



Perfectionism and eating disorders in children and adolescents: A systematic review and meta-analysis

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ABSTRACT

There is a consistent link between perfectionism and eating disorders, however no meta-analysis to date has synthesized this literature in children and adolescents. We hypothesized that there would be significant, small pooled correlations between perfectionism dimensions and eating disorder symptoms in children and adolescents. Published, peer-reviewed articles with standardised measures of perfectionism and eating disorder symptoms were included. Articles were excluded if the age range was over 18 years. Overall, 39 studies were included ($N = 13,954$ participants, M age = 13.7 years). Total perfectionism ($r = 0.25$), perfectionistic strivings ($r = 0.21$), and perfectionistic concerns ($r = 0.31$) had significant positive associations with eating disorder symptoms. Most studies were rated as fair or good quality. Limitations included high heterogeneity, insufficient studies to investigate age as a moderator, the inclusion of only English articles, and predominately cross-sectional studies which precluded causal inference. Higher perfectionism was associated with greater eating disorder symptoms in children and adolescents. Future research should focus on longitudinal studies of eating disorder symptoms in children and adolescents.

1. Introduction

1.1. Prevalence and impact of eating disorders in young people

Adolescence is the peak time for eating disorders as it is a critical period of developmental vulnerability due to an increased focus on body image and appearance (Campbell & Peebles, 2014). Eating disorders in children and adolescents are characterised by self-worth based on eating, weight, and shape, and involve restrictive or abnormal eating patterns (Campbell & Peebles, 2014). The effect of eating disorders in children and adolescents is significant, impacting physical health and psychosocial functioning (Qian et al., 2022). Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder have prevalence rates of 0.3%, 0.9%, and 1.6% in adolescents (Swanson et al., 2011). Eating disorders in children and adolescents can result in multi-systemic damage, including cardiac abnormalities (e.g., heart arrhythmia, bradycardia; Smythe et al., 2021), brain impairment (e.g., reduced gray-white matter; Donnelly et al., 2018), and bone disease (e.g., reduced bone mineral density; Workman et al., 2020). Eating disorders in young people are also associated with multiple comorbid psychological symptoms,

including anxiety, depression, self-harm, and suicide attempts (Campbell & Peebles, 2014).

1.2. The association of perfectionism with eating disorders in young people

It would be useful for research to examine constructs associated with eating disorder symptoms to inform theoretical understanding in young people. One construct which is strongly associated with eating disorders is perfectionism (Egan et al., 2011). Perfectionism is a multidimensional construct involving setting high personal standards and goals for achievement, and concern over mistakes (Frost et al., 1990). Perfectionism is recognised as a transdiagnostic factor in eating disorders (Egan et al., 2011). Perfectionism has been outlined as a central process maintaining eating disorders in the transdiagnostic theory of eating disorders (Fairburn et al., 2003). The transdiagnostic theory has been supported in cross-sectional studies of children and adolescents with eating disorders (e.g., Curzio et al., 2018). Perfectionism has been associated with suicidal behaviour (Smith et al., 2018), and symptoms of eating disorders and negative affect (Limburg et al., 2017).

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Perfectionism is often measured using two commonly used instruments: the Frost Multidimensional Perfectionism Scale (F-MPS; Frost et al., 1990) and the Hewitt and Flett (1991) Multidimensional Perfectionism Scale (HF-MPS). The F-MPS (Frost et al., 1990) is comprised of five subscales: personal standards (PS): setting high personal goals for achievement, concern over mistakes (CM): worry that the individual has made mistakes in performance, doubts about actions (DA): doubting over whether mistakes have been made, parental expectations (PE): high standards set by parents, and parental criticism (PC): parents' criticism over making mistakes. The HF-MPS (Hewitt & Flett, 1991) has three subscales: self-oriented perfectionism: setting high personal standards and goals, socially-prescribed perfectionism: believing that others hold high standards for the individual, and other-oriented perfectionism: expecting others to be perfect.

When we refer to the term “perfectionism” in this manuscript, we are referring to multidimensional perfectionism. Two higher-order dimensions of perfectionism have been identified in factor analyses of perfectionism scales: perfectionistic strivings and perfectionistic concerns (Smith & Saklofske, 2017). Perfectionistic strivings refer to aiming for high achievement (Stoeber & Otto, 2006). Perfectionistic concerns refer to a fear of making mistakes and being judged by others for one's performance (Stoeber & Otto, 2006). The higher-order dimensions of perfectionistic strivings and perfectionistic concerns will be used in this review as these dimensions are widely accepted as representing the main components of multidimensional perfectionism (Smith & Saklofske, 2017; Stoeber & Otto, 2006).

1.3. Previous meta-analyses on the association between perfectionism and eating disorder symptoms

There has been extensive empirical research that has examined the association between perfectionism and symptoms of eating disorders. A previous meta-analysis with adult samples indicated that both perfectionistic strivings and concerns are positively associated with eating disorder symptoms (Limburg et al., 2017). Studies have demonstrated that perfectionism is a predictor of disordered eating in adolescents (Boone, Soenens, & Luyten, 2014; Ferreira et al., 2012; Wade et al., 2015). Higher perfectionism is linked to poorer treatment outcomes. For example, children and adolescents with eating disorders who had higher levels of perfectionism were more likely to be readmitted to hospital (Johnston et al., 2018). Vacca et al. (2021) conducted a systematic review of the literature examining perfectionism and eating disorder symptoms in children and adolescents aged 10–19 years. Vacca et al. (2021) concluded there was a positive association between higher total perfectionism scores and greater eating disorder symptoms. Limitations of Vacca et al.'s (2021) review were not including children under 10 years of age and the strength of the association between perfectionism and eating disorder symptoms in young people was not examined in a meta-analysis.

A meta-analysis by Limburg et al. (2017) examined the association between perfectionism and psychopathology in adults ($M = 25.1$ years). Limburg et al. (2017) included 284 studies with data from samples of individuals diagnosed with eating disorders and community samples. Effect size estimates indicated a small pooled positive correlation between perfectionism and eating disorder symptoms, with a small, pooled correlation defined as $r = 0.1$ – 0.3 (Cohen, 1992). Specifically, higher perfectionistic concerns ($r = 0.27$; 95% CI = 0.23 – 0.31) and perfectionistic strivings ($r = 0.21$; 95% CI = 0.23 – 0.31), were related to greater eating disorder symptoms (Limburg et al., 2017). These findings are similar to earlier systematic reviews and meta-analyses which also found a positive relationship between perfectionism and eating disorder symptoms in adults (Bardone-Cone et al., 2007; Dahlenburg et al., 2019; Stice, 2002). That said, as previous meta-analyses were based on adult samples, generalisations cannot be made to children and adolescents.

1.4. Rationale for the current systematic review and meta-analysis in children and adolescents

A meta-analysis is required to understand if perfectionism is related to eating disorder symptoms in children and adolescents given the literature has not been synthesized to date. It would be useful to help inform theories of eating disorders whether there is a relationship between perfectionism and eating disorders. Further, understanding if there is an association between specific perfectionism dimensions and eating disorder symptoms in children and adolescents will help us gain clarity on which aspects of perfectionism are most strongly related to eating disorder symptoms to inform theoretical approaches. The aim of the current study was to conduct a systematic review and meta-analysis to determine the relationship between multidimensional perfectionism and eating disorder symptoms in children and adolescents in clinical and non-clinical settings. The novel aim of this study was to conduct the first meta-analysis of the association between multidimensional perfectionism and eating disorder symptoms in children and adolescents. Based on previous research (Limburg et al., 2017), it was hypothesized that there would be small positive pooled correlations between total perfectionism and eating disorder symptoms in children and adolescents. Further, it was predicted that both dimensions of perfectionism: perfectionistic strivings and perfectionistic concerns, would also show small positive pooled correlations with eating disorder symptoms in young people.

2. Method

2.1. Databases, search strategy, inclusion and exclusion criteria

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA; Page et al., 2021) were adhered to in this review. The research protocol was registered on PROSPERO on May 16, 2022, prior to database searching (Registration number: CRD42022324655). A literature search was completed on May 17, 2022, using the Ovid platform. The following databases were searched: Embase, Medline, PsychINFO, PsycARTICLES, CINAHL Proquest, Scopus, and Web of Science. The search terms were perfectionis* and feed* or food* or eat* or appetite* or disorder* or binge* or restrain* or compulsiv* or restrict* or addict* or anorexi* or bulimi* or OSFED or EDNOS or eating patholog* or eating symptom* or body dissatisfaction or body image or diet. The inclusion criteria were: (a) published, peer-reviewed, quantitative research; (b) in English; (c) included standardised measures of perfectionism and eating disorder symptoms; (d) reported unadjusted effect sizes; (e) correlational study designs or a group comparison, for example, between a clinical and a nonclinical group; and (f) age range between 0 and 18 years (if not listed studies were included if the sample was described as students in year 10 or below). There was no date restriction on studies. To ensure the independence of effect sizes, intervention, and longitudinal study effect sizes were calculated only from baseline correlations, which resulted in the exclusion of Shaw et al. (2004). Where multiple studies reported on the same participants, only data from the first study was used, resulting in the exclusion of González et al. (2018), Nordin-Bates et al. (2016), and Rodgers et al. (2019).

2.2. Data collection, screening and extraction

Articles were identified, screened, and assessed by the first author (see Fig. 1). Identified articles were downloaded into EndNote (Version 20.3) and duplicates removed. The first author screened at title and abstract level against the inclusion and exclusion criteria. Full texts were then retrieved and screened for inclusion. A random 30% of identified studies were also rated by an independent reviewer at title and abstract ($n = 779$) and full-text ($n = 318$). Inter-rater reliability showed excellent agreement at title/abstract (94% agreement; $k = 0.84$, $p < 0.001$) and at

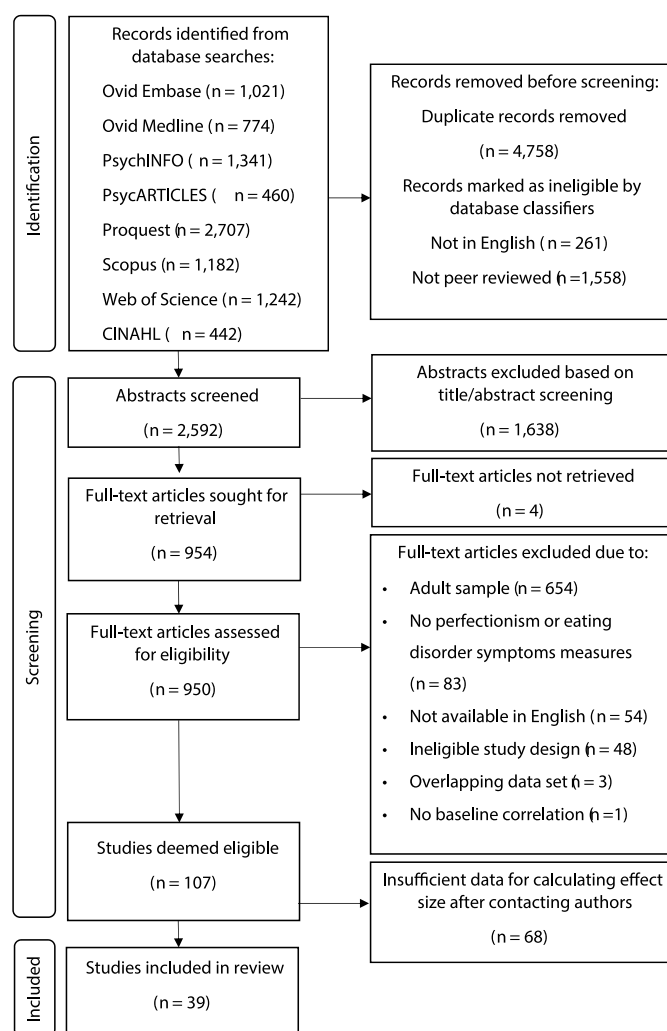


Fig. 1. Process of study selection.

full-text (99% agreement; $k = 0.86$, $p < 0.001$; Landis & Koch, 1977, pp. 159–174). Discrepancies were discussed with the last author until a consensus was reached. Additional data were requested from 66 authors of whom 12 responded with the requested data. Data extraction included author, year, country, design, sample size, population (i.e., community or clinical), eating disorder diagnosis, age, percentage of female participants, percentage of Caucasian participants, and instruments used to measure perfectionism and eating disorder symptoms (see Table 1). Correlations and standard deviations were also extracted for each of the associations. Groups were coded as clinical if authors stated the sample met the criteria for eating disorder diagnosis based on the Diagnostic and Statistical Manual (DSM-4; American Psychiatric Association, 2000), International Classification of Diseases (ICD-10; World Health Organization, 2016) or the Workgroup for Classification of Eating Disorders in Children Adolescents (WCEDCA; Bravender et al., 2010). Participants diagnosed with the Structured Interview for Anorexic and Bulimic Syndromes for Expert Rating (SIAB-EX; Fichter et al., 1998) were also classified as clinical. If the sample did not meet these diagnosis criteria, they were classified as non-clinical.

2.3. Classification of perfectionistic strivings and concerns

Perfectionism measures were classified into strivings or concerns. Perfectionistic strivings included the personal standards subscale of the F-MPS (Frost et al., 1990), the self-oriented perfectionism subscale of the HF-MPS (Hewitt & Flett, 1991), and the high standards subscale of the

APS-R (Slaney et al., 2001). Perfectionistic concerns included the concern over mistakes, doubts about actions, parental expectations, parental criticism, socially-prescribed perfectionism, and discrepancy subscales from the same instruments.

Subscales of the Perfectionism Inventory (PI; Hill et al., 2004) and the Child Perfectionism Questionnaire (Oros, 2003) were also classified into strivings and concerns (for details see Table 1, supplementary materials).

2.4. Quality assessment

The methodological quality of studies was examined using the National Institute of Health (2020) Quality Assessment Tool for Observational and Cross-sectional studies. Study quality was rated across 14 items assessing study design, selection bias, information bias, measurement bias, and confounding variables. Each applicable item was rated (i.e., 0 = no and 1 = yes). The overall quality rating was calculated by dividing the number of yes responses by the number of applicable items. Scores were multiplied by 100 to give a total percentage and categorised as poor ($\leq 50\%$), fair (50.01–74.99%), and good ($\geq 75\%$) as per previous studies (e.g., Gower et al., 2022). The study quality results can be seen in Table 2 in the supplementary materials.

2.5. Data analysis

To examine the association between perfectionism and eating disorder symptoms Pearson's r correlations were extracted. Cohen's (1992) conventions were used to interpret effect sizes ($r = 0.10$ small, $r = 0.30$ moderate, $r = 0.50$ large). The effect size for one study was reversed to match the scoring direction (Wilksch & Wade, 2013). For intervention studies, mean and standard deviations were transformed to Pearson's r correlation using the Campbell Collaboration Effect Size Calculator (Wilson, 2001). Odds ratios were converted to Pearson's r correlation using the Escal Effect Size Converter (Lin, 2019). The standard error (SE) for Pearson's correlation was calculated for each effect ($SE = (1 - r^2)/\sqrt{N - 3}$; Gnamb, 2022). Only unadjusted effect sizes were extracted, and zero-order correlations requested from authors. Where studies reported more than one perfectionism and/or eating disorder measure, the average effect size was calculated.

The meta-analysis was conducted in JASP (version 0.16.3). The pooled effect sizes between eating disorder symptoms and perfectionism were estimated using a random effects model (Schmidt & Hunter, 2014). Confidence intervals were calculated using the Wald-type confidence interval. To assess the heterogeneity of effect sizes, the Q-statistic with a p -value and I^2 statistic were calculated (Cheung, 2019). If the Q-statistic is significant, this indicates studies are heterogeneous (Huedo-Medina et al., 2006). The I^2 statistic indicates the percentage of variability due to heterogeneity rather than random error (Huedo-Medina et al., 2006). Heterogeneity was classified as low ($< 50\%$), moderate (50–75%), or high ($\geq 75\%$) (Higgins et al., 2003). Subgroup analyses and meta-regressions were used to explore heterogeneity. Potential sources of heterogeneity (e.g., study quality and clinical status) were assessed in meta-regressions. Moderator analyses were only conducted if there was moderate to high heterogeneity and four or more studies per subgroup (Fu et al., 2011). Publication bias was assessed using Egger's test for plot asymmetry (Egger et al., 1997). Egger's test for plot symmetry provides a Y-intercept from linear regression (Egger et al., 1997). If Egger's test is significant ($p < 0.05$) it indicates that publication bias is likely present (Egger et al., 1997). Sensitivity analyses were used to account for low-quality studies (quality rating of $\leq 50\%$; Gower et al., 2022).

3. Results

3.1. Study Selection and characteristics

Fig. 1 depicts the search results and study inclusion procedure. The

Table 1
Study characteristics and summary of included studies (n = 39).

Authors	Country	Sample type	Study design	Perfectionism measures	Perfectionism facet	ED measures	N (%F)	M age (range)
Bachar et al. (2010)	Israel	Year 7–9 female school students	Longitudinal correlational	HF-MPS	PS; PC; TS	EAT-26	1057 (100%)	14.0
Boone et al. (2010)	Belgium	High school students	Cross-sectional	F-MPS	PS; PC	EDE-Q*	656 (59%)	13.9 (12–15)
Boone, Soenens, and Luyten (2014)	Belgium	Female high school students	Longitudinal correlational	F-MPS (PS; CM; DA)	PS; PC	EDI-II (DT; BD; B)	455 (100%)	13.0 (12–15)
Boone, Vansteenkiste, et al. (2014)	Belgium	High school students	Longitudinal correlational	F-MPS (CM; DA)	PC	EDE-Q (SC; WC) EDI-II (B)	566 (71%)	13.3 (11–15)
Brehm and Steffen (1998)	USA	High school students	Cross-sectional	EDI (P)	TS	EDI-II (DT; BD; B)	250 (53%)	14.6 (12–17)
Cassidy et al. (1999)	UK	Adolescents with AN/BN and controls (C)	Cross-sectional	EDI (P)	TS		49 (96%)	15.6 (13–17)
Christian et al. (2019)	USA	Female high school students	Open intervention study	F-MPS	PS; PC; TS	EDE-Q	304 (100%)	15.2(14–17)
Cole and Edelman (1987)	UK	Female high school students	Cross-sectional	EDI (P)	TS	EDI (DT; BD; B)	184 (100%)	15.5 (14.3–17)
Curzio et al. (2018)	Italy	Neuropsychiatry patients with ED (C)	Cross-sectional	CAPS (SOP); EDI-III (P)	PS; TS	EDI-III (B); EDE (R)	419 (86%)	14.7(7–18)
Custers and Van den Bulck(2009)	Belgium	High school students	Cross-sectional	EDI (P)	TS	EDI (DT)	711 (55%)	13.7(13–17)
Dour and Theran (2011)	USA	Year 7 and 8 students	Cross-sectional	APS-R	PC	EAT-26	161 (54%)	12.8(12–14)
Drieberg et al. (2019)	Australia	Females with ED (C)	Cross-sectional	EDI-III (P)	TS	EDE*	231 (100%)	14.5 (11.0–17.8)
Eddy et al. (2007)	USA	Overweight patients seeking treatment	Cross-sectional	EDI-II (P)	TS	ChEDE* (WC; SC)	122 (56%)	11.5(8–18)
Elizathe et al. (2016)	Argentina	Overweight/obese school students (C)	Cross-sectional	CPQ	TS		100 (37%)	10.9(9–13)
Faust (1987)	USA	Female adolescents with both parents and no history of ED	Cross-sectional	EDI (P)	TS	EDI (DT; BD)	68 (100%)	13.2 (11.0–14.9)
Ferreiro et al. (2012)	Spain	Primary school students	Longitudinal correlational	EDI-II (P)	TS	ChEAT; EDI-II (BD)	942 (49%)	10.8
Fortes et al. (2014)	Brazil	Male high school students	Cross-sectional	HF-MPS	TS	EAT-26	368 (0%)	13.8(12–15)
Francisco et al. (2015)	Portugal; Spain	Urban dwelling adolescents	Cross-sectional	EDI-II (P)	TS	EAT-26	455 (52%)	13.3(12–16)
Goldstein et al. (2011)	Australia	Female hospital day program patients (C)	Cohort	EDI-III (P)	TS	EDI-III (DT; BD; B)	28 (100%)	(12–18)
Johnston et al. (2018)	Australia	Children and adolescents with ED (C)	Longitudinal correlational	EDI-III (P)	TS	EDE*	175 (91%)	14.5(9–17)
Jones et al. (2020)	Australia	Adolescents with ED (C)	Cross-sectional	EDI-III (P)	TS	EDE*	270 (95%)	14.9 (13.0–17.8)
Kirsh et al. (2007)	Canada	Female ED treatment group and controls (C)	Cross-sectional	CAPS	PS; PC		50 (100%)	13.0(12–14)
Magson et al. (2019)	Australia	Year 6 students	Cross-sectional	CAPS*	PS; PC	ChEAT	510 (50%)	11.2
Nichols et al. (2018)	Australia	6 year old children	Longitudinal correlational	CAPS*	PS; PC; TS	DEBQ-C (R)*	188 (55%)	6.50
Nordin et al. (2003)	UK	Female gymnasts	Cross-sectional	EDI (P)	TS	EDI (DT; BD; B)	50 (100%)	11.6(10–15)
Nordin-Bates et al. (2011)	UK	Dance students	Cross-sectional	PI*	PS; PC	EAT-26*	346 (75%)	14.4(10–18)
Ramon-Jarne et al. (2019)	Spain	High school students	Cross-sectional	EDI-II (P)	TS	EDI-II (DT; B)	493 (55%)	14.8 (13.1–16.5)
Rosewall et al. (2018)	New Zealand	Female high school students	Cross-sectional	CAPS	PS; PC	EAT-26; EDI-II (BD)	231 (100%)	15.5(14–18)
Rosewall et al. (2020)	New Zealand	Female primary school students	Cross-sectional	CAPS	PS; PC	ChEAT; EDI-II (BD)	169 (100%)	(10–12)
Sepulveda et al. (2021)	Spain	Adolescents with ED and controls (C)	Cross-sectional case-control	EDI-II (P)	TS		100 (100%)	14.7(12–17)
Serpell et al. (2006)	UK	Children and adolescents with ED (C)	Cross-sectional	HF-MPS	PS; PC; TS	EDE*	49 ^a (94%)	15.2(11–18)
Stornaes et al. (2019)	Norway	High school students	Cross-sectional	F-MPS	PS; PC	EDE-Q-11(SW; WC)	832 (53%)	(13–14)
Teixeira et al. (2016)	Portugal	Female high school students	Cross-sectional	CAPS*	PS; PC; TS	ChEAT*	575 (100%)	15.8(11–18)
van Noort et al. (2018)	Germany	Female children with early onset anorexia and controls (C)	Cross-sectional	F-MPS	TS		60 (100%)	11.9 (9.2–17.7)

(continued on next page)

Table 1 (continued)

Authors	Country	Sample type	Study design	Perfectionism measures	Perfectionism facet	ED measures	N (%)	M age (range)
Warschburger and Zitzmann (2018)	Germany	High school students	RCT	EDI-II (P)	TS	EAT-26; EDI-II (DT; B; BD)	1112 (54%)	13.0(10–16)
Wilksch et al. (2008)	Australia	Female year 10 students	Open intervention study	F-MPS (Ps; CM)	PS; PC	EDE-Q (WC; SC); DEBQ (R)	138 (100%)	15.0
Wilksch et al. (2015)	Australia	Year 7 and 8 students	Open intervention study	F-MPS (Ps; CM)	PS; PC	EDE-Q (WC; SC; EC); EDI (BD); DEBQ (R)	1316 (64%)	13.2
Wilksch et al. (2013)	Australia	Year 7 students	Open intervention study	F-MPS (Ps; CM)	PS; PC	DEBQ (R); EDE-Q (SC; WC);	114 (45%)	12.7
Wilson et al. (2015)	UK	Adolescents with type 1 diabetes	Cross-sectional	F-MPS	TS	ChEDE*	50 (60%)	(14–16)

Note. In studies where an effect size was calculated from the mean and SD of an eating disorder group and control group, the eating disorder measures has been left blank. Parentheses denotes subscales; asterisk denotes the scale has been adjusted; % F = percentage of sample that are female; APS-R = Almost Perfect Scale-Revised; AN = anorexia nervosa; B = bulimia; BD = Body Dissatisfaction; BN = bulimia nervosa; C = denotes a clinically diagnosed eating disorder sample; CAPS = Child-Adolescent Perfectionism Scale; ChEAT = Children's Eating Attitudes Test; ChEDE = Child-Adapted Eating Disorder Examination; CM = Concern Over Mistakes; CPQ = Child Perfectionism Questionnaire; DEBQ = Dutch Eating Behaviour Questionnaire; DEBQ-C = Children's Dutch Eating Behaviour Questionnaire; D = Dietary Restraint; DT = Drive For Thinness; EAT-26 = Eating Attitudes Test; EC = Eating Concern; ED = eating disorder; EDE = Eating Disorder Examination; EDE-Q = Eating Disorder Examination-Questionnaire; EDE-Q-11 = Eating Disorder Examination Questionnaire-11; EDI = Eating Disorder Inventory; EDI-II = Eating Disorder Inventory-2; EDI-III = Eating Disorder Inventory-3; DA = Doubts Over Actions; F-MPS = Frost Multidimensional Perfectionism Scale; HF-MPS = Hewitt Multidimensional Perfectionism Scale; PC = perfectionistic concerns; PI = Perfectionism Inventory; PS = perfectionistic strivings; Ps = Personal Standards; R = Restraint; RCT = randomised control trial; SC = Shape Concerns; SOP = Self-Oriented Perfectionism; SPP = Socially-Prescribed Perfectionism; TS = total score; WC = Weight Concerns.

*Calculated at $N = 24$ due to missing data.

Table 2

Summary statistics for meta-analyses of relationship between perfectionism and eating disorder symptoms, subgroup and sensitivity analysis.

	k	N	Random effects model				Heterogeneity analyses			Publication bias
			r	95% CI	z	p	Q (df)	p	I^2	p
Total perfectionism	27	9066	0.25	0.19 to 0.32	7.18	<0.001	278.69 (26)	<0.001	90.03	0.56
Clinical Status						0.714				
ED	10	1481	0.29	0.24 to 0.34	10.76	<0.001	11.39 (9)	0.250	11.37	0.37
Non-ED	17	7585	0.25	0.15 to 0.34	5.20	<0.001	266.68 (16)	<0.001	93.41	0.71
Poor quality studies removed	15	7259	0.23	0.20 to 0.27	12.46	<0.001	29.37 (14)	0.009	47.90	0.62
Perfectionistic strivings	17	7409	0.21	0.15 to 0.26	7.46	<0.001	93.84 (16)	<0.001	81.34	0.07
Poor quality studies removed	14	6644	0.18	0.13 to 0.24	6.54	<0.001	66.46 (13)	<0.001	78.17	0.06
Perfectionistic concerns	18	7717	0.31	0.26 to 0.36	12.53	<0.001	92.99 (17)	<0.001	80.02	0.59
Poor quality studies removed	14	6791	0.31	0.25 to 0.37	10.55	<0.001	86.88 (13)	<0.001	83.24	0.52

Note. Study quality was assessed using the NIH Quality Assessment Tool for Observational and Cross-sectional Studies. Studies with an overall score of $\leq 50\%$ were denoted as poor quality and removed for sensitivity analyses. ED = clinically diagnosed with an eating disorder; Non-ED = not clinically diagnosed with an eating disorder.

final included sample was 39 studies, with a total sample size of 13,954 participants, aged 7–18 years old (M age = 13.7 years). Table 1 presents an overview of the characteristics of included studies. The majority of studies used all female samples ($n = 15$, 38%) or had predominantly female samples ($n = 7$, 18%). 1 study had a male-only sample. Participants were recruited from eating disorder clinics ($n = 10$, 26%), high schools ($n = 18$, 46%), and primary schools ($n = 4$, 10%). Studies were predominantly conducted in Australia ($n = 9$, 23%), UK ($n = 6$, 15%), and USA ($n = 5$, 13%). Perfectionism was typically measured using the Eating Disorder Inventory (EDI), Perfectionism Subscale ($n = 17$, 44%; all versions; Garner, 1991, 2004; Garner et al., 1983), followed by the Frost Multidimensional Perfectionism Scale ($n = 10$, 26%; F-MPS; Frost et al., 1990), the Child-Adolescent Perfectionism Scale ($n = 7$, 18%; CAPS; Flett et al., 2000), and the Hewitt Multidimensional Perfectionism Scale ($n = 3$, 8%; HF-MPS; Hewitt & Flett, 1991). Eating disorder symptoms were typically measured with the EDI ($n = 15$, 38%), Eating Attitudes Test ($n = 7$, 18%; Garner et al., 1982), Eating Disorder Examination-Self-Report Questionnaire Version ($n = 6$, 18%; Fairburn & Beglin, 1994), and the Eating Disorder Examination ($n = 5$, 13%;

Fairburn & Cooper, 1993). Of the 39 included studies, 33 reported correlational effect sizes. In 5 studies (Cassidy et al., 1999; Elizathe et al., 2018; Kirsh et al., 2007; Sepulveda et al., 2021; van Noort et al., 2018) effect sizes were calculated using mean and SD's from a clinically diagnosed eating disorder group and a control group. Participants in these studies were diagnosed with eating disorders using the DSM-4 (American Psychiatric Association, 2000), ICD-10 (World Health Organisation, 2016), SIAB-EX (Fichter et al., 1998), or the WCEDCA (Bravender et al., 2007) criteria. In 1 study an odds ratio of a high and low perfectionism group (Fortes et al., 2014) was converted into a Pearson's correlation coefficient.

3.2. Quality assessment results

Study quality ratings are presented in supplementary materials (Table 2) and ordered from low to high risk of bias to distinguish the most trustworthy evidence. Studies varied in quality: 5% were rated good, 59% as fair, and 36% as poor.

3.3. Meta-analysis results

3.3.1. Overall effect sizes and moderators

There were 27 studies that examined the relationship between total perfectionism and eating disorder symptoms. The forest plot in Fig. 2 shows a small positive pooled effect. Fig. 3 displays the small positive pooled effect size between perfectionistic strivings and eating disorder symptoms. There were 17 studies included (see Table 2). As shown in Fig. 4, the results of 18 studies showed there was a moderate positive pooled effect for the association between perfectionistic concerns and eating disorder symptoms. Subgroup and sensitivity analyses are presented in Table 2. Study quality and clinical status were not significant moderators for total perfectionism and perfectionistic concerns (see supplementary material). In contrast, study quality and clinical status were significant moderators for perfectionistic strivings. The association between perfectionistic strivings and eating disorder symptoms was stronger in clinical than non-clinical samples ($B = 0.21$ [0.10, 0.33], $p < 0.001$), and in poorer quality studies ($B = -0.74$ [-1.17, -0.32], $p < 0.001$). Sensitivity analyses revealed that the removal of studies with a poor-quality rating did not significantly change the association between eating disorder symptoms and total perfectionism, perfectionistic strivings, or perfectionistic concerns.

3.3.2. Heterogeneity and publication bias results

Heterogeneity was high and significant for total perfectionism ($Q = 278.69$, $p < 0.001$; $I^2 = 90.03\%$), perfectionistic strivings ($Q = 93.84$, p

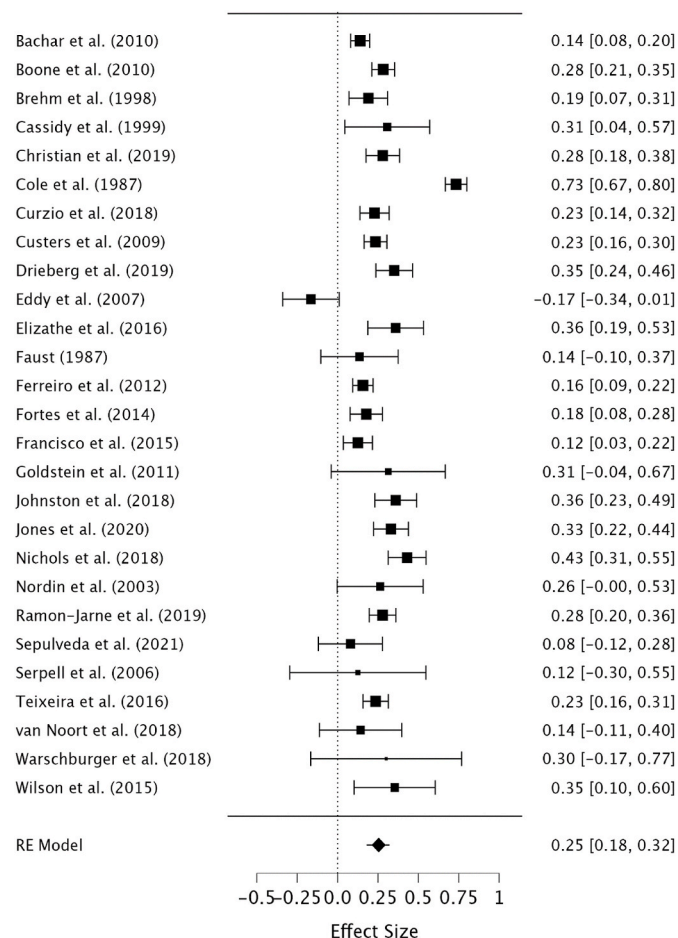


Fig. 2. Forest Plot of the Correlations between Total Perfectionism and Eating Disorder Symptoms
Note. The correlation coefficient and confidence intervals for each study are listed on the right. (i.e., correlation coefficient [lower confidence interval, upper confidence interval]).

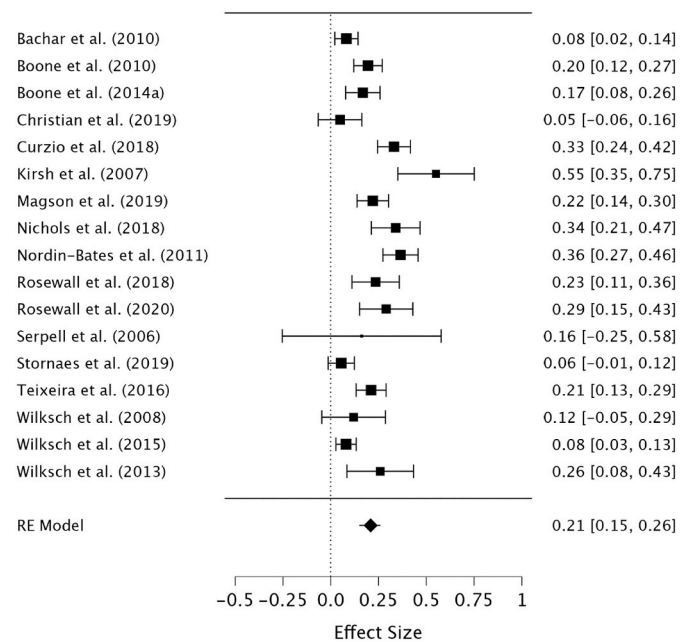


Fig. 3. Forest Plot of the Correlations between Perfectionistic Strivings and Eating Disorder Symptoms

Note. The correlation coefficient and confidence interval for each study are listed on the right. (i.e., correlation coefficient [lower confidence interval, upper confidence interval]).

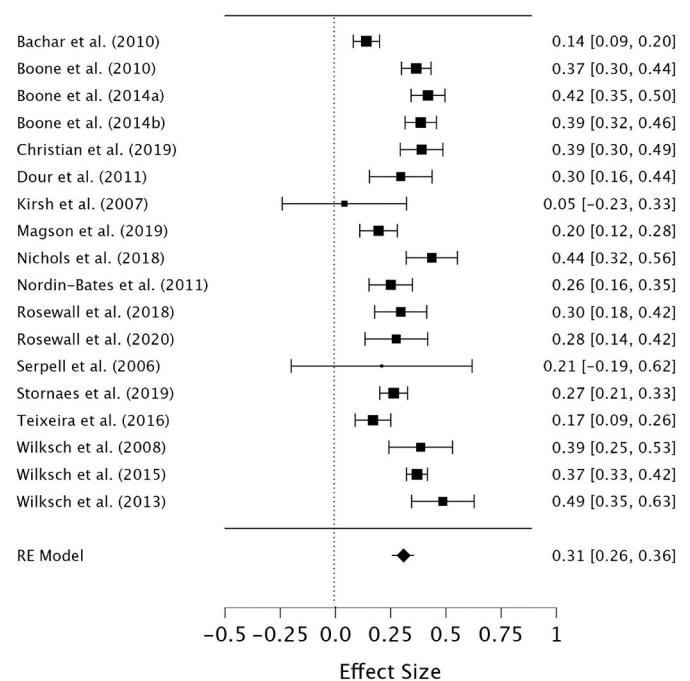


Fig. 4. Forest Plot of the Correlations between Perfectionistic Concerns and Eating Disorder Symptoms

Note. The correlation coefficient and confidence interval for each study are listed on the right. (i.e., correlation coefficient [lower confidence interval, upper confidence interval]).

< 0.001 ; $I^2 = 81.34\%$), and perfectionistic concerns ($Q = 92.99$, $p < 0.001$; $I^2 = 80.02\%$). Heterogeneity was not significant in subgroup analyses of studies with only clinically diagnosed eating disorder samples yet remained high for non-clinical samples. Heterogeneity decreased in the meta-regression analyses for perfectionistic strivings

and remained high for total perfectionism and perfectionistic concerns. In sensitivity analyses, the exclusion of low-quality studies decreased the level of heterogeneity for total perfectionism from high to low. Heterogeneity remained high for perfectionistic strivings and concerns. Egger's test was not significant ($p > 0.05$) indicating that publication bias was unlikely an issue for total perfectionism, perfectionistic strivings, and perfectionistic concerns.

4. Discussion

4.1. Overview of findings

This is the first systematic review and meta-analysis to evaluate the strength of the association between perfectionism and eating disorder symptoms in children and adolescents. The current findings indicate that perfectionism is associated with eating disorder symptoms in children and adolescents, in line with a meta-analysis in adults (Limburg et al., 2017). As hypothesized, there was a small positive pooled effect size between total perfectionism and eating disorder symptoms. There was also a small effect between perfectionistic strivings and eating disorder symptoms. Further, there was a moderate positive association between perfectionistic concerns and eating disorder symptoms. These findings support previous research demonstrating that higher perfectionism is associated with increased eating disorder symptoms (Bardone-Cone et al., 2007; Stice, 2002; Vacca et al., 2021).

4.2. Moderators

Clinical status and study quality moderated the association between perfectionistic strivings and eating disorder symptoms but did not affect the association for total perfectionism or perfectionistic concerns. This may be due to variations in diagnostic tools used to classify clinical samples. The association between eating disorder symptoms and perfectionistic strivings was stronger for clinical samples, indicating non-clinical adolescents with high levels of perfectionism may be at greater risk of developing an eating disorder compared to individuals with lower perfectionism (Wade et al., 2015). The association between perfectionistic strivings was stronger in studies with a higher risk of bias. Most studies were cross-sectional; perfectionism and eating disorder symptoms were measured at one time point. Future research could track both dimensions of perfectionism and eating disorder symptoms with multiple time points throughout childhood and adolescence. This would increase the quality of studies and may contribute to an understanding of the causal influences of perfectionism dimensions in the development of eating disorders in young people.

4.3. Heterogeneity

There was considerable heterogeneity across studies. We note that after accounting for clinical status in the association between total perfectionism and eating disorder symptoms, heterogeneity was not significant. Heterogeneity is a common issue affecting most meta-analyses in psychology (Stanley et al., 2018). It is well recognised that different study characteristics (e.g., design, population, environmental factors) can all lead to high levels of heterogeneity. There are a multitude of reasons why we might be observing high heterogeneity as diversity across studies gives rise to heterogeneity (Cordero & Dans, 2021; Higgins & Li, 2022; Ioannidis, 2008; Rodriguez et al., 2023). The factors that reflect diversity across studies in our review that may have contributed to high heterogeneity include different populations (e.g., clinical and non-clinical), severity of symptoms (e.g., low to high levels of eating disorder symptoms), and age range (e.g., children through to adolescents). The clinical versus non-clinical samples may have contributed to high heterogeneity given this was particularly observed in non-clinical samples. Future research could investigate what individual differences in non-clinical samples may strengthen the

association between perfectionism and eating disorder symptoms.

4.4. Implications of current findings for theories of eating disorders in youth

The current review extended the meta-analysis by Limburg et al. (2017) conducted with adult samples. We found the same correlation as adult samples between eating disorder symptoms and perfectionistic strivings ($r = 0.21$), and a similar correlation with perfectionistic concerns (current study, $r = 0.31$; in adults, $r = 0.27$; Limburg et al., 2017). Fairburn et al.'s (2003) transdiagnostic model of eating disorders was developed for adult populations and includes perfectionism as a core maintaining process of eating disorders. Our findings provide indirect support for the transdiagnostic model (Fairburn et al., 2003) in young people, in line with cross-sectional studies (e.g., Curzio et al., 2018). It would be useful for future meta-analyses in young people to also consider examining the associations between the other transdiagnostic maintaining processes of mood intolerance, low self-esteem, and interpersonal difficulties (Fairburn et al., 2003). Perfectionism is only one of multiple risk factors theorised as important in the development of eating disorders in children and adolescents (Stice, 2002). Future research would also benefit from longitudinal group-level and intra-individual network analyses (Levinson et al., 2020). This research could inform how elevated perfectionism and other risk factors relate to eating disorder symptoms and comorbid psychological disorder symptoms over time in children and adolescents.

4.5. Limitations of the review and directions for future research

The current systematic review and meta-analysis had several limitations. First, there was high heterogeneity across the analyses. High heterogeneity can limit to some degree the conclusions that can be drawn from meta-analyses (Imrey, 2020). Future meta-analyses on the association between perfectionism and eating disorders in young people should continue to assess for and examine potential causes of heterogeneity. Second, only English articles were included. This limitation means that relevant articles in other languages were missed in the review. Future meta-analyses could consider examining a wider range of articles in languages other than English. Third, there were insufficient studies with samples under the age of 12 to investigate if age (i.e., children vs adolescents) was a significant moderator. This is a limitation as we were not able to examine differences between children and adolescents in the pattern of associations. Understanding potential differences between children and adolescents would be useful to inform whether the relationship between eating disorders and perfectionism is stronger during a certain period of development. Fourth, most studies were cross-sectional. This limits generalisations as it precludes causal inferences regarding the role of perfectionism in eating disorder symptoms in young people (Levinson et al., 2020). It would be useful for a future meta-analysis to examine longitudinal studies of the link between perfectionism and eating disorders over time in young people.

5. Conclusion

This systematic review and meta-analysis of children and adolescents in clinical and non-clinical settings found that total perfectionism and perfectionistic strivings had small positive correlations with eating disorder symptoms. There was a moderate association between eating disorder symptoms and perfectionistic concerns. The association between perfectionistic strivings and eating disorder symptoms was moderated by clinical status and study quality. The association was stronger in clinical than non-clinical samples, and in poorer quality studies. The findings highlight the importance of considering the role of perfectionism in eating disorder symptoms in children and adolescents.

Author contributions

Elizabeth Bills: Conceptualization; data curation; formal analysis; investigation; methodology; writing first draft; writing – review and editing.

Danyelle Greene: Conceptualization; formal analysis; methodology; supervision; writing – review and editing.

Rose Stackpole: Article screening.

Sarah Egan: Conceptualization; methodology; joint contribution to writing of first draft; writing – review and editing; supervision; writing – review and editing.

All authors have approved the final article.

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Ethical statement

The article was a meta-analysis hence ethics approval was not requested.

Declaration of competing interest

Sarah Egan receives royalties for the books “Cognitive-behavioral treatment of perfectionism” and “Overcoming perfectionism: A self-help guide using cognitive behavioral techniques, second edition.”

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2023.106586>.

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