Received: 25 July 2021 | Revised: 28 October 2021 | Accepted: 30 December 2021

DOI: 10.1002/erv.2885

WILEY

RESEARCH ARTICLE

Bridging of childhood obsessive-compulsive personality disorder traits and adult eating disorder symptoms: A network analysis approach

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Abstract

Objectives: Obsessive-compulsive personality disorder (OCDP) traits are commonly associated with eating disorders (EDs), with evidence demonstrating that these traits predispose and exacerbate the ED illness course. However, limited research has examined the symptomatic interplay between ED and OCDP traits. We used network analysis to (1) identify the most central symptoms in a network comprised of OCPD traits retrospectively assessed in childhood and ED symptoms and (2) to identify symptoms which bridged OCPD traits and ED symptoms.

Methods: Participants were 320 females with an ED (anorexia nervosa $n = 227$, bulimia nervosa $n = 93$), who completed the semi-structured EATATE interview and the Eating Disorder Inventory-2. Expected influence (EI) was computed to determine each symptom's influence in the network. Bridge symptoms were identified by computing bridge EI.

Results: A regularised partial correlation network showed that ascetism, social insecurity, ineffectiveness, and impulsivity had the highest EI in the OCPD and ED network. With respect to bridging symptoms, interpersonal distrust emerged as a possible bridging node between the OCPD and ED trait/symptom clusters.

Discussion: These findings highlight the centrality of non-specific ED symptoms in the ED symptom network and suggest that interpersonal distrust may play a functional role through which childhood OCPD traits and ED symptoms are connected.

Abbreviations: AN, anorexia nervosa; BN, bulimia nervosa; CS-coefficients, correlation-stability coefficients; EBIC, Extended Bayesian Information Criterion; ED, eating disorder; EDI-2, Eating Disorder Inventory -2; EI, Expected influence; LASSO, Least Absolute Shrinkage and Selection Operator; OCD, obsessive-compulsive disorder; OCPD, obsessive-compulsive personality disorder.

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KEYWORDS
anorexia, bulimia, network analysis, obsessive-compulsive personality

Highlights

- Asceticism, social insecurity, ineffectiveness, and impulsivity were central nodes within the network.
- Interpersonal distrust emerged as a possible bridging pathway connecting childhood obsessive-compulsive personality disorder (OCPD) traits to eating disorder symptoms.
- Negative attitudes towards emotional expression and intimacy may play a functional role in linking OCPD traits and eating disorder symptom clusters.

1 | INTRODUCTION

Individuals with anorexia nervosa (AN) and bulimia nervosa (BN) display behaviours that are highly concordant with obsessive-compulsive personality disorder (OCPD) such as perfectionism, rigidity, restricted affectivity, and a propensity to derive and adhere to rule-bound behaviours (Treasure et al., 2020). Robust evidence demonstrates that AN and BN are associated with heightened OCPD traits, which represent negative prognostic factors in the eating disorder (ED) illness course (Lilenfeld et al., 2000; Steinhausen, 2009; Treasure et al., 2020). However, how specific dimensions of OCPD traits relate to ED symptoms remains unclear. The current study aimed to address this gap in the literature by using network analysis to identify central nodes across the OCPD and ED network and identify which symptoms connected these syndromes.

OCPD is characterised by rigid perfectionism, preoccupations with order and detail, and an excessive need to control one's environment (American Psychiatric Association, 2013). The prevalence of OCPD in ED samples is approximately 13% (Halmi et al., 2005). While traits characteristic of OCPD such as perfectionism, inflexibility, rule-driven behaviours, a need for order and symmetry, and excessive doubt and cautiousness are prevalent within ED samples (American Psychiatric Association, 2013; Culbert et al., 2015).

OCPD traits are evident at the symptom level in EDs. Individuals with EDs display highly detailed and ritualised weight and shape control behaviours that are difficult to change once initiated, thus highlighting their compulsive nature (Treasure et al., 2015). While compulsive features (e.g., perfectionism) have been shown to underlie the development of AN, evidence suggests that impairments in inhibitory control are implicated in the development of BN (Wu et al., 2013), with both BN and AN-binge purge (AN-BP) subtype demonstrating deficits in inhibitory control (Smith et al., 2018). While seemingly contradictory phenomena, higher impulsivity tends to be associated with higher compulsivity (Chamberlain et al., 2018), rather than the opposite. This has led researchers to suggest that an impulsive/compulsive endophenotype might underlie the habitual nature of binge eating in BN and AN-BP subtype (Treasure et al., 2015).

Evidence suggests that OCPD traits are implicated in the early stages of the ED illness course and directly increase the risk of developing an ED (Culbert et al., 2015). For example, in one of the few studies assessing childhood OCPD traits, Anderluh et al. (2003) investigated the impact of childhood OCPD traits in 72 women with a diagnosis of AN or BN. Results showed that retrospectively assessed OCPD traits in childhood increased the odds ratio for developing an ED by 6.9 for each additional OCPD trait that was present, in comparison to a control group. Perfectionism in childhood, a hallmark feature of OCPD, has also been identified as a risk factor for the development of AN and BN (Wade et al., 2016). Considerable research also demonstrates that the presence of OCPD traits is associated with poorer treatment response (Agras et al., 2014; Crane et al., 2007; Wentz et al., 2000). The culmination of this evidence has led to the hypothesis that OCPD traits may represent endophenotypic traits underpinning the development of AN and BN (Tenconi et al., 2010).

While OCPD traits have been shown to confer risk for the development of EDs, OCPD traits and EDs have a complex interrelated relationship. Of importance, the illness state associated with EDs has been associated with the exacerbation of OCPD symptoms. Specifically, Treasure et al. (2020) contend that as a result of starvation or abnormal eating patterns, OCPD traits (such as cognitive inflexibility and rigidity) may become intensified, which may serve to further maintain the ED. Therefore, OCPD traits while evident prior to the onset of the ED may

become exacerbated during the acute illness phase of AN and BN, further maintaining the ED. Notably, despite numerous studies examining EDs and OCPD traits (Young et al., 2013), the specific symptom pathways which connect these syndromes remain largely unexplored. This understanding is important as identifying whether some OCPD traits are more closely associated with specific ED symptoms may provide insight into the functional role of ED symptoms. For example, if preoccupations with order and symmetry were closely associated with drive for thinness, this may suggest that drive for thinness is in part motivated by concerns related to symmetry. Such findings would enhance our understanding of the relationships between OCPD traits and EDs at the symptom level and help guide targeted interventions.

Network theory provides a particularly useful theoretical framework for examining the interrelations among symptoms of comorbid conditions, such as OCPD and EDs (Borsboom et al., 2011). Network theorists aim to explain the functional relations among psychological symptoms (nodes) to explain why symptoms cluster syndromically (McNally et al., 2015). For example, EDs can be viewed as a cluster of symptoms wherein body image concerns lead to restrictive eating, which may then trigger episodes of binge eating, which may then be followed by inappropriate compensatory behaviours (i.e., purging). Moreover, as symptoms often affect each other through feedback loops (i.e., restriction leads to binge eating and vice a versa), once a sufficient number of symptoms become "activated", the symptom network becomes self-sustaining making it difficult to disrupt and achieve symptom remission (McNally et al., 2015).

Monteleone and Cascino (2021) systematic review included 25 studies utilising network analysis to examine which ED symptoms were the most central within clinical ED populations. Results showed that the overevaluation of the importance of weight and shape, dissatisfaction with body shape and weight, and a desire to lose weight were the most central ED symptoms. Interestingly, Monteleone and Cascino's (2021) results showed that ineffectiveness, interoceptive awareness and affective problems, while not specific ED symptoms were highly central within the ED symptom network. However, the majority of studies included the review included mixed ED samples (AN, BN, Binge Eating Disorder, and other specified feeding or eating disorders), which may have introduced confounding factors, tempering the conclusions drawn. Schlegl et al. (2021) compared the symptom networks between AN and BN in adults and adolescents in a sample of 2535 participants to determine whether there were disorder or age specific differences in the ED symptom network. Results showed considerable similarities in the network structures and strengths of the Eating Disorder Inventory-2 (EDI-2), (Garner et al., 1982) nodes across AN and BN as well as between the adolescents and adults with these disorders. These findings suggest that networks can be meaningfully interpreted within mixed AN and BN samples, and for participants with a variety of ages, providing support for Monteleone and Cascino's (2021) systematic review.

Network analysis can also be used to identify "bridge symptoms", defined as symptoms which play a key role in connecting two syndromic clusters (Jones et al., 2019). Identifying bridging symptoms is significant as it may enable these symptoms to be targeted in treatment contexts; thereby reducing comorbidity and, in turn, symptom severity. Monteleone and Cascino's (2021) review included nine studies that examined bridge centrality. The results identified low self-esteem and body mistrust as having high bridge centrality in connecting ED symptoms to symptoms of anxiety, depression, and interoceptive awareness (Elliott et al., 2020; Forrest et al., 2019; Kerr-Gaffney et al., 2020; Monteleone et al., 2019). However, to date, no study has used network analysis to examine the relationship between OCPD traits and ED symptoms.

Of interest, Meier et al. (2020) and Vanzhula et al. (2021) investigated the relationships between ED and obsessive-compulsive disorder (OCD) symptoms using network analysis. While OCPD and OCD are distinct disorders, their similarities and the novelty of this analytic approach may be informative for the current study. Meier et al. (2020) sample consisted of $N = 303$ treatment-seeking ED patients. Results showed that fear of weight gain and dietary restraint were highly central among the ED symptoms, while interference due to obsessions was the most central OCD symptom. With respect to potential bridging symptoms, difficulty controlling obsessions, time spent on compulsions, and time spent on obsessions emerged as the most likely bridging nodes. However, the bootstrapped centrality results did not reliably identify these symptoms as bridge symptoms. Meier et al. (2020) argue that this lack of stability of bridge nodes in the OCD and ED network may be attributed to the fact that they only measured symptoms directly related to ED and OCD, and that personality variables may be better candidates for bridges rather than disorder-specific cognitions and behaviours. In support of this argument, Vanzhula et al. (2021) network analyses in a mixed sample of undergraduate students and individuals diagnosed with EDs ($N = 1619$), found that two perfectionism symptoms (doubts about simple everyday things and repeating things over and over) reliably bridged ED and OCD symptoms. These findings suggest that processes such as perfectionism, while not symptoms

that serve as criteria for an ED or OCD diagnoses, may represent underlying vulnerabilities that bridge disorder-specific cognitions and behaviours.

1.1 | The current study

To date, there is limited research into the most central OCPD symptoms (perfectionism, order and symmetry, inflexibility, rule-bound, and excessive doubt and cautiousness) in ED samples. Furthermore, no research has employed network analysis to determine whether specific pathways may account for the associations between childhood OCPD traits and EDs. As such, we aimed to investigate childhood OCPD traits and ED symptoms in a combined symptom network of young adult women with a primary diagnosis of AN or BN. Given the novelty of the combination of childhood OCPD traits and ED symptoms included within this network investigation, an exploratory approach was taken with regards to centrality and there were no a priori hypotheses concerning which facets would emerge as most central. Regarding bridge pathways, we aimed to identify important bridging nodes. Cognitive inflexibility and perfectionism have been consistently and robustly associated with both the onset and maintenance of EDs (Bardone-Cone et al., 2007; Bulik et al., 2003) and are core features of OCPD (American Psychiatric Association, 2013). Therefore, we hypothesised that cognitive inflexibility and perfectionism would emerge as key network bridging factors.

2 | METHOD

2.1 | Participants and procedures

Participants were 320 women recruited as part of a large multicenter study who were referred for assessment and treatment to specialised ED units in four different European countries (Austria, the UK, Spain, Slovenia). The details of this multicenter study have been reported previously (Krug et al., 2013). All participants provided written consent. Participants were diagnosed with AN or BN according to DSM-IV-TR (American Psychiatric Association, 2000) criteria, using the structured clinical interview SCID-I (First & Gibbon, 2004) or EATATE (Anderluh et al., 2003) administered by experienced psychologists and psychiatrists. Participants were diagnosed with OCD using the ICD-10 (World Health Organization, 1992) diagnostic criteria, excluding food and body-related obsessions. Participants were included in the study on the basis that they had a lifetime DSM-IV-TR (American Psychiatric Association, 2000) diagnosis of AN or BN. Exclusion criteria for the study were: (1) individuals who had not completed a diagnostic assessment; (2) younger than 14 years old as per the age inclusion criteria for the treatment facility participants were recruited from; (3) unable to complete the assessment because of cognitive impairment and/or serious medical condition; or (4) current psychotic disorder.

2.2 | Measures

2.2.1 | EATATE diagnostic interview (Anderluh et al., 2003)

The EATATE (Anderluh et al., 2003) is a semi-structured interview developed for the European Healthy Eating Project. This measure and the procedure have been described in detail previously (Anderluh et al., 2003). The EATATE interview was used to retrospectively assess childhood traits reflecting OCPD (perfectionism, inflexibility, rule driven, drive-for-order and symmetry, and excessive doubt and cautiousness). The instrument uses behavioural examples to assess the presence of each trait. Traits were rated 0 for absent, 1 for present but not influencing the child's life, or 2 for impinging on the child's life relationship with the world or with others. The EATATE interview also has a section to determine whether participants have a lifetime diagnosis of OCD in accordance with the ICD-10 (World Health Organization, 1992) diagnostic criteria. The EATATE has demonstrated good inter-rater reliability (Kappa coefficient of 0.74) and validity (Anderluh et al., 2003).

2.2.2 | Eating disorder Inventory -2 (EDI-2 Garner et al., 1982)

The EDI-2 (Garner et al., 1982) is a 91-item self-report instrument developed to assess psychological characteristics and behaviour patterns relevant within AN and BN. Items are rated on a 6-point Likert-type scale from 1 (Never) to 6 (Always). Three subscales (drive for thinness, bulimia, and body dissatisfaction) assess ED attitudes and behaviours. The other eight subscales (ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, maturity fears, asceticism, impulse regulation, and social insecurity) assess behavioural and psychological traits. In the interest of network parsimony and to reduce multicollinearity, we excluded the perfectionism scale of the EDI-2 from the analyses as perfectionism was assessed by the EATATE. The perfectionism subscale from the EATEATE was retained in

favour of the EDI-2 perfectionism subscale, as were interested in examining the relationship between childhood OCPD traits, and the EDI-2 assesses perfectionism in adulthood. The EDI-2 has demonstrated good internal consistency (a = 0.83 to 0.93) and validity in female ED populations (Garner et al., 1982).

2.3 | Data analytic plan

2.3.1 | Statistical analyses

All statistical analyses were conducted using R (R Core Team, 2020). Data were screened for missing responses, outliers, and normality. Assumption checking revealed that the data were normally distributed, and no univariate outliers were detected. Participants were excluded if they were missing ≥50% of item responses. The percentage of missing data in the current sample was 11.76%. Missing data were handled using a single multivariate imputation using chained equations in the Multivariate imputation by chained equations (MICE) package (van Buuren & Groothuis-Oudshoorn, 2011). Continuous variables were imputed using predictive mean matching, whilst categorial variables were imputed using logistic regression specifications in the MICE package. To determine whether the AN and BN groups differed significantly on any of the demographic, ED or OCPD variables, independent samples *t*-tests were computed for all continuous variables, and Pearson's Chi-squared test with Yates' continuity correction were computed for categorical variables.

2.3.2 | Network estimation

Network analyses were conducted using the "*networktools*" package (Jones et al., 2019) in R (version 3.5.2; R Core Team, 2020). To reliably estimate the parameters in the combined OCPD and ED network we computed a regularised partial correlation network using a graphical Least Absolute Shrinkage and Selection Operator (Epskamp et al., 2012); package in R (R Core Team, 2020). Least Absolute Shrinkage and Selection Operator utilises a tuning parameter to control the degree to which regularisation is applied. For the current network, we selected the Extended Bayesian Information Criterion (EBIC) (Chen & Chen, 2008). Using regularisation in network estimation helps to return a network structure with relatively fewer edges (correlations) to explain the covariation structure in the data, which increases the interpretability of the network and shrinks edges that are likely to have occurred by chance. The thickness of each visible edge indicates the magnitude of the partial correlation between any two nodes: the thicker the edge, the higher the magnitude of the correlation.

2.3.3 | Expected influence centrality and bridge expected influence centrality

We used the "*networktools*" package (Jones et al., 2019) in R to compute Expected influence (EI) to assess which nodes were the most central (i.e., important), within our combined OCPD and ED network. The EI of a specific node is the summed weight of edges that it shares with the remaining nodes in the network, taking negative associations into account (Robinaugh et al., 2016). Therefore, EI can be preferable to strength centrality in some instances where networks have more than 25% of edges being negative (Robinaugh et al., 2016).

To examine which nodes which may connect the two symptom networks, we computed bridge EI in "*networktools*" (Jones et al., 2019). Bridge EI is the signed sum of edge weights of a node to communities other than its own (i.e., inter-community but not intra-community edges). For example, the bridge EI value for a childhood OCPD trait indicate the extent to which this trait is related to aspects of ED symptoms. Positive values reflect overall positive relationships (i.e., perfectionism being correlated with higher levels of drive for thinness), whereas negative values reflect overall negative relationships. Given the novelty of the bridge function, no guidelines for what bridge strength values are considered significant exist. Therefore, we used Jones, Ma, & McNally's (2019) recommendation to select nodes in the 80th percentile for bridge EI to denote potentially important nodes in bridging symptom communities. We then represented these nodes as their own "community" in the network for ease of interpretation.

2.3.4 | Stability

To estimate the stability of each network, we performed 1000 casedropping bootstraps with the "*bootnet*" package (Epskamp, Borsboom, & Fried, 2018). The 'bootnet' package includes several overall network correlation-stability coefficients (CS-coefficients). CS-coefficients assess whether the original estimates correlate with bootstrapped estimates, therefore examining the stability of estimated values relative to one another across bootstrapped samples. We estimated CS-coefficients for EI and bridge EI to assess their respective stabilities (Epskamp, Borsboom, & Fried, 2018). A CS-coefficient

should be at least above 0.25 for interpretation of differences in centrality, but preferably above 0.5 (Epskamp, Borsboom, & Fried, 2018). We also carried out centrality difference tests to determine whether the nodes that have with higher centrality significantly differed from those nodes with lower centrality values (Epskamp, Maris, et al., 2018). Examining the stability of psychological networks is important as it provides an indication of how accurate (i.e., prone to sampling variation) and how stable (i.e., network remains consistent with fewer observations) the network is (Epskamp, Maris, et al., 2018).

3 | RESULTS

3.1 | Demographic variables

Three-hundred-twenty young adult women (M_{age} = 28.39 years, SD = 9.80) aged between 14 and 70 years of age, were recruited as part of a large multicenter study, the details of which have been reported previously (Krug et al., 2013). Participants were recruited from London (43.80%, N = 140), Austria (41.30%, N = 132), Spain (10.60%, N = 34), and Slovenia (4.4%, N = 14). With respect to diagnosis, 27.8% (N = 89) were diagnosed with AN-Restricting (AN-R) Sub-type, 43.1% (N = 138) were diagnosed with AN-BP subtype, and 29.1% (N = 93) were diagnosed with BN. The mean age of ED symptom onset was 13.50 years (SD = 6.30). As shown in Table 1, the AN group had a higher proportion of participants with a lifetime diagnosis of OCD (34.8%) in comparison to the BN group (19.4%), with 30.3% of the overall sample meeting criteria for a lifetime diagnosis of OCD. All women reported their ethnicity as Caucasian/European. The mean current Body mass index (BMI) for the sample was 19.59 (SD = 4.90), with 41.6% being underweight, 51.7% healthy weight, 2.9% overweight, and 3.8% obese according to the World Health Organization BMI classifications (World Health Organization, 2000). Unsurprisingly, the AN group had a significantly lower current BMI than the BN group.

3.2 | Network analyses

Descriptive information of the variables included in the network are presented in Table 1. Participants endorsed high levels of impulsivity, body dissatisfaction, maturity fears, and ineffectiveness, with no significant differences emerging between the AN and BN groups. The most frequently endorsed childhood OCPD traits were rule bound (77.8%) and perfectionism (72%). A greater proportion of AN participants endorsed the OCPD traits, perfectionism, excessive doubt and cautiousness, and rule bound behaviours, in comparison to those with BN. Figure 1 depicts a visual representation the regularised partial correlation OCPD and ED network. Green edges represent positive associations and red edges represent negative associations, with all edges in the current network being positive. The thickness and saturation of the edges represent the strength of the partial correlation between the nodes. Eating disorder symptoms and childhood OCPD traits shared few edges connecting them but were strongly connected with nodes from their respective clusters'. The strongest edges emerging in the ED cluster were drive for thinness (DrivThin) to body dissatisfaction (BodDis; r = 0.45), ascetism (Ascet) to impulsivity (Impul; r = 0.37), and ineffectiveness (Ineffect) to social insecurity (SocInsec; r = 0.37). While the strongest edges within the childhood OCPD traits cluster were inflexibility (Inflex) to rule bound (RuleBoun; r = 0.39) and perfectionism (Perfect) to drive-for-order and symmetry (OrdSym; r = 0.25).

3.3 | Expected influence centrality and bridge Expected influence centrality

The EI and bridge EI centrality estimates for the network are displayed in Figure 2 and the exact estimates are reported in Table 2. With respect to EI, the ED nodes ascetism, social insecurity, ineffectiveness, and impulsivity had the highest EI centrality. Bootstrapped stability tests for EI centrality indicated that ascetism, social insecurity, ineffectiveness, and impulsivity had higher EI than 60% of nodes within the network (see supplementary Figure S1). These nodes, therefore, represent potential key nodes in maintaining the network. Whereas the least central nodes (with a substantial drop in node strength) were excessive doubt and cautiousness (DoCaut), drive-for-order and symmetry (OrdSym), and body dissatisfaction (BodDis). The network demonstrated excellent stability (EI stability CS-coefficient = 0.75).

With respect to bridge EI, interpersonal distrust, perfectionism, and drive-for-order and symmetry emerged as the nodes with the highest bridge EI (see Figure 2). Consistent with Jones et al. (2019) we then estimated a second network in which the nodes in the 80th percentile for bridge EI represented their own community of "bridge" nodes (see Figure 3). Interpersonal distrust emerged as a possible bridge node through its connection to several childhood OCPD traits, while perfectionism and drive-for-order and symmetry emerged as possible bridge nodes through their connection to the ED node interpersonal distrust. Specifically, the edges (partial correlations) connecting the ED cluster to the OCPD cluster were

TABLE 1 Descriptive information of the nodes included in the network

	Anorexia nervosa	Bulimia nervosa	Overall sample	Sig diff between AN and BN
N	227	93	320	
Age	27.40 (9.23)	30.54 (10.91)	28.39 (9.80)	*AN < BN
Age of ED symptom onset	12.97 (6.20)	14.89 (6.42)	16.70 (4.92)	-
Current BMI	18.04 (2.87)	23.41 (6.52)	19.59 (4.90)	***AN < BN
Lifetime OCD diagnosis	34.8%	19.4%	30.3%	** AN > BN
EDI-drive for thinness	14.86 (3.59)	14.38 (3.63)	14.72 (3.60)	-
EDI-bulimia symptoms	13.17 (4.24)	13.29 (3.88)	13.59 (4.14)	-
EDI-body dissatisfaction	18.96 (5.01)	19.83 (5.10)	19.21 (5.05)	-
EDI-ineffectiveness	17.80 (4.78)	17.05 (4.85)	17.58 (4.81)	-
EDI-interpersonal distrust	11.55 (3.24)	11.47 (3.16)	11.53 (3.21)	-
EDI-interoceptive awareness	11.66 (3.35)	11.87 (4.19)	11.72 (3.21)	-
EDI-maturity fears	17.76 (5.07)	18.13 (4.56)	17.87 (4.92)	-
EDI-ascetism	15.13 (4.16)	16.02 (4.56)	15.39 (4.28)	-
EDI-impulsivity	20.00 (5.43)	20.37 (4.56)	20.11 (5.50)	-
EDI-social insecurity	13.91 (3.62)	13.63 (3.98)	13.83 (3.72)	-
Percentage of participants who endorsed childhood OCPD traits				
Perfectionism	76.7%	61.3%	72.2%	** AN > BN
Excessive doubt and cautiousness	35.7%	19.4%	30.9%	** AN > BN
Inflexibility	55.5%	46.2%	52.8%	-
Drive-for-order and symmetry	39.2%	28.0%	35.9%	-
Rule bound	81.9%	67.7%	77.8%	** AN > BN

Note: The percentage of participants who endorsed an OCPD trait was calculated as any participants who scored one or two on this trait during the EATATE interview. AN and BN were compared via two-tailed *t*-tests for continuous variables, and Pearson's Chi-squared test with Yates' continuity correction for categorical variables.

Abbreviations: AN, Anorexia Nervosa; BMI, Body mass index; BN, Bulimia Nervosa; EDI, Eating Disorder Inventory; OCD, obsessive-compulsive disorder; OCPD, Obsessive-compulsive personality disorder.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

interpersonal distrust (InterDist) to perfectionism (Perfect; $r = 0.08$), interpersonal distrust (Inter-Dist) to drive-for-order and symmetry (OrdSym; $r = 0.04$), interpersonal distrust (InterDist) to rule bound (RuleBoun; $r = 0.04$), and drive for thinness (DrivThin) to drive-for-order and symmetry (OrdSym $r = 0.03$). Stability estimates for bridge EI, however, were low (CS = 0.36), but still within the acceptable range (Epskamp, Borsboom, & Fried, 2018). Bootstrapped centrality results for bridge EI, however, only identified interpersonal distrust as a reliably stronger bridge node in comparison to the other nodes in the network (see supplementary Figure S2). Specifically, interpersonal distrust was significantly higher in bridge EI than 71% of other symptoms included in the network, while perfectionism was significantly higher in bridge EI than 14% of other symptoms, and drive-for-order was significantly higher in bridge EI than only 7% of other symptoms in the network.

4 | DISCUSSION

This study is the first to employ network analysis to examine the relationships between childhood OCPD traits and ED symptoms within a clinical ED sample. We aimed to identify central nodes across the OCPD and ED network and identify whether any specific bridge nodes connected these trait/symptom clusters. The results showed that ED nodes ascetism, social insecurity, ineffectiveness, and impulsivity had the highest EI centrality, while childhood OCPD traits were generally less central in the network. Regarding bridging pathways, the results showed several moderately strong edges connecting the childhood OCPD and adult ED symptom clusters. The results did not support our hypotheses that cognitive inflexibility and perfectionism would emerge as bridging nodes. While perfectionism was in the 80th percentile for bride EI, interestingly, interpersonal distrust emerged as

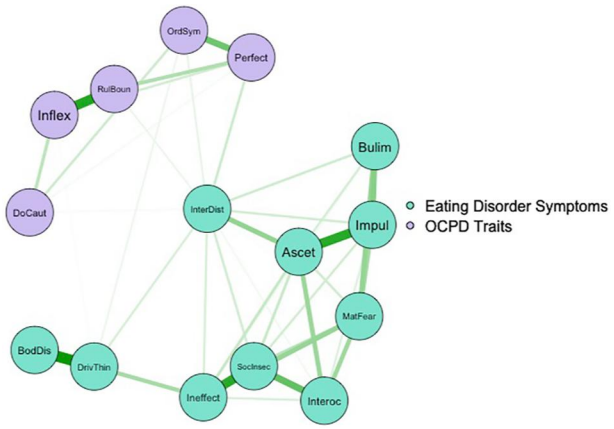

FIGURE 1 A graphical EBICglasso model of eating disorder (ED) symptoms and Obsessive-compulsive personality disorder (OCPD) traits among 320 women with an ED diagnosis. Thicker edges (i.e., line connections between nodes) represent stronger relationships. Green edges represent positive relationships and red edges indicate negative relationships. Childhood OCPD traits node labels: DoCaut; Excessive Doubt and Cautiousness, Inflex; Inflexibility, RulBoun; Rule bound, OrdSym; Order and Symmetry. Perfect; Perfectionism. Adult ED symptom node labels: InterDist; Interpersonal Distrust, Bulim; Bulimia Symptoms, Ascet; Ascetism, Impul; Impulsivity, BodDis; Body Dissatisfaction, DrivThin; Drive for Thinness, Ineffect; Ineffectiveness, SocInsec; Social Insecurity, Interoc; Interoceptive Awareness, MatFear; Maturity Fears [Colour figure can be viewed at wileyonlinelibrary.com]

the only bridging node which was reliably stronger in connecting the childhood OCPD and ED trait/symptom clusters.

4.1 | Central symptoms in the network

Ascetism, social insecurity, ineffectiveness, and impulsivity emerged as central nodes in the childhood OCPD and ED network through their strong connections to other ED symptoms. Specifically, ascetism was associated with impulsivity, interpersonal distrust, and interoceptive awareness; social insecurity was associated with ineffectiveness and interoceptive awareness, and impulsivity was associated with ascetism and bulimia. The centrality of impulsivity in our network is not surprizing given the established role of impulsivity in bulimic-type conditions and that most participants in our sample reported bulimic symptomatology (AN-BP and BN) (Smith et al., 2018). This is also supported by the strong positive correlations between bulimia and impulsivity in the current network. The strong correlations between ascetism and impulsivity, is interesting and may suggest that the struggle for control, typical of asceticism, is associated with more impulsive behaviours, or that a desire to engage in self-discipline may be fuelled by difficulties to control impulsive behaviours.

The centrality of ineffectiveness in our network is consistent with previous network analysis studies (Monteleone & Cascino, 2021). Furthermore, the central role of ascetism, social insecurity, ineffectiveness in our network aligns with theoretical models of EDs, such as the cognitive interpersonal maintenance model of AN, which argue that EDs are predisposed and maintained by heightened social threat and social anxiety and a sense of ineffectiveness is one's environment, which in turn fuels the propensity to follow detailed weight and shape control rituals to achieve a sense of control (Treasure et al., 2020). These findings highlight the centrality of non-ED specific symptoms (i.e., ascetism), as well as the central role of cognitive symptoms, more so than behavioural symptoms (i.e., bulimia), in the ED symptom network.

The low centrality of body dissatisfaction is inconsistent with previous studies which have reported dissatisfaction with body shape and weight, and a desire to lose weight as central ED symptoms (Monteleone & Cascino, 2021). This finding is also surprizing given the central maintaining role of body dissatisfaction across ED diagnoses in the transdiagnostic theory of EDs (Fairburn et al., 2003). In our network body dissatisfaction was only connected to drive for thinness, and no other ED symptoms. This may suggest that despite the sample endorsing high levels of body dissatisfaction, body dissatisfaction may not play central role in the ED symptom network, beyond its strong connections to drive for thinness.

Childhood OCPD traits demonstrated low EI centrality in our network. The childhood OCPD trait of inflexibility had the highest centrality, primarily through its connection to childhood OCPD traits rule bound and excessive doubt and cautiousness, suggesting inflexibility tends to co-occur with and rule bound behaviours, excessive doubt, and cautiousness. The lower centrality estimates for the OCPD traits may suggest these nodes are not as central to ED symptom network. These findings may in part be accounted for the by the network characteristics (the number of nodes in each cluster) which may contribute to differential variability between the clusters, in turn affecting centrality estimates (Terluin et al., 2016).

4.2 | Bridging nodes

Our analyses showed that interpersonal distrust, perfectionism, and drive-for-order and symmetry emerged as possible bridging pathways which connected adult ED symptoms and childhood OCPD traits. However, the

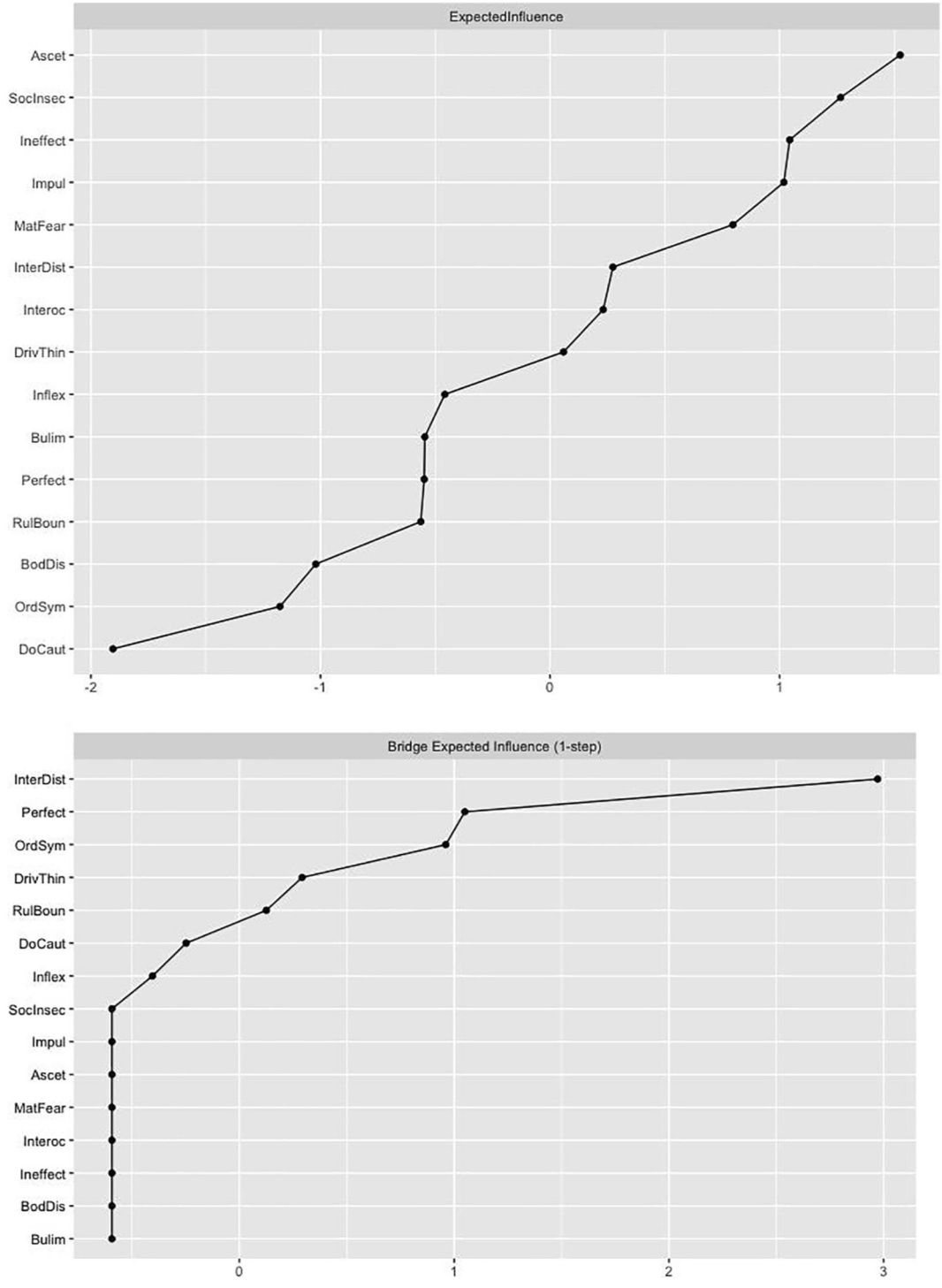

FIGURE 2 Z-score Expected influence (EI) and bridge EI centrality estimates for each node in the network, ordered by highest value

bootstrapped centrality results, only identified interpersonal distrust as a reliably stronger bridge than any other symptoms compared to the other nodes in the network. Therefore, while perfectionism, and drive-for-order and symmetry had high bridge EI, our analyses indicated that these values were not reliably stronger in bridging the childhood OCPD and ED trait/symptom clusters. The central role of interpersonal distrust is consistent with the transdiagnostic theory of EDs, which argues that interpersonal problems play a central role in maintaining the ED (Fairburn et al., 2003). Interpersonal distrust may be a suitable target to address comorbidity across OCPD and EDs. However, further research is needed replicate the current findings.

Interestingly, while childhood OCPD traits were generally less central in the network, perfectionism and

TABLE 2 Estimates for Expected influence (EI) centrality and bridge EI centrality for nodes included within the OCPD and ED network

Node	Expected influence centrality	Bridge expected influence centrality
Drive for thinness	0.06	0.06
Bulimia symptoms	−0.55	0.00
Body dissatisfaction	−1.02	0.00
Ineffectiveness	1.04	0.00
Interpersonal distrust	0.27	0.24
Interoceptive awareness	0.23	0.00
Maturity fears	0.79	0.00
Ascetism	1.52	0.00
Impulsivity	1.02	0.01
Social insecurity	1.27	0.00
Perfectionism	−0.55	0.10
Excessive doubt and cautiousness	−1.90	0.02
Inflexibility	−0.45	0.03
Drive-for-order and symmetry	−1.17	0.09
Rule bound	0.06	0.09

Note: This table contains the raw centrality estimates for the expected influence centrality and the bridge expected influence estimates.

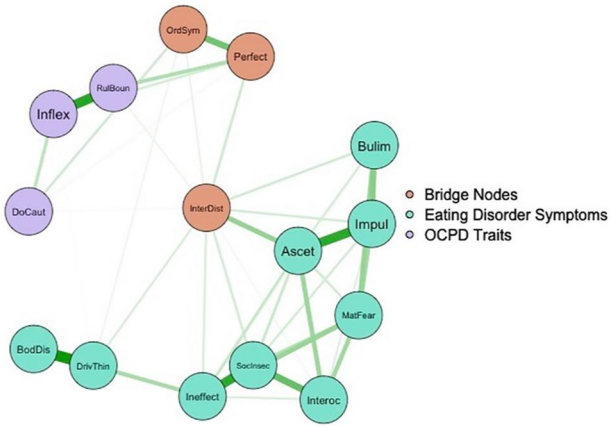

FIGURE 3 Network of adult eating disorder (ED) symptoms, childhood Obsessive-compulsive personality disorder (OCPD) traits and bridge nodes which connect these disorders. Bridge nodes labels: Order and Symmetry (OrdSym), Perfectionism (Perfect), and Interpersonal Distrust (InterDist). Childhood OCPD traits node labels: Excessive Doubt and Cautiousness (DoCaut), Inflexibility (Inflex), and Rule bound (RulBoun). Adult ED symptom node labels: Bulimia Symptoms (Bulim), Ascetism (Ascet), Impulsivity (Impul), Body Dissatisfaction (BodDis), Drive for Thinness (DrivThin), Ineffectiveness (Ineffect), Social Insecurity (SocInsec), Interoceptive Awareness (Interoc), Maturity Fears (MatFear) [Colour figure can be viewed at wileyonlinelibrary.com]

drive-for-order demonstrated high bridge EI. Due to the cross-sectional nature of our data, conclusions regarding the temporal relationships between perfectionism and drive-for-order and ED symptoms cannot be inferred. However, our findings suggest that OCPD traits evident in childhood may play a role in maintenance of EDs given their function in connecting these symptom clusters. Therefore, further understanding of the temporal relationships between OCPD traits and EDs is needed to clarify how OCPD traits are related with EDs at the symptom level. Such research would help to clarify whether OCPD traits evident in childhood play an aetiological role in the development of EDs and may therefore represent an endophenotype for EDs. However, further studies utilising recovered individuals, siblings and family members are needed to provide stronger support to that these traits are part of the ED endophenotype profile (Gottesman & Gould, 2003). Nonetheless, the insufficient reliability and stability findings temper clinical implications regarding the significance of perfectionism and drive-for-order as possible bridging pathways.

4.3 | Limitations

There are several limitations to our approach. First, bridge centrality statistics are based upon existing centrality estimates which are associated with certain limitations. Specifically, high centrality does not automatically indicate clinical relevance for a node, as some symptoms while highly central, are not viable targets for intervention. For

example, intervening on nodes which are not readily modifiable (e.g., personality constructs) would do little to disrupt the symptom network (Fried et al., 2018).

Second, while assessed via a semi-structured interview, childhood OCPD traits were assessed retrospectively and may have been affected by recall bias or illness factors present at the time of assessment. Like-wise, the age range of participants was relatively wide, spanning from 14 to 70 years of age. Consequently, older participants may have been less reliable in recalling OCPD traits from their childhood in comparison to younger participants, which may have differentially impacted the reliability of OCPD traits. We choose to retain these participants to maintain the diverse age range of our sample given the current under-representation of older age groups in previous research (Pike et al., 2013) and on the basis of Schlegl et al.'s (2021) study who found no significant differences in the ED symptom network between adults and adolescents with AN and BN.

Third, other than OCD, we did not assess whether participants had comorbid psychiatric diagnoses or whether they were taking psychotropic medication at the time of the assessment, which may have impacted the nature of ED symptoms and OCPD traits in our sample. Fourth, our sample was not balanced with respect to ED diagnosis or ED subtype. This limitation is important given the relatively lower but consistent associations reported between OCPD traits and EDs and when bulimic features are present versus restrictive symptoms (O'Brien & Vincent, 2003), and that in the current study AN participants endorsed higher rates of perfectionism, excessive doubt and cautiousness, and rule bound behaviours, than BN participants. Despite previous research suggesting combined AN and BN networks can be meaningfully interpreted (Schlegl et al., 2021), these disorder specific differences may limit the extent to which our results can be interpreted transdiagnostically.

Lastly, despite the stability of our network results, the small sample of the current study should temper strong conclusions regarding the generalisability of our findings. Therefore, replicating our results within more homogenous larger clinical groups with respect to age, ED-subtype, and ED diagnosis may help clarify whether there are disorder or subtype specific differences in the relationship between OCPD traits and EDs, and help establish the stability of central and bridging nodes identified in the current study.

4.4 | Clinical implications

The current study has several important clinical implications. Network approaches argue that bridge symptoms may play a role in the development and maintenance of comorbid mental disorders (Cramer et al., 2010). Obsessive-compulsive personality disorder traits such as perfectionism, rule-bound behaviours, and drive for order and symmetry were closely related with the bridging node interpersonal distrust. This may suggest that the need for order and control contributes towards the avoidance of close relationships and feelings of alienation. These difficulties in interpersonal functioning may influence the use of ED behaviours to cope with interpersonal distress and avoid emotional intimacy. Moreover, as symptoms in networks likely affect each other through feedback loops, interpersonal distrust may heighten OCPD traits such as perfectionism and rule-bound behaviours, which in turn influence ED behaviours. Consequently, targeting interpersonal distrust through cognitive behavioural therapy-enhanced (Fairburn et al., 2003) or interpersonal psychotherapy (Murphy et al., 2012) protocols may help to develop, or improve, interpersonal problems solving skills and challenge beliefs that maintain negative attitudes towards emotional expression and intimacy, which may help to decrease ED symptoms and the intensity of OCPD symptoms.

Both ED and childhood OCPD traits showed cognitive symptoms to be more important ("central") than behavioural ones (e.g., bulimia behaviours). This is of clinical interest as it suggests that targeting cognitive features of EDs may be more effective at disrupting the symptom network. Lastly, by analysing the network structure of childhood OCPD traits and adult ED symptoms this study contributes to the current debate as to whether OCPD and ED should be seen as distinct pathologies or if they should rather be conceptualised on a spectrum (Dell'Osso et al., 2016). Our results indicate that OCPD traits while related to ED symptoms are best represented as distinct symptom clusters.

4.5 | Conclusion

The current study represents a contemporary contribution to the literature investigating the relationships between OCPD traits and EDs. Results showed that ascetism, social insecurity, ineffectiveness, and impulsivity were central nodes in the childhood OCPD and ED, suggesting that targeting the cognitive features of EDs as well as non-ED specific symptoms (i.e., ineffectiveness) may be effective to disrupt the ED symptom network. While perfectionism showed high bridge EI, the results did not support our hypotheses that cognitive inflexibility and perfectionism would emerge as bridging nodes. Interpersonal distrust, however, emerged as possible

bridging pathway that connected adult ED symptoms to childhood OCPD traits. This finding suggests that negative attitudes towards emotional expression and intimacy may play a functional role in linking OCPD and ED trait/symptom clusters. Future research using larger ED sample sizes is needed within individual disorders (e.g., BN and AN, including separate analyses of AN-R and AN-BP) to better characterise the pathways which contribute to this diagnostic comorbidity.

ACKNOWLEDGEMENT

Supported by grant QLK1-1999-916 from the European Commission Framework V program.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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REFERENCES

Agras, W. S., Lock, J., Brandt, H., Bryson, S. W., Dodge, E., Halmi, K. A., Jo, B., Johnson, C., Kaye, W., Wilfley, D., & Woodside, B. (2014). Comparison of 2 family therapies for adolescent anorexia nervosa: A randomized parallel trial. *JAMA Psychiatry*, *71*(11), 1279–1286. https://doi.org/10.1001/jamapsychiatry.2014.1025

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (DSM-IV-TR)*. American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.

Anderluh, M. B., Tchanturia, K., Rabe-Hesketh, S., & Treasure, J. (2003). Childhood obsessive-compulsive personality traits in adult women with eating disorders: Defining a broader eating disorder phenotype. *American Journal of Psychiatry*, *160*(2), 242–247. https://doi.org/10.1176/appi.ajp.160.2.242

Bardone-Cone, A. M., Wonderlich, S. A., Frost, R. O., Bulik, C. M., Mitchell, J. E., Uppala, S., & Simonich, H. (2007). Perfectionism and eating disorders: Current status and future directions. *Clinical Psychology Review*, *27*(3), 384–405. https://doi.org/10.1016/j.cpr.2006.12.005

Borsboom, D., Cramer, A. O., Schmittmann, V. D., Epskamp, S., & Waldorp, L. J. (2011). The small world of psychopathology. *PLoS One*, *6*(11), e27407. https://doi.org/10.1371/journal.pone.0027407

Bulik, C. M., Tozzi, F., Anderson, C., Mazzeo, S. E., Aggen, S., & Sullivan, P. F. (2003). The relation between eating disorders and components of perfectionism. *American Journal of Psychiatry*, *160*(2), 366–368. https://doi.org/10.1176/appi.ajp.160.2.366

Chamberlain, S. R., Stochl, J., Redden, S. A., & Grant, J. E. (2018). Latent traits of impulsivity and compulsivity: Toward dimensional psychiatry. *Psychological Medicine*, *48*(5), 810–821. https://doi.org/10.1017/S0033291717002185

Chen, J., & Chen, Z. (2008). Extended Bayesian information criteria for model selection with large model spaces. *Biometrika*, *95*(3), 759–771. https://doi.org/10.1093/biomet/asn034

Cramer, A. O., Waldorp, L. J., Van Der Maas, H. L., & Borsboom, D. (2010). Comorbidity: A network perspective. *Behavioral and Brain Sciences*, *33*(2-3), 137–150. https://doi.org/10.1017/S0140525X09991567

Crane, A. M., Roberts, M. E., & Treasure, J. (2007). Are obsessive-compulsive personality traits associated with a poor outcome in anorexia nervosa? A systematic review of randomized controlled trials and naturalistic outcome studies. *International Journal of Eating Disorders*, *40*(7), 581–588. https://doi.org/10.1002/eat.20419

Culbert, K. M., Racine, S. E., & Klump, K. L. (2015). Research Review: What we have learned about the causes of eating disorders–a synthesis of sociocultural, psychological, and biological research. *Journal of Child Psychology and Psychiatry*, *56*(11), 1141–1164.

Dell'Osso, L., Abelli, M., Carpita, B., Pini, S., Castellini, G., Carmassi, C., & Ricca, V. (2016). Historical evolution of the concept of anorexia nervosa and relationships with orthorexia nervosa, autism, and obsessive-compulsive spectrum [article]. *Neuropsychiatric Disease and Treatment*, *12*(1), 1651–1660. https://doi.org/10.2147/NDT.S108912

Elliott, H., Jones, P. J., & Schmidt, U. (2020). Central symptoms predict posttreatment outcomes and clinical impairment in anorexia nervosa: A network analysis. *Clinical Psychological Science*, *8*(1), 139–154. https://doi.org/10.1177/2167702619865958

Epskamp, S., Borsboom, D., & Fried, E. I. (2018). Estimating psychological networks and their accuracy: A tutorial paper. *Behavior Research Methods*, *50*(1), 195–212. https://doi.org/10.3758/s13428-017-0862-1

Epskamp, S., Cramer, A. O., Waldorp, L. J., Schmittmann, V. D., & Borsboom, D. (2012). qgraph: Network visualizations of relationships in psychometric data. *Journal of Statistical Software*, *48*(4), 1–18. https://doi.org/10.3758/s13428-017-0862-1

Epskamp, S., Maris, G., Waldorp, L. J., & Borsboom, D. (2018). Network psychometrics. *In The wiley handbook of psychometric testing: A multidisciplinary reference on survey, scale and test development* (Vol. 1–2, pp. 953–986). Wiley Blackwell. https://doi.org/10.1002/9781118489772.ch30

Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: A "transdiagnostic"

theory and treatment. *Behaviour Research and Therapy*, *41*(5), 509–528.

First, M. B., & Gibbon, M. (2004). *The structured clinical interview for DSM-IV Axis I disorders (SCID-I) and the structured clinical interview for DSM-IV Axis II disorders (SCID-II)*.

Forrest, L. N., Sarfan, L. D., Ortiz, S. N., Brown, T. A., & Smith, A. R. (2019). Bridging eating disorder symptoms and trait anxiety in patients with eating disorders: A network approach. *International Journal of Eating Disorders*, *52*(6), 701–711. https://doi.org/10.1002/eat.23070

Fried, E. I., Eidhof, M. B., Palic, S., Costantini, G., Huisman-van Dijk, H. M., Bockting, C. L. H., Engelhard, I., Armour, C., Nielsen, A. B. S., & Karstoft, K.-I. (2018). Replicability and generalizability of posttraumatic stress disorder (PTSD) networks: A cross-cultural multisite study of PTSD symptoms in four trauma patient samples. *Clinical Psychological Science*, *6*(3), 335–351. https://doi.org/10.1177/2167702617745092

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The eating attitudes test: Psychometric features and clinical correlates. *Psychological Medicine*, *12*(4), 871–878. https://doi.org/10.1017/s0033291700049163

Gottesman, I. I., & Gould, T. D. (2003). The endophenotype concept in psychiatry: Etymology and strategic intentions. *American Journal of Psychiatry*, *160*(4), 636–645. https://doi.org/10.1176/appi.ajp.160.4.636

Halmi, K. A., Tozzi, F., Thornton, L. M., Crow, S., Fichter, M. M., Kaplan, A. S., Keel, P., Klump, K. L., Lilenfeld, L. R., Mitchell, J. E., Plotnicov, K. H., Pollice, C., Rotondo, A., Strober, M., Woodside, D. B., Berrettini, W. H., Kaye, W. H., & Bulik, C. M. (2005). The relation among perfectionism, obsessive-compulsive personality disorder and obsessive-compulsive disorder in individuals with eating disorders. *International Journal of Eating Disorders*, *38*(4), 371–374. https://doi.org/10.1002/eat.20190

Jones, P. J., Ma, R., & McNally, R. J. (2019). Bridge centrality: A network approach to understanding comorbidity. *Multivariate Behavioral Research*, *56*, 353–367. https://doi.org/10.1080/00273171.2019.1614898

Kerr-Gaffney, J., Halls, D., Harrison, A., & Tchanturia, K. (2020). Exploring relationships between autism spectrum disorder symptoms and eating disorder symptoms in adults with anorexia nervosa: A network approach. *Frontiers in Psychiatry*, *11*, 401. https://doi.org/10.3389/fpsyt.2020.00401

Krug, I., Penelo, E., Fernandez-Aranda, F., Anderluh, M., Bellodi, L., Cellini, E., Di Bernardo, M., Granero, R., Karwautz, A., Nacmias, B., Ricca, V., Sorbi, S., Tchanturia, K., Wagner, G., Collier, D., & Treasure, J. (2013). Low social interactions in eating disorder patients in childhood and adulthood: A multi-centre European case control study. *Journal of Health Psychology*, *18*(1), 26–37. https://doi.org/10.1177/1359105311435946

Lilenfeld, L., Stein, D., Bulik, C., Strober, M., Plotnicov, K., Pollice, C., Rao, R., Merikangas, K., Nagy, L., & Kaye, W. H. (2000). Personality traits among currently eating disordered, recovered and never ill first-degree female relatives of bulimic and control women. *Psychological Medicine*, *30*(6), 1399–1410. https://doi.org/10.1017/s0033291799002792

McNally, R. J., Robinaugh, D. J., Wu, G. W., Wang, L., Deserno, M. K., & Borsboom, D. (2015). Mental disorders as causal systems: A network approach to posttraumatic stress disorder. *Clinical Psychological Science*, *3*(6), 836–849. https://doi.org/10.1177/2167702614553230

Meier, M., Kossakowski, J. J., Jones, P. J., Kay, B., Riemann, B. C., & McNally, R. J. (2020). Obsessive–compulsive symptoms in eating disorders: A network investigation. *International Journal of Eating Disorders*, *53*(3), 362–371. https://doi.org/10.1002/eat.23196

Monteleone, A. M., & Cascino, G. (2021). A systematic review of network analysis studies in eating disorders: Is time to broaden the core psychopathology to non specific symptoms. *European Eating Disorders Review*, *29*(4). https://doi.org/10.1002/erv.2834

Monteleone, A. M., Mereu, A., Cascino, G., Criscuolo, M., Castiglioni, M. C., Pellegrino, F., Patriciello, G., Ruzzi, V., Monteleone, P., Vicari, S., & Zanna, V. (2019). Re-conceptualization of anorexia nervosa psychopathology: A network analysis study in adolescents with short duration of the illness. *International Journal of Eating Disorders*, *52*(11), 1263–1273. https://doi.org/10.1002/eat.23137

Murphy, R., Straebler, S., Basden, S., Cooper, Z., & Fairburn, C. G. (2012). Interpersonal psychotherapy for eating disorders. *Clinical Psychology & Psychotherapy*, *19*(2), 150–158. https://doi.org/10.1002/cpp.1780

O'Brien, K. M., & Vincent, N. K. (2003). Psychiatric comorbidity in anorexia and bulimia nervosa: Nature, prevalence, and causal relationships. *Clinical Psychology Review*, *23*(1), 57–74. https://doi.org/10.1016/s0272-7358(02)00201-5

Pike, K. M., Dunne, P. E., & Addai, E. (2013). Expanding the boundaries: Reconfiguring the demographics of the "typical" eating disordered patient. *Current Psychiatry Reports*, *15*(11), 411.

R Core Team. (2020). *R: A language and environment for statistical computing*. Retrieved from https://www.R-project.org

Robinaugh, D. J., Millner, A. J., & McNally, R. J. (2016). Identifying highly influential nodes in the complicated grief network. *Journal of Abnormal Psychology*, *125*(6), 747–757. https://doi.org/10.1037/abn0000181

Schlegl, S., Smith, K. E., Vierl, L., Crosby, R. D., Moessner, M., Neumayr, C., & Voderholzer, U. (2021). Using network analysis to compare diagnosis-specific and age-specific symptom networks in eating disorders. *International Journal of Eating Disorders*, *54*(8), 1463–1476. https://doi.org/10.1002/eat.23523

Smith, K. E., Mason, T. B., Johnson, J. S., Lavender, J. M., & Wonderlich, S. A. (2018). A systematic review of reviews of neurocognitive functioning in eating disorders: The state-of-the-literature and future directions. *International Journal of Eating Disorders*, *51*(8), 798–821. https://doi.org/10.1002/eat.22929

Steinhausen, H.-C. (2009). Outcome of eating disorders. *Child and Adolescent Psychiatric Clinics of North America*, *18*(1), 225–242. https://doi.org/10.1016/j.chc.2008.07.013

Tenconi, E., Santonastaso, P., Degortes, D., Bosello, R., Titton, F., Mapelli, D., & Favaro, A. (2010). Set-shifting abilities, central coherence, and handedness in anorexia nervosa patients, their unaffected siblings and healthy controls: Exploring putative endophenotypes. *World Journal of Biological Psychiatry*, *11*(6), 813–823. https://doi.org/10.3109/15622975.2010.483250

Terluin, B., de Boer, M. R., & de Vet, H. C. W. (2016). Differences in connection strength between mental symptoms might Be explained by differences in variance: Reanalysis of network data did not confirm staging. *PLoS One*, *11*(11), e0155205. https://doi.org/10.1371/journal.pone.0155205

Treasure, J., Stein, D., & Maguire, S. (2015). Has the time come for a staging model to map the course of eating disorders from high risk to severe enduring illness? An examination of the evidence. *Early intervention in psychiatry*, *9*(3), 173–184. https://doi.org/10.1111/eip.12170

Treasure, J., Willmott, D., Ambwani, S., Cardi, V., Bryan, D. C., Rowlands, K., & Schmidt, U. (2020). Cognitive interpersonal model for anorexia nervosa revisited: The perpetuating factors that contribute to the development of the severe and enduring illness [article]. *Journal of Clinical Medicine*, *9*(3), 630. https://doi.org/10.3390/jcm9030630

van Buuren, S., & Groothuis-Oudshoorn, K. (2011). mice: Multivariate imputation by chained equations in R. *Journal of Statistical Software*, *45*(3), 1–67. https://doi.org/10.18637/jss.v045.i03

Vanzhula, I. A., Kinkel-Ram, S. S., & Levinson, C. A. (2021). Perfectionism and difficulty controlling thoughts bridge eating disorder and obsessive-compulsive disorder symptoms: A network analysis. *Journal of Affective Disorders*, *283*, 302–309. https://doi.org/10.1016/j.jad.2021.01.083

Wade, T. D., O'Shea, A., & Shafran, R. (2016). Perfectionism and eating disorders. In *Perfectionism, health, and well-being* (pp. 205–222). Springer. https://doi.org/10.1007/978-3-319-18582-8_9

Wentz, E., Gillberg, I. C., Gillberg, C., & Råstam, M. (2000). Ten-year follow-up of adolescent-onset anorexia nervosa: Physical health and neurodevelopment. *Developmental Medicine and Child Neurology*, *42*(5), 328–333. https://doi.org/10.1017/s0012162200000578

World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines*. World Health Organization.

World Health Organization. (2000). *Obesity: Preventing and managing the global epidemic*.

Wu, M., Hartmann, M., Skunde, M., Herzog, W., & Friederich, H.-C. (2013). Inhibitory control in bulimic-type eating disorders: A systematic review and meta-analysis. *PLoS One*, *8*(12), e83412. https://doi.org/10.1371/journal.pone.0083412

Young, S., Rhodes, P., Touyz, S., & Hay, P. (2013). The relationship between obsessive-compulsive personality disorder traits, obsessive-compulsive disorder and excessive exercise in patients with anorexia nervosa: A systematic review. *Journal of Eating Disorders*, *1*(1), 16. https://doi.org/10.1186/2050-2974-1-16

SUPPORTING INFORMATION

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How to cite this article: Giles, S., Hughes, E. K., Fuller-Tyszkiewicz, M., Treasure, J., Fernandez-Aranda, F., Karwautz, A. F. K., Wagner, G., Anderluh, M., Collier, D. A., & Krug, I. (2022). Bridging of childhood obsessive-compulsive personality disorder traits and adult eating disorder symptoms: A network analysis approach. *European Eating Disorders Review*, *30*(2), 110–123. https://doi.org/10.1002/erv.2885