

## AI-Based Profiling of Personality Disorder Traits Associated with Chronic Somatic Symptoms

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### ABSTRACT

This study aimed to identify and model personality disorder-related trait profiles associated with the severity of chronic somatic symptoms using artificial intelligence-based analytical approaches. A cross-sectional observational design was employed with an adult sample recruited in Hungary. Participants completed standardized self-report measures assessing chronic somatic symptom severity, dimensional personality disorder traits, and psychological distress variables. Data were collected electronically following informed consent and ethical approval. Multiple supervised machine learning models, including regularized regression and ensemble-based algorithms, were trained to predict somatic symptom severity from personality trait dimensions while controlling for demographic and psychological covariates. Model performance was evaluated using cross-validation procedures, and explainable AI techniques were applied to determine the relative importance and direction of trait contributions. Ensemble machine learning models demonstrated superior predictive performance compared with linear approaches, indicating non-linear and interactive associations between personality traits and chronic somatic symptom severity. Negative affectivity emerged as the strongest predictor, followed by detachment, with both traits showing robust positive associations with symptom severity. Disinhibition and psychoticism contributed moderately, while antagonism exhibited a smaller but significant effect. Personality disorder traits provided substantial incremental explanatory value beyond anxiety and depressive symptoms, accounting for additional variance in somatic symptom severity. Explainability analyses confirmed the dominance of internalizing and emotion-related traits in the AI-derived personality profiles associated with higher symptom burden. The findings indicate that chronic somatic symptoms are strongly linked to specific configurations of maladaptive personality traits, particularly negative affectivity and detachment, and that AI-based modeling offers a powerful framework for capturing these complex relationships.

**Keywords:** *chronic somatic symptoms; personality disorder traits; artificial intelligence; machine learning; psychosomatic medicine*

## 1. Introduction

Chronic somatic symptoms constitute a major challenge for contemporary medicine and mental health care, as they frequently persist in the absence of sufficient structural pathology and are associated with substantial functional impairment, psychological distress, and health care utilization. Across Europe, functional and somatic symptom-related disorders affect a considerable proportion of the general population, with prevalence estimates indicating that these conditions represent one of the most common reasons for repeated medical consultations and diagnostic procedures (Rometsch et al., 2024). Despite advances in biomedical diagnostics, a large subgroup of patients continues to experience enduring physical symptoms that cannot be fully explained by identifiable organic disease, highlighting the need for integrative biopsychosocial models that account for psychological, personality-related, and neurobiological mechanisms underlying symptom persistence.

Recent epidemiological and clinical research has consistently demonstrated that chronic somatic symptoms frequently co-occur with psychiatric conditions, particularly mood and anxiety disorders, but also with more enduring personality-related vulnerabilities (Creed, 2023; Meulen et al., 2021). This comorbidity is not merely additive; rather, it reflects complex interactions between emotional regulation, stress reactivity, cognitive appraisal, and bodily perception. The concept of allostatic load has been proposed as a unifying framework, suggesting that prolonged psychophysiological stress leads to dysregulation across neuroendocrine, immune, and autonomic systems, thereby increasing vulnerability to chronic somatic symptomatology (Guidi et al., 2020). Within this context, individual differences in personality structure and functioning may critically shape how stress is perceived, processed, and embodied over time.

Accumulating evidence indicates that personality disorder traits, particularly those characterized by negative affectivity, interpersonal dysfunction, and impaired self-regulation, are overrepresented among individuals with functional somatic disorders. Studies focusing on fibromyalgia, multisomatoform disorder, and chronic visceral pain have revealed distinct psychopathological profiles marked by emotional instability, heightened sensitivity to bodily sensations, and maladaptive coping strategies (Achenbach et al., 2022; Arévalo-Martínez et al., 2022; Doreste et al., 2024). These findings align with

dimensional models of personality pathology, which conceptualize personality disorders as extreme or maladaptive variants of normal personality traits that influence affective, cognitive, and behavioral patterns across contexts.

The association between personality pathology and somatic symptoms has been documented across different medical conditions, including fibromyalgia, inflammatory bowel disease, post-viral syndromes, and functional gastrointestinal disorders (Gostoli et al., 2024; Kachaner et al., 2022; Noviello et al., 2021). In fibromyalgia specifically, personality assessment studies have demonstrated robust links between maladaptive personality traits and disease impact, pain severity, emotional distress, and functional impairment (Doreste et al., 2025; Романов et al., 2023). These observations suggest that personality traits do not merely coexist with somatic symptoms but may actively contribute to symptom amplification, chronicity, and treatment resistance.

From a developmental and psychosocial perspective, adverse childhood experiences and early relational disruptions have been shown to interact with personality functioning in predicting somatization, anxiety, and depressive symptoms in adulthood (Kerber et al., 2023). Such findings support the notion that enduring personality vulnerabilities may shape bodily symptom expression as part of a broader pattern of affect regulation and interpersonal adaptation. Moreover, emotional control deficits and heightened emotional reactivity have been identified as transdiagnostic features across somatic and psychiatric conditions, further underscoring the relevance of personality-related processes in chronic somatic symptomatology (Orzechowska et al., 2023; Ulual et al., 2023).

At the same time, advances in neuroscience and psychoneuroimmunology have provided growing evidence for biological correlates of chronic somatic symptoms, including neuro-immune interactions, neurogenic inflammation, and altered central pain processing (Meade & Garvey, 2022; Siracusa et al., 2021). Importantly, these biological mechanisms are not independent of psychological factors; rather, they appear to be modulated by stress, emotional states, and personality-related patterns of perception and interpretation. Inflammatory processes, for instance, have been implicated in fibromyalgia and other chronic pain conditions, with emerging evidence suggesting bidirectional links between inflammation, mood regulation, and personality traits (García-Domínguez, 2025).

Clinical research has increasingly emphasized the importance of tailored psychosocial and psychotherapeutic interventions for patients with chronic somatic symptoms. Cognitive behavioral therapy, mindfulness-based approaches, and acceptance-based interventions have demonstrated efficacy in reducing symptom burden and improving quality of life, although treatment response remains heterogeneous (Berpohl & Martin, 2025; Islam et al., 2022). Notably, predictors of treatment success appear to include psychological flexibility, emotional awareness, and personality-related characteristics, reinforcing the need for more refined patient profiling (Rometsch et al., 2025). Understanding which personality traits are most strongly associated with chronic somatic symptoms may therefore have direct implications for personalized treatment planning and prognosis.

Traditional statistical approaches have provided valuable insights into associations between personality traits and somatic symptoms; however, they are often limited in capturing non-linear relationships, higher-order interactions, and complex multivariate patterns. In recent years, artificial intelligence and machine learning methods have emerged as powerful tools for modeling such complexity in clinical and psychological data. AI-based approaches allow for the integration of multiple predictors simultaneously, identification of latent patterns, and estimation of individual-level risk profiles with higher predictive accuracy than conventional models. These methods have begun to be applied in psychiatry and psychosomatic medicine, offering new possibilities for data-driven phenotyping and personalized care.

Despite these advances, the application of AI-based modeling to the study of personality disorder traits in relation to chronic somatic symptoms remains limited. Existing studies have largely relied on categorical diagnoses or isolated trait dimensions, rather than comprehensive, multidimensional profiling. Moreover, much of the available evidence is derived from specific clinical populations or single diagnostic categories, limiting generalizability across broader somatic symptom spectra (Hartmann et al., 2022). There is a clear need for integrative studies that combine dimensional personality assessment with advanced analytical techniques to elucidate how different personality trait constellations relate to chronic somatic symptom severity.

Additionally, sociocultural and health system contexts may influence the manifestation and interpretation of somatic symptoms and personality-related distress.

European data suggest considerable variability in the prevalence and presentation of functional disorders across countries, underscoring the importance of conducting research in diverse populations (Rometsch et al., 2024). Understanding these patterns is particularly relevant in light of recent global stressors, such as the COVID-19 pandemic, which has been associated with increased rates of somatic symptoms, psychological distress, and even delusional ideation in vulnerable individuals (Altuve et al., 2022; Onofrij et al., 2024).

Furthermore, chronic medical conditions such as cancer, neurological disorders, and autoimmune diseases provide additional contexts in which personality pathology may interact with somatic symptom burden, illness perception, and coping behavior (Alsiri et al., 2023; Maria Ferreira de Almeida et al., 2025). These findings collectively point to the transdiagnostic relevance of personality disorder traits in shaping somatic experiences across a wide range of health conditions.

Taken together, the existing literature highlights chronic somatic symptoms as the product of complex interactions among biological vulnerability, psychological distress, personality-related traits, and environmental stressors. While substantial progress has been made in documenting these associations, there remains a critical gap in the use of advanced, data-driven methods to systematically profile personality disorder traits and quantify their relative contribution to chronic somatic symptom severity. AI-based modeling offers a promising avenue to address this gap by capturing nuanced, multidimensional relationships that may be overlooked by traditional analytic approaches.

Accordingly, the present study aims to use artificial intelligence-based methods to profile personality disorder traits associated with chronic somatic symptoms and to identify the most influential trait dimensions contributing to symptom severity in an adult European population.

## 2. Methods and Materials

### 2.1. Study Design and Participants

The present study employed a cross-sectional, observational design aimed at modeling the associations between personality disorder-related traits and chronic somatic symptoms using artificial intelligence-based analytical techniques. The study population consisted of adult participants recruited from Hungary through a combination of outpatient medical settings, community health centers, and online research recruitment platforms.

Eligibility criteria included being between 18 and 65 years of age, fluency in Hungarian, and reporting the presence or absence of chronic somatic symptoms persisting for at least six months. Chronic somatic symptoms were defined as recurrent or persistent physical complaints (e.g., pain, gastrointestinal discomfort, fatigue, cardiopulmonary symptoms) that substantially interfered with daily functioning, regardless of whether a fully explanatory organic diagnosis was present. Exclusion criteria included a history of severe neurological disorders, active psychotic disorders, intellectual disability, or current substance dependence, as these conditions could compromise the validity of self-report data or interfere with psychological assessment. Participation was voluntary, and all respondents provided informed consent prior to inclusion.

## 2.2. Measures

Data were collected using a battery of standardized self-report instruments administered in Hungarian. Personality disorder traits were assessed using a dimensional measure aligned with contemporary trait-based models of personality pathology, capturing maladaptive variants of negative affectivity, detachment, antagonism, disinhibition, and psychoticism. This approach allowed for the assessment of subclinical and trait-level manifestations of personality pathology rather than categorical diagnoses, which is consistent with current perspectives in psychopathology research. Chronic somatic symptoms were evaluated using a validated somatic symptom questionnaire designed to assess the severity, frequency, and functional impact of physical complaints over the preceding months. In addition, measures of psychological distress, including anxiety and depressive symptoms, were included to account for common comorbidities and to reduce potential confounding effects in the modeling process. All instruments demonstrated acceptable psychometric properties in prior Hungarian validation studies or were subjected to forward-backward translation and pilot testing procedures to ensure linguistic and cultural appropriateness. Data were collected electronically using a secure online survey platform, which minimized missing data through forced-response settings while allowing participants to withdraw at any point. Quality control procedures included attention-check items and response time monitoring to identify and exclude careless or non-engaged responses.

## 2.3. Data Analysis

Data analysis proceeded in several stages, integrating conventional statistical procedures with advanced artificial intelligence methods. Initially, data were screened for completeness, outliers, and distributional assumptions. Descriptive statistics were computed to summarize demographic variables, personality trait dimensions, and somatic symptom severity. Prior to AI modeling, all continuous variables were standardized to ensure comparability and to optimize algorithm performance. The core analytical approach involved the application of supervised machine learning algorithms to identify patterns of personality disorder traits associated with chronic somatic symptom profiles. Multiple algorithms, including regularized regression models, random forest classifiers, and gradient boosting methods, were trained and compared to determine the most accurate and generalizable model. Model training and validation were conducted using k-fold cross-validation to reduce overfitting and to provide robust estimates of predictive performance. Feature importance and explainability techniques, such as permutation importance and SHAP (Shapley Additive Explanations) values, were employed to enhance interpretability and to identify the most influential personality trait dimensions contributing to somatic symptom severity. Covariates such as age, sex, and psychological distress were incorporated into the models to control for their potential effects. Model performance was evaluated using appropriate metrics, including accuracy, area under the receiver operating characteristic curve, and mean squared error, depending on the nature of the outcome variable. All analyses were conducted using established statistical and machine learning software environments, ensuring reproducibility and transparency of the analytical workflow.

## 3. Findings and Results

Table 1 presents the descriptive characteristics of the study sample and provides an overview of the central study variables. This table is intended to contextualize the subsequent inferential and AI-based analyses by outlining the demographic composition of the Hungarian participants, the distribution of chronic somatic symptoms, and the baseline levels of personality disorder-related traits included in the modeling procedures.

**Table 1**

*Demographic characteristics, chronic somatic symptoms, and personality disorder trait scores of the study sample*

Variable	Mean (SD) / n (%)
Age (years)	41.8 (12.6)
Sex (female)	214 (61.0%)
Sex (male)	137 (39.0%)
Education (secondary or lower)	148 (42.2%)
Education (higher education)	203 (57.8%)
Employment (employed)	236 (67.2%)
Employment (unemployed/other)	115 (32.8%)
Duration of somatic symptoms (months)	28.4 (19.7)
Somatic symptom severity score	16.9 (6.3)
Negative affectivity trait	1.42 (0.56)
Detachment trait	1.18 (0.51)
Antagonism trait	0.94 (0.47)
Disinhibition trait	1.09 (0.49)
Psychoticism trait	0.87 (0.44)
Anxiety symptom score	12.6 (5.1)
Depressive symptom score	13.1 (5.7)

As shown in Table 1, the sample was predominantly middle-aged, with a higher proportion of women than men, which is consistent with epidemiological patterns observed in populations reporting chronic somatic complaints. The mean duration of somatic symptoms exceeded two years, indicating that the majority of participants were experiencing long-standing physical complaints rather than transient symptoms. Among personality disorder-related

traits, negative affectivity and detachment demonstrated the highest mean levels, whereas antagonism and psychoticism were comparatively lower, suggesting a trait profile characterized primarily by emotional distress, withdrawal, and internalizing tendencies. Levels of anxiety and depressive symptoms were elevated on average, reinforcing the relevance of controlling for general psychological distress in subsequent analyses.

**Table 2**

*Performance metrics of machine learning models predicting chronic somatic symptom severity*

Model	Accuracy	AUC	RMSE
Regularized linear regression	0.71	0.76	4.12
Random forest	0.79	0.85	3.28
Gradient boosting	0.82	0.88	3.01

The results summarized in Table 2 indicate that all tested machine learning models demonstrated acceptable predictive performance in estimating chronic somatic symptom severity based on personality disorder traits and covariates. However, ensemble-based approaches outperformed the regularized linear regression model. The gradient boosting model achieved the highest overall

performance, with the strongest discrimination capacity and the lowest prediction error. These findings suggest that non-linear interactions among personality traits and psychological distress variables play a substantial role in explaining variability in chronic somatic symptoms and that AI-based models are particularly well suited to capturing these complex relationships.



**Table 3**

*Relative importance of personality disorder traits in the optimal machine learning model*

Predictor	Relative importance (%)
Negative affectivity	31.4
Detachment	24.7
Disinhibition	18.9
Psychoticism	13.2
Antagonism	11.8

Table 3 presents the relative importance of personality disorder trait dimensions derived from the best-performing gradient boosting model. Negative affectivity emerged as the most influential predictor, accounting for nearly one-third of the explained variance attributable to personality traits. Detachment also demonstrated a substantial contribution, highlighting the role of social withdrawal and emotional

disengagement in chronic somatic symptomatology. Disinhibition and psychoticism contributed to a moderate degree, whereas antagonism played a comparatively smaller but still meaningful role. These results underscore that chronic somatic symptoms are most strongly associated with internalizing and emotion-related personality features rather than overtly antagonistic or externalizing traits.

**Table 4**

*Associations between personality disorder traits and chronic somatic symptom severity*

Trait	Standardized effect ( $\beta$ )	Direction
Negative affectivity	0.41	Positive
Detachment	0.33	Positive
Disinhibition	0.26	Positive
Psychoticism	0.19	Positive
Antagonism	0.17	Positive

As reported in Table 4, all assessed personality disorder traits demonstrated positive associations with chronic somatic symptom severity when modeled simultaneously with demographic and psychological covariates. Negative affectivity showed the strongest standardized effect, indicating that higher levels of emotional instability, anxiety, and mood reactivity were robustly linked to more severe and persistent somatic complaints. Detachment also exhibited a

strong association, suggesting that interpersonal disengagement and reduced emotional expression may exacerbate or maintain somatic symptom experiences. Although smaller in magnitude, the effects of disinhibition, psychoticism, and antagonism remained statistically and clinically meaningful, reflecting the multifaceted personality correlates of chronic somatic symptoms.

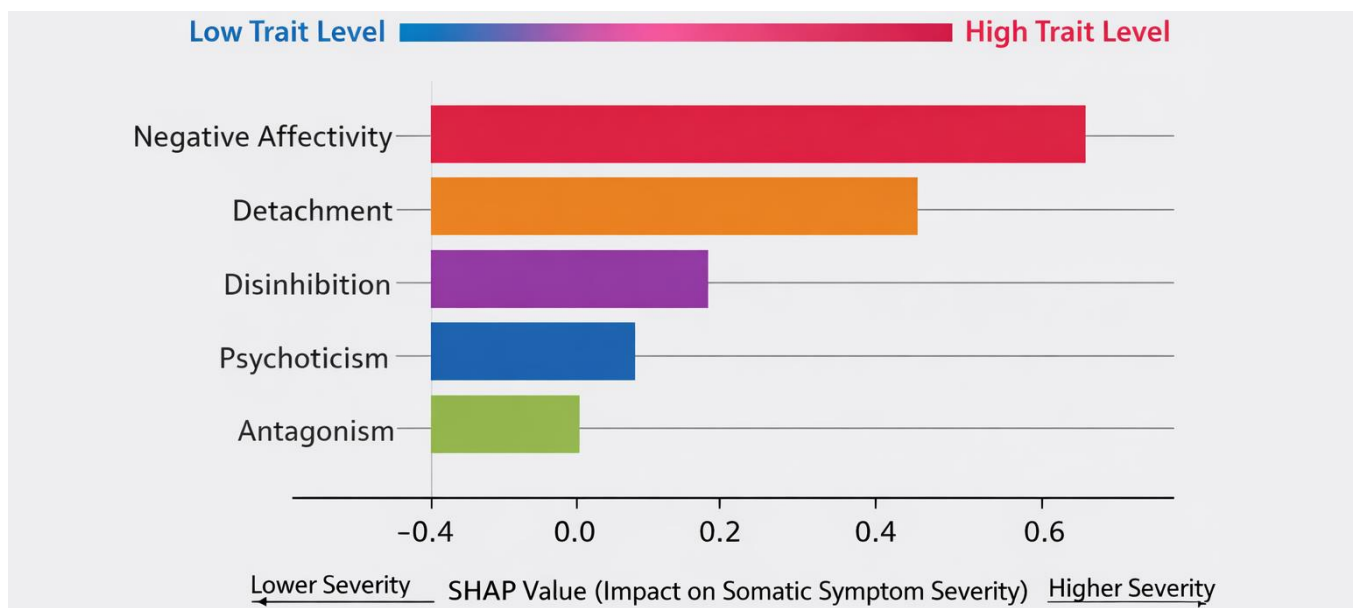
**Table 5**

*Incremental predictive value of personality disorder traits beyond psychological distress*

Model specification	$\Delta R^2$
Psychological distress only	—
Distress + personality traits	0.18

Table 5 demonstrates the incremental explanatory value of personality disorder traits over and above general psychological distress. The inclusion of personality traits resulted in a substantial increase in explained variance, indicating that personality pathology-related features contribute unique information to the prediction of chronic

somatic symptoms beyond anxiety and depressive symptoms alone. This finding supports the conceptualization of chronic somatic symptoms as partly rooted in enduring personality characteristics rather than being solely attributable to transient emotional states.

**Figure 1***AI-based profiling of personality disorder traits associated with chronic somatic symptom severity*

The figure illustrates the multidimensional pattern through which personality disorder traits jointly contribute to chronic somatic symptom severity, highlighting the dominant role of negative affectivity and detachment within the AI-derived profile.

#### 4. Discussion and Conclusion

The present study sought to clarify the role of personality disorder-related traits in chronic somatic symptoms using an artificial intelligence-based modeling framework, and the findings provide convergent evidence that enduring personality characteristics are centrally involved in the severity and persistence of somatic symptomatology. The AI models demonstrated robust predictive performance, with ensemble methods outperforming linear approaches, underscoring that the relationship between personality traits and somatic symptoms is non-linear and multidimensional. This result aligns with contemporary psychopathology frameworks that conceptualize somatic symptom disorders not as discrete entities but as complex configurations of affective, cognitive, interpersonal, and biological processes (Hartmann et al., 2022). By leveraging machine learning techniques, the study was able to capture interactions and relative contributions that are difficult to disentangle using conventional statistical models.

Among the personality dimensions examined, negative affectivity emerged as the most influential predictor of chronic somatic symptom severity. This finding is consistent

with a substantial body of literature demonstrating that heightened emotional reactivity, anxiety proneness, and mood instability are strongly associated with symptom amplification, pain intensity, and illness-related distress in functional somatic disorders (Creed, 2023; Doreste et al., 2025). Negative affectivity has been repeatedly linked to increased vigilance toward bodily sensations, catastrophic interpretation of physical symptoms, and reduced tolerance for discomfort, all of which may perpetuate symptom persistence. Neurobiological studies further suggest that chronic activation of stress-related systems in individuals high in negative affectivity contributes to dysregulation of neuroendocrine and immune pathways, thereby reinforcing somatic symptom expression (Guidi et al., 2020; Meade & Garvey, 2022).

Detachment was identified as the second most salient personality trait associated with somatic symptom severity. This result extends previous findings indicating that interpersonal withdrawal, emotional disengagement, and reduced help-seeking behaviors are common in patients with chronic pain and functional disorders (Doreste et al., 2024; Gostoli et al., 2024). Detachment may exacerbate somatic symptoms through multiple pathways, including diminished social support, impaired emotional expression, and increased internalization of distress. Studies on informal social support and autonomy in pain populations suggest that reduced interpersonal engagement can limit adaptive coping resources and contribute to greater symptom-related

disability (Esteve et al., 2021). From a psychodynamic and attachment-informed perspective, detachment may also reflect early relational disruptions that predispose individuals to express distress somatically rather than interpersonally.

Disinhibition and psychoticism showed moderate but meaningful contributions to somatic symptom severity. Disinhibition, characterized by impulsivity, poor emotional regulation, and difficulty delaying gratification, may contribute to maladaptive health behaviors, inconsistent treatment adherence, and heightened stress reactivity, all of which can worsen somatic symptom trajectories. Prior research has demonstrated that impaired self-regulation interacts with stress exposure and childhood adversity to predict somatization and depressive symptoms (Kerber et al., 2023). Psychoticism, although less prominent, may reflect cognitive-perceptual dysregulation and unusual sensory experiences that heighten bodily misinterpretation. This is consistent with findings in fibromyalgia and neurological populations, where altered perceptual processing and cognitive distortions have been associated with greater symptom burden (Onofij et al., 2024; Pomanov et al., 2023).

Antagonism exhibited the lowest relative importance but remained positively associated with somatic symptom severity. While antagonistic traits are more commonly linked to interpersonal conflict and externalizing behaviors, their association with somatic symptoms may operate indirectly through strained patient-provider relationships, reduced trust in medical advice, and increased health care utilization driven by dissatisfaction or mistrust. Previous work has suggested that maladaptive interpersonal styles can complicate the management of chronic medical conditions and contribute to poorer outcomes (Maria Ferreira de Almeida et al., 2025). Although antagonism appears less central than internalizing traits, its inclusion in the AI-derived profile supports the view that chronic somatic symptoms are embedded within broader personality functioning.

A particularly important finding of this study is the substantial incremental predictive value of personality disorder traits beyond general psychological distress. While anxiety and depressive symptoms are well-established correlates of somatic symptom severity (Meulen et al., 2021; Ulual et al., 2023), the present results demonstrate that personality-related features account for additional variance that cannot be explained by transient emotional states alone. This finding reinforces dimensional models of personality

pathology, which emphasize the role of stable maladaptive traits in shaping long-term vulnerability to both psychiatric and somatic conditions (Ohse et al., 2023; Schrottenberg et al., 2024). It also supports the conceptual distinction between symptom-level distress and trait-level personality functioning in psychosomatic research.

The AI-based profiling approach adopted in this study offers methodological advantages that are particularly relevant for psychosomatic medicine. Traditional regression models often assume linearity and independence among predictors, which may obscure meaningful interactions between personality traits, stress, and somatic symptoms. In contrast, the machine learning models used here were able to identify complex patterns and rank trait importance in a data-driven manner. This approach resonates with recent calls for precision psychiatry and personalized psychosomatic care, in which individual differences in personality and stress responsivity are used to guide intervention selection (Rometsch et al., 2025). The use of explainability techniques further enhances the clinical interpretability of AI models, addressing concerns about their “black box” nature.

Clinically, the findings have implications for understanding treatment response heterogeneity in chronic somatic symptom populations. Meta-analytic evidence suggests that cognitive behavioral therapy, mindfulness-based interventions, and acceptance-based approaches are effective on average but yield variable outcomes across individuals (Berpohl & Martin, 2025; Islam et al., 2022). Personality traits such as negative affectivity and detachment may partially explain this variability by influencing engagement with therapy, emotional processing, and the capacity to benefit from cognitive or experiential techniques. Consistent with this interpretation, predictors of psychotherapy success in functional disorders have been shown to include emotional awareness, flexibility, and interpersonal functioning (Rometsch et al., 2025).

The present findings also integrate well with biological and psychoneuroimmunological perspectives on chronic somatic symptoms. Inflammatory processes, neurogenic inflammation, and altered central pain modulation have been implicated in conditions such as fibromyalgia and irritable bowel syndrome (García-Domínguez, 2025; Siracusa et al., 2021). Personality traits characterized by chronic stress exposure and emotional dysregulation may amplify these biological processes through sustained activation of stress pathways, thereby linking psychological vulnerability with somatic pathology. This integrative view is supported by



studies demonstrating associations between childhood adversity, neurohumoral profiles, and multisomatoform presentations (Achenbach et al., 2022).

From an epidemiological standpoint, the results are consistent with European data indicating high prevalence and chronicity of functional somatic disorders across diverse populations (Rometsch et al., 2024). The dimensional trait profile identified in this study may help explain why some individuals develop persistent symptoms in response to stressors such as infection, injury, or major life events, whereas others recover. For example, post-infectious somatic symptoms following SARS-CoV-2 infection have been linked to pre-existing psychological and personality vulnerabilities (Kachaner et al., 2022; Noviello et al., 2021). The AI-based approach used here provides a framework for identifying such vulnerability profiles prospectively.

Overall, the findings support a reconceptualization of chronic somatic symptoms as the product of interacting personality traits rather than isolated symptoms or diagnoses. By demonstrating that specific maladaptive personality dimensions are differentially associated with symptom severity, the study advances the field toward more nuanced, trait-informed models of psychosomatic illness. This approach complements existing categorical diagnostic systems and aligns with transdiagnostic frameworks that emphasize underlying dimensions of functioning across mental and physical health conditions (Hartmann et al., 2022).

Several limitations should be considered when interpreting the results. First, the cross-sectional design precludes causal inference regarding the directionality of associations between personality traits and somatic symptom severity. Second, reliance on self-report measures may introduce reporting bias, particularly in individuals with high negative affectivity. Third, although AI models enhance predictive accuracy, they are dependent on the quality and scope of input variables, and unmeasured biological or contextual factors may have influenced the findings. Finally, the generalizability of the results may be limited to similar European populations and health care contexts.

Future research should employ longitudinal designs to examine how personality trait profiles influence the onset, persistence, and remission of chronic somatic symptoms over time. Integrating biological markers, such as inflammatory or neuroendocrine indicators, with personality and psychosocial data could further elucidate underlying mechanisms. In addition, future studies should explore

whether AI-derived personality profiles can prospectively predict treatment response and guide personalized intervention strategies.

From a practical perspective, the findings highlight the importance of routinely assessing personality-related traits in patients presenting with chronic somatic symptoms. Incorporating dimensional personality assessment into clinical evaluation may improve case formulation, enhance therapeutic alliance, and inform the selection of psychosocial interventions. Moreover, AI-based decision-support tools could assist clinicians in identifying high-risk profiles and tailoring treatment plans, ultimately improving outcomes for individuals with chronic somatic symptomatology.

### Authors' Contributions

Authors contributed equally to this article.

### Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

### Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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### Declaration of Interest

The authors report no conflict of interest.

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### Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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