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The Transdiagnostic Role of Perfectionism: Insights From Longitudinal Network Analyses in a Sample of College-Age Women

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Perfectionism has been proposed as a transdiagnostic risk factor, preceding symptoms of psychopathology. However, further research is required to understand how perfectionism functions as a transdiagnostic process across a range of psychological disorders. This study used a network approach in a longitudinal design which assessed both dimensions of perfectionism (perfectionistic strivings and perfectionistic concerns) and symptoms of various disorders (obsessive-compulsive disorder, eating disorders, anxiety, depression).

Participants ($N = 447$; female community sample aged 18–30) completed online surveys at baseline and 6-month follow-up, including measures of perfectionism and psy-

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chopathology. To disentangle temporal dynamics between these variables, we estimated both separate cross-sectional networks for baseline and follow-up as well as a longitudinal (cross-lagged) network across time.

In terms of cross-sectional results, perfectionistic strivings displayed low centrality in our networks. Conversely, perfectionistic concerns shared strong associations with all symptom clusters and emerged as a central bridge variable. Perfectionistic concerns shared its strongest connection with low self-worth. Longitudinal results could not be interpreted due to insufficient stability.

Results were limited by very little variation of variables over time. Final centrality measures may be biased due to a disproportionate amount of eating disorder variables.

Findings underscore the transdiagnostic role of perfectionistic concerns in psychological symptoms. However, no conclusions regarding temporal dynamics or causality can be drawn.

Keywords: perfectionism; network analysis; transdiagnostic process; psychopathology; longitudinal design

PERFECTIONISM has been proposed to be a transdiagnostic risk and maintaining factor across psychological disorders (Egan et al., 2011). Indeed, perfectionism has been found to be correlated with symptoms of various psychological disorders, such as obsessive-compulsive disorder (OCD), eating disorders, generalized anxiety disorder (GAD), and depression (Callaghan et al., 2023; Egan et al., 2011; Limburg et al., 2017; Lunn et al., 2023; Stackpole et al., 2023). Additionally, meta-analytic evidence regarding longitudinal studies suggests that perfectionism not only occurs simultaneously with psychopathology, but precedes symptoms of different disorders, including depression (Smith et al., 2021), anxiety (Smith, Vidovic, et al., 2018), and eating disorders (Kehayes et al., 2019), with small to moderate effects. Despite emerging evidence on the transdiagnostic nature of perfectionism, most studies to date have used a disorder-specific perspective, considering the role of perfectionism within one particular diagnostic group (mostly eating disorders).

Perfectionism is commonly conceptualized along two dimensions: perfectionistic strivings and perfectionistic concerns (Bieling et al., 2004; Stöber & Otto, 2006). Perfectionistic strivings encompass the setting of exceedingly high standards in striving for perfection (Gaudreau, 2019), whereas perfectionistic concerns comprise excessive self-criticism in the face of discrepancy between one's standards and one's performance (Bieling et al., 2004). One common measure for perfectionism is the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990), with the subscale "personal standards" representing perfectionistic strivings and the subscale "concern over mistakes" representing perfectionistic concerns (Howell et al., 2020). Some studies have also used the subscale "doubts about actions" to operationalize perfectionistic concerns. However, this subscale was derived from a measure of OCD symptoms and has thus been argued to primarily reflect those symptoms, rather than perfectionism specifically (Shafran & Mansell, 2001), meaning results based on this particular subscale should be interpreted with caution.

Meta-analyses show that both perfectionistic strivings and perfectionistic concerns are cross-sectionally associated with various types of psychopathology, but that perfectionistic concerns display stronger associations with psychopathology across disorders compared to perfectionistic strivings (Callaghan et al., 2023; Limburg et al., 2017; Lunn et al., 2023; Smith et al., 2016; Stackpole et al., 2023). The strongest connection between perfectionistic strivings and psychopathology has been shown for eating disorder symptoms (Bills et al., 2023; Dahlenburg et al., 2019; Limburg et al., 2017). A less consistent picture emerges when taking longitudinal evidence into account. Whereas the two dimensions appear to share similar longitudinal associations with depression and anxiety symptoms (Smith, Vidovic, et al., 2018; Smith et al., 2021), eating disorder symptoms have predominantly been predicted by perfectionistic concerns (Dickie et al., 2012; Kehayes et al., 2019; Smith et al., 2017), with perfectionistic strivings either not predicting symptoms or not having been included in analyses. These inconsistencies between cross-sectional and longitudinal evidence call for the analysis of both cross-sectional and longitudinal associations within one study. Additionally, studies investigating associations between both perfectionism dimensions and a multitude of different symptoms across multiple disorders at once are scarce. Such a simultaneous investigation of multiple disorders is crucial when trying to prove "multifinality" (Cicchetti, 1984; Egeland et al., 1996), which refers to the assumption that the same transdiagnostic process can result in several different disorders.

To tackle the complexity of the dynamics between perfectionism and psychopathology across disorders, a network analytic approach appears promising. Network theory views symptoms as associated problems that may reinforce or inhibit each other over time (Borsboom, 2017;

Borsboom & Cramer, 2013). The focus on discrete disorders is abandoned, instead focusing on syndromes that emerge from symptom interactions (Robinaugh et al., 2020), providing a truly transdiagnostic approach. Within networks, variables are called central when they emerge as most relevant to the network, i.e., share many strong connections with other variables. Variables are called bridge variables when they act as junctures between groups of symptoms, e.g., connecting a cluster of depressive symptoms with a cluster of anxiety symptoms. If a bridge variable is present, it "activates" not only one cluster, but its impact may spread through the network and activate another cluster of symptoms (Fried & Cramer, 2017). It is unclear whether perfectionism, which has shown to be a risk factor shared among various psychological disorders, could serve as one such bridge variable.

Few studies to date have used the network approach to assess perfectionism and symptoms of psychological disorders (Kim & Mackinnon, 2024; Martini et al., 2021; Vanzhula et al., 2021; Vervaet et al., 2021). All studies were cross-sectional and used the FMPS to assess perfectionism, with a predominant focus on eating disorders. In a network analysis investigating eating disorder symptoms and different vulnerability factors in eating disorder patients (Vervaet et al., 2021), perfectionistic strivings, but not perfectionistic concerns, emerged as a highly central variable. Martini and colleagues (2021) identified perfectionistic concerns as a bridge variable between eating disorder symptoms and low interoceptive awareness in both eating disorder patients and healthy controls. Only two network studies on perfectionism included symptoms of two different disorders at once (Kim & Mackinnon, 2024; Vanzhula et al., 2021). In a sample comprising both undergraduate students and individuals diagnosed with eating disorders, some of whom also had OCD symptoms, perfectionistic concerns emerged as a bridge variable between symptom clusters (Vanzhula et al., 2021). Similarly, perfectionistic concerns acted as a central bridge variable in a network comprised of symptoms of anxiety and depression, with perfectionistic concerns proving more central than perfectionistic strivings in an undergraduate sample (Kim & Mackinnon, 2024). In sum, there is preliminary evidence that perfectionism variables may act as bridge variables between clusters of symptoms, which would be in line with the theoretical assumption of perfectionism as a transdiagnostic process.

The aim of the current study was to investigate perfectionism as a transdiagnostic risk factor using network theory. To this end, analyses included the two perfectionism dimensions (perfectionistic strivings and perfectionistic concerns) as well as symptoms of four different disorders that exhibit frequent comorbidity among each other (Altman & Shankman, 2009; Kessler et al., 2015; Swinbourne & Touyz, 2007) and have each been shown to be associated with perfectionism (Limburg et al., 2017; Lunn et al., 2023; Stackpole et al., 2023), namely, eating disorders, OCD, GAD, and depression. Analyses combined (1) assessment of the stability of cross-sectional interactions at two separate time points, and (2) identification of symptoms that carry predictive value in longitudinal analysis across both time points, in a cross-lagged panel network. Based on previous research, we expected perfectionism variables to share many connections (i.e., act as central and bridge variables) in all networks. Specifically, in both *cross-sectional* networks, we expected (1) perfectionistic concerns to share more connections with psychopathology (i.e., emerge as more central and as a stronger bridge variable) than perfectionistic strivings, and (2) perfectionistic strivings to be more strongly connected with eating disorder symptoms than other symptoms. In the *cross-lagged* panel network, we expected that (3) both perfectionistic concerns and perfectionistic strivings would predict symptoms across disorders, and (4) perfectionistic concerns would emerge as a stronger predictor than perfectionistic strivings.

Method

STUDY DESIGN

This study is part of a larger project investigating perfectionism as a transdiagnostic process. The current study employed an observational repeated-measures design. It was preregistered on OSF (https://osf.io/9mgbf); minor changes to this preregistration are noted in the Supplementary Materials.

PROCEDURE

Data collection took place between April 2022 and April 2023, with online measurements at baseline and a 6-month follow-up (within a 4-week window). Data was collected via surveys on the platform REDCap (Harris et al., 2019) hosted at LMU Munich. All participants were presented with the same set of questionnaires at both measurement points. Surveys included two attention check items ("to show you have read this question, please click on [specified response option]"), in order to control for inattentive survey responses

Table 1
Demographic Characteristics of Sample at Baseline

	M (*SD*) or % Total sample (*N* = 447)
Age at enrollment in years	23.3 (3.3)
Range	18–30
Education in years[a]	15.8 (2.54)
Status of employment	
Student	74.7%
Full-time employment	13.9%
Part-time employment	4.9%
Internship or vocational training	2.5%
Unemployed	1.3%

Note. [a]Total amount, including school, vocational training, university.

(Curran, 2016; Shamon & Berning, 2020). Participants were compensated financially (10€ at baseline and an additional 15€ at follow-up) or received course credit (6.5% of the sample). They were also provided with the opportunity to receive feedback on their personal survey results after the last assessment.

PARTICIPANTS

The sample comprised 447 participants (retention rate of 90.3% from baseline to follow-up, with an average of 183 days, i.e., 26 weeks, between measurements). Participants were recruited from a community sample by means of unpaid advertisements on social media (i.e., Facebook, Instagram), mailing lists, and a public university website.

After providing informed consent, eligible participants were identified via an online screening at the beginning of the baseline assessment. Inclusion criteria were: (1) female gender, (2) age between 18 and 30 years, (3) no previous or current psychological diagnosis (single self-report item, i.e., "have you, currently or ever before, been diagnosed with a psychological disorder?"), and (4) no previous experience with psychotherapy (single self-report item, i.e., "are you currently or have you ever been in psychotherapeutic treatment?"). These criteria were chosen in order to obtain a sample in which no disorders had developed yet, but had a chance of developing symptoms within the observed 6 months. For disorders such as eating disorders and OCD, incidence rates in individuals aged 30 and younger are higher compared to older adults (Fineberg et al., 2013; Smink et al., 2016), with disordered eating in particular affecting 23% of young women (Wade et al., 2012).

Demographic and clinical characteristics are shown in Tables 1 and 2, respectively. Participants at baseline assessment showed levels of psychopathology close to but below clinical cut-offs, indicating subclinical degrees of OCD, eating disorder, anxiety, and depressive symptoms. Compared to community samples (Egan et al., 2016), scores on the perfectionism measure were elevated, particularly on the dimension of perfectionistic concerns. Clinical characteristics[1] proved stable across measurement points.

MEASURES

Frost Multidimensional Perfectionism Scale (FMPS)

The FMPS (Frost et al., 1990; German version: Stöber, 1995) consists of 35 items rated on a 5-point scale (1 = *strong disagreement* to 5 = *strong agreement*). The six subscales are concern over mistakes, doubts about actions, parental criticism, parental expectation, personal standards, and order and organization. The questionnaire is well established as a valid and reliable measure for perfectionism (Frost et al., 1990; Stöber, 1995). Internal consistency in the current sample was good (Cronbach's $\alpha = 0.88$).

For analyses, sum scores for the subscales "concern over mistakes" (9 items, Cronbach's $\alpha = 0.87$) and "personal standards" (7 items, Cronbach's $\alpha = 0.81$) were used to measure perfectionistic concerns and perfectionistic strivings, respectively. This has become a common method in perfectionism research (Howell et al., 2020), as they are the subscales most closely aligned with clinically relevant perfectionism (Shafran & Mansell, 2001).

[1] Seeing as a small group of participants indicated at follow-up to have newly received a psychological diagnosis since baseline, we performed exploratory analyses to determine whether baseline variables could predict diagnostic status at follow-up. Detailed analyses and results can be found in the Supplementary Materials.

Table 2
Clinical Characteristics of Sample at Both Measurement Points ($N = 447$)

Variable	Baseline *M* (*SD*) or %	Follow-Up *M* (*SD*) or %
OCD symptoms (OCI-R)	16.9 (11.0)	15.6 (10.9)
Eating Disorder symptoms (EDE-Q)	1.7 (1.3)	1.5 (1.3)
Generalized Anxiety symptoms (GAD-7)	8.4 (4.8)	8.1 (4.7)
Depressive symptoms (PHQ-9)	7.8 (5.0)	7.9 (5.2)
Perfectionism (FMPS)	112 (18.2)	111 (18.6)
Perfectionistic Concerns (FMPS-CM)	27.4 (7.4)	27.2 (7.8)
Perfectionistic Strivings (FMPS-PS)	25.5 (5.1)	25.1 (4.9)
Diagnosis of a psychological disorder[a]	n/a	4.0%
In psychotherapeutic treatment[b]	n/a	4.3%

Note. [a]Diagnosis as indicated by participants ("Since the last measurement, have you been diagnosed with a psychological disorder?"). [b]Current treatment as indicated by participants ("Since the last measurement, have you entered psychotherapeutic treatment?"). OCI-R = Obsessive-Compulsive Inventory-Revised. EDE-Q = Eating Disorder Examination Questionnaire. GAD-7 = Generalized Anxiety Disorder-7 Questionnaire. PHQ-9 = Patient Health Questionnaire-9. FMPS-CM = Frost Multidimensional Perfectionism Scale, subscale "concern over mistakes". FMPS-PS = Frost Multidimensional Perfectionism Scale, subscale "personal standards."

Eating Disorder Examination Questionnaire (EDE-Q)

The EDE-Q (Fairburn & Beglin, 1994; German version: Hilbert et al., 2007) is a frequently used 28-item self-report measure of eating disorder symptoms within the last 28 days (subscales: restraint, shape concern, weight concern, and eating concern). It has demonstrated good reliability and validity (Hilbert et al., 2007; Mond et al., 2004). Internal consistency in the current sample was excellent (Cronbach's $\alpha = 0.96$). For analyses, we used single as well as composite items (see Table 3 as well as Supplementary Materials for further details on node selection).

Obsessive-Compulsive Inventory–Revised (OCI-R)

The OCI-R (Foa et al., 2002; German version: Gönner et al., 2008) is a widely used self-report measure of OCD symptom severity and shows good psychometric properties (Gönner et al., 2008). The OCI-R consists of six subscales: obsessing, washing, checking, ordering, hoarding, neutralizing. Its 18 items yield a score between 0 and 72. Internal consistency in the current sample was good (Cronbach's $\alpha = 0.88$). For analyses, we used a selection of single items (see Table 3 as well as Supplementary Materials for further details on node selection).

Generalized Anxiety Disorder-7 Questionnaire (GAD-7)

The GAD-7 (Spitzer et al., 2006) is a 7-item self-report instrument assessing symptoms of GAD in the past 2 weeks. Scores range between 0 and 21. It shows good reliability and validity (Löwe et al., 2008; Spitzer et al., 2006). Internal consistency in the current sample was good (Cronbach's $\alpha = 0.86$). For analyses, we used single as well as composite items (see Table 3 as well as Supplementary Materials for further details on node selection).

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 (Kroenke et al., 2001; German version: Gräfe et al., 2004) is a 9-item self-report instrument assessing depressive symptoms within the last 2 weeks. Scores range between 0 and 27. Its psychometric properties have been shown to be adequate (Kroenke et al., 2001; Löwe, 2004). Internal consistency in the current sample was good (Cronbach's $\alpha = 0.84$). For analyses, we used a selection of single items (see Table 3 as well as Supplementary Materials for further details on node selection).

STATISTICAL ANALYSES

As preregistered, analyses included both cross-sectional and cross-lagged panel networks. However, results of the latter proved unstable and were thus deemed unfit for interpretation. For this reason, the current paper focuses on cross-sectional analyses, whereas cross-lagged panel analyses were moved to the Supplementary Materials and will only be mentioned briefly.

All statistical analyses were performed using R (R Core Team, 2022), version 4.2.2. We used the packages *bootnet* (Epskamp et al., 2018) for cross-sectional networks, centrality measures, and assessment of stability, *mgm* for predictability (Haslbeck & Waldorp, 2020), *networktools* (Jones, 2020) for bridge centrality, *NetworkComparisonTest* (van Borkulo, 2018) for comparison of cross-sectional networks, *glmnet* (Friedman

Table 3
Overview of Nodes Included in All Networks

Node	Label	Items	Measure (item number)
Perfectionism			
PerfCM	Perfectionistic Concerns	If I fail at work/school, I am a failure as a person; I should be upset if I make a mistake; If someone does a task at work/school better than I, then I feel like I failed the whole task; If I fail partly, it is as bad as being a complete failure; I hate being less than the best at things; People will probably think less of me if I make a mistake; If I do not do as well as other people, it means I am an inferior human being; If I do not do well all the time, people will not respect me; The fewer mistakes I make, the more people will like me	FMPS (CM subscale: 9 + 10 + 13 + 14 + 18 + 21 + 23 + 25 + 34)
PerfPS	Perfectionistic Strivings	If I do not set the highest standards for myself, I am likely to end up a second-rate person; It is important to me that I be thoroughly competent in everything I do; I set higher goals than most people; I am very good at focusing my efforts on attaining a goal; I have extremely high goals; Other people seem to accept lower standards from themselves than I do; I expect higher performance in my daily tasks than most people	FMPS (PS subscale: 4 + 6 + 12 + 16 + 19 + 24 + 30)
OCD symptoms			
Wash	Washing Behavior	I sometimes have to wash or clean myself simply because I feel contaminated	OCI-R (11)
Check	Checking Behavior	I repeatedly check doors, windows, drawers, etc.	OCI-R (8)
Order	Ordering Behavior	I get upset if objects are not arranged properly	OCI-R (3)
Obsess	Obsessions	I frequently get nasty thoughts and have difficulty in getting rid of them	OCI-R (18)
Eating Disorder symptoms			
Restr	Dietary restraint	Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?; Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?; Have you tried to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?; Have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?	EDE-Q (1 + 3 + 4 + 5)
BodDis	Body dissatisfaction	How dissatisfied have you been with your weight?; How dissatisfied have you been with your shape?; How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?	EDE-Q (25 + 26 + 27)
EatSelf	Influence of eating on self-worth	Has your weight influenced how you think about (judge) yourself as a person?; Has your shape influenced how you think about (judge) yourself as a person?; On what proportion of the times that you have eaten have you felt guilty (felt that you've done wrong) because of its effect on your shape or weight?	EDE-Q (20 + 22 + 23)
Fast	Fasting	Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	EDE-Q (2)
Flat	Desire for a flat stomach	Have you had a definite desire to have a totally flat stomach?	EDE-Q (6)
FearCont	Fear of losing control	Have you had a definite fear of losing control over eating?	EDE-Q (9)

Table 3 (*continued*)

Node	Label	Items	Measure (item number)
FearGain	Fear of gaining weight	Have you had a definite fear that you might gain weight?	EDE-Q (10)
Lose	Desire to lose weight	Have you felt fat?; Have you had a strong desire to lose weight?	EDE-Q (11 + 12)
Secret	Eating in secret	On how many days have you eaten in secret (i.e., furtively)?	EDE-Q (19)
Others	Concern over being seen eating	How concerned have you been about other people seeing you eat?	EDE-Q (21)
Weigh	Concern over having to weigh oneself	How much would it have upset you if you had been asked to weigh yourself once a week (no more, or less, often) for the next four weeks?	EDE-Q (24)
DiscOther	Discomfort over body being seen by others	How uncomfortable have you felt about others seeing your shape or figure (for example, in communal changing rooms, when swimming, or wearing tight clothes)?	EDE-Q (28)
GAD symptoms			
Anx	Anxiety	Feeling nervous, anxious, or on edge; feeling afraid as if something awful might happen	GAD-7 (1 + 7)
Wor	Worry	Not being able to stop or control worrying; worrying too much about different things	GAD-7 (2 + 3)
Relax	Trouble relaxing	Trouble relaxing	GAD-7 (4)
Irritab	Irritability	Becoming easily annoyed or irritable	GAD-7 (6)
Depression symptoms			
Anhed	Anhedonia	Little interest or pleasure in doing things	PHQ-9 (1)
Depr	Depressed mood	Feeling down, depressed, or hopeless	PHQ-9 (2)
Fatig	Fatigue	Feeling tired or having little energy	PHQ-9 (4)
SelfWor	Low self-worth	Feeling bad about yourself – or that you are a failure or have let yourself or your family down	PHQ-9 (6)
Focus	Trouble focusing	Trouble concentrating on things, such as reading the newspaper or watching television	PHQ-9 (7)
Suic	Suicidal ideation	Thought that you would be better off dead, or thought of hurting yourself in some way	PHQ-9 (9)

Note. Table includes only those nodes which remained after two-step node selection process, i.e., nodes included for network analyses. FMPS = Frost Multidimensional Perfectionism Scale; OCI-R = Obsessive-Compulsive Inventory-Revised; EDE-Q = Eating Disorder Examination Questionnaire; GAD-7 = Generalized Anxiety Disorder-7 Questionnaire; PHQ-9 = Patient Health Questionnaire-9.

et al., 2010) for the cross-lagged panel network, *tidymodels* (Kuhn & Wickham, 2020) for exploratory logistic regression, and *qgraph* (Epskamp et al., 2012) for visualization. Network analyses followed previous applications of this methodology to differing research questions (Chavez-Baldini et al., 2022; Schlechter et al., 2022; Schlegl et al., 2021) and current reporting standards for psychological networks (Burger et al., 2022).

Data Exclusion and Missing Data

As comparison of cross-sectional networks as well as computation of cross-lagged panel networks require equal sample sizes and no missing data (van Borkulo, 2018), all analyses were based on complete cases only (i.e., full baseline and follow-up data). Details about data exclusion are provided in the Supplementary Materials.

Node Selection

To estimate stable networks, the number of nodes needs to be limited where only one score or item should reflect each unique symptom, cognition, etc. This is to avoid topological overlap (Levinson et al., 2018) and prevent multiple highly correlated items from artificially inflating centrality estimates (Fried & Cramer, 2017). To reduce items, we used a two-stepped approach as established by previous literature (Burger et al., 2022; Tomei et al., 2022), with content-based selection followed by data-driven selection (using *goldbricker*). A thorough explanation of this node-selection process is provided in the Supplementary

Materials. Through theoretical as well as data-driven combination/removal, we reduced the original 78 items to a final amount of 28 nodes[2] (see Table 3 for overview).

Cross-Sectional Networks and Network Comparison

Two separate Gaussian graphical models were computed for the cross-sectional networks at baseline and follow-up. Within these models, nodes (i.e., symptoms and perfectionism dimensions) are connected by edges signifying the partial correlation between pairs of nodes, adjusted for the influence of all other nodes (Borsboom & Cramer, 2013). The thickness of edges visualizes the strength of this partial correlation. We applied the least absolute shrinkage and selection operator (LASSO) to avoid spurious connections within the networks, with the tuning parameter set to the default of 0.5. LASSO is widely used in psychological networks to compensate for small sample sizes (Williams et al., 2019). Network density was calculated as the number of estimated edges relative to the number of possible edges.

Within each network, standardized measures of centrality were calculated for each node. Since they have emerged as the most reliable centrality measures in psychological networks (Bringmann et al., 2019), we chose strength (sum of the absolute values of all edges) and expected influence (similar to strength but taking into account the positive and negative values of edges). In extension of our preregistration, we also report predictability (proportion of explained variance) of all nodes. These centrality measures were reported separately only if they differed meaningfully. To identify bridge nodes, nodes were divided into communities based on the measures they originate from (i.e., perfectionism, and symptoms of eating disorders, OCD, GAD and depression). We chose to calculate the centrality measures bridge strength (total connectivity with nodes in other communities) and bridge expected influence (similar to bridge strength but taking into account the positive and negative values of edges) (Jones et al., 2021). In order to assess stability and interpretability of these results, we used nonparametric bootstrapping (1,000 iterations) and inspected accuracy plots with 95% confidence intervals around each edge weight (Epskamp et al., 2018). Additionally, we calculated correlation stability coefficients and conducted difference tests for all centrality measures.

To judge temporal stability of the observed relations across six months, we compared the model at baseline and the model at follow-up. In comparing the two cross-sectional networks, we followed two steps based on previous research (Fried et al., 2018; Schlegl et al., 2021). First, we used Spearman correlations to correlate network parameters and obtain an index of similarity. Second, we used the Network Comparison Test (van Borkulo, 2018) to formally test for network differences. It was performed with 5,000 iterations, comparing network structure, global strength, edge strength, and the four centrality measures mentioned above. We used Bonferroni correction to adjust for multiple testing.

Cross-Lagged Panel Network

A detailed description of the cross-lagged panel analysis can be found in the Supplementary Materials. To assess stability and interpretability of cross-lagged results, we used bootstrapping (1,000 iterations) and calculated correlation stability coefficients for centrality measures. Correlation stability coefficients below the recommended threshold of .25 were considered an indicator of insufficient stability.

Results

CROSS-SECTIONAL NETWORKS AND NETWORK COMPARISON

Networks for baseline and follow-up yielded highly consistent results, as can be seen in the network plots in Figure 1, centrality plots in Figure 2, and bridge centrality plots in Figure 3 (also see Supplementary Table S1 for predictability). Hence, results for the two measurement points will be reported together.

Accuracy plots suggested good accuracy for both cross-sectional networks (see Supplementary Figures S1 and S2). Case-drop bootstrapping indicated strong stability of centrality measures as well (see Supplementary Figures S3 and S4), with correlation stability coefficients between .60 and .75 (see Supplementary Materials). In both networks, the number of nonzero edges was 146 out of 378. Network parameters were moderately to strongly correlated between measurement points ($r = .65$ for lists of edge weights; $r = .93$ for node strengths; $r = .94$ for node expected influences). The network comparison test yielded no significant differences between measurement points (network invariance test: $M = 0.15$, $p = .47$; global

[2] Additionally, due to concerns over the imbalanced ratio of eating disorder variables compared to other symptom clusters, we conducted the preregistered cross-sectional network analyses once more, with a reduced set of eating disorder variables. This procedure was not preregistered and was intended as a post-hoc test of robustness of results. Detailed robustness analyses and results can be found in the Supplementary Materials.

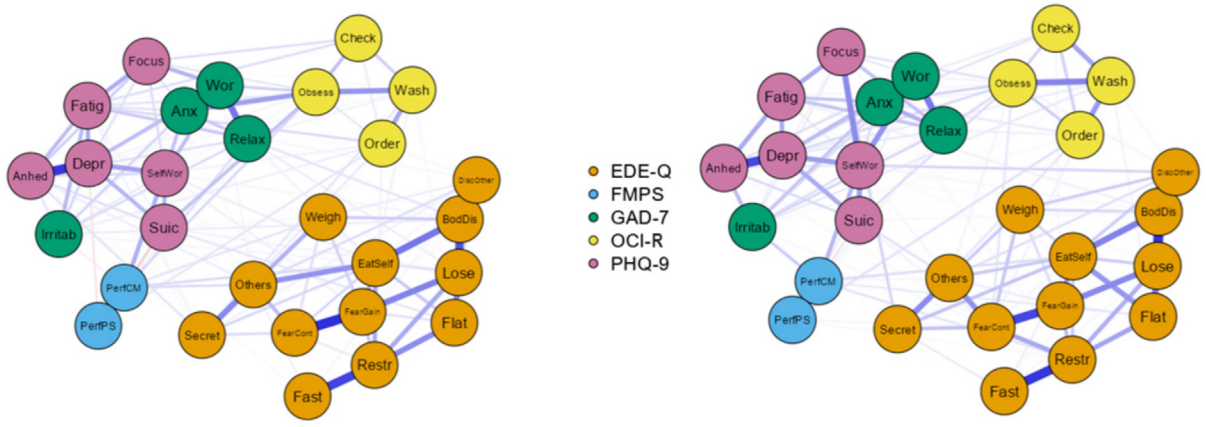

FIGURE 1 Cross-sectional networks for baseline (left) and 6-month follow-up (right). *Note.* EDE-Q = Eating Disorder Examination Questionnaire; FMPS = Frost Multidimensional Perfectionism Scale; GAD-7 = Generalized Anxiety Disorder-7 Questionnaire; OCI-R = Obsessive-Compulsive Inventory-Revised; PHQ-9 = Patient Health Questionnaire-9. PerfCM = perfectionistic concerns; PerfPS = perfectionistic strivings; Order = ordering behavior; Check = checking behavior; Wash = washing behavior; Obsess = obsessions; Restr = dietary restraint; BodDis = body dissatisfaction; EatSelf = influence of eating on self-worth; Fast = fasting; Flat = desire for a flat stomach; FearCont = fear of losing control; FearGain = fear of gaining weight; Lose = desire to lose weight; Secret = eating in secret; Others = concern over being seen eating; Weigh = concern over having to weigh oneself; DiscOther = discomfort over body being seen by others; Anx = anxiety; Wor = worry; Relax = trouble relaxing; Irritab = irritability; Anhed = anhedonia; Depr = depressed mood; Fatig = fatigue; SelfWor = low self-worth; Focus = trouble focusing; Suic = suicidal ideation.

strength invariance test: $S = 0.02$, $p = .94$; $p > .05$ for all edge invariance and centrality invariance tests).

In both networks, the strongest edges were between (1) *body dissatisfaction* and *discomfort over body being seen by others*, (2) *worry* and *anxiety*, as well as (3) *perfectionistic concerns* and *perfectionistic strivings*. These edges were significantly stronger than many other edges in their respective networks, as shown by edge weight difference plots (see Supplementary Figures 5 and 6). The strongest edges between a perfectionism variable and a symptom variable, at both measurement points, were a negative association between *perfectionistic strivings* and *suicidal ideation* (stronger than 93.2% and 46.6%, respectively, of all edges), and a positive association between *perfectionistic concerns* and *low self-worth* (stronger than 40% and 33%, respectively, of all edges). At both time points, *perfectionistic strivings* shared strong edges (each stronger than at least 10% of all edges) with at least one symptom of three out of four symptom clusters, namely OCD (*ordering behavior*), GAD (*trouble relaxing*), and depression (*suicidal ideation*). *Perfectionistic concerns* shared strong edges with at least one symptom of each of the four symptom clusters, namely OCD (*obsessions*), GAD (*anxiety*, *worry*, *trouble relaxing*), depression (*low self-worth*), and eating disorders (*concern over being seen eating* or *discomfort over body*).

The most central nodes in both networks were *body dissatisfaction*, *influence of eating on self-worth*, and *worry*. These variables showed significantly stronger centrality than many other variables in their respective networks (significantly stronger centrality than 70%–85% of all other nodes), as shown by centrality difference plots (see Supplementary Figures 7 and 8). As hypothesized (H1), *perfectionistic concerns* emerged as more central than *perfectionistic strivings*. *Perfectionistic concerns* demonstrated mid-range centrality (significantly stronger centrality measures than 56% and 67% of all other nodes at baseline and follow-up, respectively), whereas *perfectionistic strivings* proved to be among the least central variables at both time points (significantly stronger centrality measures than 41% and 52% of all other nodes). Regarding node-wise predictability (R^2), mean predictability across all nodes was 0.47 and 0.48 at baseline and follow-up, respectively. Perfectionism dimensions demonstrated moderate predictability, with greater predictability for *perfectionistic concerns* ($R^2 = 0.46$ at baseline; $R^2 = 0.46$ at follow-up) compared to *perfectionistic strivings* ($R^2 = 0.35$ at baseline; $R^2 = 0.31$ at follow-up). Predictability was highest for *body dissatisfaction* ($R^2 = 0.83$ at baseline; $R^2 = 0.83$ at follow-up), *influence of eating on self-worth* ($R^2 = 0.76$ at baseline; $R^2 = 0.76$ at follow-up), and *desire to lose weight* ($R^2 = 0.78$ at baseline; $R^2 = 0.79$ at follow-up), and lowest for *ordering*

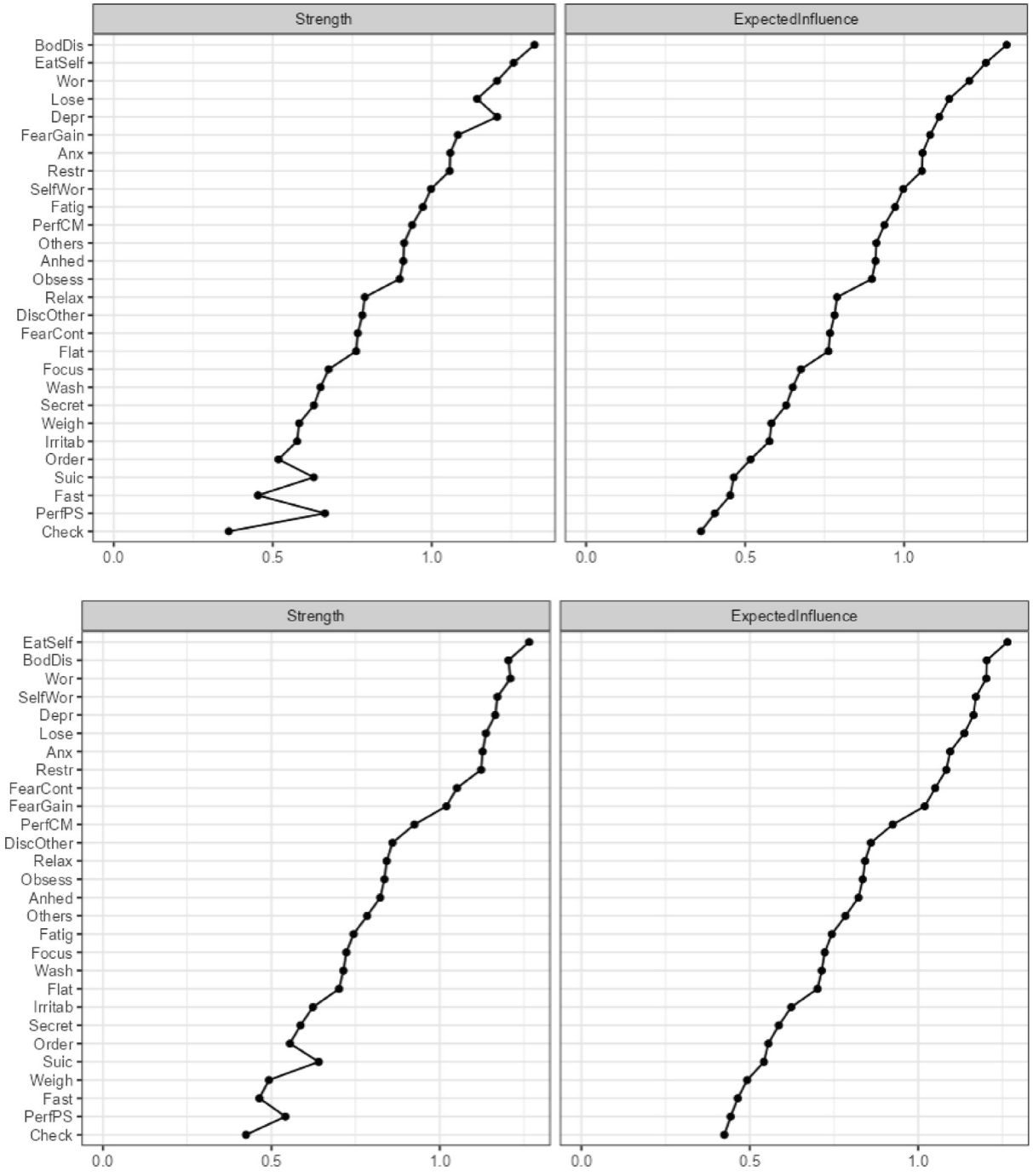

FIGURE 2 Centrality plots showing strength and expected influence for baseline (top) and 6-month follow-up (bottom). *Note.* PerfCM = perfectionistic concerns; PerfPS = perfectionistic strivings; Order = ordering behavior; Check = checking behavior; Wash = washing behavior; Obsess = obsessions; Restr = dietary restraint; BodDis = body dissatisfaction; EatSelf = influence of eating on self-worth; Fast = fasting; Flat = desire for a flat stomach; FearCont = fear of losing control; FearGain = fear of gaining weight; Lose = desire to lose weight; Secret = eating in secret; Others = concern over being seen eating; Weigh = concern over having to weigh oneself; DiscOther = discomfort over body being seen by others; Anx = anxiety; Wor = worry; Relax = trouble relaxing; Irritab = irritability; Anhed = anhedonia; Depr = depressed mood; Fatig = fatigue; SelfWor = low self-worth; Focus = trouble focusing; Suic = suicidal ideation.

behavior ($R^2 = 0.12$ at baseline; $R^2 = 0.19$ at follow-up) and *checking behavior* ($R^2 = 0.13$ at baseline; $R^2 = 0.16$ at follow-up). The variables with the highest bridge centrality in both networks were *perfectionistic concerns*, *low self-worth*, and *worry*. These variables showed significantly stronger bridge centrality than many other variables in their respective networks (significantly stronger

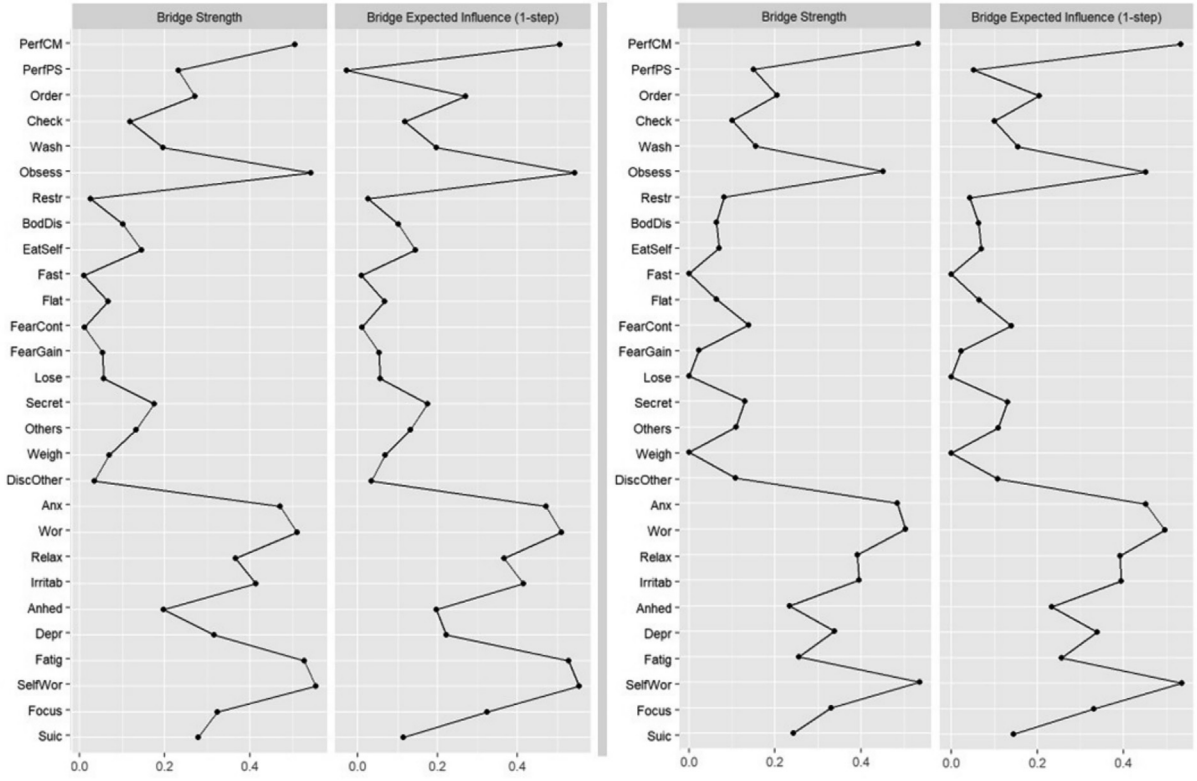

FIGURE 3 Bridge centrality plots showing bridge strength and bridge expected influence for baseline (left) and 6-month follow-up (right). *Note.* PerfCM = perfectionistic concerns; PerfPS = perfectionistic strivings; Order = ordering behavior; Check = checking behavior; Wash = washing behavior; Obsess = obsessions; Restr = dietary restraint; BodDis = body dissatisfaction; EatSelf = influence of eating on self-worth; Fast = fasting; Flat = desire for a flat stomach; FearCont = fear of losing control; FearGain = fear of gaining weight; Lose = desire to lose weight; Secret = eating in secret; Others = concern over being seen eating; Weigh = concern over having to weigh oneself; DiscOther = discomfort over body being seen by others; Anx = anxiety; Wor = worry; Relax = trouble relaxing; Irritab = irritability; Anhed = anhedonia; Depr = depressed mood; Fatig = fatigue; SelfWor = low self-worth; Focus = trouble focusing; Suic = suicidal ideation.

bridge centrality than 70%–78% of all other nodes) as shown by centrality difference plots (see Supplementary Figures 7 and 8). At both time points, *perfectionistic strivings* were among the nodes with the lowest bridge centrality (significantly stronger bridge centrality than 0% of all other nodes). Against expectation (H2), perfectionistic strivings were not more strongly connected with eating disorder symptoms than other symptoms. Note that robustness analyses revealed that these results did not change meaningfully even when the number of eating disorder variables was halved (see Supplementary Materials).

CROSS-LAGGED PANEL NETWORK

Stability analyses suggested that results from the cross-lagged panel network were unstable and hence not fit for interpretation (correlation stability coefficients below .25). Therefore, these results are provided in the Supplementary Materials, but will not be reported or discussed any further.

As exploratory analyses, we performed logistic regression to predict diagnostic status at follow-up, which suggested that rather than perfectionism, symptom variables most strongly predicted diagnosis. However, exploratory results should be interpreted with caution due to the stark data imbalance, seeing as only 18 out of 447 participants indicated having received a diagnosis. Further details are provided in the Supplementary Materials.

Discussion

The present study investigated the role of perfectionism in transdiagnostic networks. To our knowledge, it is the first network study to examine associations between perfectionism and symptoms of more than two disorders at once. More specifically, we looked at both cross-sectional and longitudinal connections between perfectionism dimensions and symptoms of OCD, eating disorders, depression, and anxiety.

Cross-sectional evidence proved stable across time points, demonstrating replicability of present results. Despite the connection between *perfectionistic concerns* and *perfectionistic strivings* ranging among the strongest in these networks, the two dimensions displayed very different associations with other variables in the network, confirming the importance of investigating them separately (Stoeber & Gaudreau, 2017).

First, *perfectionistic strivings* ranged among the variables with lowest bridge centrality and shared very few strong connections with other network variables. Our hypothesis that *perfectionistic strivings* would be more strongly connected with eating disorder symptoms than other symptoms (Dahlenburg et al., 2019; Limburg et al., 2017; Stackpole et al., 2023) could not be confirmed. It is possible that any associations *perfectionistic strivings* may have shared with eating pathology variables became too small to yield meaningful results once the effect of *perfectionistic concerns* was partialled out. Indeed, some previous evidence suggests that perfectionistic strivings is only related to eating disorder symptoms when it occurs in combination with perfectionistic concerns (Boone et al., 2010). In addition, it could be that perfectionistic strivings are not as harmful as assumed, showcased by some connections in our networks. Against expectation, the strongest association shared between *perfectionistic strivings* and another variable was not with a symptom of eating disorders, but instead with *suicidal ideation*. In fact, this association was negative, such that greater *perfectionistic strivings* would be associated with lower rates of *suicidal ideation*. On the one hand, this is surprising, as perfectionism has been deemed a vulnerability factor for suicidality (Flett et al., 2014; Roxborough et al., 2012) and both dimensions are positively associated with suicidal ideation, albeit with small effects for perfectionistic strivings (for a meta-analysis, see Smith, Sherry, et al., 2018). Moreover, meta-analyses have repeatedly demonstrated positive associations between perfectionistic strivings and psychological symptoms across diagnoses (Limburg et al., 2017; Lunn et al., 2023; Stackpole et al., 2023). Given these results, it seems unlikely that perfectionistic strivings would represent a harmless or even protective component of perfectionism (Smith et al., 2016; Stoeber, 2018), such as the association in the current sample would suggest. On the other hand, there are both theoretical and methodological considerations that could explain our current result. First, from a theoretical standpoint, suicidal ideation and striving may be motivationally opposed constructs, seeing as striving is approach-oriented (i.e., working towards attaining perfectionistic standards; Stoeber, 2011), whereas suicidality appears to be avoidance-oriented (i.e., suicide as a way to avoid suffering; e.g., Xie et al., 2014). This discrepancy may somewhat mitigate suicidal thoughts. Second, from a methodological standpoint, network analysis may reasonably yield different results than previous studies which used different analysis strategies. Since each connection between network variables represents a partial correlation which takes into account all connections between all other network variables, the *perfectionistic strivings* variable in our network may represent only "pure" perfectionistic strivings, after all overlap with *perfectionistic concerns* has been removed (Stoeber & Gaudreau, 2017). It could be argued that "pure" perfectionistic strivings share a certain overlap with the personality trait conscientiousness (Stricker et al., 2019), which is itself negatively related to suicidal ideation (for a meta-analysis, see Bogg & Roberts, 2004). Both perfectionistic strivings and conscientiousness share an achievement-striving facet (Costa & McCrae, 1992) and can be characterized through dutifulness and self-discipline (Dunkley, Blankstein, et al., 2012). Perfectionistic strivings are distinct in a rigid setting of goals, however, whereas conscientiousness is considered more flexible (Flett & Hewitt, 2006), demonstrated in differential associations with neuroticism (Stricker et al., 2019). In sum, the association between perfectionistic strivings and suicidal ideation will need to be examined critically through future replication, using more diverse samples and a more sophisticated measure of suicidal ideation. It is important to note that the current study measured suicidal ideation using only one single item ("[during the last 2 weeks, have you] thought that you would be better off dead, or thought of hurting yourself in some way"). In this nonclinical sample, we observed zero inflation for this particular item, with 85.5% of participants indicating zero at baseline and 83.0% at follow-up, respectively. Compared to other depressive symptoms (34.2%/32.2% for depressed mood, 28.9%/29.1% for anhedonia, 12.8%/12.8% for fatigue), this shows reduced variance in our data, and hence results should be interpreted with caution.

Second, results showed that *perfectionistic concerns* shared meaningful associations with at least one symptom of each symptom cluster, namely depression, anxiety, eating disorders, and OCD. This observation dovetails the concept of perfectionism, in particular perfectionistic concerns, as a transdiagnostic process that plays a role in a

multitude of psychological disorders (Egan et al., 2011). Whereas these results are only cross-sectional and thus cannot elucidate direction of effects, this is a first step towards investigating multifinality (Cicchetti, 1984; Egeland et al., 1996) of perfectionism. In addition, *perfectionistic concerns* showed moderate centrality as well as predictability and ranged among the strongest bridge variables, implicating it as a possible bridge between symptoms of different disorders. Hence, results confirmed our hypothesis that *perfectionistic concerns* would prove a more central node than *perfectionistic strivings* in a transdiagnostic symptom network. This is in line with meta-analytic evidence that perfectionistic concerns share overall stronger associations with psychopathology than perfectionistic strivings (Callaghan et al., 2023; Limburg et al., 2017; Lunn et al., 2023; Smith et al., 2016). In addition, results are consistent with a previous network study on anxiety and depression, in which perfectionistic concerns showed higher centrality than perfectionistic strivings (Kim & Mackinnon, 2024). While it must be noted that our current networks proved relatively dense, which might have impacted centrality metrics, stability of centrality measures was deemed sufficient for interpreting centrality (see Supplementary Materials for details). The current study adds to a growing body of research that implicates perfectionistic concerns as a particularly detrimental component of perfectionism. Whereas associations between the mere pursuit of perfection and mental-health outcomes have sometimes been mixed (e.g., Stoeber & Otto, 2006), an additional propensity for excessive self-criticism and fear of failure appears to consistently carry risk of psychopathology (Limburg et al., 2017; Lunn et al., 2023). Hence, research on perfectionism as a transdiagnostic process should take both perfectionism dimensions into account, but focus on perfectionistic concerns as the more likely risk factor.

Interestingly, the strongest cross-sectional connection between *perfectionistic concerns* and another variable was shared with *low self-worth*, also among the strongest bridge variables. This is consistent with a recent meta-analysis demonstrating the association between greater perfectionistic concerns and low self-esteem (Khossousi et al., 2024). Several theoretical models have closely linked perfectionism with self-worth, such as the transdiagnostic model of eating disorders (Fairburn et al., 2003a) and the model of clinical perfectionism (Shafran et al., 2002). Seeing as both low self-worth and perfectionistic concerns involve negative self-evaluation (Baumeister et al., 1989; Frost et al., 1990), it is important to point out a certain conceptual overlap between the two constructs, which may have inflated associations in the current network. However, low self-worth might typically be considered the broader concept of the two, which reflects an overall negative perception of one's self regardless of specific standards (Hewitt et al., 1991). Meanwhile, perfectionistic concerns can be understood as a possible mechanism to cope with low self-worth (Fennell, 2009), wherein self-worth is based solely on achievement (Shafran et al., 2002). Previous studies have shown that perfectionistic concerns can arise in the form of pronounced self-criticism when faced with disparity between one's high standards and one's performance, which then results in a lowered self-esteem (Blankstein et al., 2008; Dunkley, Berg, et al., 2012; Dunkley & Grilo, 2007). Low self-worth, much like perfectionism, has been linked to higher comorbidity and counts as a transdiagnostic factor (Struijs et al., 2021). Worthlessness has also emerged as a bridge variable in previous transdiagnostic networks on perfectionism, linking symptoms of depression and anxiety (Kim & Mackinnon, 2024; Van den Bergh et al., 2021). It is possible that low self-worth acts as a transdiagnostic mediator between perfectionistic concerns and psychopathology (e.g., Miegel et al., 2020). Seeing as these cross-sectional results cannot speak for moderator or mediator effects, however, this needs to be further investigated.

It is important to note that, despite these results underlining the transdiagnostic role of perfectionistic concerns, the two perfectionism dimensions did not prove as central as hypothesized. This is unexpected, seeing as perfectionism, particularly perfectionistic concerns, has been shown to be associated with psychopathology both cross-sectionally and longitudinally in various disorders (Callaghan et al., 2023; Limburg et al., 2017; Lunn et al., 2023; Smith et al., 2016, 2021; Smith, Vidovic, et al., 2018; Stackpole et al., 2023), implicating it as a possible transdiagnostic process (Egan et al., 2011). Aside from idiosyncrasies of these particular networks (e.g., ratio of network variables; see below), this could be related to the characteristics of our sample. It is conceivable that perfectionism may not play such a pronounced role in healthy participants, but rather act as a maintenance factor only once symptoms have already developed. In this case, perfectionism could be considered a maladaptive or ineffective strategy to cope with existing symptoms (Dunkley et al., 2006; Wei et al., 2006), such as

meeting the experience of symptoms itself with self-criticism (McGrath et al., 2012), but would not share such strong associations with subclinical symptoms in a healthy sample. This would be in line with the Complication Model of Perfectionism (Coyne & Whiffen, 1995; McGrath et al., 2012), which considers perfectionism a complication rather than cause of psychological symptoms. However, seeing as our longitudinal hypotheses could not be tested with these particular analyses, current results cannot speak for temporal dynamics of perfectionism in both the development and maintenance of symptoms. Exploratory analyses using logistic regression revealed baseline symptom variables (e.g., anxiety) to be stronger predictors of diagnostic status at follow-up than either perfectionism dimension. Future studies on longitudinal dynamics may consider additional strategies to ensure greater symptom changes can be observed, thus increasing the chances of detecting prediction effects. For instance, whereas the current study recruited from the general population, future studies could select more "at-risk" samples by recruiting healthy (i.e., nondiagnosable) participants with symptom levels below clinical cut-offs, but above a certain threshold indicating a risk of psychopathology. In addition, time frames longer than 6 months between baseline and follow-up may be beneficial, or indeed more than two measurement points.

Rather than perfectionism, the most central variables comprised symptoms of disordered eating. *Body dissatisfaction* in particular was significantly more central than all other variables in our cross-sectional networks. However, *body dissatisfaction* did not share strong associations with either perfectionism dimension, despite previous evidence to that effect (Boone et al., 2014; Boone & Soenens, 2015; Donovan et al., 2014). There are several explanations for these results. First, *body dissatisfaction* has been shown to be a risk factor for various disorders, including symptoms of eating disorders (Shagar et al., 2017), but also depression (Rosenström et al., 2013; Sharpe et al., 2018) and anxiety (Vannucci & Ohannessian, 2018). Especially when considering the current sample of young women, it may indeed be the case that eating pathology plays a pronounced role in symptom networks. Disordered eating behaviors, such as fasting, binge eating, and laxative use, are highly prevalent in this population and have been shown to affect between 20% and 23% of college-age women (Sonneville et al., 2013; Wade et al., 2012). Up to 40% of college-age women report moderate to high body dissatisfaction (Eck et al., 2022). Second, methodological considerations may play a role. *Body dissatisfaction* was related almost exclusively to other symptoms of eating disorder, the construct that provided the most variables in our networks. This imbalanced ratio of eating disorder variables compared to all other variables may have inflated centrality of *body dissatisfaction*, as well as centrality measures for eating disorder variables overall. Whereas robustness analyses showed that main results did not change meaningfully when including 6 instead of 12 eating disorder variables, interpretation of the network structure remains somewhat limited. Notably, while eating disorder variables demonstrated largely strong to moderate centrality, they consistently had the lowest bridge centrality values, suggesting strong within-cluster connection with few meaningful connections with symptoms of other clusters. To avoid a potential bias in interpretation of centrality, future studies should aim for a more balanced distribution of variables or consider setting paths within the same construct to zero.

LIMITATIONS AND IMPLICATIONS

The current study is limited by both the sample and the variables we included. First, we drew data from a young community sample, as we expected an increased likelihood of disordered eating in this age bracket. However, our sample showed very little change in symptoms across the 6 months we observed. Whereas this contributed to the stability of cross-sectional connections, this sample did not lend itself well to longitudinal analyses, seeing as little variation in data over time impeded prediction effects. Indeed, stability assessments deemed longitudinal centrality measures unfit for interpretation, rendering a test of our hypotheses regarding longitudinal associations impossible. This requires an independent test of these results by further studies, ideally with at-risk samples or patient samples before and after treatment. Further, in the question we used to assess whether participants had ever experienced psychotherapy, we were not able to determine whether participants had experienced other forms of counseling that were not related to seeking help for their mental health concerns (e.g., family counseling after divorce). In addition, since we included only participants with complete data, dropout (particularly of participants who had possibly developed symptoms) may have affected our results, even despite low dropout rates. Since we included only female participants, generalizability of our results is limited to healthy young women. Second, results from network analysis vary greatly depending on the variables included. Here, the number of variables

representing eating disorder symptoms outweighed variables from other constructs. This can impact centrality results (i.e., eating disorder symptoms will naturally share stronger edges among each other), which should be interpreted while keeping the distribution of variables in mind. Based on our robustness analyses, however, we would assume the exact number of eating disorder variables did not meaningfully affect results. Additionally, symptoms of disorders beyond those included in this current study may have had an impact. In particular, future studies should consider conditions such as Attention-Deficit/Hyperactivity Disorder (ADHD) or Autism Spectrum Disorder, which have been shown to be associated with perfectionism (e.g., Greven et al., 2018; Schmiedeler et al., 2020) but tend to be underdiagnosed in women (e.g., Hinshaw et al., 2022). Lastly, future studies may consider using a perfectionism measure designed to capture specifically clinical perfectionism, such as the Clinical Perfectionism Questionnaire (Fairburn et al., 2003b). Overall, while common in network analysis, the practice of using single items rather than validated subscale scores may have impacted reliability of our measures.

Conclusions

The present analyses underline the transdiagnostic role of perfectionism in the cross-sectional networks, particularly of perfectionistic concerns as a potential bridge between symptoms of different disorders. Its role may be strongly related to the association between perfectionistic concerns and low self-worth. As predictors of psychopathology, however, both perfectionism dimensions require further investigation.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.beth.2025.11.002.

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Ethical approval and consent. All procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the 1964 Helsinki Declaration and its later amendments. The procedure was approved by the ethics commission for Psychology and the Learning Sciences at the LMU Munich (08_2019_Limburg). Informed consent was obtained from all participants included in the study.

Data statement: Data have been anonymized and uploaded to OSF, along with the R code (https://osf.io/ag4jn/).

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