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Understanding Personality Disorders' Traits Through Schema Modes and Temperament – Preliminary Study in Non-Clinical Population

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Abstract

Objective: According to Schema Therapy (ST) theory, both temperament and *schema modes* play a critical role in an individual's development and functioning. This study aimed to investigate how schema modes, as conceptualized in ST, and temperament, as defined by Reinforcement Sensitivity Theory (RST)—jointly contribute to the severity of personality disorder symptoms in the general population. Specifically, it how biological predispositions (i.e., temperament) and developed psychological patterns (i.e., schema modes) co-explain dysfunctional personality symptoms in a non-clinical sample. Based on theoretical frameworks and previous single-theory research, it was expected that these factors would show meaningful associations with the severity of personality pathology.

Methods: Data were collected from 43 participants, aged 19–33 years, who completed three questionnaires: a preliminary adaptation of the Schema Mode Inventory (SMI) to assess the intensity of schema modes, the Reinforcement Sensitivity Theory Personality Questionnaire (RST–PQ) to measure temperamental system activity, and the Screening Personality Questionnaire (SCID–5–SPQ) to assess the severity of personality disorders' symptoms. Partial least squares regression (PLSR) was conducted to analyze nine models corresponding to each personality disorder.

Results: The analysis indicated that specific configurations of schema modes and temperamental systems were significant predictors of personality disorder symptoms in all models. The model for dependent personality disorder symptoms demonstrated the highest R^2 value, accounting for 62% of the variance in symptom severity.

Conclusions: Preliminary findings highlight the significance of both acquired and innate factors in the expression of pathological personality symptoms in a non-clinical population.

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These results underscore the need for further validation and the integration of both perspectives into diagnostic and therapeutic approaches.

Keywords: schema therapy, temperament, reinforcement sensitivity theory, personality disorder

Schema therapy (ST), developed by J. Young (1990), is recognized as one of the most effective approaches in the treatment of personality disorders (Arntz et al., 2021; Jacob & Arntz, 2013). The theoretical framework has been refined through empirical research and supported by psychometric tools designed to evaluate its core constructs (Roediger et al., 2021).

In ST, *early maladaptive schemas* (EMS) and *schema modes* play a pivotal role in understanding the mechanisms of an individual's functioning. Schemas are defined as maladaptive, fixed patterns of interpreting reality, involving emotions, bodily sensations, and memories, that develop during childhood or adolescence as adaptive mechanisms (Roediger et al., 2021; Young et al., 2003). These patterns shape how individuals perceive themselves, others, and the world around them, and serve a characterological function. Schema modes, in contrast, represent the emotional-cognitive-behavioral states experienced by the individual, making them more closely aligned with observable behavior (Arntz et al., 2021; Finogenow, 2020). Because schema modes reflect an individual's externalized behaviors, they demonstrate a more direct relationship with personality disorder symptoms than schemas themselves (Arntz et al., 2021).

There are four main categories of schema modes in ST — *child modes*, *coping modes*, *critic modes*, *and Healthy Adult mode* — each assessed by a specialized psychometric tool designed to measure fourteen distinct modes (Lobbestael et al., 2010). *Child modes* are innate and universal sets of behaviors, thoughts, and emotions formed during early development (Arntz et al., 2021; Young et al., 2003). When a maladaptive schema or *critic mode* is activated, the *corresponding child mode* is often triggered. For instance, the activation of a *Punitive Parent mode* may induce a *Vulnerable Child mode*, leading to feelings of severe anxiety, sadness, or helplessness. In response to distress caused by such activation, individuals often adopt self-regulation strategies based on avoidance, surrender, or overcompensation, thereby activating *coping modes*. *Critic* or *parental modes*, by contrast, are marked by punitive and demanding attitudes that provoke feelings of guilt and anxiety (Edwards, 2022; Young et al., 2003). Finally, the functional *Healthy Adult mode* is characterized by its ability to regulate dysfunctional modes and foster adaptive behaviors (Roediger et al., 2021; Young et al., 2003).

The conceptualization of schema modes as developed states of functioning aligns with the definition of personality disorders outlined in the DSM-5 classification. Personality disorders are characterized by enduring patterns of thoughts, emotions, and behaviors that significantly deviate from cultural norms, are pervasive, inflexible, and typically emerge during adolescence or early adulthood (APA, 2013) These patterns remain stable over time and contribute to significant distress and functional impairment. Within this classification, ten specific

personality disorders are grouped into three clusters: Cluster A, characterized by eccentric thinking and behavior; Cluster B, associated with impulsivity, dramatization, and emotional unpredictability; and Cluster C, which involves disorders related to experiencing anxiety. According to screening studies, more than 70% of the population exhibits some levels of personality pathology (Yang et al., 2010). Schema modes can be applied in the treatment of individuals who meet diagnostic criteria for personality disorders, as well as in non-clinical populations displaying personality difficulties (Arntz et al., 2021).

Table 1

List of 14 Schema Modes and Their General Characteristics (Based on: Dobson, 2009; Finogenow, 2020; Lobbestael et al., 2007; Roediger et al., 2021; Young et al., 2017)

Schema mode	Description
Child modes	
Vulnerable Child (vc)	The individual experiences sadness, anxiety, loneliness, isolation, helplessness, worthlessness, confusion, and hopelessness.
Angry Child (ac)	The individual experiences intense anger, irritability, impatience, and frustration with unmet needs; rebels against unfair treatment through outbursts of anger, but does not attack others.
Enraged Child (ec)	The individual experiences intense rage and fury and loses control; may destroy objects or verbally and physically attack others.
Impulsive Child (ic)	The individual immediately demands satisfaction of their needs, typically fleeting desires; quickly relieves tension and discomfort.
Undisciplined Child (uc)	The individual focuses on short-term desires; may behave selfishly and seem spoiled; struggles with delayed gratification and gives up easily.
Happy Child (hc)	The individual experiences peace, contentment, and fulfillment because their basic emotional needs are met; feels loved, protected, confident, competent, and safe; has healthy relationships with others; is optimistic; is able to play and experience childlike joy.
Coping modes	
Compliant Surrenderer (cs)	The individual behaves passively, submissively, seeking approval or self-criticism in the presence of others due to fear of conflict or rejection; endures abuse; does not express healthy needs or desires. Chooses people or actions that reinforce the schema, maintaining maladaptive thought patterns and behaviors.
Detached Protector (dpr)	The individual disconnects from unpleasant emotions, sensations, and memories; withdraws and isolates from others; may experience derealization and/or depersonalization; may adopt a cynical, distant attitude to avoid engagement in relationships and potential hurt.

Schema mode	Description
Detached Self-Soother (dss)	The individual seeks stimulation to distract themselves from negative experiences; may engage in soothing activities (e.g., sleep) or self-stimulating activities (e.g., gambling, sexual activity, work, substance use).
Self Aggrandizer (sa)	The individual believes in their exceptionalism and special status, relentlessly pursuing their desires and demands, regardless of others' opinions or feelings; expresses superiority, emphasizing their qualities (e.g., appearance, social position) while belittling others to enhance self-esteem. Often feels anger when someone tries to diminish their image.
Bully and Attack (ba)	The individual, fearing someone will have power over them, takes actions to control others, such as intimidation or verbal and non-verbal aggression; engages in violence and enjoys dominating and hurting others.
Critic modes	
Demanding Parent (dpa)	The individual feels they should meet strict standards and rules; focused on extreme efficiency and feels inadequate regardless of the result; often exhibits perfectionism and neglects their own needs; does not allow themselves to rest.
Punitive Parent (pp)	The individual aggressively criticizes and judges every action; unable to forgive; believes every mistake deserves severe punishment; devalues themselves.
Healthy adult mode	
Healthy Adult (ha)	The individual has positive feelings toward themselves; can meet their needs and care for the vulnerable child; pursues long-term goals based on their values; sets boundaries with the *Impulsive* and *Undisciplined child modes*.

According to ST, in addition to the impact of early childhood experiences, temperament is considered a pivotal factor in the development of preferred coping strategies (Young et al., 2003). Recognizing temperament as a biological and innate component of personality, as described in Gray's (1982) reinforcement sensitivity theory (RST), emphasizes the importance of further investigation into its role in shaping coping mechanisms

Reinforcement Sensitivity Theory (RST) posits that individual differences in reinforcement sensitivity, such as variations in classical conditioning, shape preferences, motivations, and behaviors (Bernatowicz et al., 2016; Gray & McNaughton, 2000), and are reflected in neurobiological correlates (Kennis et al., 2013). The revised version of RST (rRST; McNaughton & Corr, 2004) introduces three key brain systems that form the foundation of temperament: (1) the Fight–Flight–Freeze System (FFFS), which manages responses to perceived aversive stimuli—both conditioned and unconditioned—through the induction of fear and actions aimed at distancing oneself from threats, such as flight or active avoidance; (2) the Behavioral Activation System (BAS), which facilitates the reduction of spatio-temporal distance between the appetitive state and a biological reinforcer (reward); and (3) the Behavioral Inhibition System (BIS), which activates when there is a conflict

of goals within a single system (e.g., two conflicting reward stimuli activating the BAS or separate aversive stimuli activating the FFFS) or between systems. The BIS primarily functions through the induction of anxiety, discouraging decision-making in such scenarios (McNaughton & Corr, 2004).

A review of the literature highlights a limited body of research examining the relationship between temperament systems and personality disorders (Jani & Molaee, 2016; Pastor et al., 2007; Ross et al., 2013; Taylor et al., 2006), as well as between schema modes and the symptoms of these disorders (Bamelis et al., 2011; Jacobs et al., 2019; Lobbestael et al., 2005, 2008). For instance, narcissistic personality disorder has been associated with schema modes such as the *Self-Aggrandizer* and the *Bully* and *Attack mode* (Lobbestael et al., 2008), as well as the *Impulsive Child* and the *Detached Self-Soother mode* (Bamelis et al., 2011). Conversely, research on temperament indicates that high BAS activity is a significant correlate of narcissistic personality disorder (Pastor et al., 2007; Ross et al., 2013; Taylor et al., 2006), while high BIS activity appears to play a critical role in susceptibility to Cluster C disorders (Bijttebier et al., 2009). However, studies incorporating RST often rely on psychometric tools developed for its earlier, unvalidated version and fail to address separate measures for BIS and FFFS, posing a significant methodological limitation (Sylvers et al., 2011).

The determinants of personality disorders remain insufficiently understood, with no empirical studies to date combining the constructs of schema therapy and reinforcement sensitivity theory in explaining personality psychopathology. This gap is particularly evident in Polish research, where there is a notable lack of publications that encompass both single-theory research and integrative approaches that combine these perspectives.

The present study aimed to investigate whether combinations of schema modes and temperament traits could predict personality disorders' characteristics in a non-clinical population. Although participants were not formally diagnosed with personality disorders, the study examined how self-reported symptoms could be explained by innate temperament traits and acquired personality characteristics. The findings suggest that particular configurations of temperament systems and schema modes may act as predictors of symptoms associated with various personality disorders. To achieve this, the study examined the relationships between three temperamental systems, fourteen schema modes, and nine personality disorders' symptoms. Given the limited prior research on the interplay between temperament, schema modes, and personality disorders' traits, the study adopted an exploratory approach without predefined hypotheses.

Method

Participants

Data were collected as part of a larger project investigating the neurocorrelates of temperamental systems through EEG-based assessments of brain activity.

Fifty participants were initially recruited for the study; however, data from seven participants were excluded from the analyses due to incomplete responses. The final sample comprised 43 participants aged 19 to 33 years ($M = 21$, $SD = 2.94$, $Mdn = 21$), approximately 82% of whom were female. Most participants (82%) were active students at Nicolaus Copernicus University in Toruń with a high school education. To enhance the age homogeneity of the sample, the study was limited to individuals aged 18 to 35 years. Additionally, participants were excluded if they were taking substances that affect the nervous system or had a diagnosed neurological disorder. All participants provided informed consent prior to participation in the study. The study received ethical approval from the Ethics Committee of the Faculty of Philosophy and Social Sciences at Nicolaus Copernicus University in Toruń.

Measures

The research was conducted both individually and in groups using three psychometric tools in the form of questionnaires:

1) Schema Mode Inventory

Schema modes were measured using the Schema Mode Inventory (ver. 1.0) (Lobbestael et al., 2010), which underwent a preliminary Polish adaptation for this study. The adaptation process involved translation, followed by back-translation by an independent translator, and the development of a final version in consultation with experts in biology and psychology. The SMI assesses the severity of schema modes, which are defined as states that an individual experiences during the activation of schemas (Roediger et al., 2021). These modes are measured across 14 separate scales: six *child modes*, five *coping modes*, two *critic modes*, and one *Healthy Adult mode*. Each scale produces a score reflecting the severity of the *corresponding mode*. The inventory consists of 118 items, with the following number of items per scale: Vulnerable Child (VC, 10 items); Angry Child (AC, 10 items); Enraged Child (EC, 9 items); Impulsive Child (IC, 8 items); Undisciplined Child (UC, 5 items); Happy Child (HC, 10 items); Compliant Surrenderer (CS, 7 items); Detached Protector (DPR, 9 items); Detached Self-Soother (DSS, 4 items); Self-Aggrandizer (SA, 10 items); Bully and Attack (BA, 9 items); Punitive Parent (PP, 10 items); Demanding Parent (DPA, 7 items); and Healthy Adult (HA, 10 items).

Participants rated how frequently they experienced the feelings or behaviors described, using a 6-point Likert scale (1 = *never or almost never*, 6 = *always*). The translated version demonstrated high internal consistency (Cronbach's $\alpha = .91$). Cronbach's alpha for individual scales ranged from .74 to .92, except for the Undisciplined Child scale ($\alpha = .68$). Severity indicators for each schema mode were calculated as the arithmetic mean of scores for the corresponding subscale.

2) Reinforcement Sensitivity Theory – Personality Questionnaire

The Reinforcement Sensitivity Theory – Personality Questionnaire (RST–PQ; Corr & Cooper, 2016) was used to measure temperament systems, based on its Polish adaptation by Wytykowska et al. (2017). The questionnaire consists of 65 items and assesses three temperamental systems as defined by the revised RST (rRST; McNaughton & Corr, 2004): the Fight–Flight–Freeze system (FFFS), the Behavioral Inhibition System (BIS), and the Behavioral Activation System (BAS). Higher scores on the FFFS indicate a greater tendency to respond to aversive stimuli through behaviors such as fleeing, freezing, or defensive fighting, and are associated with an increased likelihood of anxiety or avoidance reactions, including panic fears or phobias (Corr, 2008; Wytykowska et al., 2017). The BIS measures sensitivity to goal conflict and risk, with higher scores reflecting heightened anxiety and vulnerability to obsessive-compulsive tendencies. The BAS scale assesses motivation to seek rewards and engage in goal-oriented actions, and it includes four subscales. The Reward Interest (RI) subscale captures openness to new experiences that may lead to rewards, while Goal-Drive Persistence (GDP) reflects sustained motivation toward achieving long-term goals. Reward Reactivity (RR) measures positive emotional responses to achieved rewards, which reinforce goal-seeking behavior, and Impulsivity (I) describes the ability to adjust behavior quickly and spontaneously to pursue rewards.

Participants responded using a 4-point Likert scale (1 = *not at all*, 4 = *very well*). Cronbach's alpha for the entire questionnaire was .87, with subscale reliabilities ranging from .76 to .93, except for the BAS Impulsivity subscale ($\alpha = .63$). Arithmetic means for each scale were calculated as indices of temperamental system activity.

3) Structured Clinical Interview for DSM-5 Screening Personality Questionnaire

The Structured Clinical Interview for DSM-5 Screening Personality Questionnaire (SCID–5–SPQ; First et al., 2016; Polish version: Zawadzki et al., 2018) was used to assess the characteristics of each personality disorder. This questionnaire contains 106 items describing patterns of behavior, thoughts, and feelings typical of various personality disorders. The scales correspond to the ten personality disorders listed in the DSM-5 classification: avoidant personality disorder, dependent personality disorder, obsessive-compulsive personality disorder, paranoid personality disorder, schizotypal personality disorder, schizoid personality disorder, histrionic personality disorder, narcissistic personality disorder, borderline personality disorder, and antisocial personality disorder. Responses were collected using a dichotomous scale (*Yes/No*). The Antisocial Personality Disorder Scale was excluded from the study because, unlike the other scales measuring the severity of personality disorder symptoms, its items refer to behaviors occurring before the age of 15 rather than symptoms relevant to adult functioning. Dependent variables were represented by the percentage of reported symptoms for each personality disorder, calculated using the formula: ([number of items marked *Yes* / total number of items on the scale] × 100%).

Procedure

This study was part of a larger project investigating neurobiological correlates of temperament using the EEG method. The research procedure involved two sessions conducted at the Institute of Psychology at Nicolaus Copernicus University in Toruń. During the first session, participants completed questionnaires. Recruitment was carried out through an online form, and written informed consent was obtained from all participants prior to their involvement. During the first session, participants completed the electronic versions of the RST–PQ and SMI questionnaires and the paper version of the SCID–5–SPQ. The study sessions were conducted either individually or in groups of up to four participants at a time.

Data Analysis

The data were analyzed by IBM SPSS Statistics ver. 29.0. Normality of the data distributions was tested using the Shapiro-Wilk test, along with descriptive statistics for skewness and kurtosis. Most variables met the assumptions of normality (see Table 2, pp. 84–85).

To assess collinearity among the predictors, correlation analysis was conducted using Spearman's rho coefficient (see Table 4 in the appendix).

To address the research questions, partial least squares regression (PLS–R; Wold et al., 2001) was employed, following the procedure described by Dreszer and colleagues (2020). PLS–R technique was selected due to its ability to effectively address situations where traditional regression techniques may be less effective, particularly in cases of high multicollinearity among predictors, deviations from normality, or when the sample size is small relative to the number of variables.

Nine independent models were tested. Consequently, the regression coefficients for individual predictors should not be directly compared across models. The models were created using the PLSR library in R (Mevik et al., 2019). The PLS–R analysis consisted of several steps (a detailed description of the method is available in Appendix 1). First, principal component analysis (PCA) was used to reduce the number of predictors by grouping them into latent variables (components). Subsequently, the optimal (statistically significant) number of components for each model was determined. This decision was based on one of two criteria:

1. Permutation test: The optimal number of components was identified using the cross-validation (CV) curve (MVDALAB package; Afanador et al., 2017).
2. Local minimum: The lowest root mean squared error of prediction (RMSEP) value for a given number of components (Mevik et al., 2019).

If the permutation test criterion was not met, the number of components for the model was determined based on the local RMSEP minimum. Once the number of significant components was established, regression analysis was performed for each model.

Results

The analysis revealed that in each of the nine tested personality disorders' models, a significant percent of the variance in the dependent variable was explained by a single component. Table 3 (pp. 85–86) presents the PLS–R analysis results for the nine tested models, including the coefficients of determination (R^2) and regression coefficients for each statistically significant predictor. The first column lists the predictors, which include temperamental systems and schema modes, while subsequent columns detail the results for each personality disorder model. For most models (six out of nine, excluding the OCPD, HPD, and NPD models), the permutation test criterion was met, allowing for cross-validation (CV) and enhancing the models' ability to generalize results to other datasets. Depending on the analyzed personality disorder, the models accounted for between 31% and 62% of the variance in the dependent variable.

Table 2

Descriptive Statistics for Temperamental Systems, Schema Modes, and Personality Disorder Symptoms

	M	*Mdn*	*SD*	Skewness	Kurtosis	Min	Max	S–W
BIS	2.74	2.87	0.66	–0.24	–1.00	1.52	3.83	.96
BAS	2.78	2.69	0.42	0.21	–0.79	1.22	3.54	.97
FFFS	2.10	2.04	0.58	0.53	–0.25	2.03	3.72	.96
BAS RI	2.73	2.71	0.70	0.14	–1.04	1.57	4.00	.96
BAS RR	2.98	2.90	0.53	–0.31	–0.19	1.60	4.00	.98
BAS GDP	3.02	3.00	0.57	–0.35	–0.47	1.71	4.00	.97
BAS I	2.37	2.50	0.53	–0.05	–0.61	1.25	3.63	.97
Vulnerable Child	2.80	2.60	0.92	0.66	0.44	1.10	5.40	.96
Angry Child	2.72	2.80	0.67	0.58	0.31	1.60	4.40	.96
Enraged Child	1.53	1.33	0.53	1.29	1.23	1.00	3.22	.85*
Impulsive Child	2.22	2.13	0.75	0.56	–0.19	1.00	3.88	.96
Undisciplined Child	3.16	3.20	0.82	–0.05	–1.02	1.60	4.60	.96
Happy Child	3.51	3.70	0.95	–0.36	–0.93	1.50	5.00	.95
Compliant Surrenderer	3.05	2.86	0.94	0.06	–1.24	1.43	4.57	.94*
Detached Protector	2.44	2.44	0.91	0.71	0.39	1.11	5.11	.95
Detached Self-Soother	3.83	3.75	1.10	0.32	–0.64	1.00	5.75	.97
Bully and Attack	2.24	2.11	0.70	0.58	0.26	1.11	4.22	.97
Self-Aggrandizer	2.86	2.90	0.73	0.03	–0.79	1.50	4.30	.97
Demanding Parent	3.50	3.43	0.86	0.02	–0.02	1.43	5.43	.99

	M	*Mdn*	*SD*	Skewness	Kurtosis	Min	Max	S–W
Punitive Parent	2.16	2.00	0.79	0.89	0.31	1.10	4.10	.93*
Healthy Adult	3.99	4.20	0.68	–0.36	–0.87	2.70	5.30	.95*
APD symptoms	46.18	42.86	26.42	0.26	–0.43	0	100	.94*
DPD symptoms	29.36	25.00	18.27	0.31	–0.64	0	75	.92*
OCPD symptoms	53.49	44.44	21.59	0.26	–0.91	11.11	88.89	.93*
PPD symptoms	25.58	25.00	17.24	0.31	–0.58	0	62.50	.93*
STPD symptoms	27.73	30.77	15.12	0.21	–0.69	0	61.54	.96
SPD symptoms	37.87	42.86	20.18	0.45	–0.40	0	85.71	.93*
HPD symptoms	31.69	25.00	19.36	0.32	–0.34	0	75	.95*
NPD symptoms	9.58	5.88	7.60	0.61	–0.16	0	29.41	.91*
BPD symptoms	32.71	33.33	25.02	1.21	1.31	0	100	.86*

Note. *M* – mean, *Mdn* – median, *SD* – standard deviation, *S–W* – Shapiro-Wilk test. BIS = Behavioral Inhibition System, BAS = Behavioral Activation System, FFFS = Fight–Flight–Freeze System, BAS RI = BAS Reward Interest, BAS RR = BAS Reward Reactivity, BAS GDP = BAS Goal-Drive Persistence, BAS I = BAS Impulsivity, APD = Avoidant Personality Disorder, DPD = Dependent Personality Disorder, OCPD = Obsessive-Compulsive Personality Disorder, PPD = Paranoid Personality Disorder, STPD = Schizotypal Personality Disorder, SPD = Schizoid Personality Disorder, HPD = Histrionic Personality Disorder, NPD = Narcissistic Personality Disorder, BPD = Borderline Personality Disorder.
* $p < .05$

Discussion

The current findings provide preliminary evidence that both innate factors and acquired factors contribute to the explanation of personality disorders' symptoms. In line with schema therapy's theoretical assumptions (Young et al., 2003), both schema modes and temperamental systems explained personality disorders' symptoms. The models accounted for 27% to 62% of the variance in the dependent variable. In similar studies applying the Five-Factor Model to understand personality disorder symptoms, regression models accounted for between 12% and 46% of the variance in symptoms of personality disorders (Bagby et al., 2005; Bagby et al., 2008). However, direct comparisons with these models are challenging due to the use of different psychometric tools to assess personality disorders' symptoms, many of which rely on older classifications, such as the DSM-IV. In the present study, additional constructs, such as schema modes, were included alongside temperamental variables, which may account for the higher R^2 values observed.

Additionally, statistical analysis using the PLS–R method allowed for the identification of key combinations of predictors for personality disorders' symptoms. Due to the extensive scope of the analyzed models and the complexity of the predictors, only selected relationships are presented here.

Table 3

R^2 Coefficients and Regression Coefficients for Predictors in the Form of Temperamental Systems and Schema Modes, Along With Their Confidence Intervals Estimated Using the Bootstrapping Method, Reported for Statistically Significant Results

	CLUSTER A			CLUSTER B			CLUSTER C		
Predictor	**PPD**	**STPD**	**SPD**	**HPD**	**NPD**	**BPD**	**APD**	**DPD**	**OCPD**
	R^2 = .49	**R^2 = .43**	**R^2 = .52**	**R^2 = .42**	**R^2 = .31**	**R^2 = .58**	**R^2 = .55**	**R^2 = .62**	**R^2 = .32**
	R^2(CV) = .34	**R^2(CV) = .27**	**R^2(CV) = .30**	–	–	**R^2(CV) = .47**	**R^2(CV) = .43**	**R^2(CV) = .52**	–
BIS	1.19 [.32, 1.90]	1.45 [.82, 2.12]	–	–	–	2.55 [1.64, 3.26]	3.0 [1.85, 4.04]	2.40 [1.65, 3.00]	–
BAS RR	–	1.04 [.3, 1.88]	–2.86 [–3.93, –0.74]	2.53 [1.31, 3.22]	–	–	–	–	1.61 [.00, 3.04]
BAS	–	–	–	2.36 [1.19, 3.0]	–	–	–1.36 [–2.41, –.14]	–	–
FFFS	–	–	–	–	–	1.66 [.04, 3.17]	1.36 [.27, 2.13]	–	–
BAS RI	–	–	–	1.52 [.30, 2.31]	–	–	–2.50 [–3.70, –1.18]	–	–
BAS GDP	–	–	–	–	0.63 [.12, 1.07]	–	–	–	–
BAS I	–	–	–	1.96 [.66, 2.86]	–	–	–	–	–
Angry Child	2.22 [1.45, 2.98]	1.65 [.99, 2.32]	–	–	0.65 [.1, 1.01]	2.46 [.95, 3.23]	2.06 [.52, 2.98]	1.86 [.95, 2.42]	2.1 [.86, 3.37]
Demanding Parent	1.28 [.44, 1.95]	1.21 [.28, 1.96]	–	–	0.80 [.30, 1.25]	1.64 [.14, 2.99]	–	1.26 [.08, 2.14]	2.06 [.75, 3.44]
Detached Protector	1.14 [.19, 1.88]	0.95 [.11, 1.68]	4.24 [2.27, 5.37]	–1.38 [–2.62, –.12]	–	2.14 [.95, 3.39]	1.73 [.49, 2.69]	–	–
Vulnerable Child	2.03 [1.23, 2.71]	–	1.87 [.03, 2.69]	–	–	3.26 [2.22, 3.97]	2.70 [1.64, 3.61]	2.09 [1.45, 2.52]	–

	CLUSTER A			CLUSTER B			CLUSTER C		
Predictor	**PPD**	**STPD**	**SPD**	**HPD**	**NPD**	**BPD**	**APD**	**DPD**	**OCPD**
	R^2 = .49	**R^2 = .43**	**R^2 = .52**	**R^2 = .42**	**R^2 = .31**	**R^2 = .58**	**R^2 = .55**	**R^2 = .62**	**R^2 = .32**
	R^2(CV) = .34	**R^2(CV) = .27**	**R^2(CV) = .30**	–	–	**R^2(CV) = .47**	**R^2(CV) = .43**	**R^2(CV) = .52**	–
Punitive Parent	1.74 [.81, 2.51]	1.17 [.34, 1.70]	–	–	–	2.75 [1.69, 3.29]	2.78 [1.80, 3.55]	2.42 [1.69, 3.0]	–
Healthy Adult	–0.84 [–1.53, –0.01]	–1.06 [–1.75, –0.28]	–	–	–	–2.59 [–3.48, –1.67]	–3.07 [–4.19, –1.69]	–1.69 [–2.22, –0.93]	–
Happy Child	–1.55 [–2.35, –0.64]	–	–2.89 [–3.77, –1.23]	–	–	–2.24 [–3.09, –1.19]	–2.28 [–3.24, –1.09]	–1.02 [–1.68, –0.04]	–
Detached Self-Soother	1.66 [.67, 2.45]	0.86 [0.02, 1.4]	–	–	–	–	2.56 [1.26, 3.46]	1.65 [.76, 2.27]	2.11 [.71, 3.49]
Enraged Child	–	–	–	2.21 [.78, 3.07]	–	–	–	1.12 [.22, 1.67]	1.60 [.43, 2.81]
Impulsive Child	–	1.32 [.48, 1.95]	–	1.57 [.43, 2.44]	–	–	–	1.16 [.14, 1.79]	–
Self-Aggrandizer	0.95 [.04, 1.67]	–	–	1.23 [.04, 2.08]	1.04 [.49, 1.65]	–	–	–	–
Compliant Surrenderer	–	0.94 [.10, 1.67]	–	–	–	1.79 [.69, 2.90]	2.63 [1.40, 3.63]	2.31 [1.45, 3.06]	–
Bully and Attack	–	–	2.74 [.91, 4.06]	–	–	–	–	–	–
Undisciplined Child	–	–	–	–	–	–	–	–	–

Note. 95% confidence intervals are provided in square brackets. CV = cross-validation, APD = Avoidant Personality Disorder, DPD = Dependent Personality Disorder, OCPD = Obsessive-Compulsive Personality Disorder, PPD = Paranoid Personality Disorder, STPD = Schizotypal Personality Disorder, SPD = Schizoid Personality Disorder, HPD = Histrionic Personality Disorder, NPD = Narcissistic Personality Disorder, BPD = Borderline Personality Disorder, BAS = Behavioral Activation System, BIS = Behavioral Inhibition System, FFFS = Fight–Flight–Freeze System, BAS RR = BAS Reward Reactivity, BAS I = BAS Impulsivity, BAS GDP = BAS Goal-Drive Persistence, BAS RI = BAS Reward Interest.

For symptoms associated with Cluster A personality disorders (paranoid personality disorder [PPD], schizoid personality disorder [SPD], schizotypal personality disorder [STPD]), the *Detached Protector mode* frequently emerged as a significant positive predictor. This relationship was previously identified in studies on PPD and SPD but not STPD (Lobbestael et al., 2008). In the case of SPD, a negative relationship was observed with the BAS RR system, which reflects low reward reactivity (Corr & Cooper, 2016), and with the *Happy Child mode*, which reflects feelings of belonging, security, and joy (Young et al., 2003). This finding aligns with the characteristic SPD profile, which includes flattened affect, emotional detachment, and a lack of satisfaction in interpersonal relationships (APA, 2013; Millon et al., 2005). A notable relationship was found in the model for schizotypal personality disorder (STPD), where the BIS and BAS RR systems served as positive predictors. These results are consistent with prior research by Pastor et al. (2007). Although schema therapy was not originally developed for treating STPD (Jacobs et al., 2019), the recognition of the positive association with the *Detached Protector mode* may help explain tendencies toward strong internalization, cynicism, and dissociative symptoms in this disorder (Jacobs et al., 2019; Young et al., 2003). The positive relationships with the BIS, BAS RR, and the *Detached Protector mode* are consistent with the disorder's pattern, which features social anxiety, paranoid hypersensitivity (APA, 2013), and tendencies toward dissociation, fantasy, and openness to unconventional, sensory-enhanced experiences as a form of positive reinforcement (Millon et al., 2005).

In Cluster B (borderline personality disorder [BPD], histrionic personality disorder [HPD], narcissistic personality disorder [NPD]), the model for borderline personality disorder demonstrated significant predictive value. In addition to various schema modes, including both *critic modes*, the BIS and FFFS systems emerged as significant positive predictors. This may indicate biological predispositions toward heightened emotional reactivity, particularly in experiencing anxiety and fear (Corr & Cooper, 2016). Consequently, this heightened reactivity can lead to active vigilance for potential threats (McNaughton & Corr, 2004) and preparation for flight or active avoidance, such as through freezing or confrontational responses (Corr, 2008). This biological predisposition, combined with the devaluing messages of the *critic modes* (Young et al., 2003), may explain BPD symptoms such as a desperate sense of rejection, lack of self-acceptance, and the tumultuous dynamics of interpersonal relationships (Butcher et al., 2021; Millon et al., 2005).

For all Cluster C personality disorders (avoidant personality disorder [APD], dependent personality disorder [DPD], obsessive-compulsive personality disorder [OCPD]), a positive association was observed with the *Angry Child* (AC) *mode*. The AC mode is typically activated when an individual's needs are frustrated, resulting in outbursts of anger (Finogenow, 2020; Young, 2013). This characteristic is more closely aligned with Cluster B personality disorders (Butcher et al., 2021; Millon et al., 2005), where, surprisingly, the AC mode was not consistently present across all disorders (e.g., HPD). One might expect that symptoms of Cluster C disorders would be dominated by frequently experienced

anxiety and fear (Butcher et al., 2021), characteristic of the *Vulnerable Child mode*. However, this mode was not present in the OCPD model, and previous studies similarly found no association with it (Bamelis et al., 2011; Lobbestael et al., 2008). Nevertheless, in models with predictive value (APD, DPD), the BIS system, which induces intense anxiety (McNaughton & Corr, 2004), emerged as a positive predictor. This finding is consistent with theoretical frameworks and prior research (Pastor et al., 2007; Ross et al., 2013). Additionally, the positive association between the *Detached Self-Soother mode* and Cluster C models, noted previously by Lobbestael et al. (2008), suggests that the prevalence of avoidant strategies in Cluster C disorders counteracts the outbursts of anger typical of the AC mode. Instead, these individuals may engage in various forms of emotional avoidance, such as sleeping, seeking distractions, or workaholism. Consequently, at a behavioral level, anger outbursts are not characteristic symptoms for this group. For APD, both the *Detached Protector* and *Detached Self-Soother modes* emerged as positive predictors, aligning with the characteristic avoidance of social situations to reduce experienced anxiety (APA, 2013; Butcher et al., 2021). Additionally, as biological factors associated with intense fear and anxiety (Butcher et al., 2021; Millon et al., 2005), the BIS and FFFS systems were also identified as positive predictors of APD symptoms. These findings are consistent with previous studies (Lobbestael et al., 2008; Pastor et al., 2007; Ross et al., 2013).

Considering the roles of the BIS and BAS systems as predispositions for developing specific personality disorders provides insight into the observable behavioral similarities and differences between APD and SPD. Activity in the BAS system was negatively associated with symptoms of both disorders. This relationship explains the reduced tendency to engage in activities aimed at achieving rewards and to favor risky behaviors in pursuit of positive reinforcement despite the potential for punishment, including negative social consequences (Corr, 2008). While individuals with SPD symptoms neither seek nor desire social interactions – and may actively avoid them (Millon et al., 2005) – those with APD traits express interest in social relationships. However, this interest is in direct conflict with their intense social anxiety. These differences may be attributable to the positive role of the BIS system, which was significant only in the APD model. Previous studies (Pastor et al., 2007; Ross et al., 2013) have similarly reported associations between APD and the BIS system exclusively.

Similarities in the number and type of modes serving as predictors can be identified for models of personality disorders across different clusters, such as DPD, PPD, and BPD. An essential aspect of conceptualizing a patient's case is understanding both their schema modes and underlying schemas (Roediger et al., 2021; Young et al., 2003). The same mode may manifest in slightly different behaviors depending on the active schema the individual is attempting to cope with (Arntz et al., 2021; Roediger et al., 2021). Therefore, incorporating simultaneous assessment of temperament, schema modes, and underlying schemas using standardized tools (Young & Brown, 2005; Polish adaptation: Oettingen et al., 2017) would enhance the methodology of research on schema therapy and personality psychopathology.

The observed similarities in the symptomatology of various personality disorders align with both theoretical frameworks (Butcher et al., 2021; Millon et al., 2005) and empirical evidence supporting the validity of a dimensional model of personality disorders (Tyrer et al., 2019), as described in the *International Classification of Diseases* (11th revision; ICD-11; World Health Organization [WHO], 2022). This new approach offers a multidimensional method for diagnosing personality disorders, utilizing trait-domain features. Employing tools based on the dimensional approach (Oltmanns & Widiger, 2018; Polish adaptation: Cieciuch et al., 2022) could significantly enhance research on schema therapy.

For the models of personality disorders across all clusters, *adaptive modes* (Healthy Adult and Happy Child) were also included. These modes consistently demonstrated negative associations with personality disorder symptoms. This finding aligns with schema therapy principles: the more developed an individual's self-regulation mechanisms are, the better they can manage dysfunctional symptoms and function adaptively (Roediger et al., 2021).

The *Undisciplined Child mode* did not emerge as a significant predictor in any of the regression analyses, despite prior studies indicating its associations with disorders across all clusters (Bamelis et al., 2011; Lobbestael et al., 2008). The lack of significance observed in this study may result from the lower reliability coefficient of this scale (Cronbach's $\alpha = 0.68$) and/or characteristics of the sample, which predominantly consisted of students.

Limitations

This study was exploratory in nature, however, a significant limitation was the relatively small sample size of 50 participants, which limited both the generalizability of the results and the use of more complex statistical analyses. The small sample size also precluded comparisons of the contribution of individual predictors across personality disorder symptoms and the application of more advanced methods, such as mediation analysis. Additionally, the sample was predominantly composed of women (85%) and young individuals (mainly students), further limiting the generalizability of the findings to the broader population. A further limitation was the reliance solely on self-report methods, without clinical interviews or behavioral observations, which may have affected the reliability of personality disorders' symptoms assessment. Future research should consider incorporating psychiatric diagnoses as a criterion for participant selection.

The study assessed temperamental predispositions based on Reinforcement Sensitivity Theory (Corr & Cooper, 2016), which focuses on motivational neurobiological systems. Although RST has introduced many innovative concepts, it has been criticized for its reliance on an animal model and its overlooking of higher cognitive processes, such as self-regulation, self-awareness, and the pursuit of long-term goals. These processes are considered crucial for understanding human behavior and the ability to consciously direct one's actions (Matthews, 2008). An additional limitation arises from the specific characteristics of one of

the scales in the RST–PQ questionnaire. The content of the FFFS scale items is restricted to questions about flight and freeze responses, omitting the third aspect of the system–fight responses. Furthermore, most of these questions focus on reactions to specific situations (e.g., contact with animals, evacuation from a shopping mall, turbulence, or looking down from a height), without addressing interpersonal contexts, which may impact the validity and reliability of the measurement. The lack of a psychometric tool capable of assessing all aspects of the FFFS system could have excluded potential associations between this system and personality disorders' traits

A notable limitation of the study is the exclusion of antisocial personality disorder measures. Future research should consider extending the use of the SCID–5–SPQ questionnaire to include the complete clinical SCID–5–PD interview administered by a clinician. This would enable a more comprehensive assessment of disorder symptoms, incorporating not only behaviors exhibited before the age of 15 but also specific symptoms present in adult life. Such an approach would allow for a more comparable and accurate evaluation of antisocial personality disorder symptoms alongside other types of personality disorders.

Summary

This study provides preliminary findings supporting the assumptions of schema therapy, emphasizing the roles of schema modes and temperament in explaining personality disorders' traits. The selected statistical method enabled regression analysis and the identification of components explaining variance in the dependent variable in a relatively small sample. Both schema modes and temperamental systems emerged as significant predictors of personality disorder symptoms. Including both in future assessment and analysis could facilitate a better understanding of the mechanisms underlying these disorders, offering theoretical insights into their progression.

Future studies should extend the analysis to include measures of schemas and dimensional assessments of personality disorder symptoms. It is further recommended to incorporate clinical interviews to improve the evaluation of personality pathology. Limitations related to the sample size and characteristics pose significant challenges for the generalization of findings. Therefore, the results should be considered preliminary, and serve as a foundation for hypotheses in the context of further, more comprehensive research on both non-clinical and clinical populations.

With a sufficiently large sample, it is advisable to conduct interaction analyses between temperament and schema modes in the context of personality disorders, as well as to examine the incremental validity of individual predictors in explaining variability in personality disorder symptoms. Additionally, incorporating advanced statistical methods, such as mediation and moderation analyses, could significantly contribute to the empirical validation and further development

of etiopathogenetic models of personality disorders. These findings point to the need for further investigation into the role of both innate and acquired factors in understanding the symptomatology of personality disorders, and underscore the importance of using larger samples, complementary tools, and advanced statistical analyses.

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Supplementary Materials

All attachments are available in the OSF repository: https://osf.io/v7ue6/?view_only=d00232d7b5e640dc850d216893e53908

- Attachment nr. 1 Description of the PLSR Method
- Attachment nr. 2 Table 4. Spearman's rho correlation coefficients for schema modes, temperamental systems, and personality disorder symptoms

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