Borderline Personality Disorder and Emotion Dysregulation

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Pathology of the self: a network analysis of personality functioning, narcissistic vulnerability, mentalizing, and epistemic trust across trauma profiles

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Abstract

Background Trauma exposure impairs personality functioning, mentalizing, and epistemic trust, yet the mechanisms linking these processes remain unclear.

Methods Using network analysis, we examined how narcissistic traits, personality functioning, reflective functioning, and epistemic stances interact across trauma profiles in emerging adults ($N = 1,081$; 72.4% female). Participants completed the Childhood Trauma Questionnaire–Short Form (CTQ-SF), Levels of Personality Functioning Scale–Brief Form (LPFS-BF), Pathological Narcissism Inventory (PNI), Reflective Functioning Questionnaire for Youth (RFQY-13), and Epistemic Trust, Mistrust, and Credulity Questionnaire (ETMCQ). Latent profile analysis identified three trauma profiles: low trauma, emotional trauma, and complex trauma.

Results For all three trauma profiles, narcissistic vulnerability and self-impairment formed a stable, central dyad, indicating a core of transdiagnostic dysfunction. Trauma exposure was associated with denser, more interconnected networks, likely reflecting self-reinforcing maladaptive patterns. Uncertainty about mental states emerged as the primary bridge mechanism, increasing with trauma severity and transmitting dysfunction into epistemic stances. Trauma was associated with both mistrust and credulity—mistrust predominated in emotional trauma, credulity in complex trauma.

Conclusions These findings delineate common and trauma-specific processes linking personality dysfunction and interpersonal traits. Clinically, they highlight the importance of addressing narcissistic vulnerability and self-functioning as stable mechanisms, reducing uncertainty through mentalization-based interventions, and tailoring treatment to trauma-specific epistemic patterns.

Keywords Trauma, Narcissistic vulnerability, Personality functioning, Mentalizing, Epistemic trust, Network analysis, Psychopathology

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Introduction

Over the past decade, the search for unifying frameworks in psychopathology research has accelerated, driven by the understanding that psychiatric disorders rarely occur in isolation and often share significant overlap in symptoms, risk factors, and neurobiological correlates [1–5]. A key development in this area is the identification of a general psychopathology factor, or p-factor, which captures the shared variance across different types of mental disorders [6, 7]. Higher p-factor scores are associated with greater symptom severity, chronicity, comorbidity, and functional impairment, highlighting its clinical significance [8], and providing the conceptual background for exploring transdiagnostic liabilities that create broad vulnerability to general psychopathology [9, 10].

One influential approach locates this liability in core impairments in self- and interpersonal functioning (DSM-5 AMPD Criterion A), implying that a broad personality dysfunction in identity, self-direction, empathy, and intimacy underlies more specific syndromes [11–13]. From this perspective, p has been interpreted as reflecting a fundamental disruption in identity, self-direction, empathy, and intimacy, that gives rise to more specific symptom patterns. This interpretation gained traction through studies of a general factor of personality disorder (g-PD), which was found to be defined by these core impairments [5, 14]. Given the empirical convergence between g-PD and p-factor models, it has been suggested that p can be meaningfully conceptualized through the lens of personality pathology. Indeed, studies have linked higher p scores to traits typical of borderline personality disorder (BPD), such as emotional instability, identity issues, and relationship difficulties [12]. However, further evidence suggests that borderline features are not the sole personality characteristics contributing to general psychopathology, with impairments in self-esteem regulation, particularly narcissistic vulnerability, also accounting for unique variance in p, beyond borderline traits alone [15].

Narcissistic vulnerability, characterized by hypersensitivity to evaluation, contingent self-esteem, social withdrawal, and shame-proneness, represents a central dimension of such self-esteem dysregulation [16, 17]. Although DSM-5 defines Narcissistic Personality Disorder (NPD) mainly by its grandiose features, research on general psychopathology and diagnostic comorbidity patterns shows that NPD is most strongly associated with the internalizing–distress domain, supporting its description as a "distress disorder" based on multivariate comorbidity rather than purely on diagnostic criteria [18]. This might suggest that the latent core driving this internalizing comorbidity is likely the vulnerable, depleted side of narcissism (e.g., shame, insufficiency) rather than pure grandiosity. Thus, Eaton and colleagues also emphasize the need to distinguish grandiose and vulnerable narcissistic features when examining transdiagnostic features, as these dimensions may show differential associations with general psychopathology.

In both adolescent and adult samples, narcissistic vulnerability shows strong links with the p-factor even when borderline traits are statistically accounted for, indicating that vulnerability-related narcissistic features reflect aspects of generalized psychopathological risk that are not solely due to borderline pathology [15, 19]. Notably, evidence from bifactor models suggests that while borderline traits and narcissistic vulnerability explain a significant amount of variance in p, narcissistic grandiosity does not, once internalizing and externalizing dimensions are considered [15]. In this context, borderline features and narcissistic vulnerability seems to capture instability in identity, affect regulation, and interpersonal sensitivity that cut across traditional diagnostic boundaries. Theoretically, this merging of identity diffusion and self-esteem dysregulation represents what can be described as the "pathology of the self" [20–22], a structural disturbance that acts as a transdiagnostic driver of dysfunction. However, less is known about how these liabilities are embedded within broader systems of sociocognitive functioning, especially in the context of trauma.

Trauma as a developmental amplifier

A substantial body of research connects childhood trauma to both personality difficulties and general mental health problems. In this context, we differentiate between early maltreatment, referring to specific acts of abuse and neglect, and the broader construct of childhood trauma, which encompasses the cumulative developmental and subjective impact of these adverse experiences. Meta-analyses of longitudinal studies consistently demonstrate that early maltreatment substantially increases the risk for a wide range of adult psychiatric disorders, including affective and psychotic disorders [23]. The effects appear to be dose-dependent, with cumulative exposure to multiple and repeated victimizations further elevating this risk [23, 24]. Trauma exposure is understood to disrupt the formation of a coherent and integrated sense of self and others by compromising core developmental processes. This includes impairments in personality functioning, particularly the sense of identity, as well as emotional regulation, mentalizing capacities, and the ability to develop trusting relationships [25, 26]. Specifically, childhood neglect and emotional abuse have been identified as having the strongest associations with later impairments in both personality functioning and mentalizing [27–29].

These findings support a diathesis-stress model where personality functioning acts as a key vulnerability or resilience factor. From this perspective, individuals with

pre-existing impairments in self and interpersonal functioning are more susceptible to developing psychopathology when exposed to adverse childhood experiences [19]. This may help explain why specific dimensions of personality dysfunction, particularly impaired self-functioning and narcissistic vulnerability, remain strongly linked regardless of trauma history, even as overall severity worsens with adversity [10, 19, 30].

Network analytic research indicates that trauma shapes psychopathology at a systems level. Converging evidence suggests that trauma-exposed individuals exhibit denser and more interconnected symptom networks, both in general psychopathology [31, 32] and in domains of personality and interpersonal functioning [33, 34]. Such increases in network density are theorized to render maladaptive systems more self-sustaining, promoting faster and more persistent symptom spread in response to stressors. Nevertheless, the mechanisms linking stable core personality vulnerabilities to these trauma-related alterations in network architecture remain poorly understood.

Mentalizing and epistemic trust as transdiagnostic mechanisms

Mentalizing, or reflective functioning, refers to the ability to interpret one's own and others' behavior based on intentional mental states such as beliefs, feelings, and desires [35, 36]. Contemporary models see mentalizing as multidimensional, organized along four interacting polarities—automatic–controlled, self–other, internal–external, and cognitive–affective—that can flexibly shift based on contextual demands [21]. High emotional arousal, attachment threats, or social exclusion can disrupt this balance, leading to temporary "mentalizing failures." Two main types of breakdown are identified: hypomentalizing, which involves insufficient and concrete attribution of mental states, and hypermentalizing, characterized by excessive, overconfident, or inaccurate attributions [37]. These failures can be understood through the lens of certainty–uncertainty about mental states. High uncertainty indicates difficulty distinguishing between one's own and others' perspectives and is associated with emotional dysregulation, interpersonal conflict, and transdiagnostic symptom activation [38–40]. Conversely, excessive certainty, especially when inaccurate, reflects a rigid interpretive style typical of maladaptive hypermentalizing and linked to borderline personality pathology [22, 35]. Meta-analytic evidence suggests that impairments in mentalizing are a strong transdiagnostic feature, with hypomentalizing and hypermentalizing profiles systematically differing across disorders [41].

The epistemic trust framework places these mentalizing processes within the broader domain of social learning [42, 43]. Epistemic trust is the ability to treat others' communication as relevant, reliable, and personally applicable, enabling the assimilation of adaptive social knowledge [44]. Mentalizing is the main process that calibrates epistemic trust, enabling individuals to recognize trustworthy sources [42]. When conditions are "good enough", secure attachment promotes accurate mentalizing and stable epistemic trust. Conversely, trauma and attachment disruptions can impair mentalizing and destabilize epistemic stances, resulting in epistemic mistrust, constant rejection of potentially useful input, and epistemic credulity, uncritical acceptance of information [39, 45]. People exposed to trauma may surprisingly show increased levels of both mistrust and credulity [45, 46], which can be an adaptive response to environments where communication from caregivers was untrustworthy or harmful.

Available literature supports network-theory insights that central nodes facilitate symptom activation and systemic propagation of maladaptive features [47–49], empirical findings that mentalizing and epistemic trust occupy central roles in stress and emotional regulation networks [50], and evidence that epistemic trust mediates the impact of trauma on personality dysfunction [51]. Within this framework, high uncertainty about mental states and, in contexts of epistemic hypervigilance, misplaced certainty, may act as bridge nodes linking core personality vulnerabilities (e.g., narcissistic vulnerability, self-functioning impairment) to maladaptive epistemic stances, thereby potentially facilitating symptom spread within densely interconnected systems.

The present study

To address these gaps, this study adopts a network approach to psychopathology [52, 53]. This framework offers a distinct conceptual advantage over traditional diathesis-stress models. While diathesis-stress models typically view disorder as a latent vulnerability triggered by an external stressor, network theory posits that psychopathology arises from dynamic interactions among symptoms themselves. We argue that this perspective is essential for the current study because it allows us to model how trauma might trigger self-sustaining cycles where vulnerabilities in personality functioning, mentalising, and epistemic trust might reinforce one another even after the external threat has passed [54]. Furthermore, mapping these dynamic systems aligns with recent calls to characterize the complexity and "staging" of mental health problems in emerging adults [55].

Building on the latter network perspective and the existing literature [21, 22, 56], this study examines how personality functioning, narcissistic traits, mentalizing, and epistemic stances are organized when modeled jointly. Specifically, we selected these variables to capture the structural organization of three theoretically

interdependent domains: (1) core personality pathology (Self- and Interpersonal functioning, and Narcissistic traits), (2) the meaning-making processes (Mentalizing: Certainty and Uncertainty), and (3) the epistemic stances regulating social learning (Trust, Mistrust, Credulity). Indeed, the main aim of this study is to evaluate the structural configuration of theoretically central constructs that are typically examined in isolation, and to assess whether this configuration is invariant or modulated by trauma exposure. Although each of these domains has been linked to trauma and personality pathology, it remains unclear how they co-occur and interrelate within the same individuals when modeled simultaneously as a system.

Network analysis was chosen for this purpose because it enables the examination of conditional associations among multiple interconnected processes without imposing a predefined causal direction [48, 49, 52]. In this study, the contribution lies in testing whether the theoretically expected components, such as impaired self-functioning, narcissistic vulnerability, and uncertainty about mental states, occupy structurally central or cross-domain positions within the same system, and whether these structural features remain consistent or vary across trauma profiles.

We aimed to test four theory-driven hypotheses. First, we predicted that narcissistic vulnerability and impaired self-functioning would show a strong and stable conditional association across trauma profiles, indicating a structurally central relationship within the network. Second, we hypothesized that uncertainty about mental states would occupy a cross-domain linking position, connecting personality-related nodes with epistemic stances. Third, we anticipated that higher trauma exposure would be associated with increased overall network connectivity (i.e., density). Finally, we tested whether network structure differed across trauma profiles beyond differences in overall connectivity.

Methods

Participants and procedures

This study used a cross-sectional design. Participants were recruited through non-probability online snowball sampling. Initial recruitment links were distributed via the University of Milano-Bicocca's institutional student mailing lists and public social media platforms (e.g., Instagram, WhatsApp), with a request that participants share the survey link with their peers. Inclusion criteria were: (a) being between 18 and 29 years of age, and (b) providing electronic informed consent.

Data were collected via the Qualtrics online platform, which ensured standardized presentation of items and response options for all participants. To control for order effects and potential fatigue, the order of the questionnaires was randomized. The platform's forced-response option was used to ensure that all submitted protocols were complete (i.e., no missing data). To minimize social desirability bias and measurement error regarding sensitive topics, the survey was completely anonymous. The study received approval from the ethical committee of the University of Milano-Bicocca [No. 775/2023], and all procedures followed the Declaration of Helsinki.

A total of 1,081 participants completed the survey. The sample had a mean age of 24.25 years (SD = 2.96; range = 18–29). Most of the sample were assigned female at birth (72.4%, $n = 783$), with 27.5% ($n = 297$) assigned male, and one participant selecting "Other. "In terms of gender identity, 69.3% ($n = 749$) identified as female, 27.4% ($n = 296$) as male, 2.5% ($n = 27$) as non-binary, and 0.8% ($n = 9$) as "Other. "The most common sexual orientation was heterosexual (74.7%, $n = 807$), followed by bisexual (11.1%, $n = 120$), gay or lesbian (10.2%, $n = 110$), and "Other" (4.0%, $n = 43$). Most participants were students (59.6%, $n = 644$), with employed individuals making up 28.9% ($n = 313$). Regarding education, 32.7% ($n = 353$) held a high school diploma, 42.8% ($n = 463$) a bachelor's degree, 20.9% ($n = 227$) a master's degree, and 2.0% ($n = 22$) a doctorate or equivalent. The majority of participants were unmarried (96.6%, $n = 1044$). All participants included in the analysis provided complete data on the variables of interest.

Measures

Levels of Personality Functioning Scale - Brief Form 2.0 (LPFS-BF 2.0) ([13] Italian validation: [57]). The LPFS-BF 2.0 is a 12-item self-report questionnaire designed to assess personality functioning as described in Criterion A of Section III of the DSM–5 [13]. It provides a total score of global personality functioning and two subscale scores: Self-Functioning and Interpersonal Functioning. Items are rated on a 4-point Likert scale ranging from 0 (very false or often false) to 3 (very true or often true) (e.g., "I often do not know who I really am" for Self-Functioning, and "I often do not understand why people feel the way they do" for Interpersonal Functioning). In the current sample, internal consistency was good for the Self-Functioning subscale ($\alpha = 0.83$, $\omega = 0.84$) and acceptable for the Interpersonal Functioning subscale ($\alpha = 0.68$, $\omega = 0.69$).

Pathological Narcissism Inventory (PNI) ([17] Italian validation: [58]). The PNI is a 52-item self-report instrument designed to assess both grandiose and vulnerable aspects of pathological narcissism in adolescents and adults. Items are rated on a 6-point Likert scale ranging from 0 (not at all like me) to 5 (very much like me) (e.g., "I often hide my needs from others" for Vulnerability, and "I often fantasize about being recognized for my accomplishments" for Grandiosity). The PNI yields seven

first-order subscales: Contingent Self-Esteem, Devaluing, Exploitativeness, Self-Sacrificing Self-Enhancement, Hiding the Self, Grandiose Fantasy, and Entitlement Rage. These form two higher-order dimensions: Narcissistic Grandiosity (comprising Exploitativeness, Self-Sacrificing Self-Enhancement, and Grandiose Fantasy) and Narcissistic Vulnerability (comprising Contingent Self-Esteem, Hiding the Self, Devaluing, and Entitlement Rage). A total score is also computed to reflect global pathological narcissism. The reliability for the higher-order dimensions in our sample was excellent for Narcissistic Vulnerability (α = 0.94, ω = 0.94) and good for Narcissistic Grandiosity (α = 0.86, ω = 0.86).

Epistemic Trust, Mistrust, and Credulity Questionnaire (ETMCQ) ([45] Italian validation: [59]). The ETMCQ is a 15-item self-report instrument assessing individual differences in epistemic trust, Mistrust, and credulity. Items are rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The ETMCQ captures three theoretically derived factors: Epistemic Trust (e.g., "I find information easier to trust and absorb when it comes from someone who knows me well"), Epistemic Mistrust (e.g., "If you put too much faith in what people tell you, you are likely to get hurt"), and Epistemic Credulity (e.g., "When I speak to different people, I find myself easily persuaded even if it is not what I believed before"). The internal consistency values in this study were acceptable for Trust (α = 0.75, ω = 0.75) and Credulity (α = 0.79, ω = 0.80), and acceptable for Mistrust (α = 0.67, ω = 0.68).

Reflective Functioning Questionnaire for Youth (RFQY-13) [38]. The RFQY-13 is a 13-item self-report questionnaire designed to assess reflective functioning or mentalization in adolescents and young adults. The Italian version was used. Although formal validation is currently ongoing, the factor structure of this version has been previously confirmed via Structural Equation Modeling in Italian emerging adults [46]. In this study, internal consistency was good for both the Uncertainty (α = 0.86, ω = 0.86) and Certainty (α = 0.89, ω = 0.89) subscales. Each item is rated on a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree). The RFQY yields two scales: Certainty about Mental States (e.g., "I usually know exactly what other people are thinking") and Uncertainty about Mental States (e.g., "I don't always know why I do what I do"). Mean scores are computed for each subscale, with higher scores indicating stronger tendencies in each domain. In this study, internal consistency was good for both the Uncertainty (α = 0.86, ω = 0.86) and Certainty (α = 0.89, ω = 0.89) subscales.

Childhood Trauma Questionnaire–Short Form (CTQ-SF) ([60] Italian validation: [61]). The CTQ-SF is a 28-item retrospective self-report inventory used to assess five domains of childhood maltreatment: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Each domain is assessed via five items rated on a 5-point Likert scale from 1 (Never) to 5 (Very often). Sexual abuse involves inappropriate sexual contact between an adult and a child (e.g., "Someone tried to touch me in a sexual way or tried to make me touch them"), while physical abuse constitutes bodily assaults posing a risk of injury (e.g., "Hit so hard that I had to see a doctor"). Emotional abuse is characterized by verbal assaults on a child's well-being (e.g., "My family said hurtful or insulting things to me"), and physical neglect encompasses the failure to provide basic physical needs (e.g., "Parents too drunk/high to take care"). Emotional neglect involves failing to address emotional and psychological needs (e.g., the reverse-scored "Someone helped me feel important"). In the present study, the internal consistencies for the five subscales were excellent for Sexual Abuse (α = 0.93, ω = 0.93) and Emotional Neglect (α = 0.89, ω = 0.90), good for Emotional Abuse (α = 0.85, ω = 0.86) and Physical Abuse (α = 0.84, ω = 0.86), and acceptable for Physical Neglect (α = 0.64, ω = 0.70).

Data analysis

Data were analyzed using R (Version 4.5.1) [62, 63]. Data preparation was performed using the *readxl* [64], *dplyr*, and *tidyr* packages [65]. To ensure the reliability of the network estimates, we adhered to sample size guidelines for Gaussian Graphical Models (GGM). Recent simulation studies indicate that sample sizes below 150 can lead to unstable parameter estimation and low replicability in psychological networks [48, 49].

Analytic strategy

To align with the study's theoretical aims, we employed a dual-analytic strategy that combined Latent Profile Analysis (LPA) and Network Analysis. These methods were selected to address two distinct but complementary levels of heterogeneity. First, because adverse childhood experiences rarely occur in isolation, we used LPA, a person-centered approach, to identify population heterogeneity. This allowed us to classify individuals into empirically distinct subgroups based on the quality and severity of their trauma exposure, rather than relying on arbitrary cut-offs or single-variable scores. Second, to understand how these trauma profiles affect psychological functioning, we used Network Analysis, a variable-centered approach, to examine process heterogeneity. This enabled us to map the unique structural organization of personality, mentalizing, and epistemic stances within each group. By integrating these methods, we aimed to test whether the "architecture" of psychopathology is invariant across the population or whether specific trauma profiles modulate the connectivity among core personality vulnerabilities, meaning-making processes,

and epistemic stances. Statistical outliers were not removed because extreme scores in trauma and personality pathology are considered clinically meaningful to the research questions rather than error variance.

Latent profile analysis

To identify subgroups of individuals with distinct trauma histories, a Latent Profile Analysis (LPA) was conducted on the five standardized CTQ-SF subscale scores using the *mclust* package [66]. A series of models with one to nine profiles were compared. The Bayesian Information Criterion (BIC) was used for model selection, with larger values indicating a better fit. Although the VEI five-profile solution achieved the lowest BIC, closer inspection revealed that this solution produced a specific subgroup characterized by high sexual abuse scores, but with a sample size ($n = 92$) insufficient for stable network estimation. Given that Gaussian Graphical Models (GGM) and permutation-based Network Comparison s require larger sample sizes to ensure parameter stability and replicability [48, 49], the three-profile VEV model was selected primarily on the grounds of parsimony and theoretical interpretability. This solution offered the optimal balance between model fit and the methodological requirement to ensure sufficient power ($n > 150$) across all subgroups for robust network analysis. One-way Analyses of Variance (ANOVAs) with Tukey's HSD post-hoc tests were then conducted to validate the resulting profiles by examining mean-level differences across the nine psychological variables.

Network estimation and analysis

The psychological structure of the nine core variables was modeled as a Gaussian Graphical Model (GGM), where nodes represent variables and edges represent their partial correlation coefficients. Networks were estimated using the *bootnet* package [67], employing the graphical LASSO (gLASSO) regularization method with the Extended Bayesian Information Criterion (EBIC) for model selection. This procedure reduces weak correlations to zero to generate a sparse, interpretable network. EBICglasso was estimated with $\gamma = 0.50$ using cor_auto to handle mixed ordinal and continuous data. The full-sample network retained 31 of 36 possible undirected edges (density = 0.86); smaller edges were interpreted cautiously due to the relatively dense model chosen by the EBIC criterion. This estimation process was applied first to the full sample and then separately to each of the three trauma subgroups, using a shared node layout for visual comparability.

The stability and accuracy of each network were assessed using two bootstrapping procedures (1,000 resamples each): (1) non-parametric bootstrapping for edge-weight confidence intervals and (2) case-dropping bootstrapping to compute the Correlation Stability (CS) coefficient for centrality indices. Key node-level metrics were also computed: centrality indices (Strength, Expected Influence, Closeness, and Betweenness) identified the most influential nodes, and predictability (R^2), the variance in a node explained by its neighbors, was calculated using the *mgm* package [68].

Network comparison and bridge centrality

To examine differences between the trauma groups, pairwise Network Comparison s (NCTs) were conducted (1,000 permutations) to evaluate significant differences in (a) overall network structure, (b) global strength, (c) individual edge weights, and (d) node centrality [69]. Edgewise p-values were treated as exploratory and interpreted with caution; inference focused on global strength and overall structure. To identify nodes connecting different theoretical constructs, a bridge centrality analysis was performed using the networktools package. Four a priori communities were defined: Reflective Functioning (RF), Epistemic Trust (ET), Narcissistic Traits (NAR), and Personality Functioning (LPFS). Bridge centrality metrics were calculated, and their stability was confirmed through case-dropping bootstrapping.

Finally, network visualization was generated using the Fruchterman-Reingold algorithm. Readers are cautioned that while this algorithm positions strongly connected nodes closer together to enhance readability, the specific spatial layout should not be interpreted as a precise representation of latent geometric distances [70].

Results

Descriptive statistics for the nine psychological variables included in the network analyses are presented in Table 1. All variables were within acceptable ranges for skewness and kurtosis. Bivariate correlations for all study variables are presented in Table 2.

Trauma profiles

To determine the optimal number of trauma profiles, a series of Latent Profile Analyses were conducted on the five standardized CTQ subscale scores, and models with one to nine profiles were compared. Models were evaluated using the Bayesian Information Criterion (BIC), where higher values indicate better model fit. A summary of the best-fitting models showed that a five-profile solution with varying volume, equal shape, and diagonal orientation (VEI,5) had the highest absolute BIC value (BIC = -3479.96). However, an examination of the BIC plot (see Fig. 1) revealed a notable "elbow" at the three-component mark, after which the rate of improvement in model fit diminished considerably for most model types. Therefore, in line with the principle of parsimony and the visual information from the elbow plot, the three-profile

Table 1 Descriptive statistics for all study variables

Variable	M	SD	Skewness	Kurtosis
CTQ_EMOAB	9.12	4.24	1.08	0.45
CTQ_PHYAB	6.01	2.40	3.23	11.79
CTQ_SEXAB	5.56	2.13	5.00	28.30
CTQ_EMONEG	10.54	4.31	0.70	-0.05
CTQ_PHYNEG	6.42	2.11	2.27	6.22
SELF	14.46	4.22	-0.01	-0.69
INTER	11.93	3.20	0.24	-0.10
NV	2.22	0.77	-0.02	0.02
NG	2.41	0.68	-0.02	0.11
rfqU	3.35	1.24	0.26	-0.49
rfqC	3.89	1.23	-0.04	-0.40
TRUST	4.84	1.06	-0.37	0.01
MISTRUST	3.75	1.06	-0.04	-0.08
CREDULITY	2.92	1.21	0.49	-0.18

Note. $N = 1081$. *M* and *SD* represent the mean and standard deviation, respectively. CTQ_EMOAB = Emotional Abuse; CTQ_PHYAB = Physical Abuse; CTQ_SEXAB = Sexual Abuse; CTQ_EMONEG = Emotional Neglect; CTQ_PHYNEG = Physical Neglect; SELF = Self-Impairment; INTER = Interpersonal Impairment; NV = Narcissistic Vulnerability; NG = Narcissistic Grandiosity; rfqU = Uncertainty about Mental States; rfqC = Certainty about Mental States; TRUST = Epistemic Trust; MISTRUST = Epistemic Mistrust; CREDULITY = Epistemic Credulity

solution with varying volume, equal shape, and varying orientation (VEV,3; BIC = -4980.22) was selected as the optimal model, offering the best balance of model fit, simplicity, and theoretical interpretability.

The LPA identified three distinct profiles, labeled according to their patterns of scores on the CTQ subscales (see Fig. 2): Low Trauma Exposure ($n = 199$), marked by scores consistently below the sample mean across all five trauma subscales. Emotional Trauma ($n = 607$), characterized by scores near the sample mean with a slight increase in Emotional Neglect. Complex Trauma ($n = 275$), characterized by scores significantly above the sample mean on all trauma subscales, particularly Emotional Abuse, Emotional Neglect, and Physical Neglect.

A series of one-way ANOVAs was performed to validate these profiles against the nine psychological variables. The results showed statistically significant differences among groups for seven of the nine variables (see Table 3). Post-hoc comparisons using Tukey's HSD (see Supplementary Table S1) revealed a clear gradient for most variables, with the Complex Trauma group exhibiting the highest levels of distress and impairment, followed by the Emotional Trauma group, and then the Low Trauma Exposure group (see Supplementary Figure S1 for distributions). Post-hoc comparisons indicated that mistrust was highest in the emotional trauma group, whereas credulity was highest in the complex trauma group.

Table 2 Bivariate correlations for all study variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. CTQ_EMOAB	—													
2. CTQ_PHYAB	0.575***	—												
3. CTQ_SEXAB	0.241***	0.307***	—											
4. CTQ_EMONEG	0.695***	0.381***	0.176***	—										
5. CTQ_PHYNEG	0.487***	0.441***	0.386***	0.553***	—									
6. NG	0.122***	0.047	0.033	0.062*	0.101***	—								
7. NV	0.249***	0.103***	0.037	0.183***	0.142***	0.609***	—							
8. SELF	0.319***	0.169***	0.043	0.273***	0.158***	0.326***	0.631***	—						
9. INTER	0.264***	0.149***	0.075*	0.198***	0.172***	0.219***	0.566***	0.528***	—					
10. rfqU	0.302***	0.162***	0.071*	0.208***	0.167***	0.310***	0.563***	0.655***	0.511***	—				
11. rfqC	0.084**	0.055	0.022	0.069*	0.067*	0.407***	0.133***	−0.011	−0.079*	0.059	—			
12. TRUST	−0.009	−0.020	−0.016	−0.163***	−0.064*	0.166***	0.038	−0.010	−0.101***	0.065*	0.060*	—		
13. MISTRUST	0.284***	0.165***	0.077*	0.198***	0.172***	0.297***	0.575***	0.466***	0.474***	0.475***	0.121***	−0.107**	—	
14. CREDULITY	0.232***	0.172***	0.089**	0.115***	0.175***	0.253***	0.454***	0.412***	0.371***	0.472***	−0.010	0.181***	0.444***	—

Note. $N = 1081$. CTQ_EMOAB = Emotional Abuse; CTQ_PHYAB = Physical Abuse; CTQ_SEXAB = Sexual Abuse; CTQ_EMONEG = Emotional Neglect; CTQ_PHYNEG = Physical Neglect; NG = Narcissistic Grandiosity; NV = Narcissistic Vulnerability; SELF = Self-Impairment; INTER = Interpersonal Impairment; rfqU = Uncertainty about Mental States; rfqC = Certainty about Mental States; TRUST = Epistemic Trust; MISTRUST = Epistemic Mistrust; CREDULITY = Epistemic Credulity. * $p < .05$. ** $p < .01$. *** $p < .001$

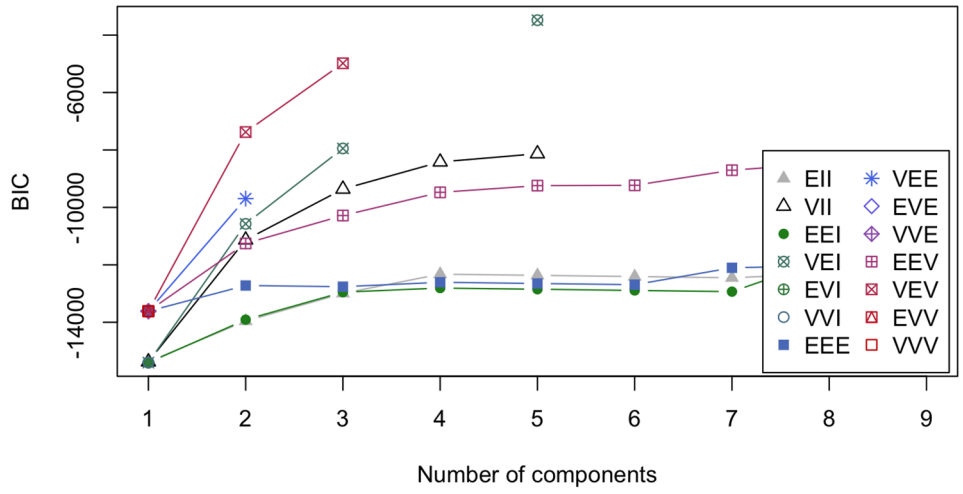

Fig. 1 Model fit comparison for Latent Profile Analysis (LPA) using the Bayesian Information Criterion (BIC). *Note.* The plot displays Bayesian Information Criterion (BIC) values for Latent Profile Analysis (LPA) models with one to nine profiles. Higher BIC values indicate better model fit. Different symbols represent different covariance structures tested by the mclust package. A notable "elbow" is visible at the three-component mark, after which the rate of improvement in model fit diminishes, supporting the selection of a three-profile solution based on the principle of parsimony

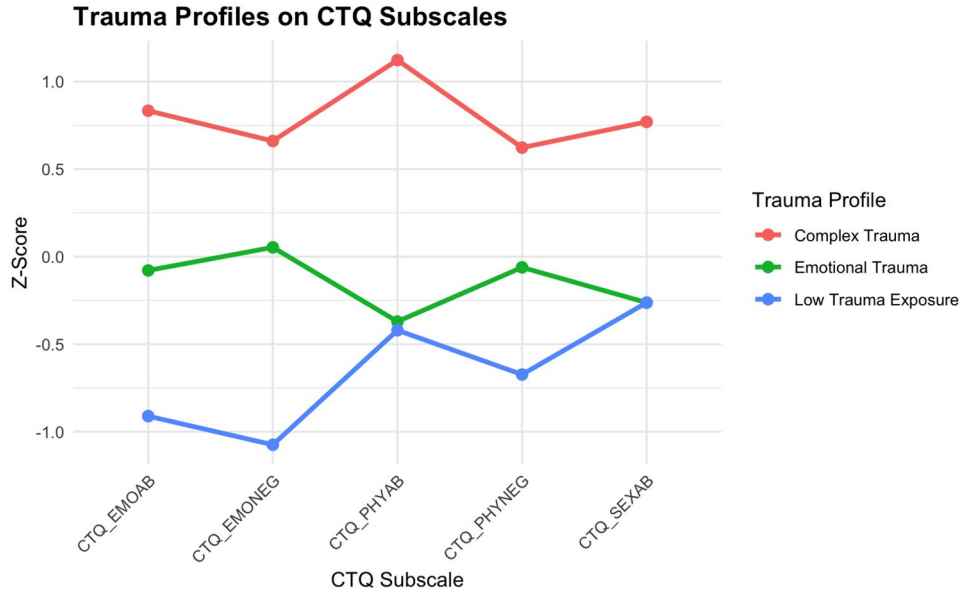

Fig. 2 Mean standardized scores on the Childhood Trauma Questionnaire (CTQ) subscales for the three latent profiles. Note. The figure displays the mean standardized scores (Z-scores) on the five subscales of the Childhood Trauma Questionnaire (CTQ-SF) for each of the three latent profiles. A Z-score of 0 represents the sample average for that subscale. Sample sizes for the profiles were: Complex Trauma ($n = 275$), Emotional Trauma ($n = 607$), and Low Trauma Exposure ($n = 199$)

Network structure in the full sample

A Gaussian Graphical Model (GGM) of the nine psychological variables was estimated for the entire sample ($N = 1{,}081$). The resulting network is depicted in Fig. 3. The estimation procedure yielded a dense network, with 86.1% of all possible undirected edges present (31 out of 36 possible).

Despite the network's density, stability, and accuracy, analyses revealed excellent robustness. Non-parametric bootstrapping (1,000 resamples) showed that edge-weight estimates were accurate, with generally narrow 95% confidence intervals (see Figure S2 in Supplementary Materials). Furthermore, case-dropping bootstrap analysis demonstrated a high degree of stability for the centrality indices; the Correlation Stability (CS) coefficient was 0.75 for Strength and Expected Influence, indicating a highly reliable ordering of nodes.

Node predictability (R^2), the variance in a node explained by its neighbors, ranged from 0.13 to 0.68. The most predictable node was Vulnerable Narcissism (NV)

Table 3 Summary of one-way ANOVAs comparing psychological variables across trauma profiles

Variable	df	F	η^2
rfqU	2, 1078	36.50***	0.063
rfqC	2, 1078	1.95	0.004
TRUST	2, 1078	2.63	0.005
MISTRUST	2, 1078	25.63***	0.045
CREDULITY	2, 1078	26.62***	0.047
NV	2, 1078	19.64***	0.035
NG	2, 1078	3.90*	0.007
SELF	2, 1078	42.30***	0.073
INTER	2, 1078	18.89***	0.034

Note. df = degrees of freedom. η^2 = eta-squared. * $p < .05$. ** $p < .01$ *** $p < .001$

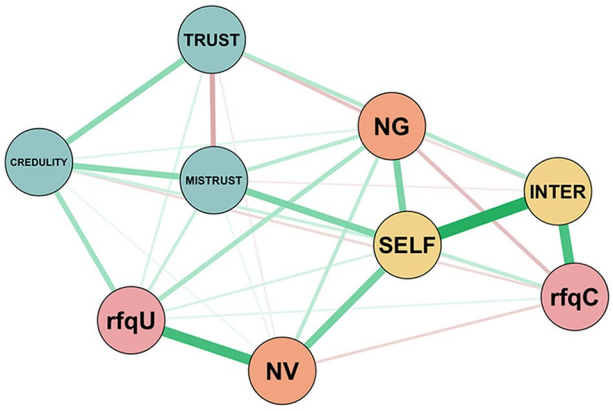

Fig. 3 Psychological network for the full sample ($N = 1,081$). *Note.* Each node represents a psychological variable. Edges represent regularized partial correlations. Green edges indicate positive correlations, and red edges indicate negative correlations. The thickness of an edge corresponds to its strength. Node colors represent a priori theoretical communities

(R^2 = 0.68), followed by Self-Impairment (SELF) (R^2 = 0.53) and Uncertainty (rfqU) (R^2 = 0.51). The least predictable node was Trust (TRUST) (R^2 = 0.13). An examination of centrality indices (see Fig. 4) confirmed that NV, SELF, and rfqU were the most influential nodes in the network. Detailed centrality metrics are provided in Supplementary Table S2, and predictability values are in Supplementary Table S3.

Bridge centrality in the full-sample network

To identify nodes that serve as key connectors between different conceptual domains, a bridge centrality analysis was conducted on the full-sample network. Four a priori communities were defined based on the measures: Reflective Functioning (RF), Epistemic Trust (ET), Narcissistic Traits (NAR), and Personality Functioning (LPFS). Bridge centrality analysis identified narcissistic vulnerability (NV) as having the highest Bridge Strength (1.00) and Uncertainty about mental states (rfqU) as having the highest Bridge Expected Influence (0.98). This indicates that while NV is most strongly connected to other communities in absolute terms, rfqU exerts the strongest influence across domains. Thus, NV showed the strongest absolute cross-community connectivity, whereas rfqU exerted the strongest directional influence across communities. The stability of these bridge centrality metrics was excellent. A case-dropping bootstrap analysis (1,000 resamples) yielded a Correlation Stability (CS) coefficient of 0.75 for both bridge strength and bridge expected influence. Detailed bridge centrality metrics are provided in Supplementary Table S4, and the results are visualized in Supplementary Figure S3.

Subgroup networks and comparisons

Separate networks were estimated for each of the three trauma subgroups. The stability of the centrality indices was assessed for each network. The network for the Low Trauma Exposure group ($n = 199$) showed adequate stability (*CS*-coefficient = 0.59). The networks for the Emotional Trauma group ($n = 607$) and the Complex Trauma group ($n = 275$) were stable to highly stable (*CS*-coefficients = 0.75 and 0.67, respectively). The three subgroup networks, plotted on a shared layout to facilitate visual comparison, are presented in Fig. 5.

Pairwise Network Comparison Tests (NCTs) were conducted to test for differences between the three networks. The analyses revealed that the primary structural differences existed between the Low Trauma group and the two high-trauma groups.

Low trauma vs. Emotional trauma The overall network structure did not differ significantly between these groups ($p = .427$). However, the Global Strength of the Emotional Trauma network was significantly higher than that of the Low Trauma network (4.19 vs. 2.82, $p = .020$), indicating a more densely interconnected system. The strength centrality of MISTRUST ($p = .010$), rfqC ($p = .033$), and INTER ($p = .048$) also differed significantly between the groups.

Emotional trauma vs. Complex trauma The networks of the two high-trauma groups were highly similar. There were no significant differences in overall network structure ($p = .930$), Global Strength ($p = .817$), or any node centrality measure. Only two individual edges, TRUST–NV and rfqU–NG, differed significantly between the groups.

Low trauma vs. Complex trauma This comparison revealed the most substantial differences. The overall network structure was significantly different between the groups ($p = .044$). The Global Strength of the Complex Trauma network was significantly higher than the Low Trauma network (4.05 vs. 2.82, $p = .020$). At the edge level, the connection between TRUST and CREDULITY was highly significantly different ($p = .006$). The strength

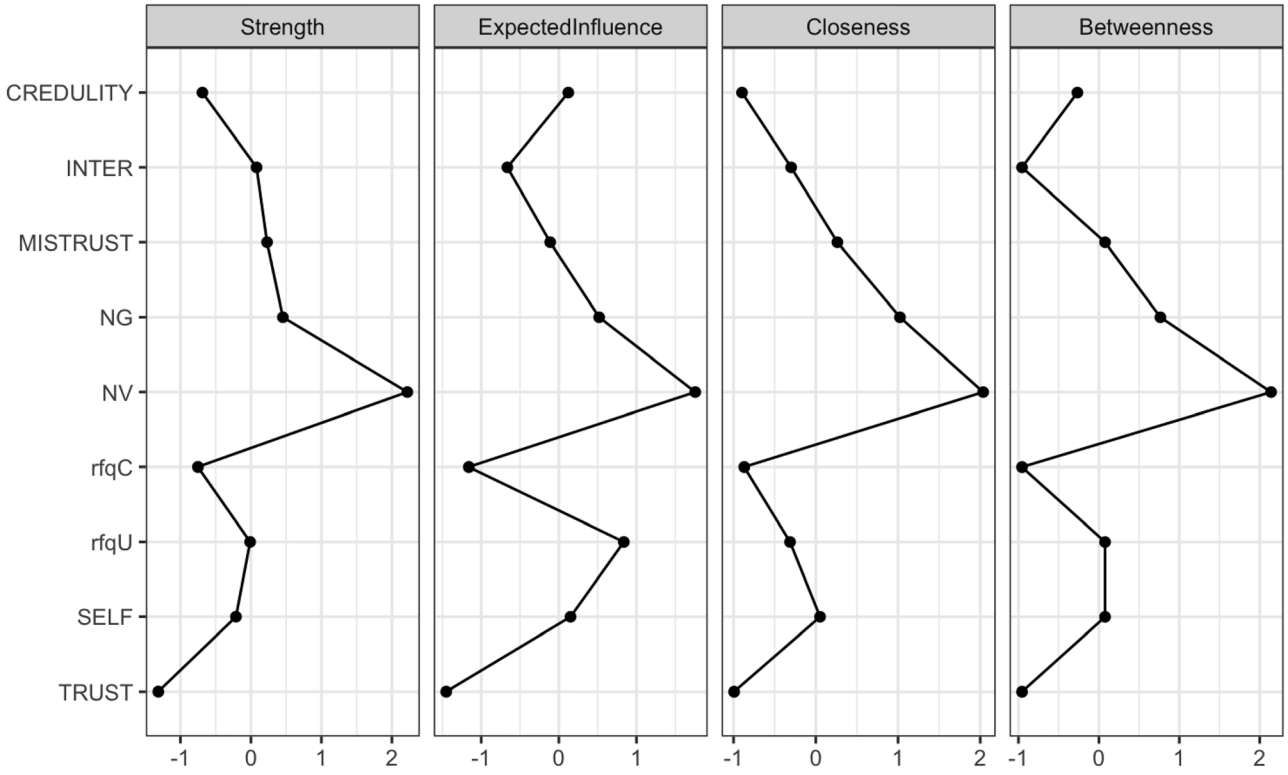

Fig. 4 Standardized Centrality Indices for the Full-Sample Network. *Note.* The plot displays four standardized (z-scored) centrality metrics for each node in the full-sample network. Higher values on the x-axis indicate greater centrality or influence

centrality of CREDULITY was also significantly different between the groups (p = .034).

A complete summary of the Network Comparison Test results is provided in Supplementary Table S5.

Discussion

The primary aim of this study was to evaluate the structural configuration of core personality pathology, mentalizing processes, and epistemic stances when modeled as a unified system, and to assess whether this organization remains invariant or is modulated by trauma exposure. Our findings provide an answer to this question, revealing a dual architecture characterized by both stability and change. Specifically, by jointly modeling these three theoretically interdependent domains, we identified a stable, invariant core centered on the link between narcissistic vulnerability and self-impairment that persists regardless of adversity. Simultaneously, we found that trauma exposure significantly modulates the system, not by altering its core, but by increasing overall network density and reshaping the configuration of epistemic stances.

The latent profile analysis identified three subtypes based on the quality of adverse experiences. The low trauma group reported minimal exposure; the emotional trauma group was characterized by neglect and emotional abuse without physical trauma; and the complex trauma group showed extensive exposure to physical and sexual abuse together with neglect. Group comparisons confirmed significant differences for most variables (with a clear gradient: complex > emotional > low). The largest effects were observed for self-impairment and uncertainty about mental states, aligning with prior work linking trauma to impairments in personality functioning [19] and mentalizing [30].

These profile-level distinctions provide the foundation for interpreting how specific processes manifest in the network models. Taken together, the results can be organized around three central findings: first, an invariant core centered on the link between vulnerable narcissism and self-impairment; second, the densification of networks with trauma exposure; and third, the bridging role of uncertainty about mental states in channeling dysfunction into epistemic stances.

Pathology of the self: the invariant core of vulnerable narcissism and self-impairment

First, in the full-sample network, vulnerable narcissism and self-impairment emerged as two of the most central nodes and showed the highest levels of variance explained by their neighbors. Their connection was also among the strongest in the model. Importantly, this vulnerable narcissism–self-impairment dyad remained

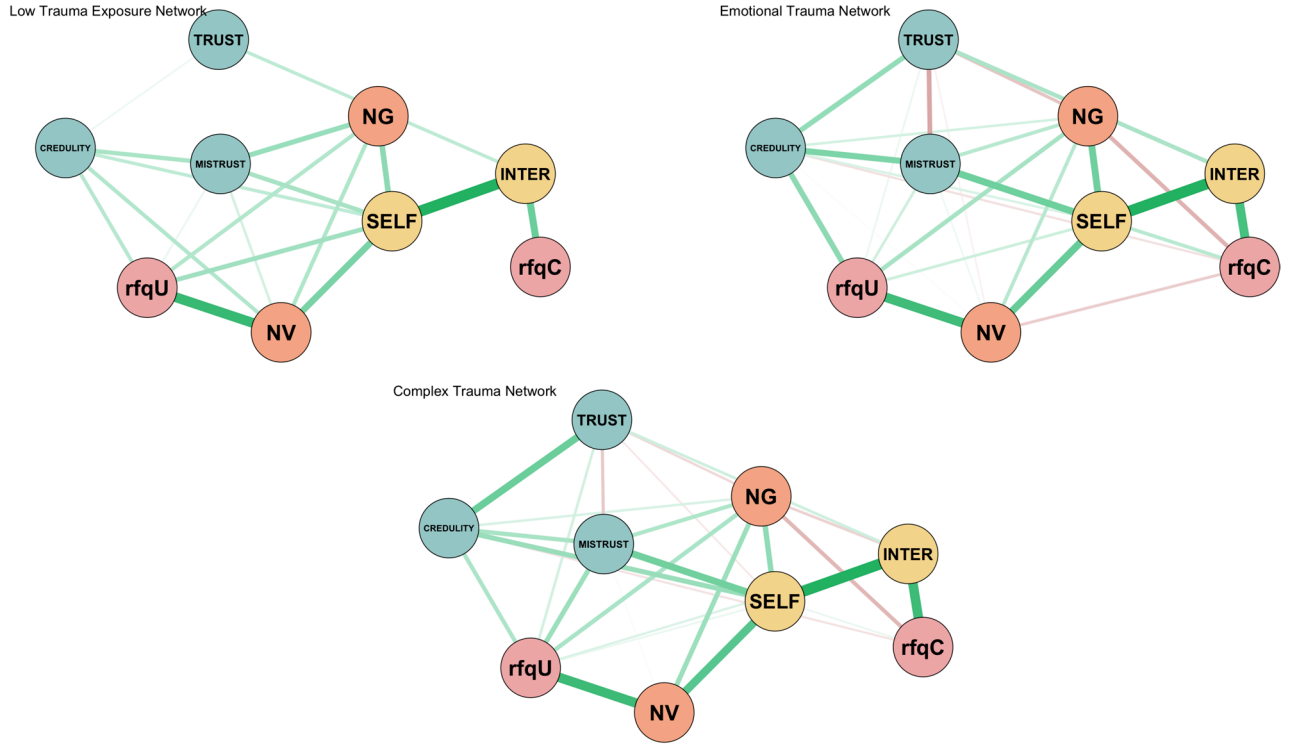

Fig. 5 Psychological Networks for the Low Trauma, Emotional Trauma, and Complex Trauma Subgroups. *Note.* Networks for the (**A**) Low Trauma Exposure ($n = 199$), (**B**) Emotional Trauma ($n = 607$), and (**C**) Complex Trauma ($n = 275$) subgroups. All networks are plotted on a shared layout to facilitate visual comparison. Green edges represent positive partial correlations; red edges represent negative partial correlations. Edge thickness corresponds to the strength of the correlation

consistent across trauma groups: no significant differences were found in the strength of this edge or in the centrality of these two nodes. These findings support the view that the dyad represents a fundamental, transtraumatic mechanism. Trauma seems to amplify its expression more than determine its origin. Conceptually, this aligns with frameworks that position personality dysfunction at the heart of general psychopathology [5–7, 10] and extends adolescent findings identifying vulnerable narcissism and self-impairment as central contributors to the general psychopathology factor [15, 46]. Within this perspective, the narcissistic vulnerability–self-impairment dyad can be understood as a stable core underlying maladaptive functioning. Although the present study did not include a direct measure of the general psychopathology factor, the consistent centrality of vulnerable narcissism and self-impairment resonates with prior evidence linking these features to *p* [5, 10, 15, 46]. This suggests that impairments in self-functioning and narcissistic vulnerability may serve as clinically meaningful proxies for broad transdiagnostic liability. Taken together, this invariant dyad seems to capture what classical and contemporary models describe as the pathology of the self, a structural disturbance in identity and self-esteem regulation that transcends trauma history [12, 13, 20, 22]. Notably, although the network included both self and interpersonal dimensions, the analysis highlighted the centrality of the self-domain. Self-Impairment showed higher predictability and bridge centrality than Interpersonal Functioning, suggesting that, for trauma-exposed emerging adults, interpersonal dysfunction may be a downstream consequence of this core structural disturbance in identity and self-regulation.

Trauma and the strengthening of networks

Second, the networks associated with trauma exposure were more densely interconnected than the low trauma network. Specifically, overall global strength was significantly higher in both the emotional trauma and complex trauma groups compared with the low trauma group, while the two high-trauma groups did not differ from one another. These results indicate that trauma is associated with increased overall network density. Although cross-sectional data limit causal conclusions, this finding aligns with theories of psychopathology as self-reinforcing systems [32]. From this perspective, a denser network suggests that psychological difficulties are less isolated and potentially more prone to activating and sustaining one another, offering a theoretical explanation for the persistence and severity of trauma-related disorders.

Uncertainty as a bridge mechanism

Third, bridge centrality analysis showed that uncertainty about mental states had the highest bridge expected influence, surpassing other nodes in its capacity to connect distinct domains. Uncertainty about mental states increased progressively from the low- to the high-trauma groups. This suggests that uncertainty may function as the primary pathway through which the vulnerable narcissism–self-impairment dyad extends its influence into other domains, particularly epistemic stances. Crucially, Certainty's peripheral role provides an important mechanistic distinction. While theoretical models often emphasize hypermentalizing (or "pseudomentalizing"), characterized by rigid, excessive certainty, as a key driver of personality pathology, our network analysis indicates that the system is structurally organized around hypomentalizing (uncertainty). This finding suggests that uncertainty about mental states occupies a more structurally cross-domain position than certainty: the primary deficit linking trauma to epistemic mistrust might not be a "distorted story" about reality but the inability to form a coherent story at all (a collapse of meaning-making). These findings converge with prior evidence identifying uncertainty about mental states as a robust transdiagnostic predictor [26, 38, 41] and align with developmental models in which mentalizing mediates the effects of maltreatment [21, 22, 25].

Beyond these three main findings, there are additional details worth noting. Trauma exposure was linked to surprising increases in both mistrust and credulity, while trust levels showed a slight decrease that wasn't statistically significant. This pattern suggests that trauma mainly affects mistrust and credulity rather than changing baseline trust. This asymmetry aligns with recent theoretical contributions [45], suggesting that trauma might not necessarily erode the fundamental capacity to trust when safety is clearly established, but rather overlays it with vigilance-based defensive strategies. Group comparisons showed a stepwise pattern where both mistrust and credulity grew with trauma severity, with mistrust most elevated in the emotional trauma group and credulity in the complex trauma group. In addition, the network comparison analysis revealed that the association between trust and credulity was significantly stronger in the complex trauma group compared with the low trauma group. This suggests that under conditions of severe trauma, the boundary between adaptive trust and maladaptive credulity becomes blurred, leaving individuals more prone to uncritical acceptance of information.

Taken together, these results indicate that trauma disrupts the regulation of epistemic stances, producing a paradoxical pattern in which individuals are simultaneously more likely to reject potentially useful information and yet remain vulnerable to persuasion. Prior research has described this paradox [44, 45, 59], and the present study extends it by showing trauma-specific profiles: mistrust predominates in emotional trauma, whereas credulity is more pronounced in complex trauma [46, 51, 71].

These distinctions also point to different adaptive strategies under adversity. In the emotional trauma group, mistrust emerged as central, consistent with epistemic withdrawal as a protective response to unpredictable caregiving environments [36, 40]. By contrast, in the complex trauma group, credulity assumed a more prominent role, suggesting a reliance on external sources of information in contexts marked by coercion and fear of abandonment [51]. Thus, while trauma amplifies dysfunction across profiles, the specific way it distorts epistemic stances may reflect different attempts to adapt to hostile or inconsistent relational contexts.

The identification of an invariant narcissism–self-impairment core, the bridging role of uncertainty about mental states, and trauma-specific patterns in epistemic stances have clear clinical importance. These findings suggest that interventions may benefit from stabilizing self-functioning and addressing narcissistic vulnerability, which appear to constitute the stable core of dysfunction. Approaches grounded in personality functioning frameworks (e.g., Criterion A of the DSM-5 Alternative Model) may be particularly well suited for this purpose, as they target broad impairments in identity, self-direction, and intimacy [12, 13]. Mentalization-based interventions [35, 42] are especially relevant for reducing uncertainty about mental states, which emerged as the principal bridge mechanism. By strengthening reflective functioning, such approaches may buffer against the spillover of narcissistic vulnerability and self-impairment into epistemic stances and interpersonal problems.

At the same time, trauma-specific profiles point to the importance of tailoring interventions. In emotional trauma, therapeutic efforts may need to address epistemic mistrust and foster selective openness to social information. In complex trauma, by contrast, work may focus on strengthening boundaries against over-credulity and promoting critical evaluation of interpersonal input. Such tailoring resonates with emerging calls for mechanism-based, trauma-informed precision interventions in personality pathology [21, 22, 43].

Despite its strengths (large sample, robust network methods, theory-driven hypotheses), this study should be understood in light of its limitations. First, because the estimated networks were relatively dense, centrality indices may be less discriminative than in sparse symptom networks and should be interpreted as indicators of relative influence within this construct system rather than precise rank-orderings. Second, while our focus on the structural organization of core personality pathology, meaning-making processes, and epistemic stances

provided a theoretically cohesive framework, it necessarily excluded other relevant variables often linked to these domains, such as adult attachment styles or explicit emotion regulation strategies. Future research would benefit from expanding this network to examine how these broader regulatory systems intersect with the specific mechanisms identified in the present study. Similarly, while we prioritized the certainty-uncertainty axis to capture this specific dimension of mentalizing, we recognize that reflective functioning is a multidimensional construct organized around additional polarities (e.g., automatic vs. controlled, internal vs. external; [21, 22]). Future research should use comprehensive batteries to examine whether other mentalizing dimensions occupy distinct positions within the network.

Given that participants were recruited via non-probability online snowball sampling, the sample may not be representative of the broader population of emerging adults. Therefore, findings should be interpreted as reflecting structural associations among constructs within this sample rather than as population-level estimates. Furthermore, the study's cross-sectional design prevents causal inferences about the role of narcissistic vulnerability, self-impairment, and uncertainty in psychopathology. Reliance on self-report measures may have inflated associations through shared method variance, and some scales, particularly the Physical Neglect subscale, showed modest reliability. Moreover, the sample was largely non-clinical and predominantly female (72.4%), which may limit the generalizability of the findings to clinical populations or to the study of gender-specific trauma responses. Future research should use more balanced and clinically diverse samples to determine whether the identified network configurations remain consistent across demographic groups. Additionally, specific sociodemographic variables, such as ethnicity, socioeconomic status, and IQ, were not assessed, preventing a more detailed characterization of the sample's background. Also, although bootstrapping indicated adequate stability, network edges are sample-specific estimates and should be interpreted as patterns of conditional association rather than causal pathways. We also acknowledge that Bridge Centrality estimates are contingent on the specific a priori assignment of nodes to communities. Future research should examine whether the narcissism–self-impairment–uncertainty triad predicts longitudinal outcomes, such as the onset or maintenance of psychopathology. Intensive longitudinal designs are required to capture daily fluctuations in these mechanisms, enabling researchers to test whether dynamic shifts in reflective functioning and epistemic stances mediate responses to daily stressors. Experimental paradigms could also clarify causality by manipulating epistemic trust under controlled conditions of attachment threat or stress. Extending this work to clinical samples and across cultures will be essential for establishing the universality and clinical utility of these mechanisms. A further limitation concerns the interpretation of personality dysfunction as a proxy for the general psychopathology factor. While prior work has established strong empirical and theoretical overlap between the two constructs, this study did not directly operationalize p through broad symptom batteries or latent factor modeling. Therefore, conclusions regarding *p* should be viewed as interpretative extensions rather than direct empirical validations. Finally, we acknowledge that the analysis plan was not pre-registered; therefore, the model selection procedures (LPA) and network estimation should be interpreted as exploratory and hypothesis-generating rather than confirmatory.

Conclusions

Overall, this study delineates a coherent process model in which vulnerable narcissism and self-impairment constitute a stable core of dysfunction, uncertainty about mental states functions as the key bridge, and trauma is associated with distinct network densities and configurations, and specific epistemic stance profiles. Together, these findings offer theoretical insights into transdiagnostic models of the *p*-factor, proposing that its structural core may not be merely statistical but rather deeply rooted in the interplay among the pathology of the self, failures in mentalizing, and epistemic trust.

Finally, the study findings underscore the importance of multilevel prevention strategies. Our network analysis highlights self-dysfunction and uncertainty about mental states as highly central features of maladaptive networks, suggesting that interventions focusing on self-identity and mentalization could be promising leverage points for addressing trauma-related epistemic dysregulation.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40479-026-00335-5.

Supplementary Material 1

Supplementary Material 2

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Author contributions

I.M.A.B. and K.E. conceptualized the study. I.M.A.B. designed the methodology, performed the formal analyses, and wrote the original draft of the manuscript. A.F., N.C., F.L., L.P., and K.E. contributed to reviewing and editing the manuscript. K.E. and I.M.A.B. supervised the study. All authors read and approved the final manuscript.

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Data availability
The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request. All analysis scripts and supplementary materials are provided in the online Supplementary Information.

Declarations

Ethics approval and consent to participate
The study was approved by the Ethics Committee of the University of Milano-Bicocca and complied with the Declaration of Helsinki. Informed consent was obtained from all participants prior to participation.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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