.00	0.00	–	–	–	–
Evaluative concerns perfectionism	3	679	.56***	[.51; .62]	0.03	0.00	0.61	[-2.47; 3.69]	0	.56 [.51; .61]
Perfectionistic strivings	11	2,851	.11**	[.05; .18]	26.08**	61.66	1.89	[-2.15; 5.92]	0	.11 [.05; .18]
Self-oriented perfectionism	8	2,238	.12***	[.05; .19]	19.81**	64.67	2.35	[-2.33; 7.03]	0	.12 [.05; .19]
Personal standards	2	432	.17***	[.08; .26]	0.05	0.00	–	–	–	–
High standards	1	181	-.05	[-.19; .10]	0.00	0.00	–	–	–	–
Stress	11	2,397	.27***	[.18; .36]	56.84	82.41	1.45	[-5.37; 8.27]	0	.27 [.18; .36]
Social disconnection	14	2,689	.29***	[.21; .37]	63.76***	79.61	1.07	[-4.04; 6.19]	0	.21 [.21; .37]
Follow-up depression	20	4,406	.59***	[.55; .62]	51.24***	62.92	-0.34	[-3.41; 2.74]	0	.59 [.55; .62]
Social disconnection										
Perfectionistic concerns	14	3,408	.30***	[.19; .39]	131.43***	90.08	4.13	[-1.63; 9.89]	0	.27 [.18; .36]
Socially prescribed perfectionism	10	1,895	.23***	[.13; .32]	37.99***	76.31	3.86	[-0.72; 8.43]	1	.21 [.11; .30]
Concern over mistakes	4	780	.28***	[.11; .44]	18.61***	83.88	-1.16	[-69.00; 66.68]	0	.28 [.11; .44]
Doubts about actions	1	139	.11	[-.06; .27]	0.00	0.00	–	–	–	–
Discrepancy	1	360	.36***	[.17; .52]	0.00	0.00	–	–	–	–
Evaluative concerns perfectionism	2	498	.45***	[.07; .78]	40.13***	97.51	–	–	–	–
Perfectionistic strivings	9	1,423	.16***	[.05; .26]	30.25***	73.55	-5.13	[-14.99; 4.72]	0	.17 [.05; .25]
Self-oriented perfectionism	6	906	.19***	[.06; .31]	19.18**	73.94	-2.83	[-21.84; 16.17]	0	.19 [.06; .31]
Personal standards	2	421	.19***	[.10; .28]	0.04	0.00	–	–	–	–
High standards	1	96	-.16	[-.35; .04]	0.00	0.00	–	–	–	–
Follow-up depression	14	2,678	.40***	[.32; .48]	77.81	83.29	2.79	[-2.63; 8.21]	4	.34 [.26; .42]
Stress										
Perfectionistic concerns	11	3,779	.21***	[.15; .27]	37.76***	73.51	-0.25	[-4.13; 3.63]	0	.21 [.15; .27]
Socially prescribed perfectionism	9	2,151	.20***	[.11; .28]	31.89***	74.91	-1.58	[-8.65; 5.49]	0	.20 [.11; .28]
Concern over mistakes	3	691	.13**	[.06; .20]	0.50	0.00	-1.90	[-26.10; 22.29]	0	.13 [.06; .20]
Doubts about actions	3	691	.24*	[.10; .37]	6.70*	70.15	-9.77	[-22.31; 2.77]	0	.24 [.10; .37]
Discrepancy	1	96	.41***	[.23; .56]	0.00	0.00	–	–	–	–
Evaluative concerns perfectionism	1	150	.32***	[.17; .46]	0.00	0.00	–	–	–	–
Perfectionistic strivings	7	1,489	.05	[-.04; .14]	15.29*	60.77	1.34	[-4.17; 6.85]	0	.05 [-.04; .14]
Self-oriented perfectionism	6	1,393	.06	[-.03; .16]	14.67*	65.92	2.37	[-4.61; 9.34]	0	.06 [-.03; .16]
Personal standards	–	–	–	–	–	–	–	–	–	–
High standards	1	96	-.04	[-.24; .16]	0.00	0.00	–	–	–	–
Follow-up depression	11	2,397	.41***	[.26; .54]	167.26	94.02	3.30	[-8.28; 14.88]	0	.41 [.26; .54]
Follow-up depression										
Perfectionistic concerns	20	6,240	.30***	[.25; .34]	71.50***	71.49	-0.17	[-2.92; 2.58]	3	.27 [.22; .32]
Socially prescribed perfectionism	15	3,473	.26***	[.20; .31]	37.70***	62.86	-0.85	[-4.29; 2.60]	5	.21 [.15; .27]
Concern over mistakes	6	1,332	.26***	[.21; .31]	5.33	6.24	5.45	[-3.15; 14.05]	0	.26 [.21; .31]
Doubts about actions	3	691	.40***	[.33; .46]	2.10	4.57	-1.75	[-67.90; 64.39]	0	.40 [.33; .46]
Discrepancy	1	96	.46***	[.29; .61]	0.00	0.00	–	–	–	–
Evaluative concerns perfectionism	3	648	.42***	[.35; .49]	2.22	9.82	1.56	[-88.39; 91.50]	0	.42 [.35; .49]
Perfectionistic strivings	11	2,243	.11***	[.06; .15]	12.80	21.88	0.17	[-3.03; 3.38]	0	.11 [.06; .15]
Self-oriented perfectionism	8	1,726	.12***	[.06; .17]	7.98	12.32	1.32	[-2.16; 4.79]	0	.12 [.06; .17]
Personal standards	2	421	.09	[-.06; .25]	2.68	62.72	–	–	–	–
High standards	1	96	-.04	[-.24; .16]	0.00	0.00	–	–	–	–

Note. k = number of included samples; N = total number of participants in k samples; r^+ = observed weighted mean correlation; r_c^+ = corrected weighted mean correlation; corrected effect sizes were obtained by dividing the observed correlation by the square root of the product of the two corresponding Cronbach's alpha coefficients; CI = confidence interval for r_c^+; Q_T = measure of heterogeneity for r_c^+; I^2 = percentage of heterogeneity for r_c^+; k^{TF} = number of imputed studies as part of "trim and fill" method for r_c^+.

* $p < .05$.
** $p < .01$.
*** $p < .001$.

sures (see Table 1). We operationalized stress as situations and events that are objectively or subjectively distressing. We operationalized social disconnection as cognitions and behaviors characterized by relational negativity, conflict, and alienation.

4. Results

4.1. Bivariate meta-analysis

Overall weighted mean effects between perfectionistic strivings, perfectionistic concerns, stress, social disconnection, baseline depressive symptoms, and follow-up depressive symptoms are in Table 2. Perfectionistic concerns had large positive relationships with baseline and follow-up depressive symptoms (r = .30 to .36) and social disconnection (r = .30), and a moderate positive relationship with stress (r = .21). Perfectionistic strivings had small positive relationships with baseline and follow-up depressive symptoms (r = .11) and social disconnection (r = .16), and a marginal non-significant relationship with stress (r = .05). Baseline depressive symptoms had a strong positive relationship with follow-up depressive symptoms (r = .59) and moderate positive relationships with stress (r = .27) and social disconnection

(r = .29). The percentage of total heterogeneity across studies ranged from 0.0% to 90.1%, suggesting the possible influence of moderators on certain relationships.

4.2. Moderator analysis

Following the inclusion of covariates, meta-regression revealed the year of data collection moderated the relationship between perfectionistic concerns and social disconnection (β = −.051, p = .018), implying perfectionistic concerns' positive relationship with social disconnection decreased as the year of data collection increased. Likewise, again following the inclusion of covariates, the perfectionistic strivings-social disconnection link was moderated by age (β = .020, p = .001) and time lag (β = −.042, p = .009), such that perfectionistic strivings' positive relation with social disconnection increased as age increased and decreased as time lag increased. Nonetheless, inspection of scatter plots revealed the moderating effect of age may have been driven by outliers and should be interpreted with caution (Supplemental Material D).

Categorical moderation indicated concern over mistakes' relationships with baseline depressive symptoms (r = .49) and follow-up depressive symptoms (r = .40) was larger relative to socially prescribed perfectionism's relationships with baseline depressive symptoms (r = .30) and follow-up depressive symptoms (r = .26), and doubts about actions' relationships with baseline depressive symptoms (r = .33) and follow-up depressive symptoms (r = .26). Results also implied the relationship between perfectionistic concerns and stress was larger for achievement-related stressors (r = .26) relative to person-dependent stressors (r = .10).

4.3. Publication bias

Funnel plots (Supplemental Material F) and Egger's regression intercepts (Table 2) provided mixed evidence for publication bias. Egger's regression intercept was significant for certain effects, whereas adjusted "trim and fill" estimates provided the same substantive implications in terms of magnitude and significance of observed effects.

4.4. TS-MASEM–homogeneity of correlation matrices

The approximate fit statistics obtained via fixed-effect estimates were poor and suggested random-effect models were more appropriate. Thus, Stage 1 was repeated, and random-effect estimates were used for all remaining analysis. Q_T was significant across the four pooled correlation matrices (p < .001) and implied substantial heterogeneity (see Tables 3 and 4). However, similar to other applications of random effects, such as multilevel models (Cheung & Hong, 2017), there is value in testing if a proposed solution fits the average study. As such, following Cheung and Cheung (2016) recommendations, we proceeded to Stage 2.

4.5. TS-MASEM–meta-analytic structural equation modeling

Congruent with the stress-generation model, and as hypothesized, the indirect effect of perfectionistic concerns on follow-up depressive symptoms, controlling for baseline depressive symptoms, via stress was significant: .03 (95% CI: .01; .06). Constraining the path from perfectionistic concerns to follow-up depressive symptoms to zero did not result in a significant loss of fit: Δx^2 (1) = 2.64, p = .104 (Model 1c in Table 5 and Fig. 1). Likewise, congruent with the PSDM, the indirect effect of perfectionistic concerns on follow-up depressive symptoms (controlling for baseline depressive symptoms) via social disconnection was significant: .05 (95% CI: .02; .09). And constraining the path from perfectionistic concerns to follow-up depressive symptoms to zero did not result in a substantial loss of fit: Δx^2 (1) = 1.15, p = .283 (Model 2C in Table 5 and Fig. 2). Results suggest stress and social disconnection fully explained why perfectionistic concerns confer risk for increased depressive symptoms.

Contrary to the stress generation model, the indirect effect of perfectionistic strivings on follow-up depressive symptoms, controlling for baseline depressive symptoms, via stress was not significant: .06 (95% CI: −.01; .02). Likewise, constraining the path from perfectionistic strivings to stress to zero, and the path from perfectionistic strivings to follow-up depressive symptoms to zero, did not result in a significant loss of fit: Δx^2 (2) = 2.46, p = .292 (Table 5: Model 3E and Fig. 3). Even so, consistent with the PSDM, the indirect effect of perfectionistic strivings on follow-up depressive symptoms, controlling for baseline depressive symptoms, through social disconnection was significant: .03 (95% CI: .01; .06). And constraining the direct effect from perfectionistic strivings to follow-up depressive symptoms did not lead to a significant loss of fit: Δx^2 (1) = 0.01, p = .931 (Table 5: Model 4C and Fig. 4). Thus, results indicate perfectionistic strivings engender depressive symptoms due to social disconnection, but not stress Fig. 5.

Table 3
Random effect estimates of mean correlations for perfectionistic concerns, baseline depressive symptoms, social disconnection, stress, and follow-up depressive symptoms.

Mediating variable	k	N	Q_T	df	Mean r	SE	95% CI	I^2
Stress	11	2,397	276.63[***]	60				
Perfectionistic concerns with follow-up depression					.30[***]	.03	[.23; .36]	67.87
Baseline depression with follow-up depression					.57[***]	.02	[.54; .61]	39.89
Stress with follow-up depression					.39[***]	.06	[.28; .50]	89.53
Perfectionistic concerns with baseline depression					.35[***]	.05	[.27; .44]	83.37
Perfectionistic concerns with stress					.21[***]	.04	[.15; .26]	47.58
Baseline depression with stress					.27[***]	.04	[.20; .34]	69.26
Social disconnection	14	2,678	354.24[***]	78				
Perfectionistic concerns with follow-up depression					.28[***]	.03	[.22; .34]	65.22
Baseline depression with follow-up depression					.58[***]	.02	[.54; .62]	54.37
Social disconnection with follow-up depression					.39[***]	.04	[.32; .47]	79.81
Perfectionistic concerns with baseline depression					.34[***]	.04	[.25; .43]	85.18
Perfectionistic concerns with social disconnection					.28[***]	.04	[.20; .37]	80.87
Baseline depression with social disconnection					.29[***]	.03	[.23; .36]	68.68

Note. Depression = depressive symptoms; k = number of included samples; N = total number of participants in k samples; Q = measure of homogeneity of effect sizes; df = degrees of freedom for Q statistic; **mean r** = corrected weighted mean correlation; SE = standard error; CI = confidence interval; I^2 = percentage of heterogeneity.
   [*] p < .05.
   [**] p < .01.
   [***] p < .001.

Table 4
Random effect estimates of mean correlations for perfectionistic strivings, baseline depressive symptoms, social disconnection, stress, and follow-up depressive symptoms

Mediating variable	k	N	Q_T	df	Mean r	SE	95% CI	I^2
Stress	7	1,489	99.17[***]	36				
Perfectionistic strivings with follow-up depression					.10[**]	.03	[.04; .17]	0.00
Baseline depression with follow-up depression					.55[***]	.02	[.51; .59]	19.10
Stress with follow-up depression					.30[***]	.05	[.19; .40]	78.14
Perfectionistic strivings with baseline depression					.10[*]	.03	[.03; .17]	29.92
Perfectionistic strivings with stress					.05	.04	[-.03; .13]	51.68
Baseline depression with stress					.19[***]	.04	[.12; .27]	54.83
Social disconnection	9	1,423	156.92[***]	48				
Perfectionistic strivings with follow-up depression					.11[***]	.03	[.01; .16]	0.00
Baseline depression with follow-up depression					.56[***]	.03	[.51; .62]	50.98
Social disconnection with follow-up depression					.42[***]	.06	[.30; .53]	85.61
Perfectionistic strivings with baseline depression					.13[***]	.03	[.08; .19]	17.26
Perfectionistic strivings with social disconnection					.15[***]	.04	[.07; .24]	64.05
Baseline depression with social disconnection					.32[***]	.04	[.23; .41]	71.29

Note. Depression = depressive symptoms; *k* = number of included samples; *N* = total number of participants in k samples; *Q* = measure of homogeneity of effect sizes; *df* = degrees of freedom for Q statistic; **mean r** = corrected weighted mean correlation; *SE* = standard error; *CI* = confidence interval; *I²* = percentage of heterogeneity.
   [*] *p* < .05.
  [**] *p* < .01.
 [***] *p* < .001.

5. Discussion

The stress generation model of perfectionism posits perfectionism indirectly predicts depressive symptoms through stress (Hewitt & Flett, 2002). Alternatively, the PSDM maintains perfectionism indirectly predicts depressive symptoms through social disconnection (Hewitt et al., 2006). However, despite decades of research, understanding of these important models was limited by inconsistent findings, underpowered studies, and an overreliance on cross-sectional designs. We addressed these challenges by conducting the first meta-analytic test of these two models. Findings were derived from 18 longitudinal studies with 20 samples and 5,568 participants. Depressive symptoms displayed strong rank-order stability and controlling for this stability allowed us to test the extent to which stress and social disconnection mediated the effect of perfectionistic concerns and perfectionistic strivings on change in follow-up depressive symptoms. Results indicated perfectionistic concerns predicted increased depressive symptoms through both stress and social disconnection, whereas perfectionistic strivings predicted increased depressive symptoms through social disconnection, but not through stress.

5.1. An improved understanding of the perfectionism–depressive symptoms link

Congruent with Smith et al. (2016) and Limburg et al. (2017), perfectionistic concerns and perfectionistic strivings had small-to-large positive relationships with depressive symptoms at baseline and follow-up. This result is consistent with longstanding conceptualizations of perfectionism as part of the premorbid personality of people vulnerable to depressive symptoms (e.g., Hewitt & Flett, 1991). This finding also adds to accumulating evidence calling into question Stoeber and Otto (2006) conceptualization of perfectionistic strivings as a resiliency factor that protects against depressive symptoms.

We also found perfectionistic strivings' relationship with social disconnection increased as the mean sample age increased. This complements a broader literature suggesting perfectionistic strivings corrode mental health over time (Smith et al., 2019). But why do people high in perfectionistic strivings appear to experience greater social disconnection as they transition from adolescence to adulthood? We speculate this reflects the tendency for people high on perfectionistic strivings to strive rigidly for agentic goals, at the expense of communal goals, which over time might

cause them to become increasingly disconnected from their social world (Sherry et al., 2016).

5.2. An improved understanding of the role of stress

Perfectionistic concerns had a moderate positive relationship with stress, and stress mediated the relationship between perfectionistic concerns and follow-up depressive symptoms (controlling for baseline depressive symptoms). Thus, consistent with the stress generation model, people high in perfectionistic concerns appear to think, feel, and behave in ways that increase the likelihood of experiencing and eliciting stressful events, leaving them vulnerable to depressive symptoms (Hewitt & Flett, 2002). Consequently, our findings are congruent with a broader literature suggesting people high in perfectionistic concerns generate stress due to their proclivity to use ineffective coping strategies in the face of either perceived or actual stressors (Dunkley et al., 2003).

In contrast, unlike perfectionistic concerns, stress was not related to perfectionistic strivings, and stress did not mediate the effect of perfectionistic strivings on depressive symptoms. However, some evidence suggests people high in perfectionistic strivings are more likely to experience depressive symptoms in the presence of ego-involving stressors (Békés et al., 2015; Flett, Hewitt, Blankstein, & Mosher, 1995; Hewitt & Flett, 1993; *Hewitt, Flett, & Ediger, 1996). Accordingly, we speculate that stress as a moderator, rather than stress as a mediator, may be more relevant to understanding perfectionistic strivings' link to depressive symptoms. Nonetheless, we are unable to evaluate this contention, as TS-MASEM does not allow for tests of moderation (Cheung & Cheung, 2016; Cheung & Hong, 2017).

### 5.3. An improved understanding of the role of social disconnection

Congruent with the PSDM (Hewitt et al., 2006, 2017), perfectionistic concerns and strivings had small-to-large positive relationships with social disconnection. Findings also revealed that age moderated the relationship between perfectionistic strivings and social disconnection, such that people higher in perfectionistic strivings appear to become increasingly disconnected from their social world as time passes (Hewitt et al., 2006; Sherry et al., 2016). Moreover, consistent with the PSDM, both perfectionistic concerns and perfectionistic strivings indirectly predicted increased depressive symptoms through social disconnection.
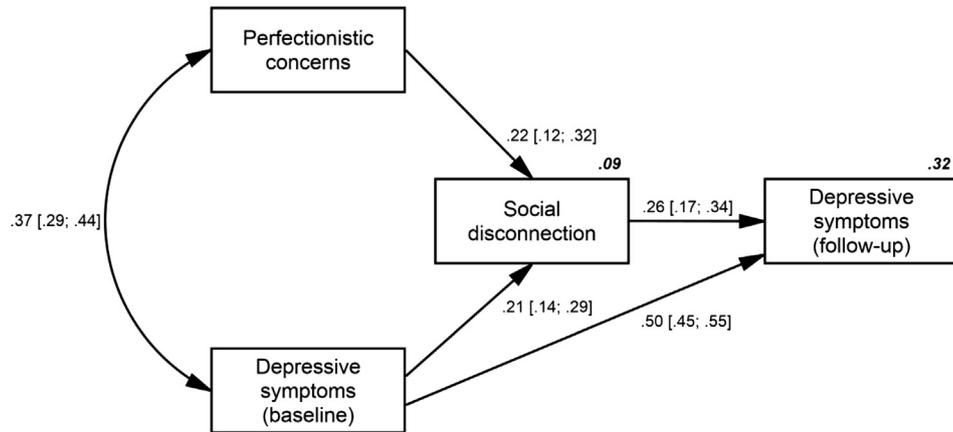
Table 5
Model comparison.

Stage/Model	k	N	x^2	df	p	CFI	TLI	SRMR	RMSEA [95% CI]	Δx^2
Stress as a mediator of perfectionistic concerns and baseline depressive symptoms on follow-up depressive symptoms										
Stage 1–Homogeneity of correlation matrices	11	2,397	299.00	60	<.001	.88	.86	.13	.14 [.12; .15]	—
Stage 2–Meta-analytic structural equation modeling	—	—	—	—	—	—	—	—	—	—
Model 1A	11	2,397	0.00	0	—	—	—	—	—	—
Model 1B	11	2,397	132.46	1	<.001	.88	.27	.20	.23 [.20; .27]	132.46***
Model 1C	**11**	**2,397**	**2.64**	**1**	**.104**	**1.00**	**1.00**	**.02**	**.03 [.00; .07]**	**2.64**
Model 1D	11	2,397	12.64	1	<.001	.99	.94	.05	.07 [.04; .11]	12.64***
Model 1E	11	2,397	14.28	2	<.001	.99	.97	.05	.05 [.03; .08]	14.28***
Model 1F	11	2,397	98.70	2	<.001	.91	.73	.14	.14 [.12; .17]	98.70***
Model 1G	11	2,397	168.77	2	<.001	.85	.54	.25	.19 [.16; .21]	168.77***
Social disconnection as a mediator of perfectionistic concerns and baseline depressive symptoms on follow-up depressive symptoms										
Stage 1–Homogeneity of correlation matrices	14	2,678	364.58	78	<.001	.88	.87	.14	.14 [.12; .15]	—
Stage 2–Meta-analytic structural equation modeling	—	—	—	—	—	—	—	—	—	—
Model 2A	14	2,678	0.00	0	—	—	—	—	—	—
Model 2B	14	2,678	149.71	1	<.001	.85	.11	.18	.24 [.20; .27]	149.71***
Model 2C	**14**	**2,678**	**1.15**	**1**	**.283**	**1.00**	**1.00**	**.02**	**.01 [.00; .05]**	**1.15**
Model 2D	14	2,678	17.01	2	<.001	.98	.90	.07	.08 [.05; .11]	17.01***
Model 2E	14	2,678	18.84	2	<.001	.98	.95	.07	.06 [.03; .08]	18.84***
Model 2F	14	2,678	118.15	2	<.001	.88	.65	.17	.15 [.13; .17]	118.15***
Model 2G	14	2,678	203.08	2	<.001	.80	.40	.20	.19 [.17; .22]	203.08***
Stress as a mediator of perfectionistic strivings and baseline depressive symptoms on follow-up depressive symptoms										
Stage 1–Homogeneity of correlation matrices	7	1,489	110.08	36	<.001	.90	.89	.11	.10 [.08; .12]	—
Stage 2–Meta-analytic structural equation modeling	—	—	—	—	—	—	—	—	—	—
Model 3A	7	1,489	0.00	0	—	—	—	—	—	—
Model 3B	7	1,489	181.39	1	<.001	.74	-.55	.26	.35 [.31; .39]	181.39***
Model 3C	7	1,489	1.84	1	.175	1.00	1.00	.01	.02 [.00; .08]	1.84
Model 3D	7	1,489	0.53	1	.465	1.00	1.00	.01	.00 [.00; .05]	0.53
Model 3E	**7**	**1,489**	**2.46**	**2**	**.292**	**1.00**	**1.00**	**.02**	**.01 [.00; .05]**	**2.46**
Model 3F	7	1,489	24.72	2	<.001	.97	.90	.08	.09 [.06; .12]	24.72***
Model 3G	7	1,489	186.74	2	<.001	.74	.21	.26	.25 [.22; .28]	186.74***
Social disconnection as a mediator of perfectionistic strivings and baseline depressive symptoms on follow-up depressive symptoms										
Stage 1–Homogeneity of correlation matrices	9	1,423	147.80	48	<.001	.90	.89	.11	.11 [.09; .14]	—
Stage 2–Meta-analytic structural equation modeling	—	—	—	—	—	—	—	—	—	—
Model 4A	9	1,423	0.00	0	—	—	—	—	—	—
Model 4B	9	1,423	94.23	1	<.001	.82	-.05	.19	.26 [.21; .30]	94.23***
Model 4C	**9**	**1,423**	**0.01**	**1**	**.931**	**1.00**	**1.00**	**.00**	**.00 [.00; .02]**	**.01**
Model 4D	9	1,423	6.48	1	.012	.99	.94	.04	.06 [.02; .11]	6.48*
Model 4E	9	1,423	7.29	2	.026	.99	.97	.05	.04 [.04; .08]	7.29*
Model 4F	9	1,423	62.63	2	<.001	.89	.66	.15	.15 [.12; .18]	62.63***
Model 4G	9	1,423	94.28	2	<.001	.83	.48	.19	.18 [.15; .21]	94.28***

Note. **k** = number of included samples; **N** = total number of participants in k samples; **df** = degrees of freedom for x^2; **p** = p value of x^2; **CFI** = comparative fit index; **TLI** = tucker-lewis index; **SRMR** = standardized root mean squared error; **RMSEA** = root mean squared error of approximation. Results for Stage 1 are based on a fixed effect model; results for Stage 2 are based on a random effects model. **Model A** = unconstrained model; **Model B** = path from baseline depression to follow-up depression constrained to zero; **Model C** = path from perfectionism to follow-up depression constrained to zero; **Model E** = path from perfectionism to mediator constrained to zero; **Model E** = path from perfectionism to follow-up depression constrained to zero and path from perfectionism to mediator constrained to zero; **Model F** = path from perfectionism to mediator constrained to zero and path from baseline depression to follow-up depression constrained to zero; **Model G** = path from perfectionism to follow-up depression constrained to zero and path from baseline depression to follow-up depression constrained to zero. Bolded models correspond to model selected based on model comparisons.
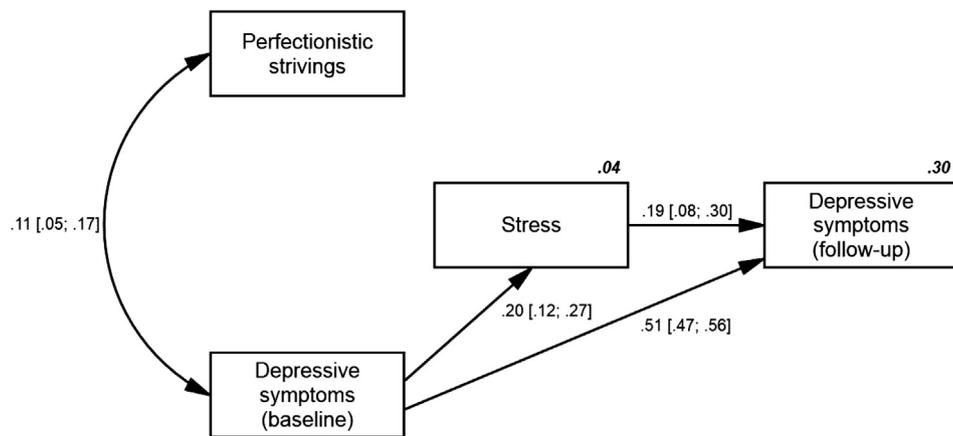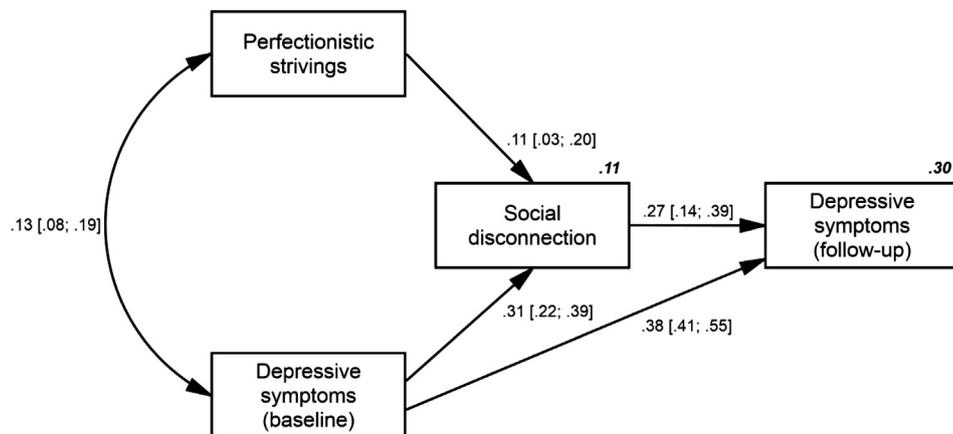* $p < .05$.
** $p < .01$.
*** $p < .001$.
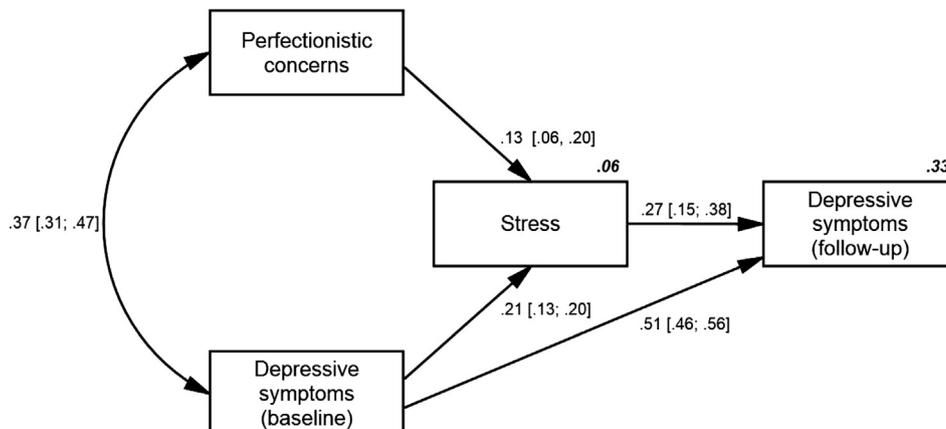
Fig. 2. Selected path model for the mediating role of stress in the relationship between baseline perfectionistic concerns and follow-up depressive symptoms, controlling for baseline depressive symptoms (see Table 2 Model 1C). Rectangles represent observed variables. Bolded italicized numbers in the top right-hand corner of rectangles represent the proportion of variance explained by exogenous variables. Standardized path coefficients are reported with 95% confidence intervals in brackets.

Fig. 3. Selected path model for the mediating role of social disconnection in the relationship between baseline perfectionistic concerns and follow-up depressive symptoms, controlling for baseline depressive symptoms (see Table 2 Model 2C). Rectangles represent observed variables. Bolded italicized numbers in the top right-hand corner of rectangles represent the proportion of variance explained by exogenous variables.

Fig. 4. Selected path model for the mediating role of stress in the relationship between baseline perfectionistic strivings and follow-up depressive symptoms, controlling for baseline depressive symptoms (see Table 2 Model 3E). Rectangles represent observed variables. Bolded italicized numbers in the top right-hand corner of rectangles represent the proportion of variance explained by exogenous variables. Standardized path coefficients are reported with 95% confidence intervals in brackets.

Fig. 5. Selected path model for the mediating role of social disconnection in the relationship between baseline perfectionistic strivings and follow-up depressive symptoms, controlling for baseline depressive symptoms (see Table 2 Model 4C). Rectangles represent observed variables. Bolded italicized numbers in the top right-hand corner of rectangles represent the proportion of variance explained by exogenous variables. Standardized path coefficients are reported with 95% confidence intervals in brackets.

Overall, this accords with theory (Hewitt et al., 2017; Sherry et al., 2016) and evidence (Smith et al., 2017) that social disconnection is essential for understanding why perfectionism places people at risk for depressive symptoms. Indeed, establishing meaningful connections with others is often difficult for people high in perfectionistic concerns, as others' approval, acceptance, and love are judged as forthcoming only if they achieve perfect outcomes (Hewitt & Flett, 1991; Hewitt et al., 2006, 2017).

Likewise, people high in perfectionistic strivings frequently pursue agentic goals, at the expense of collective goals, which we speculate causes them to miss or ignore chances for participating in meaningful relationships, which, in turn, leads to depressive symptoms (Sherry et al., 2016).

5.4. Limitations of overall literature

Our meta-analysis offers new insights into the state of research on the stress generation model and the PSDM, and by doing so, underscores limitations. Most tests of the stress generation model and the PSDM rely on cross-sectional designs which are not adequate for assessing temporal precedence. Research in this area would benefit from more longitudinal studies controlling for baseline depressive symptoms. Except for Smith et al. (2017), all included studies used mono-source designs. Mono-source designs are problematic when studying traits such as perfectionism in which self-presentational bias could influence results. Likewise, 10 included studies had sample sizes below 250, suggesting much of the longitudinal literature on the stress generation model and the PSDM is underpowered. As well, 14 included studies tested stress or social disconnection, without reference to a unifying integrative model explaining how stress and social disconnection combine to produce depressive symptoms.

5.5. Limitations of present study and future directions

Limitations in the literature translate into limitations of the present study. Apart from *Mandel et al. (2015), Sherry et al. (2013), and Smith et al. (2017), stress and/or socially disconnection were extracted from the same time point as follow-up depressive symptoms. As such, we were unable to conduct a full test of mediation with predictors, mediators, and outcomes measured at separate time points. Likewise, the extent to with perfectionistic concerns and strivings predicted changes in the mediators which, in turn, lead to changes in depressive symptoms, is unclear. Future research should address these limitations by testing all variables (perfectionistic concerns, perfectionistic strivings, stress, social disconnection, and depressive symptoms) at all points in time as part of a longitudinal study with three or more waves. Additionally, the exclusive use of self-reports may have inflated the effect sizes reported due to shared method variance and prevented us from distinguishing between actual versus perceived stressors and objective versus subjective social disconnection. It is essential for future research to address this limitation by supplementing self-reports with observer reports (see McCrae, 1994) or interview-based measures (see Alloy, Liu, & Bender, 2010). Samples were also predominantly Caucasian, and results may not generalize to more diverse samples. Similarly, the extent to which participants in included studies were suffering from a diagnosed disorder is unclear, and future research should attempt to determine the generalizability of our findings to clinical samples. Likewise, the age of participants in included studies was narrow (range = 15.3 to 46.1 years), and we were unable to test the moderating effect of age on observed relationships across the full lifespan. As such, future research should test whether the age differences reported replicate by studying perfectionism, stress, and social disconnection in a large sample with a broad age range. Furthermore, based on theoretical accounts (Hewitt & Flett, 2002; Hewitt et al., 2006, 2017; Sherry et al., 2016) and empirical evidence (e.g., *Joiner & Schmidt, 1995; Sherry et al., 2013; Smith et al., 2017), we tested a specific sequence of events. However, different sequences are possible. For instance, perfectionistic concerns and strivings might be consequences of, rather than antecedents of, depressive symptoms. Nonetheless, we were unable to test such models as 14 of the 18 studies included did not report stability coefficients for per-

fectionism dimensions. Similarly, we were unable to evaluate moderated mediation as TS-MASEM does not allow for the inclusion of continuous moderators (Cheung & Cheung, 2016; Cheung & Hong, 2017). Lastly, some authors contend funnel plots are ill-equipped to detect publication bias and future research could address this through the use of alternatives, such as *p*-curve analysis (Simonsohn, Nelson, & Simmons, 2014).

5.6. Concluding remarks

Our study is the most rigorous test to date of the stress generation model of perfectionism and the PSDM. In synthesizing extant longitudinal research, we found partial support for the stress generation model and full support for the PSDM. Perfectionistic concerns, but not perfectionistic strivings, predicted increased depressive symptoms through stress. In contrast, perfectionistic strivings and perfectionistic concerns both predicted increased depressive symptoms through social disconnection. Researchers and clinicians seeking to understand depressed perfectionists are encouraged to consider how they may shape their environments by generating stressful events and social disconnection conducive to depressive symptoms.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2020.103954.

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