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Normative and Maladaptive Personality Traits in Borderline Personality Disorder: A Comparative and Hierarchical Analysis of HEXACO and PID-5

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Abstract

Background: Dimensional models of personality pathology invite the question of how normative and maladaptive trait systems jointly characterize borderline personality disorder (BPD). This study examined how the HEXACO model of personality and the DSM-5 Alternative Model for Personality Disorders trait system, operationalized with the Personality Inventory for DSM–5, differentiate individuals with BPD from mentally healthy control (HC) individuals, both separately and jointly.

Methods: Data from two assessment waves of a large clinical research program were combined into a final sample of 575 participants (233 with BPD, 342 HC). Logistic regression models were used to examine domain- and facet-level associations with diagnostic status, and predictive performance was evaluated using leave-one-out cross-validation. A Bass-Ackwards principal components analysis was conducted to examine the joint hierarchical structure of HEXACO and PID-5 items.

Results: Compared with HC, individuals with BPD showed lower HEXACO Extraversion, Agreeableness, and Conscientiousness, and higher Emotionality, as well as higher scores on all PID-5 domains, particularly Negative Affectivity and Disinhibition. In the combined domain model, low Extraversion and high PID-5 Negative Affectivity, Disinhibition, and Psychoticism uniquely predicted BPD status. At the facet level, low Social Self-Esteem (HEXACO) and high Emotional Lability (PID-5) were especially discriminative. Joint item analyses indicated a dominant general maladaptivity component, with PID-5 items loading positively and HEXACO items largely loading inversely, alongside more specific lower-order trait dimensions.

Conclusions: These findings suggest that BPD is characterized by both broad general personality pathology and a more specific trait profile involving affective instability, interpersonal insecurity, irritability, and reduced behavioral control. The findings support integrating normative and maladaptive trait models in the dimensional description of BPD.

Background

Personality disorder nosology is undergoing a fundamental reorganization from categorical types toward dimensional descriptions of severity and trait configuration. In ICD-11, all former personality disorder categories were replaced by a single personality disorder diagnosis specified by severity and chronicity of impairments in self- and interpersonal functioning, which can be qualified with five maladaptive trait domains (World Health Organization, 2019). The categorical diagnosis of Borderline Personality Disorder (BPD) was retained in ICD-11 as an optional Borderline pattern qualifier, reflecting the unusually extensive research base on BPD and the availability of well-evaluated disorder-specific treatments that support clinical utility (Herpertz et al., 2017; Tyrer et al., 2019). In parallel, the DSM-5 Alternative Model of Personality Disorders (AMPD), included in Section III of DSM-5 as a research model, combines impairments in personality functioning with 25 maladaptive trait facets organized into five domains and measured with the Personality Inventory for DSM-5 (PID-5; American Psychiatric Association, 2013;

Krueger et al., 2012). Although only ICD-11 is formally implemented, both systems have fundamentally reshaped empirical research on personality pathology.

The shift toward dimensional and hybrid approaches to personality disorder diagnosis was driven by persistent shortcomings of categorical models, including high comorbidity, marked heterogeneity within diagnoses, and arbitrary diagnostic thresholds (Hopwood, 2018; Hopwood et al., 2018; Widiger & McCabe, 2020; Zimmermann et al., 2019). In both ICD-11 and AMPD, personality pathology is no longer described solely in terms of discrete disorder categories, but in terms of broader dysfunction and trait-based variation. At the same time, the two systems are not identical. The AMPD is a hybrid model that combines impairments in personality functioning with maladaptive trait domains and facets, whereas ICD-11 distinguishes severity of personality disorder and optional trait qualifiers within a different diagnostic framework.

Across both systems, an important idea is that overall severity of personality pathology can be distinguished conceptually from stylistic trait expressions that shape how this pathology is manifested in affect regulation and interpersonal behavior. Empirical work has shown that maladaptive traits explain variance in symptom burden and interpersonal problems beyond the level of personality functioning alone (Few et al., 2013; Hopwood et al., 2012; Williams & Simms, 2016). However, whether this incremental utility persists across contexts remains debated. Wright et al. (2022) argue that personality disorders are fundamentally interpersonal disorders, suggesting that general severity of dysfunction may capture most clinically relevant variance. In contrast, Widiger et al. (2023) emphasize that maladaptive traits provide indispensable information about how dysfunction manifests and should therefore be retained alongside severity. Recent ecological momentary assessment studies further support the incremental relevance of maladaptive traits in ecologically valid contexts, demonstrating that trait domains account for meaningful variance in daily affective and interpersonal dynamics beyond general personality pathology (Kaurin et al., 2023; Ringwald et al., 2021).

Historically, the AMPD trait domains were explicitly modeled to align with the Five-Factor Model (FFM) of personality (Krueger et al., 2012; Widiger & McCabe, 2020), with Negative Affectivity paralleling Neuroticism, Detachment reflecting low Extraversion, Antagonism corresponding to low Agreeableness, and Disinhibition aligning with low Conscientiousness. Psychoticism shows more complex and debated relations to Openness (Gore & Widiger, 2013; Ashton et al., 2012). A large body of research demonstrates robust convergence between PID-5 domains and FFM traits across community and clinical samples (Crego et al., 2015; Gore & Widiger, 2013; Thimm et al., 2016). Thus, maladaptive traits can be conceptualized as extreme or dysfunctional variants of general personality dimensions.

In addition to the FFM, the HEXACO model of personality can offer an informative framework with regard to interpersonal functioning. Like the FFM, HEXACO emerged from lexical research but identified six broad factors: Honesty–Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness (Ashton & Lee, 2007; Lee & Ashton, 2008). The remaining HEXACO factors, Emotionality, Extraversion, Openness to Experience, and Conscientiousness, largely align with their corresponding

FFM counterparts, though subtle conceptual differences exist (e.g., Emotionality partially overlaps with but is not identical to FFM Neuroticism). Crucially, HEXACO separates Honesty–Humility from Agreeableness. Honesty–Humility captures tendencies toward sincerity, fairness, and modesty versus exploitation and entitlement. Agreeableness captures tendencies toward patience and forgiveness versus anger proneness and retaliatory responding. This distinction enables a theoretically precise differentiation between active and reactive cooperativeness (Hilbig et al., 2013; Thielmann et al., 2014). Active cooperativeness refers to proactively acting fairly even when exploitation would be possible and is primarily associated with Honesty–Humility. Reactive cooperativeness refers to responding cooperatively when treated fairly but retaliating when treated unfairly and is primarily associated with Agreeableness.

This distinction is particularly relevant for BPD. In a nonclinical sample, Hepp et al. (2014) found that borderline features were more strongly associated with low HEXACO Agreeableness than with low Honesty–Humility, suggesting heightened anger and retaliatory tendencies rather than a primarily exploitative interpersonal style. Complementing this, Thielmann et al. (2014) demonstrated experimentally that individuals high in borderline features were not generally uncooperative. Instead, they showed reduced reactive cooperativeness, reflected in lower forgiveness and stronger retaliation following unfair treatment.

A broader body of economic game research corroborates that prosocial impairments in BPD are context-dependent rather than global. Individuals with BPD show disturbances in cooperation particularly in situations affording reciprocity and dependence under uncertainty, such as multi-round trust games or prisoner's dilemma paradigms, whereas they do not consistently exploit others in unilateral dictator contexts (Hepp & Niedtfeld, 2021; King-Casas et al., 2008; Unoka et al., 2009). Synthesizing this literature, Hepp and Niedtfeld (2021) conclude that BPD is not characterized by a generalized lack of prosociality but by specific disruptions in reciprocity, mistrust, and retaliatory responding that become expressed under particular situational affordances. These findings converge with trait-based evidence pointing toward reactive antagonism rather than primary exploitative intent.

Within maladaptive trait frameworks, BPD is typically characterized by high negative affectivity and elevations in disinhibition and some facets of antagonism, such as hostility (American Psychiatric Association, 2013; Bach et al., 2018). Studies mapping categorical BPD onto dimensional trait systems demonstrate substantial convergence between ICD-11 and DSM-5 trait domains in capturing borderline pathology (Bach et al., 2018). Notably, Bach et al. (2018) also found BPD to be associated with elevated Detachment and Psychoticism, suggesting that the trait profile of BPD may be broader than a selective elevation on Negative Affectivity and Disinhibition alone. Yet normative and maladaptive models are not redundant. Structural analyses integrating normal and abnormal personality measures indicate that HEXACO-like dimensions can be recovered from joint analyses of normative and pathological inventories, alongside additional psychoticism-related variance (Ashton et al., 2012; Ashton & Lee, 2019). This suggests shared higher-order organization, but leaves open the empirical question of how strongly

each system differentiates clinically diagnosed BPD from mentally healthy control (HC) individuals when directly compared.

A further line of research addresses the hierarchical organization of personality pathology. Bifactor and hierarchical analyses have repeatedly identified a dominant general factor of personality pathology (sometimes referred to as the p factor) that cuts across categorical personality disorder diagnoses (Sharp et al., 2015; Wright et al., 2016). Sharp et al. (2015), for instance, found that borderline criteria loaded almost exclusively on this general factor, suggesting that BPD may reflect variance that is largely shared across personality disorders rather than diagnostically specific. Whether normative trait models such as HEXACO and maladaptive systems such as the PID-5 converge on such a general dimension when their items are analyzed jointly has not yet been directly examined in a clinically characterized sample.

Taken together, the literature highlights three research gaps. First, although PID-5 domains are widely used to describe BPD dimensionally, relatively few studies have directly contrasted maladaptive trait domains with normative trait domains in predicting diagnostic group membership. Second, HEXACO-based findings on borderline features stem largely from convenience samples and dimensional self-report (Hepp et al., 2014; Thielmann et al., 2014) and require replication in clinically diagnosed individuals. Third, although substantial convergence between FFM traits and the AMPD trait model as assessed by the PID-5 has been documented (Crego et al., 2015; Gore & Widiger, 2013; Thimm et al., 2016), joint factor-analytic work also indicates non-trivial structural complexities at the facet and higher-order levels, including interstitial facets and sample-dependent solutions (Watters et al., 2019; Wright & Simms, 2014). Accordingly, it remains unclear what higher-order structure emerges when items from both systems are analyzed jointly in a clinically characterized sample including individuals with BPD (e.g., Sharp et al., 2015). Addressing these issues is consequential for dimensional PD research. If normative traits, such as low Agreeableness, were able to differentiate healthy individuals from those with a former categorical PD diagnosis, this would support broader integration of general personality models into dimensional assessment. Conversely, if PID-5 domains provide clearer or more specific discrimination, this would underscore the added value of explicitly pathological trait systems. Finally, identifying shared latent dimensions across instruments may inform harmonization efforts between the AMPD and normative trait frameworks.

The present study therefore examined the extent to which two contemporary dimensional models of personality, HEXACO and the AMPD as operationalized by the PID-5, can distinguish individuals diagnosed with BPD from HC. Specifically, we addressed three preregistered research questions to examine (1) whether the trait domains of the HEXACO and the PID-5 short form reliably predict diagnostic group membership, both separately and in a combined model that directly contrasts their relative contributions, (2) which trait facets within each instrument show the strongest differentiation between BPD and HC individuals, and (3) which higher-order latent dimensions emerge when items from both instruments are jointly factor-analyzed. By directly comparing normative and maladaptive trait frameworks within a clinically characterized sample, this study aimed to clarify their relative and shared

contributions to the dimensional characterization of BPD. Understanding which trait dimensions most strongly differentiate BPD from healthy functioning is clinically relevant because dimensional trait profiles, unlike categorical diagnoses, can inform treatment targets, track subclinical change, and capture heterogeneity within the BPD diagnosis.

Method

Participants

This study was based on secondary analyses of data collected across two assessment waves (i.e., funding periods) of a DFG-funded research group (see https://gepris.dfg.de/gepris/projekt/190034061), with recruitment taking place between June 2013 and June 2022. The parent sample included individuals with current BPD, remitted BPD, clinical control participants, and healthy controls (HCs) without a lifetime history of mental disorder. Participants were recruited via newspaper and website advertisements or referred from the outpatient unit of the Department of Psychosomatic Medicine and Psychotherapy at the Central Institute of Mental Health. For the present preregistered reanalysis, only individuals with current BPD and HCs were included. Cases with missing HEXACO-60 or PID-5-SF data were excluded listwise, and duplicate cases were removed after merging the two assessment waves.

In the first assessment wave, the eligible HC/BPD subsample comprised 305 participants, of whom 239 remained after listwise deletion. In the second assessment wave, the eligible HC/BPD subsample comprised 344 participants, of whom 338 remained after listwise deletion. After removal of two duplicate HC cases, the final analytic sample consisted of 575 participants, including 233 individuals with current BPD and 342 HCs. Demographic characteristics and group differences are reported in the Results section and Table 1.

Table 1
Demographic characteristics.

Variable	*HC (n = 342)*	*BPD (n = 233)*	*Test statistic*	*p*
Age, years	27.95 (7.49)	29.60 (8.53)	t(428.64) = 2.34	.020
Sex			$\chi^2(1) = 5.13$	.023
Female	276 (80.7%)	196 (88.3%)		
Male	66 (19.3%)	26 (11.7%)		
Nationality			$\chi^2(1) = 1.79$	.180
German	309 (91.7%)	210 (95.0%)		
Other	28 (8.3%)	11 (5.0%)		
Marital status			Fisher's exact	< .001
Single	242 (71.0%)	154 (69.7%)		
Married	70 (20.5%)	24 (10.9%)		
Cohabiting	25 (7.3%)	24 (10.9%)		
Divorced	3 (0.9%)	14 (6.3%)		
Separated	1 (0.3%)	5 (2.3%)		
Number of biological children	0.83 (0.98)	0.76 (1.13)	KS *D* = .086	.848
Educational attainment			KS *D* = .197	< .001
No qualification	2 (0.6%)	3 (1.4%)		
Lower secondary school	7 (2.1%)	19 (8.6%)		
Intermediate secondary school	64 (19.0%)	67 (30.3%)		
University entrance qualification	255 (75.7%)	123 (55.7%)		
Other	9 (2.7%)	9 (4.1%)		
Current living situation			Fisher's exact	< .001
Living alone	85 (25.4%)	83 (38.6%)		
Living with family/partner	135 (40.4%)	66 (30.7%)		
Living with parents	47 (14.1%)	27 (12.6%)		

Note. BPD = borderline personality disorder; HC = healthy controls. Continuous variables are reported as M (SD). For categorical variables, frequencies and percentages are based on available data. Valid n varied across variables because of missing demographic information, particularly for employment status. Dashes indicate cells with zero observations in the HC group.

Variable	*HC (n = 342)*	*BPD (n = 233)*	*Test statistic*	*p*
Shared flat	67 (20.1%)	34 (15.8%)		
Therapeutic shared housing/family care	—	2 (0.9%)		
Psychiatric transitional facility	—	1 (0.5%)		
No regular housing situation	—	2 (0.9%)		
Employment status			Fisher's exact	< .001
No regular employment	6 (5.0%)	24 (20.9%)		
Self-employed	5 (4.1%)	8 (7.0%)		
Employed	98 (81.0%)	49 (42.6%)		
Civil servant	12 (9.9%)	3 (2.6%)		
Early retirement	—	4 (3.5%)		
In training/education	—	27 (23.5%)		

Note. BPD = borderline personality disorder; HC = healthy controls. Continuous variables are reported as M (SD). For categorical variables, frequencies and percentages are based on available data. Valid n varied across variables because of missing demographic information, particularly for employment status. Dashes indicate cells with zero observations in the HC group.

The same exclusion criteria were applied in both assessment waves: current alcohol or drug abuse, including a positive urine toxicology screening; alcohol or drug abuse within the previous two months; alcohol or drug dependence within the previous 12 months; psychotropic medication within the previous two weeks; neurological disorders; severe medical illness; endocrine or other medical conditions with endocrine implications; and lifetime schizophrenia, schizoaffective disorder, or bipolar disorder.

Structured diagnostic interviews were administered by trained clinical psychologists who received regular supervision and training from experienced experts. Patients were included if they met DSM-IV criteria for BPD, as assessed with the International Personality Disorder Examination (IPDE; Loranger, 1999; interrater reliability $\kappa = .77$). The German version of the Structured Clinical Interview for DSM-IV (SCID-I; Wittchen et al., 1997) was used to assess exclusion criteria and Axis I comorbidity.

All participants received verbal and written information about the study procedures and provided written informed consent prior to participation. Participants were reimbursed €36 for 3 hours of participation. The parent research program was approved by the Ethics Committee of the Medical Faculty Mannheim, Heidelberg University (application no. 2011-255N-MA). Data collection was conducted in accordance with the ethical principles of the Declaration of Helsinki versions applicable during the assessment period.

Measures

The variables that were analyzed in this study were the 60-item version of the HEXACO Personality Inventory (HEXACO-60; Ashton & Lee, 2009; German version: Moshagen et al., 2014) and the reduced 100-item version of the PID-5 (PID-5-SF; Maples et al., 2015; German version: Zimmermann et al., 2014). The HEXACO assesses six broad domains: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. Each domain comprises four facets. Items are rated on a five-point Likert scale ranging from 1 to 5. HEXACO facet and domain scores were calculated as mean scores across the corresponding items.

The PID-5-SF assesses 25 maladaptive trait facets organized into five domains: Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism. Items are rated on a four-point Likert scale ranging from 0 to 3. PID-5-SF facet scores were calculated as mean scores across the four corresponding items. Domain scores were calculated according to the scoring recommendations by averaging the three facets with the strongest loadings on their respective domain (Krueger et al., 2013; Maples et al., 2015). In the first assessment wave, the original 220-item version of the PID-5 was administered (Krueger et al., 2012; German version: Zimmermann et al., 2014). For comparability across assessment waves, the items corresponding to the PID-5-SF proposed by Maples et al. (2015) were extracted from the full PID-5, and PID-5-SF facet and domain scores were calculated from these items only.

Internal consistency estimates are reported in Table S1. For PID-5 facets, α ranged from .44 to .85 in HCs and from .63 to .90 in individuals with BPD, with consistently higher estimates in the BPD group, likely reflecting greater response variance. PID-5 domain-level reliability was good to excellent in both groups (HCs: α = .77–.86; BPD: α = .80–.91). For HEXACO domains, α ranged from .65 to .76 in HCs and from .71 to .81 in individuals with BPD. Facet-level estimates were lower, particularly for two-item HEXACO facets, consistent with the structural constraints of the HEXACO-60.

Statistical Analysis

This study was preregistered as a secondary data analysis at the Open Science Framework (https://osf.io/mrhq5). All analyses were conducted in *R* (version 4.5.2), and anonymized self-report data and analytic code are publicly available at the Open Science Framework (https://osf.io/ea8s5).

Logistic regression models were used to examine associations between personality trait scores and diagnostic group membership (BPD vs. HC). The primary predictive model was specified at the domain level and included all six HEXACO domains and all five PID-5 domains simultaneously as predictors (main effects) of group membership. Because all 11 domains were entered simultaneously, each regression coefficient reflects the unique predictive contribution of that domain after adjusting for all other HEXACO and PID-5 domains in the model. This model estimated the unique contribution of each broad personality dimension while statistically adjusting for overlap between the two trait systems.

To explore more fine-grained predictive patterns and to isolate the predictive utility of each instrument independently, two additional models were estimated: one including only HEXACO facets and one including only PID-5 facets. Predictive performance of the domain-level model and the instrument-specific facet models was evaluated using leave-one-out cross-validation (LOOCV). The resulting LOOCV delta was interpreted as the cross-validated misclassification rate and thus provided an index of out-of-sample classification performance.

Finally, to investigate the joint hierarchical structure of HEXACO and PID-5 at the item level, all HEXACO-60 and PID-5-SF item responses were analyzed jointly. The suitability of the item correlation matrix for dimensionality reduction was evaluated using the Kaiser-Meyer-Olkin measure and Bartlett's test of sphericity. Principal components analysis (PCA) was then applied to the correlation matrix, and the number of components to retain was guided by three convergent criteria: the Kaiser criterion (eigenvalue > 1), visual inspection of the scree plot for a clear inflection point, and parallel analysis. A final PCA solution with varimax rotation was estimated to obtain interpretable, orthogonal components. To examine the hierarchical organization of the joint item space, a Bass-Ackwards procedure was then applied using PCA extraction and varimax rotation (Goldberg, 2006). This procedure extracted a sequence of solutions from the broadest one-component level to the final retained component solution and computed correlations between components across adjacent levels. This approach allowed us to examine how broad trait dimensions subdivided into narrower components and to identify hierarchical relations between HEXACO and PID-5 constructs. Unadjusted two-tailed p values ≤ .05 were considered statistically significant.

Results

Descriptive Results

Demographic characteristics are summarized in Table 1. Across the two assessment waves, the analytic HC/BPD subsample comprised 577 participants before duplicate removal. In the first assessment wave, 239 participants remained after listwise deletion of cases with missing HEXACO-60 or PID-5-SF data, including 96 individuals with BPD and 143 HCs. In this wave, HCs had a mean age of 26.78 years (SD = 7.97), 82% were female, and 91% reported German nationality; individuals with BPD had a mean age of 29.00 years (SD = 8.64), 84% were female, and 98% reported German nationality. In the second assessment wave, 338 participants remained after listwise deletion, including 137 individuals with BPD and 201 HCs. In this wave, HCs had a mean age of 28.77 years (SD = 7.02), 80% were female, and 92% reported German nationality; individuals with BPD had a mean age of 29.99 years (SD = 8.48), 91% were female, and 93% reported German nationality. After removal of two duplicate HC cases, the final sample consisted of 575 participants, including 233 individuals with current BPD and 342 HCs.

In the final sample, the BPD group was slightly older than the HC group, with a mean age of 29.60 years (SD = 8.53) compared with 27.95 years (SD = 7.49), respectively, t(428.64) = 2.34, p = .020. Participants recorded as female were overrepresented in both groups, but especially among individuals with BPD.

Among participants with available data on sex, 196 BPD participants (88.3%) were female and 26 (11.7%) were male. In the HC group, 276 participants were female (80.7%) and 66 were male (19.3%). The sex distribution differed significantly between groups, $\chi^2(1) = 5.13$, $p = .023$.

Most participants in both groups reported German nationality. Among participants with available data on nationality, 210 BPD participants (95.0%) reported German nationality and 11 (5.0%) reported another nationality. In the HC group, 309 participants reported German nationality (91.7%) and 28 reported another nationality (8.3%). Nationality did not differ meaningfully between groups, $\chi^2(1) = 1.79$, $p = .180$. The number of biological children was also comparable between groups, with means of 0.76 (SD = 1.13) in the BPD group and 0.83 (SD = 0.98) in the HC group, KS $D = 0.086$, $p = .848$.

Educational attainment differed significantly between groups, KS $D = .197$, $p < .001$. Among participants with available data on educational attainment, 123 BPD participants (55.7%) reported a university entrance qualification, 67 (30.3%) reported an intermediate secondary school certificate, 19 (8.6%) reported a lower secondary school certificate, 9 (4.1%) reported another qualification, and 3 (1.4%) reported no qualification. In the HC group, 255 participants (75.7%) reported a university entrance qualification, 64 (19.0%) reported an intermediate secondary school certificate, 7 (2.1%) reported a lower secondary school certificate, 9 (2.7%) reported another qualification, and 2 (0.6%) reported no qualification.

Marital status also differed between groups, Fisher's exact $p < .001$. Most participants in both groups were single, including 154 individuals with BPD (69.7%) and 242 HCs (71.0%). However, marriage was more common among HCs (n = 70, 20.5%) than among individuals with BPD (n = 24, 10.9%). By contrast, divorce and separation were more frequent in the BPD group. Fourteen individuals with BPD were divorced (6.3%) and five were separated (2.3%), compared with three divorced HCs (0.9%) and one separated HC (0.3%). Cohabitation was reported by 24 individuals with BPD (10.9%) and 25 HCs (7.3%).

Current living situation differed significantly between groups, Fisher's exact $p < .001$. Individuals with BPD more often lived alone than HCs, with 83 individuals with BPD (38.6%) and 85 HCs (25.4%) reporting this living situation. Living with family or a partner was more common among HCs (n = 135, 40.4%) than among individuals with BPD (n = 66, 30.7%). Similar proportions lived with parents (BPD: n = 27, 12.6%; HC: n = 47, 14.1%) or in a shared flat (BPD: n = 34, 15.8%; HC: n = 67, 20.1%). A small number of individuals with BPD reported therapeutic shared housing or family care (n = 2, 0.9%), a psychiatric transitional facility (n = 1, 0.5%), or no regular housing situation (n = 2, 0.9%); these categories were not observed in the HC group.

Employment status differed significantly between groups, Fisher's exact $p < .001$, but missingness was substantial for this variable and these results should therefore be interpreted with caution. Among participants with available employment data, regular employment was more common in the HC group, reported by 98 HCs (81.0%) and 49 individuals with BPD (42.6%). No regular employment was more frequent among individuals with BPD (n = 24, 20.9%) than among HCs (n = 6, 5.0%). Being in training or education was reported by 27 individuals with BPD (23.5%) and by no HCs. Self-employment was

reported by eight individuals with BPD (7.0%) and five HCs (4.1%), whereas civil-servant status was more frequent among HCs (n = 12, 9.9%) than among individuals with BPD (n = 3, 2.6%). Early retirement was reported by four individuals with BPD (3.5%), but not by HCs.

- Table 1 -

Highly systematic differences emerged between individuals with BPD and HC across both normative personality traits (HEXACO) and maladaptive personality domains (PID-5; see Fig. 1 and Table 2). In the HEXACO model, individuals with BPD showed substantially lower levels of Extraversion (d = − 2.14), Agreeableness (d = − 1.43), Conscientiousness (d = − 0.91), and Honesty–Humility (d = − 0.47) as well as substantially higher levels of Emotionality (d = 1.18) than HCs. No meaningful group difference was observed for Openness to Experience (d = − 0.02, p = .800). Descriptively, effect sizes were numerically larger for maladaptive personality traits assessed with the PID-5 (|d| range: 0.86–3.33) than for HEXACO domains (|d| range: 0.02–2.14), though no formal test of this difference was conducted. Compared to HC, individuals with BPD showed substantially higher levels of Negative Affectivity (d = 3.33), Disinhibition (d = 2.64), Detachment (d = 2.40), Psychoticism (d = 2.55), and Antagonism (d = 0.86). The magnitude of these effects indicates a clear separation of the two groups on several pathological trait dimensions. Comparison with published reference data (see Table 2) indicated that HC scores on HEXACO domains were largely consistent with values reported for large German-speaking community samples (Wiechers & Kandler, 2025; Moshagen et al., 2018). By contrast, HC scores on all PID-5 domains fell substantially below published community norms (Rek et al., 2021; Roskam et al., 2015), whereas BPD scores considerably exceeded these reference values across all five domains.

Table 2

Descriptive Data of HEXACO and PID-5 Domains and Reference Values from the Literature.

Trait	HC *M* (SD)	BPD *M* (SD)	Cohen's d	Wiechers & Kandler (2025) *M* (SD)	Moshagen, Hilbig, & Zettler (2018) *M* (SD)	Rek et al. (2021) *M* (SD)	Roskam et al. (2015) *M* (SD)
HEXACO							
Honesty-Humility	3.67 (0.56)	3.37 (0.76)	**−0.47**	3.60 (0.63)	3.53 (0.62)		
Emotionality	2.97 (0.54)	3.63 (0.58)	**1.18**	3.19 (0.62)	3.11 (0.56)		
Extraversion	3.70 (0.49)	2.51 (0.64)	**−2.14**	3.51 (0.59)	3.26 (0.58)		
Agreeableness	3.35 (0.45)	2.59 (0.63)	**−1.43**	3.16 (0.55)	3.15 (0.48)		
Conscientiousness	3.78 (0.48)	3.27 (0.66)	**−0.91**	3.57 (0.59)	3.60 (0.49)		
Openness	3.52 (0.62)	3.51 (0.77)	−0.02	3.44 (0.63)	3.22 (0.68)		
PID-5							
Antagonism	0.34 (0.36)	0.77 (0.63)	**0.86**			0.52 (0.43)	0.68 (0.41)
Detachment	0.27 (0.33)	1.33 (0.56)	**2.40**			0.70 (0.45)	0.74 (0.41)
Disinhibition	0.38 (0.33)	1.50 (0.53)	**2.64**			0.67 (0.42)	0.98 (0.35)
Negative Affectivity	0.50 (0.40)	1.99 (0.51)	**3.33**			0.96 (0.53)	1.11 (0.40)
Psychoticism	0.17 (0.23)	1.14 (0.53)	**2.55**			0.71 (0.47)	0.67 (0.49)

Note. HC = healthy controls; BPD = borderline personality disorder. Wiechers & Kandler (2025) report descriptive data from 3,046 German-speaking adults (61% female; age range: 14–90 years). Moshagen, Hilbig, and Zettler (2018) reported data comprising 1,261 German adults (Study 3; 48% female; age range: 18–65 years). Rek et al. (2021) report normative data from 4,727 German adults (50.2% female; age range: 20–65 + years); note that this study used the brief 34-item version of the PID-5 rather than the 100-item short form. Roskam et al. (2015) provide normative data from 2,532 French-speaking European community adults (74.1% female; age range: 18–85 years) assessed with the 220-item PID-5. Cohen's *d* values in bold indicate group differences significant at $p < .001$. Positive values indicate higher scores in the BPD group; negative values indicate higher scores in the HC group.

- Fig. 1 -

- Table -

HEXACO and PID-5 domain-level prediction of BPD diagnosis

In the domain model, the combined model showed good overall fit (McFadden R^2 = .897, Nagelkerke R^2 = .948) and excellent leave-one-out cross-validated predictive accuracy (LOOCV delta = .0231), indicating that the combined HEXACO and PID-5 domain profile showed very high classification performance distinguishing individuals with BPD from HC. Within this model (see **Table S2** for complete results table), one HEXACO domain and three PID-5 domains emerged as unique predictors of BPD diagnostic status. Among normative personality traits, Extraversion was a strong predictor, with an odds ratio of 0.09 (95% CI [0.02, 0.32], $p < .001$), when all other domains were held constant. No other HEXACO domain showed a significant unique effect after adjusting for all other HEXACO and PID-5 domains (all *ps* ≥ .146).

Among maladaptive traits, three PID-5 domains showed positive associations with BPD, after controlling for all other HEXACO and PID-5 domains. Negative Affectivity showed the largest OR among the significant predictors (OR = 27.03, 95% CI [4.99, 146.40], $p = .001$). Disinhibition also showed a very large effect (OR = 24.46, 95% CI [2.67, 223.97], $p = .005$). Psychoticism independently predicted BPD as well (OR = 8.09, 95% CI [1.54, 42.63], $p = .014$). PID-5 Antagonism and Detachment did not independently predict diagnosis once Disinhibition, Negative Affectivity, and Psychoticism were included (all *ps* ≥ .381).

HEXACO facet–level prediction of BPD diagnosis

The HEXACO facet-level model (McFadden R^2 = .865, Nagelkerke R^2 = .930) yielded a misclassification rate of 4.02% (LOOCV delta = .0402), demonstrating that the HEXACO facet profile alone provided very high classification performance between individuals with BPD and healthy controls. Several HEXACO facets were significant and highly discriminative predictors of BPD status (see **Table S3** for complete results table). The strongest effect was observed for Social Self-Esteem, which showed a very large negative association with BPD status (OR = 0.038, 95% CI [0.014, 0.105], $p < .001$). Within the Honesty–Humility domain, Fairness was negatively associated with BPD status (OR = 0.44, 95% CI [0.21, 0.90], $p = .024$), whereas Greed Avoidance was positively associated with BPD status (OR = 2.90, 95% CI [1.41, 5.96], $p = .004$). Within the Agreeableness domain, Patience was negatively associated with BPD status (OR = 0.25, 95% CI [0.08, 0.80], $p = .018$). Within the Conscientiousness domain, Prudence was also negatively associated with BPD status (OR = 0.19, 95% CI [0.06, 0.60], $p = .005$), after controlling for all other HEXACO facets. None of the remaining HEXACO facets showed significant independent associations with diagnostic status once the full facet set was entered into the model (all *ps* ≥ .054).

PID-5 facet–level prediction of BPD diagnosis

In the PID-5 facet-level model (McFadden R^2 = .916, Nagelkerke R^2 = .958, LOOCV delta = .0322), three PID-5 facets emerged as significant unique predictors of BPD status after controlling for all other PID-5 facets (see **Table S4** for complete results table). Emotional Lability showed a large effect (OR = 82.46,

95% CI [5.76, 1181.21], $p < .001$), indicating that emotional lability was strongly associated with BPD status. Separation Insecurity was also a significant predictor (OR = 4.01, 95% CI [1.29, 12.50], $p = .017$), reflecting heightened fear of abandonment and attachment anxiety in BPD. In addition, Depressivity independently predicted BPD (OR = 7.16, 95% CI [1.26, 40.59], $p = .026$), indicating that dysphoric mood and hopelessness contributed uniquely even after adjusting for all other pathological traits.

None of the remaining PID-5 facets showed significant independent effects once the full facet set was entered into the model (all $ps \geq .073$). Again, LOOCV demonstrated excellent predictive performance, with a misclassification rate of 3.07%, corresponding to a classification accuracy of approximately 97%.

Hierarchical component structure

The combined item pool of HEXACO and PID-5 items ($k = 160$) showed excellent factorability (KMO = .96; Bartlett's test of sphericity: $\chi^2(12720) = 71568.6$, $p < .001$). Parallel analysis suggested extraction of 11 components, and eigenvalue inspection was consistent with a strongly dominant first component followed by a gradual elbow. A varimax-rotated PCA solution with 11 components explained 54.1% of the total variance. The first rotated component (RC1) alone accounted for 24.0% of the variance, with subsequent RCs contributing substantially less (RC2 = 7.4%, RC3 = 3.2%, RC4 = 2.8%, RC5 = 2.4%, RC6 = 2.6%, RC7 = 2.1%, RC8 = 2.6%, RC9 = 2.5%, RC10 = 2.9%, RC11 = 1.7%).

Inspection of the loading structure revealed that RC1 was dominated by PID-5 items. Using a threshold of $|\text{loading}| \geq .30$, 78 of 102 RC1 loadings (76.5%) were PID-5 items, whereas 24 (23.5%) were HEXACO items. Moreover, all PID-5 loadings on RC1 were positive (78 positive, 0 negative), while HEXACO loadings were predominantly negative (18 negative vs. 6 positive). This pattern indicates that RC1 primarily captured a broad maladaptivity dimension, with higher PID-5 scores and lower adaptive HEXACO scores contributing in opposite directions. For full factor loadings, see Table S5.

Beyond the first component, inventory dominance varied across components (see Fig. 2). RC2 continued to show a PID-5 preponderance (22 PID-5 vs. 10 HEXACO salient loadings), whereas several components were HEXACO-dominated (e.g., RC4: 9 HEXACO vs. 4 PID-5; RC5: predominantly HEXACO salient loadings, 9 HEXACO vs. 0 PID-5). In contrast, RC9 was exclusively PID-5 (12 PID-5, 0 HEXACO). Overall, this pattern suggests that after accounting for the general component, HEXACO content differentiates into more specific trait domains, while subsets of PID-5 items continue to cluster into psychopathology-relevant components.

- Fig. 2-

The hierarchical organization of these components was evaluated using a Bass-Ackwards procedure. Across successive solutions (k = 2 to k = 11), the first component exhibited extremely high stability, with correlations between adjacent levels ranging from .909 to .999 (mean $r = .987$), indicating that the dominant general component was preserved almost perfectly as the model became more differentiated. Other components also showed substantial continuity: depending on the level, 50% to 90.9% of

components showed |*r*| ≥ .90 with a component at the previous level, consistent with a coherent hierarchical unfolding rather than arbitrary reconfiguration.

Variance partitioning across levels further supported this interpretation. The cumulative variance explained increased monotonically from 28.1% in the one-component solution to 45.9% at seven components, 47.5% at eight components, 48.6% at nine components, and 50.6% at eleven components. Together, these results indicate a highly stable and variance-dominant general component, with progressively more specific HEXACO- and PID-5-linked dimensions emerging at higher levels of the hierarchy.

Discussion

The present study examined how normative HEXACO traits and maladaptive PID-5 traits jointly characterize BPD, and whether their shared variance converges on a broader latent dimension of personality pathology. Specifically, we aimed to delineate the descriptive trait profile of BPD relative to HC, to identify those facets that uniquely differentiate BPD at a more fine-grained level, and to explore whether dimensional trait variation is captured by a dominant higher-order component consistent with proposals of a general factor of personality pathology (e.g., Sharp et al., 2015). Importantly, the contribution of the joint approach does not lie primarily in improving diagnostic prediction per se, as both instruments individually achieved very high classification performance, but rather in revealing the latent hierarchical structure that organizes normative and maladaptive trait variance in a clinically characterized sample. This structural perspective goes beyond the question of which instrument predicts BPD better and instead addresses how normative and maladaptive personality frameworks relate to each other at the level of shared latent dimensions.

At the descriptive level, individuals with BPD showed pronounced differences from HC across both normative and maladaptive trait domains. Within HEXACO, the largest group differences emerged for Extraversion, Agreeableness, and Conscientiousness, with individuals with BPD scoring markedly lower, and for Emotionality, with individuals with BPD scoring higher. The pattern of reduced Agreeableness combined with comparatively modest differences in Honesty–Humility is consistent with prior FFM and HEXACO-based work on borderline features. In a nonclinical sample, Hepp et al. (2014) reported that borderline features were more strongly associated with low Agreeableness than with low Honesty–Humility, and Thielmann et al. (2014) demonstrated experimentally that borderline features were linked to lower reactive cooperativeness rather than a generalized exploitative style. The present findings extend this pattern to a clinically diagnosed BPD sample. In a Spanish community sample, Garcia et al. (2022) examined associations between NEO-PI-R, PID-5-SF, and PiCD scores and borderline features assessed with the IPDE screening questionnaire, rather than comparing a clinically diagnosed BPD group with controls. In their data, borderline-feature scores were primarily associated with negative affectivity/neuroticism and disinhibition, whereas associations with PID-5 antagonism and PiCD dissociality were comparatively smaller. Importantly, antagonism/dissociality was situated within a Five-Factor Model-related framework and aligned mainly with low Agreeableness. These findings converge

with the present pattern in suggesting that borderline pathology is more strongly linked to affective dysregulation, disinhibition, and reactive interpersonal antagonism than to a broadly exploitative interpersonal style. In line with previous research on maladaptive traits, the most pronounced differences between BPD and HC were observed for PID-5 Negative Affectivity and Disinhibition, followed by Detachment and Psychoticism. More specifically, BPD was characterized by both elevated internalizing tendencies and deficits in behavioral constraint, consistent with dimensional models positioning BPD at the intersection of internalizing and externalizing symptoms (e.g., Eaton et al., 2011). The marked elevations in Detachment and Psychoticism further suggest that the maladaptive trait profile of BPD in this sample was broader than Negative Affectivity and Disinhibition alone.

At the trait facet level, the analyses refined previous findings. Within the HEXACO Extraversion domain, the trait facet *social self-esteem* showed the strongest negative association with BPD diagnostic status, underscoring profoundly diminished social confidence in BPD. Within the Agreeableness domain, the trait facet *patience* emerged as the strongest negative correlate, pointing to heightened irritability and difficulty tolerating frustration. Within the Conscientiousness domain, the trait facet *prudence* was strongly negatively correlated with a diagnosis of BPD, consistent with impulsive decision-making and limited forethought as central features of BPD. Within Honesty–Humility, lower scores on the facet *fairness* were associated with higher odds of BPD diagnosis, whereas the trait facet *greed avoidance* showed a positive, though counterintuitive association. Because this association emerged only in the multivariable facet model, it may reflect suppressor dynamics or sample-specific covariance rather than a straightforward substantive effect. It should therefore be interpreted with caution until replicated. Importantly, the HEXACO trait facet analyses again suggested that BPD is more strongly characterized by reactive antagonism within the Agreeableness domain than by pervasive exploitative tendencies within Honesty–Humility, converging with earlier studies in non-clinical samples by Hepp et al. (2014) and Thielmann et al. (2014).

Within the PID-5, the most robust unique associations clustered in the Negative Affectivity domain. The trait facet *emotional lability* showed the strongest positive association with BPD, followed by *separation insecurity* and *depressivity*. Thus, although multiple maladaptive trait domains differentiated BPD descriptively, the most pronounced unique signals were related to Negative Affectivity. This pattern is consistent with long-standing conceptualizations of BPD emphasizing affective instability and interpersonal insecurity as core features of the disorder (American Psychiatric Association, 2013; Sharp et al., 2015). However, given the number of facet-level predictors tested, Separation Insecurity and Depressivity should be interpreted as exploratory unique associations, whereas Emotional Lability was the most robust facet-level PID-5 predictor.

Regarding the latent structure, the dimensional trait space was dominated by a first principal component characterized by high loadings of maladaptive traits and low loadings of adaptive normative traits. Conceptually, this component is consistent with proposals of a general factor of personality pathology. In a bifactor analysis of DSM personality disorder criteria, Sharp et al. (2015) found that borderline criteria loaded almost exclusively on a general factor capturing shared impairment across disorders,

suggesting that BPD may reflect core variance common to personality pathology more broadly. Similarly, Wright et al. (2016) demonstrated longitudinal stability and clinical relevance of a general personality pathology factor, supporting its substantive interpretation beyond statistical artifact. The convergence of maladaptive PID-5 traits and HEXACO traits on a dominant component in the present study is in line with this literature. This first component appears to index a severity-like dimension of global maladaptivity that cuts across both trait models.

Importantly, however, BPD was not reducible to this general dimension alone. Trait facet analyses indicated meaningful differentiation within this broader general factor, particularly in the domains of affective instability, interpersonal insecurity, irritability, and impulsivity. Thus, the results support a hierarchical view in which BPD is characterized by both elevated general personality pathology and a specific configuration within personality traits.

Limitations and Implications

Several limitations warrant consideration. First, the sample was demographically restricted in ways that meaningfully constrain generalizability. Participants were predominantly recruited from a single geographic region, and most reported German nationality. Educational attainment was comparatively high, and the HC group was rigorously screened to exclude current and lifetime mental disorders. This likely resulted in a comparison group with particularly low levels of psychopathology, which may have accentuated group separation and inflated classification performance. Future studies should therefore examine whether similar trait configurations emerge when BPD is compared with community samples exhibiting subthreshold symptoms, or with other clinical control groups. This interpretation is further supported by the direct comparison with published community reference data: whereas HEXACO scores in the HC group were broadly in line with normative reference values, PID-5 scores were substantially lower than those observed in unscreened German community samples, underscoring the particularly low-pathology nature of our control group.

Second, BPD participants were recruited within the context of a structured clinical research program, which selectively enrolled patients stable enough to participate in a multi-hour assessment battery and free of extensive medical and psychiatric exclusion criteria. This procedure likely over-represents treatment-seeking, predominantly female, and relatively internalizing BPD presentations, while under-representing impulsive or externalizing profiles, male patients, and individuals with more severe acute psychopathology. Generalizability to the broader BPD population, including less help-seeking subgroups, therefore remains to be established.

Third, the sample was limited with respect to demographic diversity and the demographic variables assessed in the parent study. Dimensional trait expression and diagnostic thresholds may vary across developmental stages and cultural contexts. Cross-cultural work has shown that both normative personality structure and the expression of personality pathology are influenced by sociocultural factors (Schmitt et al., 2007; Ronningstam et al., 2018). The parent study did not assess race or ethnic

identification, income, or self-identified gender beyond the recorded female/male variable. Nationality and recruitment region therefore provide only limited indicators of geographic or cultural background, and educational attainment and employment status provide only partial indicators of socioeconomic status. Future studies with more comprehensive and diverse demographic assessment are needed to test measurement invariance and to examine whether the observed trait-BPD associations generalize across populations.

Fourth, the design was cross-sectional and correlational. Thus, the reported associations cannot be interpreted as causal effects, and it remains unclear whether specific trait manifestations precede the onset of BPD, reflect consequences of chronic disorder, or arise from shared underlying vulnerabilities. Longitudinal designs are necessary to disentangle temporal ordering and developmental pathways. Moreover, only Social Self-Esteem and Emotional Lability would have survived a Bonferroni–Holm correction as robust facet-level predictors; all remaining significant facets – including Fairness, Greed Avoidance, Patience, Prudence, Separation Insecurity, and Depressivity – should therefore be regarded as exploratory findings pending replication.

With these caveats in mind, the findings have several implications. At the theoretical level, the results support dimensional conceptualizations of BPD that integrate normative and maladaptive trait models and position BPD within a broader framework of personality maladaptivity, consistent with the severity-oriented architecture of contemporary dimensional personality disorder models. At the same time, the facet-level results underscore the value of fine-grained assessment for capturing clinically meaningful differentiation within this general pathology factor. At the clinical level, the identified facet-level predictors point to concrete potential treatment targets. Low Social Self-Esteem and elevated Separation Insecurity map directly onto interpersonal effectiveness and abandonment sensitivity modules of Dialectical Behavior Therapy (Linehan, 1993); high Emotional Lability corresponds to emotion regulation and distress tolerance targets; and low Prudence and elevated Depressivity are relevant for behavioral and cognitive interventions addressing impulsive decision-making and hopelessness, respectively. Dimensional trait profiles encompassing these facets could complement categorical diagnosis by providing individually differentiated intervention targets, by tracking subclinical change over the course of treatment, and by capturing meaningful heterogeneity within the BPD diagnosis that a categorical label alone cannot convey.

Conclusion

In sum, the present study demonstrates that BPD is characterized by a pronounced and coherent trait profile spanning low HEXACO Extraversion, Agreeableness, and Conscientiousness, high Emotionality, and elevated maladaptive AMPD traits of Negative Affectivity, Detachment, Disinhibition, and Psychoticism. At a higher-order level, normative and maladaptive traits converged on a dominant broad maladaptivity dimension that is consistent with a general factor of personality pathology, in line with contemporary hierarchical models and the current conceptualization of PD in ICD-11. At the same time, facet-level analyses revealed meaningful specificity within this broader general factor. Together, these

findings contribute to an integrated dimensional understanding of BPD that bridges normative and maladaptive trait frameworks while situating the disorder within a broader structure of personality pathology.

Abbreviations

AMPD: Alternative Model of Personality Disorders; BPD: Borderline personality disorder; DFG: German Research Foundation; DSM: Diagnostic and Statistical Manual of Mental Disorders; HC: Healthy controls; HEXACO: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience; IPDE: International Personality Disorder Examination; KMO: Kaiser-Meyer-Olkin; LOOCV: Leave-one-out cross-validation; OSF: Open Science Framework; PCA: Principal components analysis; PID-5: Personality Inventory for DSM-5; PID-5-SF: Personality Inventory for DSM-5 Short Form; SCID-I: Structured Clinical Interview for DSM-IV.

Declarations

Ethics approval and consent to participate: The parent research program was approved by the Ethics Committee of the Medical Faculty Mannheim, Heidelberg University (application no. 2011-255N-MA). All participants received verbal and written information about the study procedures and provided written informed consent prior to participation. Data collection was conducted in accordance with the ethical principles of the Declaration of Helsinki versions applicable during the assessment period.

Consent for publication: Not applicable.

Availability of data and materials: The anonymized self-report datasets and analytic code supporting the conclusions of this article are available in the Open Science Framework repository: https://osf.io/ea8s5. The preregistration for the present secondary analysis is available at https://osf.io/mrhq5.

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Authors' contributions: IN and LL conceptualized the study. MW, LL, SS, and KIS curated the data. MW and LL conducted the formal analyses. MW and IN drafted the manuscript. MW, IN, JH, NK, and KIS critically revised the manuscript. All authors read and approved the final manuscript.

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Figures

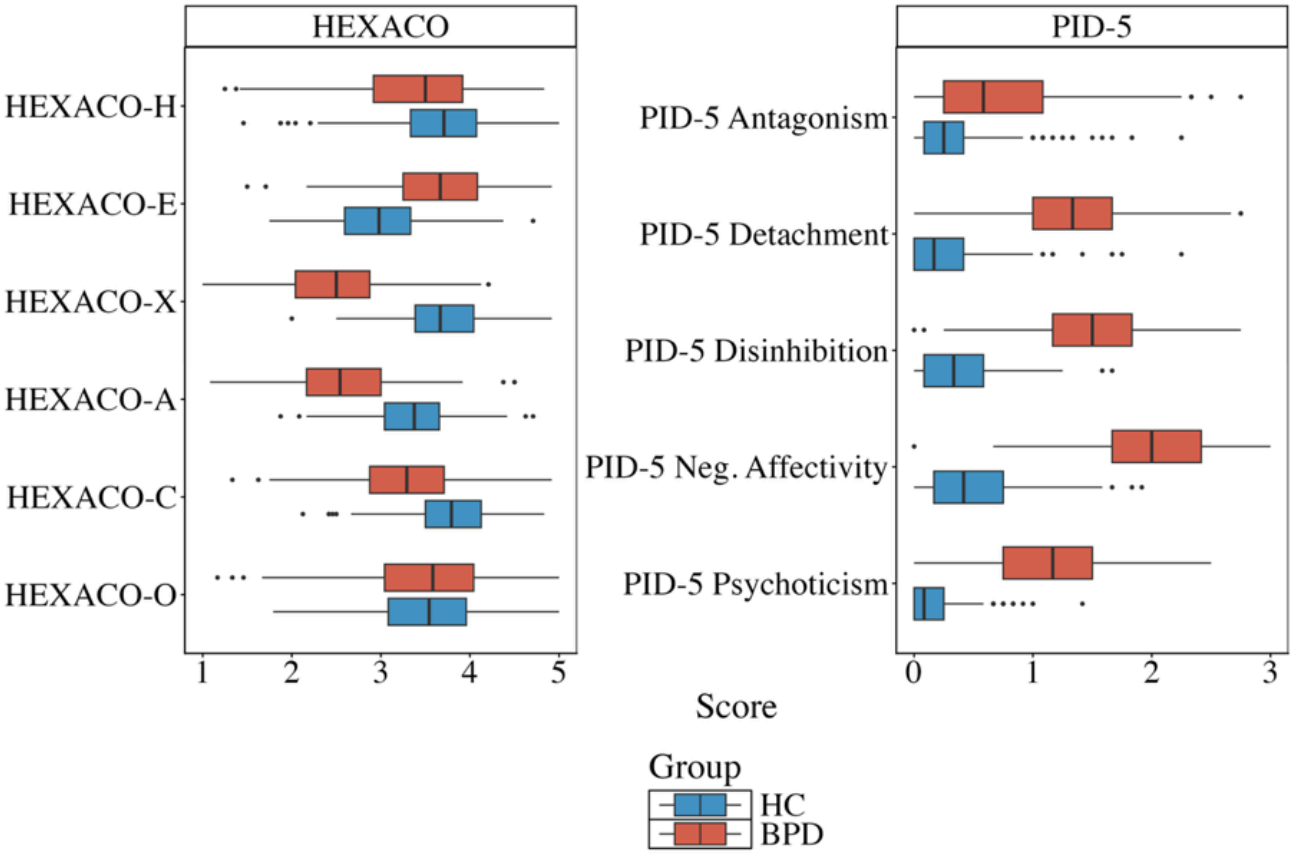


Figure 1

Boxplots for HEXACO and PID-5 domain scores by group (HC = healthy control group, BPD = participants with borderline personality disorder). Higher PID-5 scores indicate greater maladaptive trait expression; higher HEXACO scores indicate higher levels of the respective normative trait.

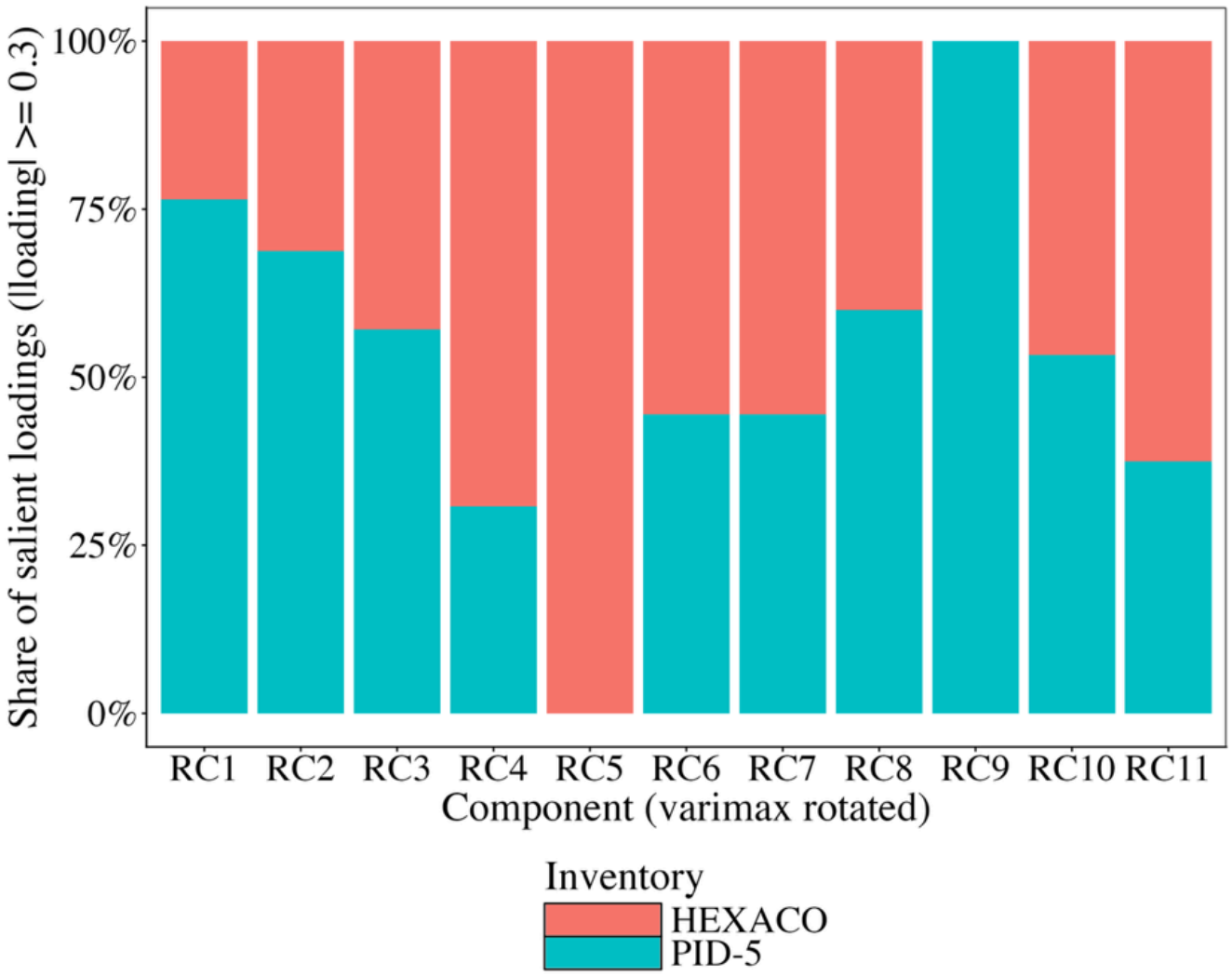


Figure 2

Stacked bar chart showing, for each varimax-rotated principal component (RC1–RC11), the proportion of salient item loadings (|loading| ≥ .30) contributed by the PID-5 versus HEXACO inventories. Bar heights sum to 100% within each component; segments indicate the within-component share of salient loadings from each inventory.

Supplementary Files

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- SupplementWeiNiedtfeldDraft27.04.2026.docx