

The Effects of Diagnostic Group on the Association Between Personality and Psychopathological Symptoms: A Moderated Network Analysis

O'Driscoll, C.¹ Nolte, T.^{2,3} Pilling, S.^{1,3} Feigenbaum, J.¹ King-Casas, B.⁵ Leibowitz, J.⁴ Lohrenz, T.⁵ London Personality and Mood Disorder Research Network, Fonagy, P.^{1,3} & Montague, P.R.^{2,5,6,7}

1. Research Department of Clinical, Educational & Health Psychology, University College London, UK

2. Wellcome Trust Centre for Neuroimaging, University College London, London, UK

3. Anna Freud National Centre for Children and Families, London, UK

4. Camden & Islington NHS Foundation Trust, St Pancras Hospital, London, UK

5. Fralin Biomedical Research Institute, Department of Psychology, Virginia Tech, Roanoke, VA, United States of America

6. Department of Physics, Virginia Tech, Blacksburg, VA, United States of America

7. Department of Psychiatry and Behavioral Medicine, Virginia Tech Carilion School of Medicine, Virginia Tech, Roanoke, VA, United States of America

Abstract

Personality functioning and psychopathology are interrelated, yet clinically they are demarcated. Diagnostically, we can distinguish between affective disorders and personality disorders, but there is overlap between features, and the interrelationship between these features may be important in the consideration of treatment approaches. Taking an integrative perspective, the present study aimed to determine whether the associations between personality processes (e.g., mentalization, attachment, and emotion regulation) and psychopathological symptoms differed between diagnostic groups.

Cross sectional group differences were examined by estimating the moderation effects of diagnostic groups (borderline personality disorder, affective disorders, and community controls: N = 1386) on the relationship between features within a graphical network model. The resulting model displayed two-way interactions (linear regressions) between variables and three-way interactions (moderation effects of the group).

Results: The network model evidenced 11 direct associations between variables and the diagnosis group when controlling for all other variables. The influence of the group on pairwise interactions (the strength of dependencies between groups) indicated nine effects. The results indicate differential associations between personality factors and psychopathology between diagnostic groups notably affective instability and facets of mentalization and emotion

regulation. Notably, identity problems and symptoms of PTSD did not differentiate clinical groups.

Conclusion: Conditional dependence between features provides additional information (above mean severity) to discriminate between, and identify putative causal relations within, diagnostic groups.

Keywords:

Network models, psychopathology, personality disorders, affective disorders, mentalizing, attachment

General Scientific Summaries

Personality traits and psychopathological symptoms are associated with both BPD and mood disorder. This study highlights the clinical relevance of considering functioning across both domains regardless of diagnosis.

Introduction

Personality and psychopathology are not distinct. Historically a distinction has been drawn between psychopathology (mood disorders) and personality disorders (PD) (Wright & Hopwood, 2022) with recent advances such as Hierarchical Taxonomy of Psychopathology (Kotov et al., 2017) and Research Domain Criteria (Insel et al., 2010) moving towards increased integration. Indeed, research suggests that personality traits show stronger relationships to clinical disorders (Kotov et al., 2010) than personality disorders (Samuel & Widiger, 2008). The question is not just about the unique features of PD but also how the common elements with mood disorder function differently in generating the clinical features that we use to recognise the disorder.

From a developmental perspective, the theory suggests that early formative experiences result in adaptive responses to the environment. Early adversity may interrupt the development of 'ideal' relations between a child and caregiver, i.e. epistemic trust (Luyten et al., 2020) leading to the development of, at least, initially adaptive responses (attachment style) optimising adjustment and enabling the regulation of emotions. Experiencing multiple or persistent trauma or adverse events, at any stage, has been associated with a disturbance in an individual's ability to regulate their emotions and their ability to form and maintain relationships (Gerber et al., 2018; Poole et al., 2018). These responses can influence the

development of other cognitive processes (e.g., effective mentalizing). Responses may alter in response to changes in the environment, but, where they do not, they may become less adaptive, potentially leading to the development of psychopathology (Luyten & Fonagy, 2022). The emergence and severity of psychopathology throughout the developmental trajectory will, in turn, influence the development of personality features (Hilsenroth et al., 2018). Where comorbidity is common, in the case of BPD the prevalence of having a co-morbid mood disorder has been estimated at 29% (Grant 2008), it is important to consider mutually reinforcing interactions both within and between disorder specific criteria (e.g., Rifkin-Zybutz et al., 2021 for mentalizing capacities).

Contemporaneously, the pattern of behaviour will be informed by the developmental trajectories, with personality and psychopathology reciprocally relaying between behaviour and consequence. A person experiences distress, psychopathological symptoms may arise, and unhelpful behaviours develop in response to their experience. For example, someone with borderline personality disorder may engage in self-harming behaviours in response to feeling rejected, while someone with a mood disorder may withdraw from social life in response to the same experience. These thoughts, feelings and behaviours make it more difficult for the person to maintain or develop their functioning. While borderline personality disorder is characterized by interpersonal difficulties, and mood disorders by affective symptoms, it is self-evident that as a consequence of experiencing a mood disorder one's interpersonal functioning is likely to be affected, and consequences of interpersonal difficulties will likely affect one's mood.

Within a network theory approach to mental disorders (Borsboom, 2017) these bi-directional interactions between features of an experience operate within a system. While a state may be triggered by an event, if it crosses a threshold, a 'disordered' state, this can become self-sustaining, where symptoms influence other symptoms in the absence of the triggering event and are difficult to shift out of without intervention (Hayes & Andrews, 2020). According to this theory, it would be expected that disorder systems or networks should be different, with different features driving the maintenance of the disorder.

Network analysis allows us to model these processes, identify cooccurrence and interdependence of symptoms, and inform us about commonalities and differences between groups and can help to explain the comorbidity that exists between disorders. To date, the network literature has focused on the central features of BPD rather than the distinguishing features. Network analysis in BPD supports the view that affective instability plays a central role within BPD (Peters et al., 2022; Richetin et al., 2017; Southward & Cheavens, 2018; von

Klipstein et al., 2021). Where associations have been explored with personality and psychopathology, facets of emotional regulation have been prominent (Southward & Cheavens, 2018) as well as chronic emptiness (Köhne & Isvoranu, 2021; Southward & Cheavens, 2018). This study aimed to overcome methodological shortcomings in these studies, specifically the use of non-clinical samples and small sample sizes, that affect the ability to robustly estimate and compare networks. In addition, this study is the first to compare BPD to a mood disorder and control group. With this, we acknowledge that given the heterogeneity of the diagnostic groups, it is likely that this characterization will obscure important differences.

The aim of this study was to determine whether the demarcation between personality and psychopathology was warranted. In order to identify what is unique to each group and what is shared we compared the

the diagnostic groups in terms of both severity and the interrelation between symptoms and traits. Although the study was exploratory, we expected there to be differences between groups with the relationships between symptoms and traits generally stronger for BPD than for mood disorder and, stronger for mood disorder than for nonclinical controls. This hypothesis is consistent with studies demonstrating increased comorbidity between symptoms and traits in BPD compared to mood disorder and nonclinical controls (Oldham, 2011).

Method

Design

The study used a cross sectional between groups design. Key variables capture social functioning (personality and attachment), emotional and cognitive regulation (emotional regulation and mentalization), and symptoms of psychiatric disorders (borderline personality traits, paranoia, depression, hostility, anxiety, and posttraumatic stress).

Participants

Data collected as part of the 'Probing Social Exchanges' project, which employs computational neuroscience to better understand mood disorders as well as Borderline and Antisocial personality disorder. Ethical approval for the BPD/ASPD/ HC study was acquired from the Research Ethics Committee (REC) of Wales (REC number: 12/WA/0283) and for the reduced sub-study from the London Queen Square REC (REC number: 16/LO/0077). Participants with borderline personality disorder were recruited from clinical services in London specialising in the treatment of PD, a sample of individuals with primary diagnosis of affective disorder

including major depression (MD) were recruited from local NHS psychological treatment services (IAPT); and non-clinical controls from the community (CR) were recruited following their responding to advertisement material distributed through various media. Findings from separate analyses of subsamples from this research program have been published (Euler et al., 2021; Huang et al., 2020; Michael et al., 2021; Rifkin-Zybutz et al., 2021; Stagaki et al., 2022).

The participants were between 18 and 65 years old, fluent in spoken and written English. Individuals with recent psychotic episodes, severe learning disabilities, or current or past neurological disorders or traumas were excluded.

Diagnoses were based on the Structured Clinical Interview for DSM-IV axis II personality disorders (American Psychiatric Association, 2000).

Measures

Social/interpersonal functioning

Inventory of Interpersonal Problems-32 (IIP-32, Barkham, Hardy, & Startup, 1996) a 32-item measure span a range of social behaviours that people find challenging to engage in (e.g., hard to make friends) or use too much (e.g., argue with other people too much). The IIP subscales demonstrated good internal consistency in this study (Cronbach's $\alpha = 0.80$ to 0.88). Two circumplex scores for individual dimensions, affiliation -sociability (affiliation) and control - dominance (dominance), were computed from the eight standardized scale scores to index the degree of warmth and dominance in the profile of problems (Acton & Revelle, 2004).

Experiences in Close Relationships Revised (ECR-R; (Sibley et al., 2005) et consists of 36 items with 18 items for each subscale capturing Attachment Avoidance (anxiety over abandonment) and Attachment Anxiety (avoidance of intimacy). Subscale internal consistency in this study were $\alpha = 0.91$ and 0.90 for avoidance and anxiety respectively.

Emotional and cognitive regulation

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) a 36-item questionnaire assessing problems in multiple domains of emotion regulation, including Lack of Emotional Awareness (Awareness), Nonacceptance of Emotional Responses (Nonacceptance), Difficulties Engaging in Goal-Directed Behavior (Goals), Lack of Clarity of Emotional Responses (Clarity), Limited Impulse Control Difficulties (Impulse), and Access to Emotion Regulation Strategies (Strategies). The internal consistency of DERS subscales in this study were: $\alpha = 0.81$ (Awareness), 0.93 (Nonacceptance), 0.86 (Goals), 0.87 (Clarity), 0.92 (Impulse), and 0.91 (Strategies).

Reflective Functioning Questionnaire (RFQ; Fonagy et al., 2016), a 54-item measure of reflective functioning, the operationalized form of mentalizing. The RFQ assesses the mentalization capacity of oneself and others. The first subscale is certainty about mental states (Mentalization - certain); high scores on this scale reflect excessive certainty about mental states. The second subscale refers to a lack of knowledge about mental states (Mentalization - uncertain); this scale reflects a lack of knowledge about mental states. Subscale internal consistency in this study were $\alpha = 0.91$ and 0.90 for uncertain and certain respectively.

Symptoms of psychiatric disorders

Personality Assessment Inventory – Borderline sub-section (PAI-BOR; Morey, 2004) was used to assess borderline personality traits, with subscales for affective instability, identity problems, negative relationships, and self-harm. Internal consistency for subscales in this study: identity problems $\alpha = 0.82$, affective instability $\alpha = 0.88$, negative relationships $\alpha = 0.74$, and self-harm $\alpha = 0.87$.

Green Paranoid Thought Scale (GPTS; Green et al., 2008), is a 16 item measure assessing persecutory ideation, with two scales, thoughts of social reference and thoughts of persecution. Internal consistency for the subscales in this study: $\alpha = 0.95$ and 0.97 for thoughts of social reference and thoughts of persecution, respectively.

Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), a 53-item scale assessing psychological symptomatology. In this study we used the depression, hostility and anxiety subscales, with respective internal consistencies ($\alpha = 0.93, 0.92$ and 0.87).

Posttraumatic Stress Checklist Scale (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) measures the 17 PTSD symptoms described in the DSM-V. The three subscales are re-experiencing, avoidance and arousal, with respective internal consistencies in this study of $\alpha = 0.92, 0.90$, and 0.90 .

Statistical Analysis

Missing data were handled using the multivariate imputation by chained equation (MICE) package (Zhang, 2016). Data were transformed to relax the normality assumption (nonparanormal transformation: (Zhao et al., 2012). Unique Variable Analysis (UVA) and Exploratory Graph Analysis (EGA) were applied using the *EGAnet* package (Christensen & Golino, 2021) and Mixed Graphical Model (MGM), implemented in the R-package *mgm* (Haslbeck et al., 2020) in R (R Core Team, 2021).

Unique Variable Analysis (UVA) was used to identify and reduce the influence of redundant variables in this multivariate data set (Christensen et al., 2020). There are two reasons to

reduce redundancy in data. First, as redundant variables can create minor factors or correlated residuals which lead to the overestimation of the number of factors in the data (Christensen et al., 2020). Second, redundant variables can influence the accurate and valid estimation of network measures (Hallquist et al., 2019). Specifically, redundant nodes in a network are likely to have higher node strength values (absolute sum of a node's connections) due to redundancy rather than actual increased connectivity to other nodes.

UVA begins by first computing a pairwise association measure. In this study, the weighted topological overlap was calculated. Weighted topological overlap is a network measure that determines the extent to which nodes in a network “overlap” by quantifying the similarity between a pair of variables' shared connections (e.g., weights, signs, quantity; see Christensen et al., 2020 for more details). Next, using only the nonzero (absolute) weighted topological overlap values, an empirical distribution is estimated to obtain the p-values (with significance $p < 0.05$). Significant values suggest that a pair of variables is redundant. Because there are many non-zero values (leading to multiple comparisons), an adjustment to the p-value is necessary. We applied the default method that uses an ‘adaptive’ alpha (Pérez & Pericchi, 2014), which adjusts the alpha based on sample size (here, the number of nonzero values). After, UVA passes the redundancies onto us and we made the definitive decisions on whether variables were redundant based on the shared connections, and our theoretical knowledge about the topological overlap between the variables, where uncertain redundancies were ignored. The redundant variables were then combined into a latent variable.

We then used exploratory graph analysis (EGA) to estimate the number of dimensions in multivariate data using undirected network models (Golino et al., 2020; Golino & Epskamp, 2017)). EGA first applies a network estimation method followed by a community detection algorithm (Louvain) for weighted networks. The algorithm begins by randomly sorting nodes into communities with their neighbours and then uses modularity (Newman, 2006) to iteratively optimize its community partitions by exchanging nodes between communities and evaluating the change in modularity until it no longer improves.

We then estimated a Mixed Graphical Model (MGM, in which we included all subscales as continuous, and diagnosis as categorical. In estimating the networks, an elastic net regularization was applied to reduce the inclusion of spurious edges, resulting in networks that are sparser and have higher specificity (Epskamp et al., 2018). The moderation approach proposed here uses a nodewise estimation approach with a single L1-regularization term that includes both main effects and interactions (which are interactions and moderation effects, respectively, from a graph-perspective). Models select the regularization parameter with 10-

fold cross-validation and specified that estimates across neighbourhood regressions should be combined (AND rule). As the regression on the moderator variable includes many terms, this renders the AND-rule very conservative (Haslbeck & Waldorp, 2015). In estimating the MGM, all linear moderation effects of diagnosis are estimated. Direct associations between group and nodes are reported as odds ratios. In order to estimate the stability of the estimated edges and moderation effects, the model was refit using 1000 bootstrap samples to provide the bootstrapped sampling distribution of all parameters. When interpreting edges, those between variables can be interpreted as partial correlations, whereas relations between the diagnostic group and variables can be interpreted in terms of (averaged) regression coefficients.

Within the MGM, the inclusion of diagnosis allows us to explore moderation effects, identifying constructs that are uniquely influenced by diagnosis, thereby demarcating diagnosis-specific effects with the network. While focusing on links between the diagnosis node, we are also interested in differences in network structure among the constructs, as these may also reflect group differences. Identifying moderation effects (group differences) between networks requires significant power; as such, smaller and less stable moderation effects are expected (Haslbeck et al., 2019).

Within the network model, the edges between diagnosis and a construct indicate a larger direct construct-specific effect for one of the groups. In the interpretation of these edges, it is important to note that direct effects that are shared by all groups will not be included into the network model. This direct effect may account for the spread throughout the network and indicate likely pathways through which a disorder may be maintained. Within the network the main effects from the diagnosis node to the other variables gives you the mean differences in those variables across the moderator group variable. Edges connecting to diagnosis are explored to identify the specific effect and reported as odds ratio. We also directly inspect the three-way interactions (moderation effects) to see how the moderator affects the pairwise interactions between the other variables.

Open data and transparency

Raw data will be available on request. Covariance matrices and r code to reproduce the analysis and the supplementary material are available in an open repository: <https://osf.io/948qj/>.

Results

Participant characteristics

The study sample consisted of 1386 adults, aged 16 to 65 years. There was no significant difference between groups on age $F(2, 1383) = 1.44, p = 0.24$. There were more women ($n = 997$) than men ($n = 379$) in the sample, $X^2(8, 1386) = 40.58, p < 0.001$. Groups did not differ by ethnicity, $X^2(8, 1386) = 13.58, p = 0.94$, however participants were primarily white. Groups differed by employment status, $X^2(8, 1386) = 206.11, p < 0.001$. Individuals with a diagnosis of BPD were more likely to be unemployed (BPD: 53.5%, CR: 15.6%, MD: 23.0%).

	BPD (n=398)	CR (n=675)	MD (n=313)
Gender			
Male	71 (17.8%)	228 (33.8%)	80 (25.6%)
Female	322 (80.9%)	445 (65.9%)	230 (73.5%)
Transgender /	2 (0.5%)	1 (0.1%)	3 (1.0%)
Other	2 (0.5%)	1 (0.1%)	0 (0%)
Missing	1 (0.3%)	0 (0%)	0 (0%)
Age			
Mean (SD)	30.7 (9.66)	31.8 (11.2)	31.1 (10.4)
Median [Min, Max]	29.0 [17.0, 58.0]	29.0 [16.0,	28.0 [18.0,
Missing	4 (1.0%)	0 (0%)	0 (0%)
Employment status			
Employed	120 (30.2%)	413 (61.2%)	186 (59.4%)
Unemployed	213 (53.5%)	105 (15.6%)	72 (23.0%)
Student	54 (13.6%)	151 (22.4%)	50 (16.0%)
Retired	4 (1%)	6 (0.9%)	2 (0.6%)
Missing	7 (1.8%)	0 (0%)	3 (1.0%)
Ethnicity			
White	292 (73.4%)	492 (72.9%)	207 (66.13%)
Black/Black British	31 (7.8%)	44 (6.5%)	28 (9.0%)
Mixed	36 (9.0%)	52 (7.7%)	26 (8.3%)
Asian/British Asian	25 (6.3%)	70 (10.3%)	39 (12.4%)
Not stated	14 (3.5%)	17 (2.5%)	13 (4.2%)

Table 1. Descriptive data on sample.

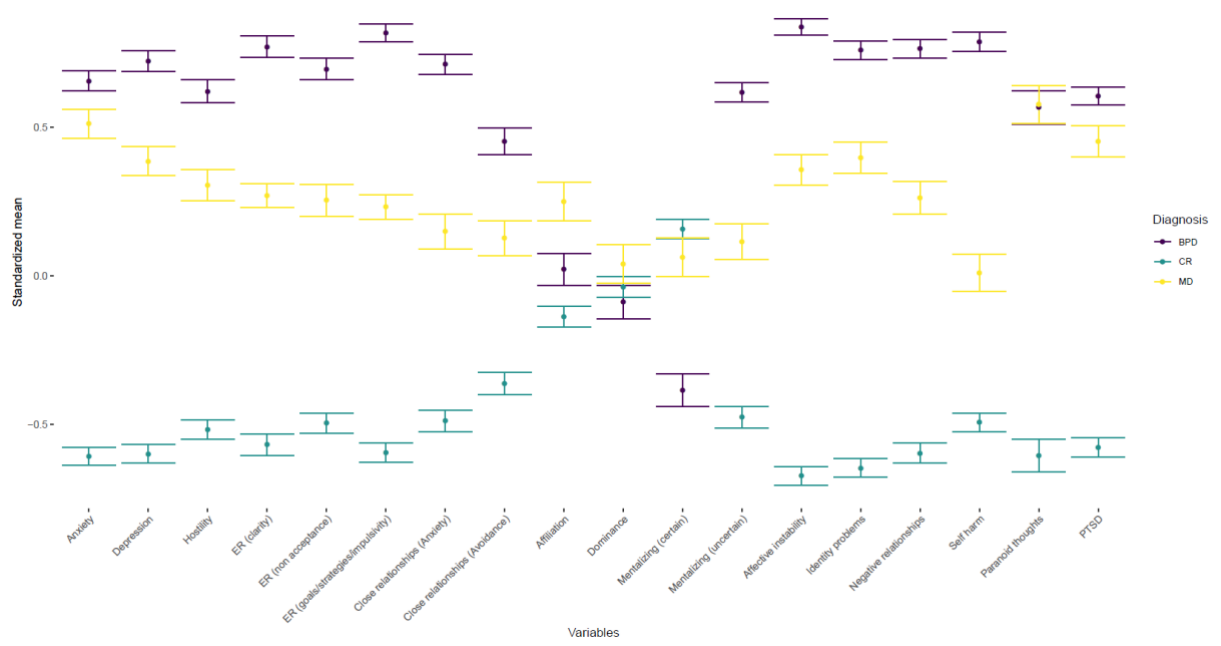


Figure 1: Standardised mean and error of all variables for each group included in the network model.

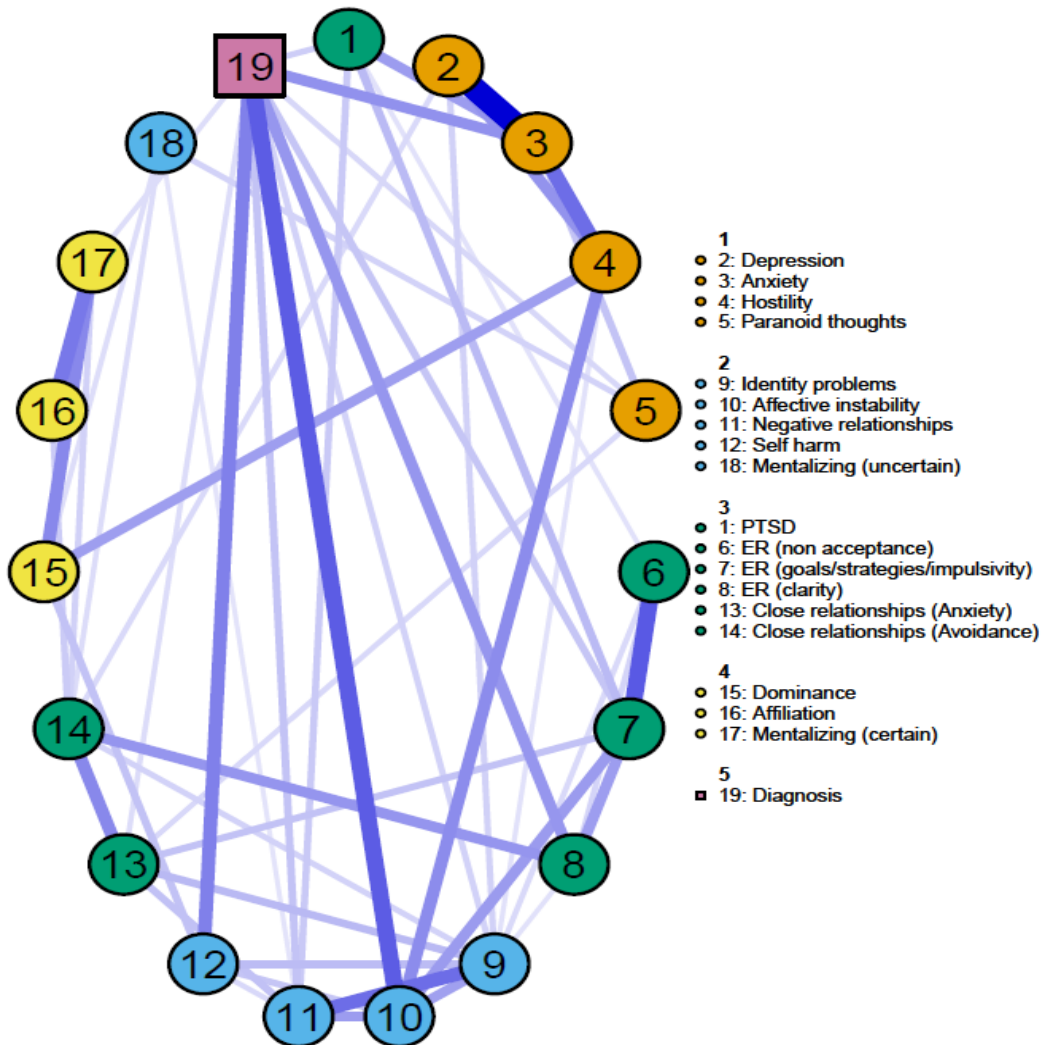


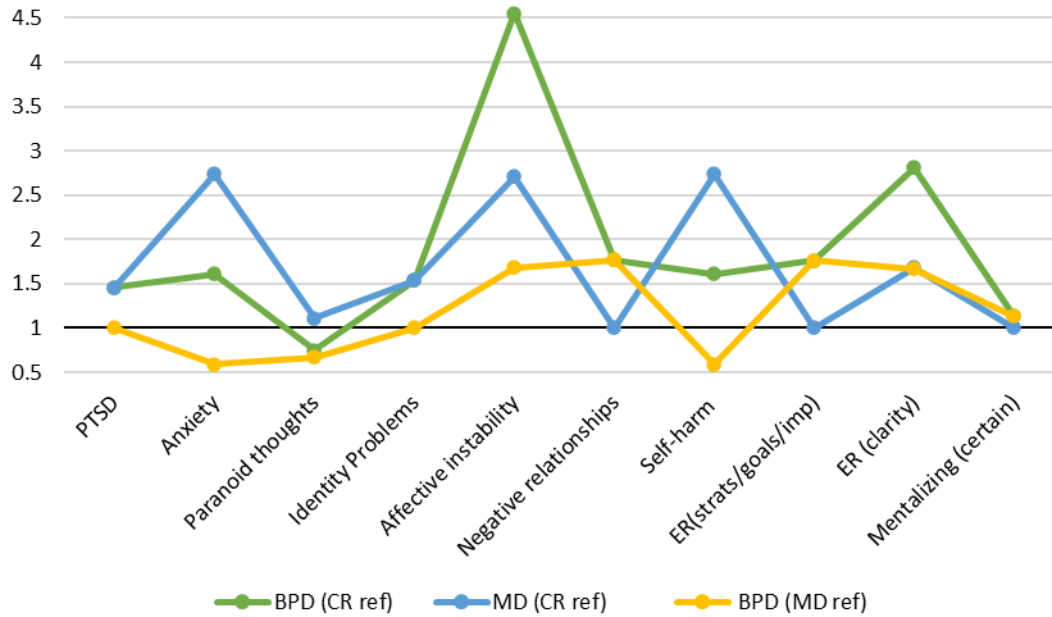
Figure 2. Moderated Network. The network includes subscales from the DERS, RFQ, PAI, PCL, BSI, IIP-32, ECR and the diagnosis. The edges represent the conditional dependence relations among the variables that capture the unique associations among the variables, while controlling for all the other variables in the network. Blue edges represent positive associations, red edges represent negative associations, and the thickness and colour saturation of the edge is proportional to the strength of the association. Colour of node represents the community the variable falls under.

Network modelling

UVA analysis suggested redundancy for 8 associations. PCL subscales were combined into a PTSD node, GPTS subscales were combined into a paranoid thoughts node and DERS strategies, goals, impulsivity were combined into an emotional regulation (ER goals, strategies, impulsivity) node. Other suggestions were rejected due to lack of clear content overlap. The standardized means and errors for the included variables are shown in Figure 1. Descriptives for all items are included in supplementary materials. The mean difference was

significant between groups, except for paranoia (BPD and MD were not significantly different), mentalizing (certainty), (MD and CR were not significantly different) and dominance (no significant difference between groups).

Exploratory graph analysis identified four communities. The first community included depression, anxiety, hostility, and paranoid thoughts, all related to psychopathology. The second community included identity problems, affective instability, negative relationships, self-harm and mentalizing (uncertain). This community was characterised by borderline personality traits. The third community included PTSD, the three ER variables and the two close relationship variables. The fourth community included mentalizing (certain) with dominance and affiliation. The network model evidenced 11 direct associations between variables and the diagnosis group when controlling for all other variables (Table 2 and Figure 3). Most edges were reliably estimated, included in all or nearly all, of the 1000 bootstrapped samples (see supplementary figure 1). The ORs are conditional on all other variables in the model. The model has been estimated with ℓ_1 -regularized regression, in which the regularization parameters have been selected with 10-fold cross-validation with the goal that the parameter estimates generalize to new samples. As such, the reported parameters are all significant, and it is not necessary to perform any hypothesis test on the ORs or the underlying variables. ER (strategies/goals/impulsivity), ER (clarity), affective instability, negative relationships, close relationships (anxiety) and mentalizing (certain) were associated with increased odds of having BPD compared to both other groups. PTSD and identity problems were associated with increased odds of having BPD or MD compared to CR but not compared to each other. Anxiety, paranoid thoughts, and self-harm were associated with increased odds of having MD compared to BPD and CR.



	BPD (CR ref)	MD (CR ref)	BPD (MD ref)
<i>Symptoms of psychiatric disorders</i>			
PTSD	1.46	1.46	1
Anxiety	1.61	2.74	0.59
Paranoid thoughts	0.75	1.11	0.67
Identity problems	1.54	1.54	1
Affective instability	4.55	2.71	1.68
Negative relationships	1.77	1	1.77
Self-harm	1.61	2.74	0.59
<i>Emotional and cognitive regulation</i>			
ER (strategies/goals/impulsivity)	1.76	1	1.76
ER (clarity)	2.81	1.68	1.67
Mentalizing (certain)	1.13	1	1.13
<i>Social/interpersonal functioning</i>			
Close Relationships (Anxiety)	1.24	0.88	1.4

Table 2 and Figure 3: Odds ratios (OR) for direct associations between group and variables as identified within the network model. Note that the ORs are conditional on all other variables in the model.

After conditioning on diagnostic group, the individual networks showed similar structures ($r = 0.91$ to 0.96). The influence of the group on pairwise interactions (i.e., the strength of dependencies between groups) indicated 9 effects (Table 2). For instance, the linear dependency between node 8, ER (clarity) and node 18, Mentalizing (uncertain) was strongest for BPD (0.24), less so for CR (0.13) and absent in MD. Conversely, the linear dependency

between node 13, close relationships (Anxiety) and node 14, close relationships (Avoidance) was strongest for MD (0.52), slightly lower for CR (0.44) and absent in BPD.

		BPD	MD	CR	%
ER (goals/strategies /impulsivity)	ER (clarity)	0.18	0.08	0.21	59
ER (goals/strategies /impulsivity)	Depression	0.07	0	0	77
Mentalizing (uncertain)	Self-harm	0	0.16	0	87
Mentalising (uncertain)	ER (clarity)	0.24	0	0.13	97
Mentalizing (certain)	ER (clarity)	0	0	0.2	94
Mentalizing (certain)	Hostility	0	0.2	0	89
Negative relationships	Hostility	0.07	0	0	71
Close relationships (Anxiety)	Close relationships (Avoidance)	0.22	0.52	0.44	57
Identity problems	Affective instability	0.18	0.41	0.21	78

Table 2. Influence of the moderator on pairwise interactions. The weights between variables are not partial correlation coefficients (but have the same interpretation). % = the proportion of all 1000 bootstrap estimations where diagnosis would influence the pairwise association.

Discussion

This study reveals differences in the personality and symptom networks between BPD, mood disorder and control groups. While the general topology of the networks was similar between groups, there were differences in terms of the direct influence of diagnostic group on node, and the associations between nodes. This suggests that when comparing BPD and mood disorder, personality and psychopathology are less distinct than previously thought. The most notable were the roles of emotional and cognitive regulation. The findings support established criteria, while also raising new insights. In the remainder of the discussion, we interpret the findings and consider the difference between our findings and previous work, highlight some limiting conditions, and raise clinical implications.

In the area of social/interpersonal functioning, close relationships (anxiety) differed between groups, where they were more pronounced for BPD, and less associated with MD than with CR. In contrast, the pairwise association between both close relationship scales, anxiety and avoidance, was strongest for MD, then CR, and less for BPD. This may relate to a level of coherence that is only there for organized attachment, secure or insecure, while BPD may more closely associated with a disorganized attachment style (Luyten et al., 2020). The attachment style findings highlight the potential role of switching between attachment strategies in interpersonal contexts in BPD where unstable relationships and attachment are

strong predictors of BPD severity (Conway et al., 2012; Feske et al., 2007) and the incoherence may contribute to ER (Gunderson, 1996)

There were clear emotional and cognitive regulation differentiators with ER (clarity and goals/strategies/impulsivity), and mentalizing (certain) differentiating BPD from both other groups. The pairwise association between mentalizing (uncertain) and ER (clarity) was strong for BPD, less so for CR and absent in MD, while an association between mentalizing (certain) and ER (clarity) was only present for CR. These results are in line with a previous study highlighting these aspects of ER in relation to PAI and IIP items (Southward & Cheavens, 2018). Where there were no associations between mentalization and ER (clarity) in MD, this may suggest that poor mentalization in MD may be a consequence of depression and not its cause. The importance of ER in BPD has previously been highlighted and suggested to more strongly associate with BPD features than interpersonal difficulties and psychopathology (Cheavens et al., 2012; Glenn & Klonsky, 2009). Metacognitive problems may affect the ability of individuals with BPD to set goals, use strategies, and control impulsive behaviours, as well as their ability to think clearly about their emotions (Vega et al., 2020).

As expected, affective instability strongly differentiates BPD from the other groups, in line with prior network analysis (Richetin et al., 2017; Southward & Cheavens, 2018). However, identity problems were associated with higher odds of having BPD or MD compared to CR but not each other – a finding not reported before, although the severity of BPD was greater than that of MD. Further, the strength of association between identity problems and affective stability was strongest for MD, then CR and BPD. Items assessing identity problems overlap with features of depression (e.g., emptiness, abandonment, lack of purpose) and while qualitative differences may exist (Elsner et al., 2018), the distinction may not be captured by the PAI-BOR. However, the analysis does control for symptoms of depression and anxiety suggesting that this may still reflect an elevated trait. While defining, these features are not specific to BPD, with other studies supporting a dimensional association (Distel et al., 2016; Peckham et al., 2020; Skodol et al., 2011) which is also in line with HiTop conceptualizations.

Negative relationships also differentiated BPD from the other groups, and an association between negative relationships and hostility was only present for BPD. Hostility for individuals with BPD may be experienced as more intense, and expressed more frequently, compromising the quality of the relationships (Critchfield et al., 2008; Zanarini et al., 2007). This relationship is supported by momentary assessment research (Hepp et al., 2017), where the bidirectional relationships between hostility and rejection and disagreement were stronger in a BPD group compared to a depression group. An association between psychiatric symptoms and mentalization was only present in the MD group. Within MD, mentalizing

(certain) was associated with hostility and mentalizing (uncertain) was related to self-harm. This may indicate that different modes of emotional expression are associated with different modes of mentalizing. It may also be the case that this may differentiate subtypes of mood disorder (Blatt & Zuroff, 1992). Given the absence of impact of hostility on relationships in MD, hostility may be directed against the self in MD, where hostility may be indicative of shame and self-criticism. Symptoms of PTSD were also associated with an increased odds of having BPD or MD compared to CR but not with each other. This finding is interesting given the argument around complex trauma and calls to rename BPD, complex PTSD (Ford, 2019; Kulkarni, 2017). The findings here suggest that trauma is related more broadly to psychopathology and not specific to BPD, in line with recent findings regarding the p-factor (Caspi & Moffitt, 2018; Schaefer et al., 2018). MD was more associated with anxiety, paranoia, and self-harm than the two other groups. While self-harm (severity) was more pronounced for BPD, within the network self-harm was associated with increased odds of having MD compared to BPD and CR. This suggests that a feature prominently associated with BPD but the predisposition may be more pervasive. Regarding the self-harm subscale, it is important to note that these items measure impulsive tendencies that may lead to self-harm; they do not specifically ask about the frequency of suicidal or self-harming behaviours which may be a more suitable differentiator (Nelson et al., 2022).

Our theoretical structure did not directly map onto the network community structure. Mentalizing (certain) and mentalizing (uncertain) fell into different communities. Mentalizing (uncertain) was in a community with the borderline personality traits while mentalizing (certain) grouped with both close relationship variables and dominance and affiliation. This would suggest that these modes of mentalization are not only separable and conceptually distinct but are associated with different aspects of personality functioning, where uncertainty may be more indicative of impaired mentalizing (Morosan et al., 2020). From a measurement perspective, mentalizing (certain) may be a psychic equivalence parameter reflecting non-mentalizing mode (equating internal states with reality) (Luyten et al., 2020) and may serve as an amplifier of inner experience (appraisals and affect) not only in BPD but also depression (Luyten & Fonagy, 2018). PTSD (a latent variable comprising re-experiencing, avoidance, and arousal subscales) was in a community with ER strategies indicating a close relationship between PTSD symptoms and emotional regulation in this sample.

The present findings have implications for enhancing the understanding of integrating personality functioning and psychopathology. Specifically, that processes viewed as being specific to a disorder can be prominent in other disorders, for instance, the relevance of identity problems and affective instability in the mood disorders group. With development in clinical research of empirically support personalised treatment selection approaches (Cohen et al.,

2020; Keefe et al., 2021) assessment of personality features may have transdiagnostic relevance. From this study, identity problems, emotion regulation, and mentalizing may be of particular interest as testable candidates for such approaches. Clinically, mean level severity coupled with information derived from idiographic networks can inform assessment and treatment, where intervention selection (or components thereof) focuses on targeting the relationship between nodes rather than the node specifically or disorders more broadly.

There are limiting conditions of this study that limit the ability to derive inferences in relations to the association between groups. As a cross-sectional study, we are limited in our ability to identify causality. Temporal analysis, for instance, through panel modelling (Epskamp, 2020) would improve the ability to establish Granger causality. While cross-sectional networks reflect the between person associations, there is evidence in the BPD network literature that baseline networks are strongly predictive of relationships between change trajectories in BPD (von Klipstein et al., 2021) providing some support for inference. It also fails to recognize the heterogeneity of the diagnostic groups and can miss important differences between groups at the within-person level. The variables in the model were chosen by the researchers from a large battery of assessments as best reflecting the constructs of interest. There are invariably unmeasured variables that may confound the results. For instance, within the analysis it was assumed that group moderated the associations however it is possible that that relations between features may be consequent to the presence of an unmeasured construct.

Conclusion

The study highlights the importance of taking an integrative approach to personality and the psychopathology. and findings suggest some practical recommendations. Considering the difference between groups, and considering the associations within groups, we must not only integrate psychopathology into personality, but personality into psychopathology.

References

- Acton, G. S., & Revelle, W. (2004). Evaluation of Ten Psychometric Criteria for Circumplex Structure. *MPR-Online*, 9, 1–27.
- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders* (4th Editio).
- Barkham, M., Hardy, G. E., & Startup, M. (1996). The IIP-32: A short version of the Inventory of Interpersonal Problems. *British Journal of Clinical Psychology*, 35(1), 21–35. <https://doi.org/10.1111/j.2044-8260.1996.tb01159.x>
- Blatt, S. J., & Zuroff, D. (1992). Interpersonal relatedness and self-definition: two prototypes for depression from an ethological and object relations point of view. *Clinical Psychology Review* *Psychology Reuim*, 12, 527–562.

- Borsboom, D. (2017). A network theory of mental disorders. *World Psychiatry*, 16(1), 5–13. <https://doi.org/10.1002/wps.20375>
- Caspi, A., & Moffitt, T. E. (2018). All for one and one for all: Mental disorders in one dimension. *American Journal of Psychiatry*, 175(9), 831–844. <https://doi.org/10.1176/appi.ajp.2018.17121383>
- Cheavens, J. S., Strunk, D. R., & Chriki, L. (2012). A Comparison of Three Theoretically Important Constructs: What Accounts For Symptoms of Borderline Personality Disorder? *Journal of Clinical Psychology*, 68(4), 477–486. <https://doi.org/10.1002/jclp.20870>
- Christensen, A. P., Garrido, L. E., & Golino, H. (2020). Unique variable analysis: A novel approach for detecting redundant variables in multivariate data. *PsyArXiv*. <https://doi.org/10.31234/osf.io/4kra2>
- Christensen, A. P., & Golino, H. (2021). On the equivalency of factor and network loadings. *Behavior Research Methods*, October 2020. <https://doi.org/10.3758/s13428-020-01500-6>
- Cohen, Z. D., Kim, T. T., Van, H. L., Dekker, J. J. M., & Driessen, E. (2020). A demonstration of a multi-method variable selection approach for treatment selection: Recommending cognitive–behavioral versus psychodynamic therapy for mild to moderate adult depression. *Psychotherapy Research*, 30(2), 137–150. <https://doi.org/10.1080/10503307.2018.1563312>
- Conway, C., Hammen, C., & Brennan, P. (2012). A comparison of Latent class, Latent trait, and factor mixture models of DSM-IV borderline Personality Disorder criteria in a community setting: Implications for DSM-5. *Journal of Personality Disorders*, 26(5), 793–803. <https://doi.org/10.1521/pedi.2012.26.5.793>
- Critchfield, K. L., Levy, K. N., Clarkin, J. F., & Kernberg, O. F. (2008). The relational context of aggression in borderline personality disorder: using adult attachment style to predict forms of hostility. *Journal of Clinical Psychology*, 64(1), 67–82. <https://doi.org/10.1002/jclp.20434>
- Derogatis, L. R., & Melisaratos, N. (1983). The Brief Symptom Inventory: an introductory report. *Psychological Medicine*, 13(3), 595–605. <https://doi.org/10.1017/S0033291700048017>
- Distel, M. A., Smit, J. H., Spinhoven, P., & Penninx, B. W. J. H. (2016). Borderline personality features in depressed or anxious patients. *Psychiatry Research*, 241, 224–231. <https://doi.org/10.1016/j.psychres.2016.05.007>
- Elsner, D., Broadbear, J. H., & Rao, S. (2018). What is the clinical significance of chronic emptiness in borderline personality disorder? *Australasian Psychiatry*, 26(1), 88–91. <https://doi.org/10.1177/1039856217734674>
- Epskamp, S. (2020). Psychometric network models from time-series and panel data. *Psychometrika*, 85(1), 206–231. <https://doi.org/10.1007/s11336-020-09697-3>
- 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>
- Euler, S., Nolte, T., Constantinou, M., Griem, J., Montague, P. R., & Fonagy, P. (2021). Interpersonal problems in borderline personality disorder: Associations with mentalizing, emotion regulation, and impulsiveness. *Journal of Personality Disorders*, 35(2), 177–193. https://doi.org/10.1521/pedi_2019_33_427

- Feske, U., Kirisci, L., Tarter, R. E., & Pilkonis, P. A. (2007). An application of item response theory to the DSM-III-R criteria for borderline personality disorder. *Journal of Personality Disorders, 21*(4), 418–433. <https://doi.org/10.1521/pedi.2007.21.4.418>
- Fonagy, P., Luyten, P., Moulton-Perkins, A., Lee, Y. W., Warren, F., Howard, S., Ghinai, R., Fearon, P., & Lowyck, B. (2016). Development and validation of a self-report measure of mentalizing: The reflective functioning questionnaire. *PLoS ONE, 11*(7), 1–28. <https://doi.org/10.1371/journal.pone.0158678>
- Ford, J. D. (2019). Commentary on the Special Section on Complex PTSD: Still Going Strong After All These Years. *Journal of Traumatic Stress, 32*(6), 877–880. <https://doi.org/10.1002/jts.22474>
- Gerber, M. M., Frankfurt, S. B., Contractor, A. A., Oudshoorn, K., Dranger, P., & Brown, L. A. (2018). Influence of Multiple Traumatic Event Types on Mental Health Outcomes: Does Count Matter? *Journal of Psychopathology and Behavioral Assessment, 40*(4), 645–654. <https://doi.org/10.1007/s10862-018-9682-6>
- Glenn, C. R., & Klonsky, E. D. (2009). Emotion Dysregulation as a Core Feature of Borderline Personality Disorder. *Journal of Personality Disorders, 23*(1), 20–28. <https://doi.org/10.1521/pedi.2009.23.1.20>
- Golino, H. F., & Epskamp, S. (2017). Exploratory graph analysis: A new approach for estimating the number of dimensions in psychological research. *PLOS ONE, 12*(6), e0174035. <https://doi.org/10.1371/journal.pone.0174035>
- Golino, H., Shi, D., Christensen, A. P., Garrido, L. E., Nieto, M. D., Sadana, R., Thiyagarajan, J. A., & Martinez-Molina, A. (2020). Investigating the performance of exploratory graph analysis and traditional techniques to identify the number of latent factors: A simulation and tutorial. *Psychological Methods*. <https://doi.org/10.1037/met0000255>
- Gratz, K. L., & Roemer, L. (2004). Multidimensional Assessment of Emotion Regulation and Dysregulation: Development, Factor Structure, and Initial Validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment, 26*(1), 41–54. <https://doi.org/10.1023/B:JOBA.0000007455.08539.94>
- Green, C. E. L., Freeman, D., Kuipers, E., Bebbington, P., Fowler, D., Dunn, G., & Garety, P. A. (2008). Measuring ideas of persecution and social reference: The Green et al. Paranoid Thought Scales (GPTS). *Psychological Medicine, 38*(1), 101–111. <https://doi.org/10.1017/S0033291707001638>
- Gunderson, J. (1996). The borderline patient's intolerance of aloneness: insecure attachments and therapist availability. *American Journal of Psychiatry, 153*(6), 752–758. <https://doi.org/10.1176/ajp.153.6.752>
- Hallquist, M. N., Wright, A. G. C., & Molenaar, P. C. M. (2019). Problems with Centrality Measures in Psychopathology Symptom Networks: Why Network Psychometrics Cannot Escape Psychometric Theory. *Multivariate Behavioral Research, 0*(0), 1–25. <https://doi.org/10.1080/00273171.2019.1640103>
- Haslbeck, J. M. B., Borsboom, D., & Waldorp, L. J. (2019). Moderated Network Models. *Multivariate Behavioral Research, 0*(0), 1–32. <https://doi.org/10.1080/00273171.2019.1677207>
- Haslbeck, J. M. B., Bringmann, L. F., & Waldorp, L. J. (2020). A Tutorial on Estimating Time-Varying Vector Autoregressive Models. *Multivariate Behavioral Research, 0*(0), 1–30. <https://doi.org/10.1080/00273171.2020.1743630>

- Haslbeck, J. M. B., & Waldorp, L. J. (2015). *MGM: Estimating Time-Varying Mixed Graphical Models in High-Dimensional Data*. VV(li). <https://doi.org/10.1111/j.1151-2916.1994.tb09777.x>
- Hayes, A. M., & Andrews, L. A. (2020). A complex systems approach to the study of change in psychotherapy. *BMC Medicine*, *18*(1), 1–13. <https://doi.org/10.1186/s12916-020-01662-2>
- Hepp, J., Lane, S. P., Carpenter, R. W., Niedtfeld, I., Brown, W. C., & Trull, T. J. (2017). Interpersonal Problems and Negative Affect in Borderline Personality and Depressive Disorders in Daily Life. *Clinical Psychological Science*, *5*(3), 470–484. <https://doi.org/10.1177/2167702616677312>
- Hilsenroth, M. J., Katz, M., & Tanzilli, A. (2018). Psychotherapy research and the Psychodynamic Diagnostic Manual (PDM–2). *Psychoanalytic Psychology*, *35*(3), 320–327. <https://doi.org/10.1037/pap0000207>
- Huang, Y. L., Fonagy, P., Feigenbaum, J., Montague, P. R., & Nolte, T. (2020). Multidirectional Pathways between Attachment, Mentalizing, and Posttraumatic Stress Symptomatology in the Context of Childhood Trauma. *Psychopathology*, *53*(1), 48–58. <https://doi.org/10.1159/000506406>
- Insel, T., Cuthbert, B., Garvey, M., Heinssen, R., Pine, D., Quinn, K., Sanislow, C., & Wang, P. (2010). Research Domain Criteria (RDoC): Toward a. *American Journal of Psychiatry Online*, *July*, 748–751.
- Keefe, J. R., Kim, T. T., Derubeis, R. J., Streiner, D. L., Links, P. S., & McMain, S. F. (2021). Treatment selection in borderline personality disorder between dialectical behavior therapy and psychodynamic psychiatric management. *Psychological Medicine*, *51*(11), 1829–1837. <https://doi.org/10.1017/S0033291720000550>
- Köhne, A. C. J., & Isvoranu, A. M. (2021). A Network Perspective on the Comorbidity of Personality Disorders and Mental Disorders: An Illustration of Depression and Borderline Personality Disorder. *Frontiers in Psychology*, *12*(July). <https://doi.org/10.3389/fpsyg.2021.680805>
- Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking “Big” personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, *136*(5), 768–821. <https://doi.org/10.1037/a0020327>
- Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., Brown, T. A., Carpenter, W. T., Caspi, A., Clark, L. A., Eaton, N. R., Forbes, M. K., Forbush, K. T., Goldberg, D., Hasin, D., Hyman, S. E., Ivanova, M. Y., Lynam, D. R., Markon, K., ... Zimmerman, M. (2017). The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of Abnormal Psychology*, *126*(4), 454–477. <https://doi.org/10.1037/abn0000258>
- Kulkarni, J. (2017). Complex PTSD – a better description for borderline personality disorder? *Australasian Psychiatry*, *25*(4), 333–335. <https://doi.org/10.1177/1039856217700284>
- Luyten, P., Campbell, C., & Fonagy, P. (2020). Borderline personality disorder, complex trauma, and problems with self and identity: A social-communicative approach. *Journal of Personality*, *88*(1), 88–105. <https://doi.org/10.1111/jopy.12483>
- Luyten, P., & Fonagy, P. (2022). Integrating and differentiating personality and psychopathology: A psychodynamic perspective. *Journal of Personality*, *90*(1), 75–88. <https://doi.org/10.1111/jopy.12656>
- Michael, J., Chennells, M., Nolte, T., Ooi, J., Griem, J., Christensen, W., Feigenbaum, J.,

- King-Casas, B., Fonagy, P., & Montague, P. R. (2021). Probing commitment in individuals with borderline personality disorder. *Journal of Psychiatric Research*, 137, 335–341. <https://doi.org/10.1016/j.jpsychires.2021.02.062>
- Morey, L. C. (2004). *The Personality Assessment Inventory (PAI)*. Lawrence Erlbaum Associates Publishers.
- Morosan, L., Ghisletta, P., Badoud, D., Toffel, E., Eliez, S., & Debbané, M. (2020). Longitudinal Relationships Between Reflective Functioning, Empathy, and Externalizing Behaviors During Adolescence and Young Adulthood. *Child Psychiatry and Human Development*, 51(1), 59–70. <https://doi.org/10.1007/s10578-019-00910-8>
- Nelson, R. K., Lass, A. N. S., Fanning, J. R., McCloskey, M. S., Winer, E. S., & Berman, M. E. (2022). A Network Model of Borderline Personality Traits, Aggression, and Self-Harm. *Journal of Affective Disorders Reports*, 8, 100330. <https://doi.org/10.1016/j.jadr.2022.100330>
- Newman, M. E. J. (2006). Modularity and community structure in networks. *Proceedings of the National Academy of Sciences*, 103(23), 8577–8582. <https://doi.org/10.1073/pnas.0601602103>
- Oldham, J. M. (2011). Interaction of personality disorders with other co-occurring psychiatric disorders. *World Psychiatry*, 10(2), 111–112. <https://doi.org/10.1002/j.2051-5545.2011.tb00029.x>
- Peckham, A. D., Jones, P., Snorrason, I., Wessman, I., Beard, C., & Björgvinsson, T. (2020). Age-related differences in borderline personality disorder symptom networks in a transdiagnostic sample. *Journal of Affective Disorders*, 274, 508–514. <https://doi.org/10.1016/j.jad.2020.05.111>
- Pérez, M.-E., & Pericchi, L. R. (2014). Changing statistical significance with the amount of information: The adaptive $\frac{1}{n}$ rule. *Statistics & Probability Letters*, 85, 20–24. <https://doi.org/10.1016/j.spl.2013.10.018>
- Peters, J. R., Zimmerman, M., Shea, M. T., Andrew, E., Crowe, M. L., Sharp, C., Morgan, T., Grilo, C. M., Sanislow, C. A., Zanarini, M. C., Mcglashan, T. H., & Morey, L. C. (2022). *Borderline personality disorder symptom networks across adolescent and adult clinical samples : examining symptom centrality and replicability*.
- Poole, J. C., Dobson, K. S., & Pusch, D. (2018). Do adverse childhood experiences predict adult interpersonal difficulties? The role of emotion dysregulation. *Child Abuse and Neglect*, 80(April), 123–133. <https://doi.org/10.1016/j.chiabu.2018.03.006>
- R Core Team. (2021). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.r-project.org/>
- Richetin, J., Preti, E., Costantini, G., & De Panfilis, C. (2017). The central role of identity in Borderline Personality Disorder: Evidence from network analysis. *PLoS ONE*, 12(10), e0186695.
- Rifkin-Zybutz, R. P., Moran, P., Nolte, T., Feigenbaum, J., King-Casas, B., Fonagy, P., & Montague, R. P. (2021). Impaired mentalizing in depression and the effects of borderline personality disorder on this relationship. *Borderline Personality Disorder and Emotion Dysregulation*, 8(1), 4–9. <https://doi.org/10.1186/s40479-021-00153-x>
- Samuel, D. B., & Widiger, T. A. (2008). A meta-analytic review of the relationships between the five-factor model and DSM-IV-TR personality disorders: A facet level analysis.

Clinical Psychology Review, 28(8), 1326–1342.
<https://doi.org/10.1016/j.cpr.2008.07.002>

- Schaefer, J. D., Moffitt, T. E., Arseneault, L., Danese, A., Fisher, H. L., Houts, R., Sheridan, M. A., Wertz, J., & Caspi, A. (2018). Adolescent Victimization and Early-Adult Psychopathology: Approaching Causal Inference Using a Longitudinal Twin Study to Rule Out Noncausal Explanations. *Clinical Psychological Science*, 6(3), 352–371.
<https://doi.org/10.1177/2167702617741381>
- Sibley, C. G., Fischer, R., & Liu, J. H. (2005). Reliability and validity of the revised Experiences in Close Relationships (ECR-R) self-report measure of adult romantic attachment. *Personality and Social Psychology Bulletin*, 31(11), 1524–1536.
<https://doi.org/10.1177/0146167205276865>
- Skodol, A. E., Grilo, C. M., Keyes, K. M., Geier, T., Grant, B. F., & Hasin, D. S. (2011). Relationship of personality disorders to the course of major depressive disorder in a nationally representative sample. *American Journal of Psychiatry*, 168(3), 257–264.
<https://doi.org/10.1176/appi.ajp.2010.10050695>
- Southward, M. W., & Cheavens, J. S. (2018). Identifying Core Deficits in a Dimensional Model of Borderline Personality Disorder Features: A Network Analysis. *Clinical Psychological Science*, 6(5), 685–703. <https://doi.org/10.1177/2167702618769560>
- Stagaki, M., Nolte, T., Feigenbaum, J., King-Casas, B., Lohrenz, T., Fonagy, P., & Montague, P. R. (2022). The mediating role of attachment and mentalising in the relationship between childhood maltreatment, self-harm and suicidality. *Child Abuse and Neglect*, 128(March). <https://doi.org/10.1016/j.chiabu.2022.105576>
- Vega, D., Torrubia, R., Marco-Pallarés, J., Soto, A., & Rodríguez-Fornells, A. (2020). Metacognition of daily self-regulation processes and personality traits in borderline personality disorder. *Journal of Affective Disorders*, 267(February), 243–250.
<https://doi.org/10.1016/j.jad.2020.02.033>
- von Klipstein, L., Borsboom, D., & Arntz, A. (2021). The exploratory value of cross-sectional partial correlation networks: Predicting relationships between change trajectories in borderline personality disorder. *PLoS ONE*, 16(7 July), 1–14.
<https://doi.org/10.1371/journal.pone.0254496>
- Weathers, F. W., Litz, B. T., Herman, D. S., Huska, J. A., & Keane, T. M. (1993). The PTSD checklist: reliability, validity, & diagnostic utility. *Paper Presented at the Annual Meeting of the International Society for Traumatic Stress Studies*.
- Wright, A. G. C., & Hopwood, C. J. (2022). Integrating and distinguishing personality and psychopathology. *Journal of Personality*, 90(1), 5–19.
<https://doi.org/10.1111/jopy.12671>
- Zanarini, M. C., Frankenburg, F. R., Reich, D. B., Silk, K. R., Hudson, J. I., & McSweeney, L. B. (2007). The subsyndromal phenomenology of borderline personality disorder: A 10-year follow-up study. *American Journal of Psychiatry*, 164(6), 929–935.
<https://doi.org/10.1176/ajp.2007.164.6.929>
- Zhang, Z. (2016). Multiple imputation with multivariate imputation by chained equation (MICE) package. *Annals of Translational Medicine*, 4(2), 30.
<https://doi.org/10.3978/j.issn.2305-5839.2015.12.63>
- Zhao, T., Liu, H., Roeder, K., Lafferty, J., & Wasserman, L. (2012). The huge package for high-dimensional undirected graph estimation in R. *Journal of Machine Learning Research*, 13, 1059–1062.

