Short title: SCHEMA MODES AND BORDERLINE PERSONALITY DISORDER SYMPTOMS

Associations between borderline personality disorder features, early maladaptive schemas, and schema modes: A network analysis in a nonclinical sample

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Abstract

Background: Borderline Personality Disorder (BPD) is a heterogeneous personality disorder. Early Maladaptive Schemas (EMSs) and schema modes are two core concepts of schema theory that play an essential role in understanding BPD symptomatology. **Methods:** This study aimed to model the complex associations between key BPD features (e.g., Affective Instability, Identity Problems, Negative Emotions, and Self-Harm), EMSs, and schema modes using network analysis in a sample of undergraduate students ($n= 989$). The Personality Assessment Inventory-Borderline subscale (PAI-BOR), the Young Schema Questionnaire-Short Form (YSQ-SF), and the Schema Mode Inventory (SMI) were used to assess the severity of BPD features, EMSs, and schema modes, respectively. **Results:** The schema modes were the most central nodes in the model, and the activated EMSs were related to BPD features through schema modes. Distinctive BPD features were also associated with specific schema modes. Interestingly, Affective Instability and Self-Harm features were directly associated with Impulsive Child mode. Identity Problems showed unique associations with the Abandonment schema, Vulnerable Child, and Punitive Parent modes. Finally, Negative Relations were also uniquely connected to the Angry Child mode. **Conclusions:** The findings of this study can be helpful for clinicians and researchers to deepen their knowledge about BPD conceptualization.

Keywords: Borderline, BPD, network analysis, schema, YSQ, SMI

1. Introduction

Borderline personality disorder (BPD) is a prevalent and difficult-to-treat mental disorder characterized by dramatic shifts in emotional, cognitive, and behavioral states (Gunderson et al., 2018). These momentary shifts are central to BPD since, based on DSM-5 and ICD-11, the pervasive patterns of instability in interpersonal relationships, affects, self-image, and behaviors are the main clinical features for BPD diagnosis (Bach & First, 2018). Besides unstable BPD features, the heterogeneous nature of the disorder challenges clinicians and researchers to find effective ways for BPD treatment. Research shows that schema therapy (ST) is a promising psychotherapeutic approach for BPD to develop emotional stability, improve social relationships, and reduce incidents of self-harm in these patients (Arntz et al., 2005; Bach & Lobbestael, 2019; Sempértegui et al., 2013; Young et al., 2003). Early maladaptive schemas (EMSs) and schema modes are considered two significant components of ST (Bach & Lobbestael, 2019; Bach & Farrell, 2018).

EMSs are dysfunctional core beliefs about self, others, and the world mainly developed during childhood and adolescence due to an unfavorable early environment (e.g., insecure attachment, emotional abuse) and failure to meet basic needs in childhood (e.g., express feelings, safety, autonomy) (Young, 1999). EMSs form the individuals' views about themselves and their interpersonal relations, give meaning to their new experiences, and prevent individuals from developing adequate emotional and interpersonal skills (Young et al., 2003). Schema modes result from the activation of EMSs and contain coping styles reflecting individuals' affective, cognitive, and behavioral states (Young et al., 2003). As such, schema modes are momentary mind states, reactive to events or stimuli that trigger EMSs, leading to instability in individuals' thoughts, emotions and behaviors (Kellog & Young, 2006).

Thus far, previous studies examining the associations between EMSs and schema modes in BPD have revealed mixed results (Bach & Farrell, 2018; Barazandeh et al., 2018; Johnston et al., 2009; Lobbestael et al., 2005; Sempértegui et al., 2013). These studies partially confirm some distinctive associations between EMSs and modes with BPD symptoms, but the unique associations between these two ST core concepts and BPD symptoms have not yet been modelled in a comprehensive way. Specifically, because of the heterogeneous nature of BPD, researchers need novel approaches to explore the interrelations between EMSs, schema modes, and BPD symptoms in an accurate data-driven manner. Network analysis performed on cross-sectional data provides a comprehensive view of the unique associations between different constructs and offers insightful ways to visualize complex data (Borsboom & Cramer, 2013; Bringmann & Eronen, 2018). In the context of schema theory components and BPD features, only two studies relied on network analysis in the past years. In the first study, Esmaeilian and colleagues (2019a) mapped the unique associations between EMSs and the severity of BPD features (i.e., affective instability, negative relations, identity problems, and self-harm) in a nonclinical sample, suggesting unique patterns of connectivity between BPD features and EMSs (see Esmaeilian et al., 2019). More recently, Aalbers and colleagues (2021) modelled the network structure of functional and dysfunctional schema modes in a nonclinical (121 healthy individuals) and clinical (325 individuals with paranoid, narcissistic, histrionic, and Cluster-C personality disorders) sample. Their results suggested a less central role for the healthy adult mode in clinical and nonclinical samples (see Aalbers et al., 2021). Despite the progress in this area, several questions remain unanswered.

In particular, although it is assumed that schema modes link EMSs to BPD symptoms, it remains to be tested how different schema modes and EMSs uniquely contribute to BPD features.

In this context, investigation of unique associations between these constructs and centrality of schema modes while accounting for EMSs may have important implications for BPD treatment. As to date, no studies have mapped the unique associations between EMSs and schema modes with distinct BPD features (affective instability, negative relations, identity problems, and self-harm). Exploring the unique associations may increase our understanding of the heterogeneous nature of BPD and how ST core constructs relate to this. For this purpose, the present study used network analysis to clarify specific connections between EMSs, schema modes, and BPD symptoms in a sizable nonclinical sample with substantial heterogeneity in central BPD features.

2. Method

2.1. Participants

The final sample included 989 undergraduate students (women = 672; men = 317) between 18 and 24 years, all of whom were fluent in Persian. Participants were excluded if they were not Persian native speakers or if – based on a set of self-report screening items – there was a possibility of psychiatric problems or a history of that. All participants volunteered to participate in the survey and provided written consent.

2.2. Instruments

2.2.1 Screening items

The following screening items were added to the survey to get an estimation of mental healthcare services consumption and (self-reported) history of psychiatric problems: "Have you ever visited a psychologist or a psychiatrist?", "Has a psychologist/psychiatrist ever told you that you are suffering from a psychological problem?" and "What was the diagnosis of the psychologist/psychiatrist?". If participants answered these items positively, they were excluded from the analyses.

2.2.2. Borderline features subscale of the **Personality Assessment Inventory**

In the current study, the items of the Borderline features scale of the Personality Assessment Inventory (PAI-BOR; Morey, 1991) were used to measure the main borderline personality disorder features. The PAI-BOR consists of 24 items such as "I worry a lot about other people leaving me", "I have little control over my anger", and "When I am upset, I typically do something to hurt myself". These items are rated on a four-point Likert scale, ranging from false (0) to very true (3). This subscale measures four borderline personality features (affective instability, self-harm, negative interpersonal relations, and identity problems), which denotes the main characteristics of BPD based on DSM-5 (APA, 2013). Studies have reported adequate reliability and validity for the PAI-BOR in nonclinical samples (Trull, 1995; Trull et al., 1997). The Persian version of the PAI-BOR also has good concurrent validity (correlation coefficients from .68 to .89) in the Iranian sample (Esmaeilian et al., 2019b).

2.2.3. Young Schema Questionnaire - Short Form

The short version of the Young Schema Questionnaire (YSQ-SF) was employed to assess 15 early maladaptive schemas comprising emotional deprivation, abandonment, mistrust, social isolation, shame, failure, incompetence, vulnerability to harm, enmeshment, subjugation, self-sacrifice, emotional inhibition, unrelenting standards, entitlement, and insufficient self-control (Young & Brown, 2003). The YSQ-SF consists of 75 items, among which "other people are not going to meet one's emotional needs", "other people will harm, abuse, or take advantage of one", and "I prefer taking care of others to taking care of myself". The items of this questionnaire are rated on a 6-point scale from 1 (completely untrue about me) to 6 (describes me perfectly). Studies show good psychometric properties of the English version of YSQ-SF (Glaser et al., 2002). The

Persian version of YSQ-SF has good validity and reliability among Persian speakers (Sadooghi et al., 2008).

2.2.4. Schema Mode Inventory

The Schema Mode Inventory (SMI) is a self-report inventory consisting of 124 items, first constructed by Young and colleagues (2003) and then revised by a Dutch research team (Lobbestael et al., 2010). SMI investigates 14 schema modes in which responses have to be made on a Likert-type scale from 1 (never or seldom) to 6 (all the time). The list of all schema modes can be found in Table 1. In this inventory, participants respond to items like "I break the rules and regret it later", "I cannot forgive myself", and "I want to distract myself from upsetting thoughts and feelings". The psychometric properties of SMI have been demonstrated in different international samples (Bamelis et al., 2011; Lobbestael et al., 2010; Panzeri et al., 2016; Reiss et al., 2012; Riaz et al., 2013; Talbot et al., 2015). Hanaei and colleagues (2015) demonstrated good validity and reliability for the Persian version of SMI in an Iranian sample.

2.3. Procedures

Participants completed the questionnaires online. Before accessing the questionnaires, the purpose of the study, the procedure, the subject's rights to confidentiality and the voluntary basis to take part in the study were explained to the participants. Next, the eligibility of the sample for participation was examined by a brief screening of self-reported history of psychiatric problems. Upon completing the consent form, demographic information, and screening questions, participants could access the questionnaires, including YSQ-SF, SMI, and PAI-BOR. After gathering data to prepare the obtained data (n = 1021) for analyses, the responses' accuracy was first checked by detecting unengaged cases in the dataset. To do this, we calculated the standard deviation (SD) for items comprising one variable and excluded those responses that were almost

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constant (*SD* around zero) (Moradi & Miralamsi, 2020). We did this because, especially in lengthy self-report questionnaires, it occurs that respondents provide the same ratings to all items regardless of the reverse items, and they should be excluded. Therefore, we first removed unengaged cases (n=23) and then examined outliers and missing data, which led to the exclusion of another small group of participants (n=9). The distribution of the final dataset (n=989) was normal. The Ethics Committee of Shahid Beheshti University approved the study procedure, including informed consent, the voluntary right to participate in or withdraw from the study, and privacy and confidentiality aspects.

2.4. Data analysis

The statistical analyses were conducted in R version 3.6.1 (see supplemental material for version information of relevant R packages). The analyses of this follow-up study were kept identical to the analyses reported in Esmaeilian et al. (2019), with the exception that in the current study, (1) we investigated unique patterns of connectivity between borderline personality symptom domains, dysfunctional core beliefs, *and* schema modes, and (2) we relied on Strength centrality – which appeared as the most stable centrality index in Esmaeilian et al. (2019) – as an indicator of node centrality. Below, we provide a brief overview of the analytical approach used in the current manuscript. We refer to Esmaeilian et al. (2019) for a more detailed discussion of choices made within this analytical strategy, and Epskamp and Fried (2018), Epskamp, Borsboom, and Fried (2018) for a detailed discussion of the estimation and evaluation of GGMs.

Data were preprocessed with the *huge* package (Zhao et al., 2015), where we used a nonparanormal transformation to improve normality. We estimated a Gaussian Graphical Model (GGM; Epskamp & Fried, 2018) using the *qgraph* package (Epskamp et al., 2012), relying on the Graphical Least Absolute Shrinkage and Selection Operator (gLASSO; Friedman et al., 2014) with

Extended Bayesian Information Criterion model selection (EBIC; $\gamma = 0.5$). We implemented additional thresholding to maximize model specificity. Node predictability (explained variance of each node by its neighbouring nodes; Haslbeck & Fried, 2017) was estimated using the *mgm* package (Haslbeck & Waldorp, 2015). We relied on Strength centrality – reflecting the absolute strength of connectivity of a given node within the obtained network model – to identify the most central nodes within the network. Finally, evaluation of the network model, and in particular accuracy of the obtained edge weights and stability of Strength centrality, took place using bootstrapping procedures implemented in the *bootnet* package (Epskamp & Fried, 2017). In line with Esmaeilian et al. (2019), we plotted the network model using *qgraph* where nodes were positioned in the model based on their level of connectivity (Frucherman-Reingold's algorithm; Fruchterman & Reingold, 1991). Edges in the model reflect regularized partial correlations, where edge thickness corresponds to the strength of association, whereas edge color and line type used reflect edge valence (blue/full = positive; red/dashed = negative). Node predictability is presented as a pie chart in the outer ring of the edges. To investigate how BPD features are uniquely related to dysfunctional core beliefs and schema modes within the network model, we relied on flow diagrams.

3. Results

The analyses are based on *n* = 989 participants who completed all questionnaires. Descriptive statistics for the variables of interest are reported in Table 1. The obtained GGM is depicted in Figure 1 (see supplemental Table 1 for the edge weight matrix), representing unique associations between BPD features, schema modes, and dysfunctional core beliefs. Figure 2 depicts the order of Strength centrality within the obtained network model. Schema modes emerged as the most central nodes within the model, among which Vulnerable Child, Healthy

Adult, Impulsive Child, Punitive Parent, Happy Child, and Demanding Parent, whereas BPD features emerged among the least central nodes in the model in terms of Strength centrality. This is also reflected in the levels of explained variance for each of these nodes (node predictability; Figure 1).

Table 1

Figure 1

Figure 2

Investigation of direct associations between central BPD features, schema modes, and dysfunctional core beliefs (Figure 3) suggests that activation of dysfunctional core beliefs is mostly linked to BPD features via schema modes. That is, within the obtained network model, Affective Instability was only directly associated with Impulsive Child (Figure 3a), via which Affective Instability was linked with Self-Harm and other schema modes, further connecting Affective Instability with dysfunctional core beliefs. Similarly, Negative Relations and Self-Harm were only directly connected with one another, in addition to a unique association with Angry Child for Negative Relations (Figure 3c) and Impulsive Child for Self-Harm (Figure 3d). Identity Problems was uniquely connected to Vulnerable Child and Punitive Parent, in addition to a positive association with the schema of Abandonment (Figure 2b). Noteworthy, after controlling for dysfunctional core beliefs and schema modes, Affective Instability and Identity Problems were only indirectly connected to the other BPD features (for analysis of stability and accuracy of the network model and significant edge differences, see supplemental materials).

Figure 3

4. Discussion

This study examined how specific schema modes and EMSs are associated with distinctive BPD features such as Affective Instability, Identity Problems, Negative Relations, and Self-Harm in a sizeable nonclinical sample. We used a nonclinical sample since schemas and personality disorder features represent dimensional constructs that vary across clinical and nonclinical samples (Carr et al., 2010). As an additional advantage, the sampling strategy used in this study allowed for the recruitment of a large and heterogeneous sample, which was necessary for the network analyses. The network analysis revealed which schema modes, EMSs, or BPD features are most central in the model and how BPD features uniquely link to specific schema modes and EMSs. To the best of our knowledge, it is the first study that used network analysis to model the interrelations between schema modes, EMSs, and distinctive BPD features in a nonclinical sample. The network model identified schema modes as the most central nodes within the model and suggested that activation of EMSs is mainly connected to BPD features via schema modes. Moreover, our findings indicated that the Affective Instability feature was directly related to the Impulsive Child mode. The Identity Problem feature was linked to the Abandonment schema, Vulnerable Child, and Punitive Parent modes. Finally, Negative Relations and Self-Harm features were directly connected and showed unique associations with Angry and Impulsive Child modes. Although these findings are in line with most prior studies (Bach & Farrel, 2018; Barazandeh et al., 2018; Johnston et al., 2009; Puri et al., 2021; Young et al., 2003), most of them have examined the relationships between schemas and modes with BPD as a single construct instead of their associations with distinctive core BPD features.

The results imply that activation of the Impulsive Child mode has direct associations with Affective Instability and Self-Harm separately. Affective instability is a core feature of BPD and is defined as repeated, sudden, and rapid shifts in mood (APA, 2013). When BPD individuals are

in Impulsive Child mode, they tend to act impulsively without considering the outcomes. Such impulsive behaviors may increase mood reactivity and result in affective instability (e.g., intense emotional reactivity to stimuli) due to elevated irritability, dysphoria, and anxiety (Salgo et al., 2021). In addition, the activation of the Impulsive Child mode may cause intense feelings of frustration, rage, and anger when impulses and desires remain unmet, which might increase self-harming behaviors under severe emotional distress (Young et al., 2003; Barazandeh et al., 2018).

The Identity Problem feature of BPD showed connections with the abandonment schema and Vulnerable Child and Punitive Parent modes in this study. Research indicates that BPD individuals are susceptible to rejection and suffer from an intense fear of abandonment while strongly needing emotional support (APA, 2013). When BPD individuals struggle with an active abandonment schema, they firmly believe that their significant others are emotionally unavailable and unpredictable and cannot provide them with the required emotional support and security (Young et al., 2003). Therefore, they experience a paradoxical combination of intense needs for support with an intense fear of abandonment which may explain the associations between the abandonment schema and identity problems. With the activation of Vulnerable Child mode, BPD individuals strongly feel emotional pain. They believe that they are alone, socially unacceptable, undeserving of love, and worthless, which has roots in their childhood history of experiencing abandonment and abuse (Young et al., 2003). When the Vulnerable Child mode is dominant, individuals with BPD features become more fragile. It is not only because of carrying the burden of the emotional pain but also because of the possibility that the Punitive Parent mode (reflecting the inner voice of their parents, punishing and criticizing them) can also be activated as a result of that (Arntz et al., 2005). Most people with these active schema modes have difficulties integrating

positive and negative representations of themselves and others, leading to identity problems (Wilkinson-Ryan & Westen, 2000).

Our findings also show a unique association between the BPD feature of Negative Relationships and the Angry Child mode. This mode reflects that individuals with BPD features are prone to inappropriate, intense, and uncontrollable anger that, in the long run, can be damaging for them and their interpersonal relationships. Young and colleagues (2003) state that BPD individuals avoid expressing their anger since they fear rejection. So, their suppressed anger may build up and suddenly appear uncontrolled in their interpersonal relationships.

Possible clinical implications of our findings are that therapeutically changing more central or directly connected nodes might be associated with more significant changes in specific BPD features. That is, the observed edges between the schema modes, EMSs and BPD features may aid clinical case conceptualization while offering targets that could be addressed in the treatment of BPD symptoms. These findings, when confirmed in clinical samples, may assist in obtaining better outcomes from ST for individuals suffering from BPD symptoms.

There are a few limitations of this study. First, the current study used cross-sectional data, not allowing for causal inferences. Related to this, the presented network models are undirected. As such, no interpretations can be made regarding the direction of effects. Moreover, network analysis is a data-driven approach, where our findings should be considered exploratory. While allowing hypothesis generation, further confirmatory studies are needed. For instance, prospective designs would be required to model the dynamics between core concepts of ST and BPD features. For this purpose, it would be interesting to use self-report ecological momentary assessments (EMA) to evaluate the role of given ST concepts in specific BPD features in daily life. Second, a large nonclinical sample in early adulthood (between 18 and 24) was used in the current study,

which had the advantage of potentially not being biased by comorbid disorders. However, it should be noted that some associations may not generalize to clinical samples of BPD. Therefore, future studies should examine clinical BPD samples during various developmental stages to explore how ST core concepts develop and maintain BPD features. In addition, we used self-report measures for (history of) mental healthcare consumption and psychiatric problems to exclude participants with (a history of) mental disorders. Although this provides a rough estimate of the history of mental problems, and for this purpose was used during the screening phase of this study, the lack of a structured clinical interview warrants caution. Finally, the gender distribution in the present study did not allow for examining potential gender-related effects. It would be helpful for future research to include the influence of gender in the relations between BPD features, schemas, and modes. Similarly, given that recent findings suggest an impact of age on the interrelation between BPD symptoms (Peckham et al., 2020), an examination of the associations between BPD features and ST core constructs is warranted.

5. Conclusion

The current study modeled the specific associations between distinctive BPD features, EMSs, and schema modes in a sizable nonclinical sample using network analysis as a novel data-driven approach. Importantly, our findings identified schema modes as the most central nodes in the model and suggested directly unique associations between schema modes and BPD features, connecting BPD features with EMSs. These results explored potential pathways between schema modes and specific BPD features and may assist in understanding the dynamics of BPD.

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Figures captions

Figure 1. Regularized Partial Correlation Network

Figure 2. Order of Strength Centrality

Figure 3. Unique associations between BPD features, schema modes, and dysfunctional core beliefs. *Note:* (a) Flow chart for Affective Instability (upper left panel); (b) Flow chart for Identity Problems (upper right panel); (c) Flow chart for Negative Relations (lower left panel); (d) Flow chart for Self-Harm (lower right panel).

Table 1. Descriptive statistics

	M	SD	Cronbach's alpha
Demographics			
Age	20.51	1.88	
BPD Features			
Affective Instability	7.17	2.40	.79
Identity Problems	6.03	2.97	.85
Negative Relations	6.06	2.58	.82
Self-Harm	3.95	3.24	.90
Schema Modes			
Vulnerable Child	20.79	9.70	.90
Angry Child	25.12	8.03	.80
Enraged Child	17.36	7.87	.90
Impulsive Child	21.09	6.37	.78
Undisciplined Child	15.19	5.12	.80
Happy Child	36.84	7.57	.74
Compliant Surrender	16.92	5.15	.83
Detached Protector	20.28	8.17	.86
Detached Self-Soother	12.54	4.24	.92
Self-Aggrandizer	30.46	7.18	.73
Bully and Attack	23.00	6.67	.78
Punitive Parent	16.90	6.59	.84
Demanding Parent	33.78	8.12	.77
Healthy Adult	41.73	7.94	.80
Dysfunctional Core Beliefs			
Emotional Deprivation	12.89	5.88	.84
Abandonment	13.38	6.04	.84
Mistrust/Abuse	13.61	4.66	.72
Social Isolation	11.74	4.87	.74
Defectiveness/Shame	8.53	4.07	.83
Failure	9.44	4.49	.84
Dependence/Incompetence	8.10	3.69	.79
Vulnerability to Harm & Illness	12.17	5.06	.74
Enmeshment	10.03	4.32	.75
Subjugation	9.60	4.32	.79
Self-Sacrifice	14.29	5.44	.79
Emotional Inhibition	12.35	5.85	.83
Unrelenting Standards	16.74	5.34	.76
Entitlement	15.56	5.18	.73
Insufficient Self-Control/Self-Discipline	13.26	4.49	.70