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ABSTRACT

BACKGROUND: Anorexia nervosa (AN) is characterized by heterogeneous clinical manifestations, which complicates diagnosis and treatment. It is important to define the clinical variants and therapeutic targets for AN.

AIM: To identify empirical patient phenotypes within the AN diagnostic category using Latent Class Analysis (LCA) of clinically assessed psychopathological symptoms.

METHODS: Psychiatrists clinically assessed psychopathological symptoms of AN using an original checklist (57 symptoms in total) and the Mini-International Neuropsychiatric Interview (M.I.N.I.) was used to identify mental disorders. Patients completed the Symptom Check List-90-Revised questionnaire (SCL-90-R) to self-assess psychopathological symptoms and distress. Clinically homogeneous patient subgroups were identified using LCA.

RESULTS: A total of 115 patients with AN were examined. Based on the LCA, four patient groups (C1–C4) were identified, with high classification certainty ($R^2=0.908$), model significance ($p<0.001$), and clear separation of the latent groups (class separation index = 0.957). ED-related symptoms were key determinants of class formation only in 68 patients (59%) — those in C1 and C3. No statistically significant differences were found between classes on any SCL-90-R subscales or most M.I.N.I. diagnoses. In C1 ($n=41$), core ED symptoms dominated: dysmorphophobia, fears related to eating, weight gain, loss of control. In C2 ($n=39$), low frequencies are observed for core ED symptoms; this group was characterized by a high incidence of sleep disturbances, anxiety, apathy, melancholy, and anhedonia. C3 ($n=27$) represents a polymorphic clinical profile with a combination of core ED symptoms, affective symptoms, thought disorders, cognitive impairments, and sleep disturbances. C4 ($n=8$) was defined by the presence of hypochondriacal concerns, somatoform autonomic symptoms, and apathy; none of the core ED symptoms were typical for C4.

CONCLUSION: Four empirically derived clinical phenotypes of AN were identified, each characterized by a distinct symptomatic profile. Each phenotype was defined by specific combinations of core ED symptoms and general psychopathological manifestations.

АННОТАЦИЯ

ВВЕДЕНИЕ: Нервная анорексия (НА) характеризуется гетерогенными клиническими проявлениями, что затрудняет ее диагностику и лечение. Описание клинических вариантов и мишеней терапии НА является актуальной задачей.

ЦЕЛЬ: Изучение наличия эмпирических фенотипов пациентов внутри диагностической категории «нервная анорексия» с применением анализа латентных классов (LCA) психопатологических симптомов, выявленных в результате клинической оценки психического состояния врачами-психиатрами.

МЕТОДЫ: Психопатологические симптомы НА были клинически оценены психиатрами с использованием оригинального чек-листа (всего 57 симптомов), для выявления психических расстройств применялся опросник Mini-International Neuropsychiatric Interview (M.I.N.I.). Для самооценки психопатологических симптомов и дистресса пациенты использовали опросник Symptom Check List-90-Revised (SCL-90-R). Клинически гомогенные подгруппы пациентов были выделены с помощью LCA.

РЕЗУЛЬТАТЫ: Обследовано 115 пациентов с НА. По результатам LCA выделены 4 группы пациентов (K1–K4) с высокой определенностью классификации ($R^2=0,908$), значимостью модели ($p<0,001$) и четким разделением латентных групп (индекс несходства классов = 0,957). Симптомы расстройства пищевого поведения (РПП) являлись ключевыми для формирования кластера только у 68 (59%) — в группах K1 и K3. Статистически значимых различий между классами по субшкалам SCL-90-R или большинству диагнозов M.I.N.I. выявлено не было. В группе K1 ($n=41$) доминировали ключевые симптомы РПП: дисморфофобия, страхи, связанные с едой, набором веса, потерей контроля. В группе K2 ($n=39$) наблюдалась низкая частота ключевых симптомов РПП, для этой группы была характерна высокая распространенность нарушений сна, тревоги, апатии, тоски и ангедонии. Группа K3 ($n=27$) представляет полиморфный клинический профиль с сочетанием ключевых симптомов РПП, аффективных симптомов, расстройств мышления, когнитивных нарушений и нарушений сна. Группа K4 ($n=8$) определялась наличием ипохондрических опасений, соматоформных вегетативных симптомов и апатии; ни один из ключевых симптомов РПП не был типичен для K4.

ЗАКЛЮЧЕНИЕ: Выделены 4 эмпирических клинических фенотипа НА, каждый из которых отличался уникальным симптоматическим профилем. Были определены специфичные для каждой группы симптомы, которые включали ключевые симптомы расстройства пищевого поведения и общие психопатологические проявления.

Keywords: *anorexia nervosa; latent class analysis; psychopathology; phenomenology*

Ключевые слова: *нервная анорексия; анализ латентных классов; психопатология; феноменология*

INTRODUCTION

Anorexia nervosa (AN) is an eating disorder (ED) characterized by diverse psychopathological manifestations, which may relate both to the disorder itself and to accompanying mental disorders. According to the International Classification of Diseases, 11th Revision (ICD-11), AN must be differentiated from schizophrenia and other primary psychotic disorders, obsessive-compulsive disorder (OCD), body dysmorphic disorder, bulimia nervosa and avoidant/restrictive food intake disorder [1]. AN is associated with high rates of psychiatric comorbidity, including depressive disorders (from 36 to 80%), anxiety disorders (up to 65%), autism spectrum

disorders (up to 22.9%), post-traumatic stress disorder (up to 22.7%), and OCD (up to 44%) [2–4]. The overlap between AN symptoms and those of other psychiatric disorders, combined with this high comorbidity, significantly complicates both the diagnosis and treatment of AN [3]. Moreover, there is still no robust evidence supporting the efficacy of pharmacotherapy either for core AN symptoms or for its concomitant mental disorders [5]. The marked heterogeneity of AN symptoms is widely regarded as a major barrier to developing effective treatment strategies [6–8].

Researchers increasingly recognize the need to reconceptualize AN [9, 10]. Empirical classifications of

the broader ED diagnostic category have been proposed, which use mathematical modeling of ED clinical features to integrate patient symptoms into the analysis. Latent Class Analysis (LCA) is applied to identify patient groups with similar symptoms [11–14], network analysis is used to detect symptom interrelationships in static and dynamic states [15, 16], and combinations of these methods are also used [17].

Identifying homogeneous patient subgroups may facilitate the development of more targeted and personalized therapeutic strategies, as well as the elucidation of biological factors contributing to the disorder [18]. LCA enables the detection of hidden, homogeneous patient groups within a population displaying diverse clinical manifestations, identifying discrete clinical categories of psychopathological symptom diversity [13, 16]. In this approach, patient characteristics cannot overlap between groups, allowing clear differentiation of patients based on the assessed features [19].

Over the past two decades, several studies have focused on the empirical identification of AN patient phenotypes using LCA. This approach formed the basis for modern ED classifications [20]. Some of these studies were conducted at the general population and aimed to: assess the prevalence of EDs variants based on clinical signs according to the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R) [11]; identify phenotypes considering possible concomitant mental issues such as OCD, temperament, and personality traits (perfectionism and trait anxiety) [12]; and, determine the features of ED manifestation in different age groups [13]. Studies on clinical samples of patients diagnosed with AN identified latent classes based on the distribution of ED diagnostic criteria among classes [9, 14, 21], or focused on the combination of ED symptoms and patient personality traits [22], but without accounting concomitant psychopathological symptoms. However, the results of findings from network analysis studies on clinical samples highlight the importance of assessing symptoms beyond the behavioral manifestations of EDs [23, 24]. Despite this, to date, no studies have been conducted to identify latent classes within a clinical sample of patients with AN, considering the full spectrum of psychopathological manifestations.

In prior studies of ED that used LCA or network analysis, the models relied on psychometric scales, self-report questionnaires, or participant reports on the presence or

absence of symptoms included in the ED diagnostic criteria [6, 13–15, 24–27]. Relying on self-report questionnaires instead of clinical assessment for constructing empirical classifications may lead to biased information about the patient's status into the model. This is a well-known limitation of the self-reported method compared with clinician evaluation [28–32].

For more detailed and personalized patients' assessment, the phenomenological approach, which captures phenomena of lived experience, has been increasingly used in recent years [33, 34]. This approach appears to be a promising direction for describing patient phenotypes in neurobiological research, developing therapeutic strategies, and incorporating the patients' subjective illness experience in care organization [33–35]. Phenomenological studies in AN have focused on manifestations that patients themselves view as important and that form part of their illness narrative. However, these studies have predominantly been limited to body image dissatisfaction and related phenomena [36].

A limitation of this approach is that information about the clinical condition is restricted to the patient's self-assessment. In addition to the methodological problem of data heterogeneity [35], this creates the risk of subjective selectivity, with some psychopathological phenomena omitted because patients do not recognize them or do not consider them significant. The egosyntonic nature of AN symptoms leads to discrepancies in the assessment of the condition by both patient and clinician assessments [36–38]. These limitations can be overcome by employing a clinical psychopathological assessment. This approach enables the psychiatrist not only to identify phenomena of the patient's mental functioning but also to perform their psychopathological qualification (the determination of symptoms and syndromes) [39, 40].

Thus, attempts are currently being made to identify subgroups of patients within ED diagnostic categories; however, there is a lack of research that would account for the entire complex of psychopathological manifestations observed in patients' mental status. Furthermore, there is a lack of research on empirical classifications of AN that incorporate psychopathological symptoms based on the results of clinical assessment by psychiatrists.

The aim of this study was to identify empirical patient phenotypes within the AN diagnostic category using LCA of psychopathological symptoms identified through clinical psychiatric assessment.

We hypothesized that within the single diagnostic category of “anorexia nervosa”, several clinical phenotypes would be identified, differing from one another in both ED symptoms and accompanying psychopathological symptoms.

METHODS

Study design

A cross-sectional study was conducted.

Setting

The study was conducted at the Eating Disorders Clinic (Clinic) inpatient and day hospitals of Mental-health clinic No. 1 named after N.A. Alexeev (Moscow) from April 2023 to September 2024. Psychiatrists from the Clinic ($n=6$) with 1–5 years of clinical experience participated in the patient assessment and data collection. Clinical assessment was supervised by department heads, who were psychiatrists with more than 20 years of work experience ($n=2$).

All study information was recorded in an electronic case report form (eCRF) developed specifically for the study.

Participants

The study included patients diagnosed with anorexia nervosa who were admitted for treatment at the Clinic. Non-inclusion criteria: refusal to participate. Exclusion criteria: duration of hospitalization less than 7 days.

The diagnosis of anorexia nervosa was established by psychiatrists during routine clinical assessment, according to the International Classification of Diseases, 10th Revision (ICD-10).

Measurements

Data were collected during the first week of hospitalization.

For all patients, age and duration of AN were recorded, and Body Mass Index (BMI) was calculated as weight (kg)/height² (m²). In addition, an ICD-11 ED diagnosis was assigned to each patient based on a clinical assessment by psychiatrists.

Evaluated parameters and study tools

To identify concomitant mental disorders, the semi-structured Mini-International Neuropsychiatric Interview, version 6.0 (M.I.N.I.) [41] was used by psychiatrists. All participating psychiatrists had previously undergone standardized training in its administration.

Patients also completed the Symptom Checklist-90-Revised (SCL-90-R) [42], a self-report questionnaire designed

to assess psychopathological symptoms and the severity of associated distress. The questionnaire comprises 90 items rated on a 5-point Likert scale from 0 (“not at all”) to 4 (“very strong”). Each item corresponds to one of nine subscales: “Somatization”, “Obsessive-compulsive symptoms”, “Interpersonal sensitivity”, “Depression”, “Anxiety”, “Hostility”, “Phobic anxiety”, “Paranoid ideation”, and “Psychoticism”. In addition, the questionnaire includes three global indices: the Global Severity Index, the Positive Symptom Distress Index, and the Positive Symptom Total. For the results, the mean score across all items within each subscale is calculated; higher scores indicate greater severity of the corresponding symptom.

Clinician-rated assessment of psychopathological symptoms of anorexia nervosa

The clinical-psychopathological evaluation, which was used to assess the patient’s mental state and inform decisions regarding psychopharmacotherapy, was conducted as part of routine clinical assessment. This included a structured clinical interview with the patient, behavioral observation during the inpatient stay, and collection of medical history from both the patient and their relatives.

For this study, a symptom checklist (see Table S1 in the Supplementary) was specifically developed to document psychopathological symptoms identified as treatment targets for psychopharmacotherapy. The checklist was completed by the patients’ physicians in the eCRFs at initiation of pharmacotherapy, as well as each time the medication dose was adjusted or a new medication was prescribed. One or several target symptoms could be noted depending on the reasons for prescribing the drug. Psychopharmacotherapy was prescribed by psychiatrists under routine clinical practice. In the eCRFs, psychiatrists indicated the specific symptoms being targeted and entered the name and dose of the medication prescribed to address those symptoms in designated fields of the electronic form. Data on target symptoms for psychopharmacotherapy were collected throughout the treatment period, encompassing both inpatient and day hospitals at the Clinic. The designation of target symptoms was reviewed and verified by department heads.

The checklist was based on a standardized mental status evaluation framework [43] routinely used by psychiatrists. It included a total of 54 psychopathological symptoms, categorized into nine subgroups: affective symptoms, neurotic and somatoform symptoms, thought

disorders, cognitive symptoms, behavioral disturbances, perceptual disturbances, obsessive-compulsive symptoms, physiological disturbances, and ED-specific symptoms. Additionally, the presence of three symptoms related to the management of antipsychotic side effects was assessed, allowing psychiatrists to evaluate 57 symptoms in each patient. Symptom selection for the checklist from the wide range of clinical manifestations based on the presence of two criteria: the symptom must be a potential target for psychopharmacotherapy, and the symptom must be potentially clinically present in patients diagnosed with AN. Before the study began, the completeness of symptom coverage and usability of the checklist were evaluated through iterative consultation with all participating investigators until it was considered sufficiently comprehensive and practical for describing psychopharmacotherapy targets in patients with AN.

Statistical analysis

No preliminary sample size calculation was performed; however, it was planned to include a minimum of 100 patients in the study.

Statistical data analysis was conducted by investigators who were not employed by the Clinic. They were provided with a fully de-identified dataset to ensure patient anonymity and minimize the risk of interpretation bias.

Data analysis included descriptive statistics, frequency analysis of psychopathological symptoms, the LCA, and comparative analysis of the characteristics of the groups identified using the LCA. Statistical significance was set at $p < 0.05$. Two-sided statistical tests were used in all cases. Quantitative and ordinal variables were summarized using either mean (standard deviation) or median values (first; third quartiles). The selection between mean (SD) and median (IQR) for describing quantitative variables was based on the results of the Shapiro–Wilk test for normality.

Preparation of data for statistical analysis

Data were extracted from the eCRFs into an Excel spreadsheet (Microsoft Corporation), and no imputation of missing values was performed.

Based on the documented target symptoms, a dedicated electronic dataset was created, with each row representing a unique “patient–drug–target symptom” entry. Binary values (0/1) were used to indicate whether the psychiatrist explicitly documented that a given medication was prescribed to

address a specific symptom. A symptom was considered clinically significant if it appeared as a treatment target in at least five cases. We chose this threshold value to exclude idiosyncratic or extremely rare symptoms that could introduce statistical noise and obscure the identification of stable latent classes. Following the exclusion of rare target symptoms, a binary “patient–symptom” matrix was constructed, reflecting all clinically relevant symptoms designated as treatment targets. This matrix served as the basis for LCA.

Latent class analysis

LCA was performed to identify latent, homogeneous subgroups (classes) of patients characterized by similar patterns of binary symptom features (i.e., combinations of target symptoms). The unit of analysis was the individual patient. The analysis was conducted using XLSTAT software (version 2024.2.2.1422, Addinsoft, Paris, France), with the number of latent classes varied automatically from 1 to 4. Model parameters were estimated using the Expectation–Maximization (EM) algorithm refined by the Newton–Raphson method. To ensure stability of solutions, a fixed random number seed (seed=123456789) and multiple random starting conditions (16 distinct initializations) were employed, which minimized the risk of local minima. The model assumed local independence of symptom indicators; therefore, covariance parameters between symptoms were not included. The optimal model was selected based on the following criteria: Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), Consistent Akaike Information Criterion (CAIC) and Sample-Adjusted Bayesian Information Criterion (SABIC), the highest classification entropy (Entropy R^2); and the lowest classification error rate. Additionally, the model fit was evaluated using the likelihood-ratio chi-square statistic (L^2) and the associated degrees of freedom. This approach ensured a balanced assessment of both model fit and the discriminative power of the resulting solution [19]. After determining the optimal number of classes according to these criteria, classification function coefficients were computed for each class. These coefficients correspond to the parameters of multinomial logit models and enable the calculation of the post-hoc probability that a given patient belongs to a specific class, based on the presence or absence of particular target symptoms. Positive coefficient values indicate that the presence of a given symptom increases the likelihood of a patient’s membership in the corresponding class, whereas

negative values indicate that the symptom decreases this likelihood.

Subsequently, a comparative analysis of classes characteristics was performed, including demographic variables (age), clinical features (body mass index, ICD-11 diagnosis, duration of AN), psychometric data (results from the M.I.N.I. and SCL-90-R questionnaires), and psychotropic medications prescribed to address psychiatric symptoms. For continuous variables, normality was assessed using the Shapiro–Wilk test. When the assumption of normality was met, one-way analysis of variance (ANOVA) was employed, reporting the F-statistic, statistical significance level (p -value), and effect size (η^2). In cases of asymmetrical distributions, the Kruskal–Wallis H test was used, with estimation of the proportion of explained variance (ϵ^2). Categorical variables were analyzed using Pearson’s chi-square (χ^2) test. When expected cell frequencies in contingency tables were less than 5, Fisher’s exact test was applied. Effect sizes for categorical comparisons were quantified using Cramér’s V coefficient. Comparisons between classes were conducted without a priori grouping, and multiple comparison corrections were applied using the Bonferroni adjustment for post hoc tests. Interpretation of results was based on both statistical significance ($p < 0.05$) and effect size magnitude to assess the practical and clinical relevance of observed differences.

Ethical considerations

The study was approved by the local ethics committee of Mental-health clinic No. 1 named after N.A. Alexeev (Minutes No. 2 dated March 9, 2023). Before the inclusion in the study, the patients signed the informed consent form for participation.

RESULTS

Participants

A total of 115 patients were enrolled in the study. Clinical and demographic parameters of the sample are presented in Table 1.

According to the M.I.N.I. questionnaire (data available for 110 patients), the most common comorbid disorders were current major depressive episode ($n=27$, 24.5%); recurrent depressive episode ($n=48$, 43.6%); OCD ($n=50$, 45.5%); generalized anxiety disorder (GAD) ($n=39$, 35.5%). Four (3.6%) patients had an ongoing psychotic disorder. All M.I.N.I. diagnoses are presented in Table S2 in the Supplementary.

Table 1. Clinical and demographic characteristics of the sample

Parameter	Value ($n=115$)
General characteristics Me (Q1; Q3)	
Age, years	22.0 (19.0; 26.0)
BMI, kg/m ²	14.6 (12.7; 16.3)
Duration of the disease, years	5.0 (2.0; 9.0)
Diagnosis according to the ICD-11 ($n=111$), n (%)	
AN with significantly low body weight, restricting pattern (6B80.00)	39 (35.1%)
AN with significantly low body weight, binge-purge pattern (6B80.01)	33 (29.7%)
AN with dangerously low body weight, restricting pattern (6B80.10)	28 (25.2%)
AN with dangerously low body weight, binge-purge pattern (6B80.10)	10 (9.1%)
AN in recovery with normal body weight	1 (0.9%)
SCL-90-R	
Scale	Me (Q1; Q3)
Somatization	0.8 (0.5; 1.4)
Obsessive-compulsive symptoms	1.4 (0.7; 2.1)
Interpersonal sensitivity	1.3 (0.6; 2.0)
Depression	1.5 (0.9; 2.1)
Anxiety	0.9 (0.4; 1.6)
Hostility	0.7 (0.2; 1.3)
Phobic anxiety	0.4 (0.0; 0.9)
Paranoid ideation	0.7 (0.2; 1.2)
Psychoticism	0.6 (0.3; 1.3)
GSI	1.0 (0.6; 1.6)
PST	50.0 (31.0; 64.0)
PSDI	1.9 (1.5; 2.3)

Note: AN — anorexia nervosa; BMI — body mass index; GSI — Global Severity Index; ICD-11 — International Classification of Diseases, 11th Revision; Me — median; PSDI — Positive Symptom Distress Index; PST — Positive Symptom Total; SCL-90-R — Symptom Checklist-90-Revised.

Frequency of the target symptoms for psychopharmacotherapy in the sample

All patients received psychopharmacotherapy, and information about the treatment-target symptoms was available for all 115 patients. Forty-six of the possible 57 symptoms were present in the sample. Eleven symptoms were not specified as targets for psychopharmacotherapy (euphoria; delusional mania; depersonalization and

derealization; contrasting obsessions; aggression; decreased appetite; decreased libido; increased somnolence; epilepsy syndrome; and delirium). The distribution of symptom frequencies is presented in Table 2.

Symptom frequencies showed high variability. The most frequent targets of psychopharmacotherapy were mood-related symptoms — anxiety, apathy, melancholy, anhedonia, and mood swings — as well as sleep-onset difficulties and AN-specific symptoms, including fears related to eating, weight gain, loss of control, and body-image-related dysmorphic symptoms.

Latent class model

LCA enabled the identification of the most probable latent structure of therapy-target symptoms of the 115 patients.

The total number of recorded clinically significant target symptoms (with a frequency of occurrence ≥ 5) in the sample was 830, indicating sufficient data saturation for LCA [19]. Twenty-six of the 46 symptoms were clinically significant (with a frequency of ≥ 5). The final data matrix for LCA comprised “115 patients \times 26 symptoms”. To assess the number of latent classes, models of one to four classes were built. The selection of the optimal number of classes was based on information criteria and classification quality indices (see Table S3 in the Supplementary).

The model with four classes demonstrated the lowest BIC value (BIC=2951.94) compared with the one- to three-class models and the lowest classification error (0.041) as well as a high entropy value ($R^2=0.908$), and minimal probability of misclassification of patients into multiple

Table 2. Ranking of target symptoms in the sample by frequency

Symptoms	n (%)	Symptoms	n (%)
Anxiety	98 (85.2%)	Memory deficits	5 (4.3%)
Apathy	92 (80.0%)	Vomiting	5 (4.3%)
Difficulties falling asleep	78 (67.8%)	Akathisia*	5 (4.3%)
Fears related to eating, weight gain, loss of control	56 (48.7%)	Pain	4 (3.5%)
Melancholy	54 (47.0%)	Conflict behavior	4 (3.5%)
Anhedonia	50 (43.5%)	Suicidal thoughts	4 (3.5%)
Mood swings	44 (38.3%)	Hallucinations	4 (3.5%)
Dysmorphophobia (regarding body size)	39 (33.9%)	Ideas of reference (except for EDs)	3 (2.6%)
Formal thought disorders	36 (31.3%)	Impulsive actions	3 (2.6%)
Superficial sleep	35 (30.4%)	Cenesthopathies	3 (2.6%)
Delusional level of anxiety	34 (29.6%)	Rituals (except for EDs)	3 (2.6%)
Prevention of EPS*	33 (28.7%)	Fears (except for ED-related symptoms)	2 (1.7%)
Irritability	22 (19.1%)	Self-harm	2 (1.7%)
Obsessive ideas (regarding food, weight, and body shape)	21 (18.3%)	Early awakening	2 (1.7%)
Hypochondriacal concerns	20 (17.4%)	Rituals (food, evaluation of one's own body)	2 (1.7%)
Overvalued ideas (regarding food, weight, and body shape)	20 (17.4%)	Compulsions as part of EDs	2 (1.7%)
Reduced attentional focus	19 (16.5%)	Elevated mood	1 (0.9%)
Extrapyramidal effects*	19 (16.5%)	Dysmorphophobia (except for body size)	1 (0.9%)
Somatoform autonomic dysfunction	12 (10.4%)	Delusional level of depression	1 (0.9%)
Sensitive ideas of reference	12 (10.4%)	Overvalued ideas (except for EDs)	1 (0.9%)
Obsessive thoughts (except for EDs)	8 (7.0%)	Compulsions (except for ED-related symptoms)	1 (0.9%)
Delusional ideas (except for EDs)	7 (6.1%)	Fatigue	1 (0.9%)
Dysmorphomania	6 (5.2%)	Decreased appetite	1 (0.9%)

Note: *Additional signs introduced as indications for prescribing “agents to treat the side effects of antipsychotics”. ED — eating disorder; EPS — extrapyramidal symptoms.

classes. The L^2 statistic value ($L^2=1,359.49$, $df=8$, $p<0.0001$) confirmed the model's significance, while the dissimilarity index between classes (dissimilarity index=0.957) indicated a clear separation of latent groups. Thus, the model with four latent classes was considered statistically justified and the most appropriate for describing the existing data structure.

The final distribution of patients across classes was: class 1 (C1) — 41 patients (35.7%), class 2 (C2) — 39 (33.6%),

class 3 (C3) — 27 (23.5%) and class 4 (C4) — 8 (7.0%). Table 3 demonstrates the classification matrix showing the estimated likelihood of being in each class based on the results of the multinomial logistic regression. Regression coefficients (logits) reflect the contribution of each symptom to class membership: positive values indicate that a symptom increases the likelihood of belonging to a given class, whereas negative values suggest that the symptom is not typical for that class.

Table 3. Regression coefficients* of the multinomial logistic model for estimating the post-hoc probabilities of belonging to each class

Groups of symptoms	Symptoms	Class 1	Class 2	Class 3	Class 4
	<i>Intercept</i>	-1.286	-7.962	13.960	-4.713
Affective disorders	Anxiety	-0.063	0.128	0.214	-0.279
	Apathy	-0.194	-0.394	-0.849	1.437
	Melancholy	-0.967	0.193	0.985	-0.212
	Anhedonia	-0.199	0.721	1.049	-1.570
	Mood swings	0.086	0.021	0.468	-0.576
	Irritability	0.514	0.206	0.707	-1.427
ED-related symptoms	Fears related to eating, weight gain, loss of control	0.813	-1.288	1.113	-0.638
	Dysmorphophobia (concerns regarding body size or its parts)	0.877	-0.861	1.305	-1.321
	Obsessive ideas (regarding food, weight, and body shape)	0.514	-0.185	1.039	-1.368
	Overvalued ideas (regarding food, weight, and body shape)	0.846	-1.657	1.723	-0.913
	Sensitive ideas of reference ("others are critically judging me")	1.511	-1.566	0.854	-0.799
	Vomiting	-1.034	-1.032	2.323	-0.257
Neurotic and somatoform symptoms	Hypochondriacal concerns	-2.608	-0.440	0.450	2.598
	Somatoform autonomic symptoms	-0.459	-2.275	0.494	2.239
OCD	Obsessive thoughts (except for EDs)	-2.199	0.434	0.645	1.120
Thought disorders	Delusional level of anxiety (including regarding EDs)	0.525	-0.851	0.071	0.255
	Dysmorphomania (including regarding body size or its parts)	0.623	-2.117	0.596	0.898
	Formal thought disorders (associative process disorders)	-0.438	0.098	0.466	-0.126
	Delusional ideas (except for EDs)	0.440	-2.151	0.530	1.180
Psychological disorders	Difficulties falling asleep	-1.369	0.066	1.962	-0.658
	Superficial sleep	-0.051	0.643	0.836	-1.427
Cognitive impairments	Reduced attentional focus	-0.018	0.414	0.994	-1.390
	Memory deficits	-1.075	-0.967	2.311	-0.270
Treatment of adverse effects	Extrapyramidal symptoms**	-0.926	-0.187	0.774	0.338
	Prevention of EPS**	0.211	-0.768	0.342	0.215
	Akathisia**	-2.134	0.759	0.365	1.011

Note: *Regression coefficients are calculated as the logarithm of the odds ratio of a patient being assigned to a given class in the presence of a particular symptom. **Additional signs introduced as indications for prescribing "agents to treat the side effects of antipsychotics". ED — eating disorder; EPS — extrapyramidal symptoms; OCD — obsessive-compulsive disorder.

The quality of classification based on modal and proportional probability of belonging is presented in Table S4 in the Supplementary. The classification matrix confirmed the model's high accuracy, demonstrating that the vast majority of patients were unambiguously assigned to one Class.

Clinical characteristics of the classes

The analysis of the regression coefficients allowed the identification of the key symptoms determining the patients' membership in specific class. Table 4 presents the frequency of symptom occurrence in each Class. Table 5 provides a comparison of Classes based on clinical characteristics

Table 4. Frequency of symptoms in the classes

Groups of symptoms	Symptoms	Class 1 (n=41)	Class 2 (n=39)	Class 3 (n=27)	Class 4 (n=8)	χ^2 (df), p
Affective disorders	Anxiety	34 (82.9%)	34 (87.2%)	24 (88.9%)	6 (75.0%)	$\chi^2(3)=1.24, p=0.743$
	Apathy	36 (87.8%)	31 (79.5%)	17 (63.0%)	8 (100.0%)	$\chi^2(3)=8.47, p=0.037$
	Melancholy	4 (9.8%)	23 (59.0%)	24 (88.9%)	3 (37.5%)	$\chi^2(3)=44.39, p<0.001$
	Anhedonia	7 (17.1%)	23 (59.0%)	20 (74.1%)	0 (0.0%)	$\chi^2(3)=31.88, p<0.001$
	Mood swings	15 (36.6%)	13 (33.3%)	15 (55.6%)	1 (12.5%)	$\chi^2(3)=6.12, p=0.106$
	Irritability	9 (22.0%)	5 (12.8%)	8 (29.6%)	0 (0.0%)	$\chi^2(3)=5.03, p=0.170$
ED-related symptoms	Fears related to eating, weight gain, loss of control	31 (75.6%)	1 (2.6%)	23 (85.2%)	1 (12.5%)	$\chi^2(3)=63.69, p<0.001$
	Dysmorphophobia (concerns regarding body size or its parts)	19 (46.3%)	1 (2.6%)	19 (70.4%)	0 (0.0%)	$\chi^2(3)=40.04, p<0.001$
	Obsessive ideas (regarding food, weight, and body shape)	8 (19.5%)	2 (5.1%)	11 (40.7%)	0 (0.0%)	$\chi^2(3)=15.48, p=0.001$
	Overvalued ideas (regarding food, weight, and body shape)	6 (14.6%)	0 (0.0%)	14 (51.9%)	0 (0.0%)	$\chi^2(3)=32.43, p<0.001$
	Sensitive ideas of reference ("others are critically judging me")	10 (24.4%)	0 (0.0%)	2 (7.4%)	0 (0.0%)	$\chi^2(3)=14.28, p=0.003$
	Vomiting	0 (0.0%)	0 (0.0%)	5 (18.5%)	0 (0.0%)	$\chi^2(3)=17.04, p<0.001$
Neurotic and somatoform symptoms	Hypochondriacal concerns	0 (0.0%)	3 (7.7%)	9 (33.3%)	8 (100.0%)	$\chi^2(3)=53.96, p<0.001$
	Somatoform autonomic symptoms	1 (2.4%)	0 (0.0%)	4 (14.8%)	7 (87.5%)	$\chi^2(3)=58.74, p<0.001$
OCD	Obsessive thoughts (except for EDs)	0 (0.0%)	3 (7.7%)	3 (11.1%)	2 (25.0%)	$\chi^2(3)=7.84, p=0.049$
Thought disorders	Delusional level of anxiety (including regarding EDs)	20 (48.8%)	3 (7.7%)	8 (29.6%)	3 (37.5%)	$\chi^2(3)=16.47, p<0.001$
	Dysmorphomania (including regarding body size or its parts)	3 (7.3%)	0 (0.0%)	2 (7.4%)	1 (12.5%)	$\chi^2(3)=3.63, p=0.304$
	Formal thought disorders (associative process disorders)	6 (14.6%)	14 (35.9%)	14 (51.9%)	2 (25.0%)	$\chi^2(3)=11.13, p=0.011$
	Delusional ideas (except for EDs)	3 (7.3%)	0 (0.0%)	2 (7.4%)	2 (25.0%)	$\chi^2(3)=7.72, p=0.052$
Psychological disorders	Difficulties falling asleep	11 (26.8%)	35 (89.7%)	27 (100.0%)	5 (62.5%)	$\chi^2(3)=53.07, p<0.001$
	Superficial sleep	6 (14.6%)	16 (41.0%)	13 (48.1%)	0 (0.0%)	$\chi^2(3)=14.40, p=0.002$
Cognitive impairments	Reduced attentional focus	3 (7.3%)	6 (15.4%)	10 (37.0%)	0 (0.0%)	$\chi^2(3)=12.38, p=0.006$
	Memory deficits	0 (0.0%)	0 (0.0%)	5 (18.5%)	0 (0.0%)	$\chi^2(3)=17.04, p<0.001$
Treatment of adverse effects	Extrapyramidal effects*	1 (2.4%)	4 (10.3%)	12 (44.4%)	2 (25.0%)	$\chi^2(3)=22.69, p<0.001$
	Prevention of EPS*	15 (36.6%)	3 (7.7%)	12 (44.4%)	3 (37.5%)	$\chi^2(3)=13.23, p=0.004$
	Akathisia*	0 (0.0%)	3 (7.7%)	1 (3.7%)	1 (12.5%)	$\chi^2(3)=4.23, p=0.239$

Note: *Additional signs introduced as indications for prescribing "agents to treat the side effects of antipsychotics". ED — eating disorder; EPS — extrapyramidal symptoms; OCD — obsessive-compulsive disorder.

Table 5. Comparison of classes by clinical characteristics* and psychopharmacotherapy prescriptions*

Variable	Class 1 (n=41)	Class 2 (n=39)	Class 3 (n=27)	Class 4 (n=8)	Total (n=115)	Test
Age, Me (Q1; Q3), years	21.0 (18.0; 24.0)	22.0 (19.0; 26.0)	27.5 (21.3; 31.0)	21.0 (20.5; 25.0)	22.0 (19.0; 26.0)	H(3)=10.05, p=0.018, ε²=0.091
BMI, M±SD, kg/m²	14.2±2.0	15.5±1.9	14.2±2.6	14.8±2.3	14.7±2.2	F(3; 107)=3.21, p=0.026, η²=0.083
Current suicidal risk Moderate (n (%))	3 (7.5%)	2 (5.4%)	6 (24.0%)	0 (0.0%)	11	χ²(3)=7.48, p=0.058
Ongoing OCD (n (%))	19 (47.5%)	14 (37.8%)	11 (44.0%)	6 (75.0%)	50	χ²(3)=3.77, p=0.287
Psychotic disorders. Current episode (n (%))	1 (2.5%)	1 (2.6%)	0 (0.0%)	2 (28.6%)	4	χ²(3)=13.78, p=0.003
Antidepressants						
Agomelatine	1 (2.4%)	1 (2.6%)	4 (14.8%)	0 (0%)	6	χ²(3)=6.67, p=0.083
Amitriptyline	0 (0%)	1 (2.6%)	1 (3.7%)	1 (12.5%)	3	χ²(3)=4.24, p=0.236
Venlafaxine	6 (14.6%)	6 (15.4%)	9 (33.3%)	0 (0%)	21	χ²(3)=7.14, p=0.068
Vortioxetine	2 (4.9%)	1 (2.6%)	1 (3.7%)	1 (12.5%)	5	χ²(3)=1.63, p=0.652
Duloxetine	1 (2.4%)	1 (2.6%)	1 (3.7%)	3 (37.5%)	6	χ²(3)=18.18, p<0.001
Clomipramine	0 (0%)	1 (2.6%)	2 (7.4%)	0 (0%)	3	χ²(3)=3.70, p=0.296
Mirtazapine	12 (29.3%)	8 (20.5%)	8 (29.6%)	0 (0%)	28	χ²(3)=3.23, p=0.357
Paroxetine	1 (2.4%)	0 (0%)	0 (0%)	0 (0%)	1	χ²(3)=1.82, p=0.610
Sertraline	13 (31.7%)	17 (43.6%)	7 (25.9%)	2 (25.0%)	39	χ²(3)=4.41, p=0.221
Trazodone	0 (0%)	1 (2.6%)	0 (0%)	0 (0%)	1	χ²(3)=1.94, p=0.585
Fluvoxamine	5 (12.2%)	10 (25.6%)	15 (55.6%)	3 (37.5%)	33	χ²(3)=17.10, p<0.001
Fluoxetine	1 (2.4%)	0 (0%)	0 (0%)	0 (0%)	1	χ²(3)=1.82, p=0.610
Escitalopram	10 (24.4%)	7 (17.9%)	8 (29.6%)	1 (12.5%)	26	χ²(3)=1.81, p=0.613
Antipsychotic drug						
Alimemazine	3 (7.3%)	3 (7.7%)	3 (11.1%)	1 (12.5%)	10	χ²(3)=0.56, p=0.906
Aripiprazole	3 (7.3%)	3 (7.7%)	5 (18.5%)	0 (0%)	11	χ²(3)=3.90, p=0.273
Brexpiprazole	0 (0%)	0 (0%)	1 (3.7%)	0 (0%)	1	χ²(3)=3.25, p=0.355
Haloperidol	6 (14.6%)	0 (0%)	2 (7.4%)	3 (37.5%)	11	χ²(3)=12.58, p=0.006
Cariprazine	0 (0%)	5 (12.8%)	7 (25.9%)	4 (50.0%)	16	χ²(3)=18.32, p<0.001
Quetiapine	10 (24.4%)	24 (61.5%)	17 (63.0%)	5 (62.5%)	56	χ²(3)=21.43, p<0.001
Clozapine	0 (0%)	0 (0%)	1 (3.7%)	0 (0%)	1	χ²(3)=3.25, p=0.355
Lurasidone	2 (4.9%)	1 (2.6%)	5 (18.5%)	0 (0%)	8	χ²(3)=7.71, p=0.052
Olanzapine	30 (73.2%)	11 (28.2%)	19 (70.4%)	3 (37.5%)	63	χ²(3)=11.75, p=0.008
Paliperidone	1 (2.4%)	0 (0%)	1 (3.7%)	0 (0%)	2	χ²(3)=1.56, p=0.669
Periciazine	2 (4.9%)	2 (5.1%)	4 (14.8%)	0 (0%)	8	χ²(3)=3.72, p=0.294
Perphenazine	3 (7.3%)	0 (0%)	2 (7.4%)	1 (12.5%)	6	χ²(3)=3.59, p=0.309
Risperidone	6 (14.6%)	5 (12.8%)	7 (25.9%)	3 (37.5%)	21	χ²(3)=4.77, p=0.190
Sulpiride	0 (0%)	3 (7.7%)	9 (33.3%)	8 (100%)	20	χ²(3)=53.38, p<0.001
Tiapride	0 (0%)	1 (2.6%)	5 (18.5%)	0 (0%)	6	χ²(3)=12.75, p=0.005
Triptazine	0 (0%)	0 (0%)	3 (11.1%)	0 (0%)	3	χ²(3)=9.93, p=0.019
Flupentixol	1 (2.4%)	0 (0%)	0 (0%)	0 (0%)	1	χ²(3)=1.82, p=0.610

Chlorpromazine	4 (9.8%)	3 (7.7%)	7 (25.9%)	0 (0%)	14	$\chi^2(3)=7.16, p=0.067$
Chlorprothixene	1 (2.4%)	1 (2.6%)	6 (22.2%)	0 (0%)	8	$\chi^2(3)=12.78, p=0.005$
Agents to treat the side effects of antipsychotics						
Biperiden	16 (39.0%)	10 (25.6%)	20 (74.1%)	4 (50.0%)	50	$\chi^2(3)=19.94, p<0.001$
Trihexyphenidyl	0 (0%)	0 (0%)	2 (7.4%)	1 (12.5%)	3	$\chi^2(3)=7.58, p=0.056$
Mood stabilizers						
Valproic acid	0 (0%)	0 (0%)	3 (11.1%)	0 (0%)	3	$\chi^2(3)=9.93, p=0.019$
Carbamazepine	7 (17.1%)	6 (15.4%)	5 (18.5%)	1 (12.5%)	19	$\chi^2(3)=0.25, p=0.969$
Lamotrigine	5 (12.2%)	6 (15.4%)	4 (14.8%)	0 (0%)	15	$\chi^2(3)=1.64, p=0.651$
Lithium carbonate	0 (0%)	1 (2.6%)	2 (7.4%)	0 (0%)	3	$\chi^2(3)=3.70, p=0.296$
Oxcarbamazepine	1 (2.4%)	1 (2.6%)	2 (7.4%)	0 (0%)	4	$\chi^2(3)=1.76, p=0.624$
Tranquilizers						
Hydroxyzine	9 (22.0%)	10 (25.6%)	13 (48.1%)	3 (37.5%)	35	$\chi^2(3)=8.07, p=0.045$
Diazepam	0 (0%)	0 (0%)	1 (3.7%)	0 (0%)	1	$\chi^2(3)=3.25, p=0.355$
Tofisopam	11 (26.8%)	3 (7.7%)	3 (11.1%)	0 (0%)	17	$\chi^2(3)=5.32, p=0.150$

Note: *Only variables that demonstrated statistically significant differences between classes at $p<0.05$, or the most frequent features in the sample, are presented. BMI — body mass index; M — mean value; Me — median; SD — standard deviation; OCD — obsessive-compulsive disorder.

with statistically significant differences and on the frequency of drug prescriptions. Notably, no statistically significant differences were found between Classes in terms of any subscales of the SCL-90-R questionnaire or most of the diagnoses stated in the M.I.N.I. Data for all evaluated parameters across Classes are presented in Table S2 in the Supplementary.

Class1 (C1) is dominated by symptoms typical for AN. Dismorphophobia, fears related to eating, weight gain, loss of control and sensitive ideas of reference are defining symptoms of C1. The presence of target symptoms — specifically, hypochondriacal concerns, akathisia, and obsessive thoughts unrelated to the ED — indicates that a patient is unlikely to belong to C1. These patterns are reflected in the clinical presentation of C1 patients: fears related to eating, weight gain, or loss of control were present in 75.6% of patients; dysmorphophobia in 46.3%; sensitive ideas of reference in 24.4%; while hypochondriacal concerns, akathisia, and obsessive thoughts unrelated to the ED context are entirely absent in this class. Apathy was highly prevalent (87.8%), in contrast to the relatively low frequencies of melancholy (9.8%) and anhedonia (17.1%). A high frequency of delusional anxiety (48.8%) is noteworthy in C1.

The most commonly prescribed agents for these symptoms are antidepressants — sertraline, mirtazapine, and escitalopram. Among antipsychotics, olanzapine

was prescribed most frequently; among tranquilizers, tofisopam and hydroxyzine. Patients in the first class had the lowest BMI of 14.2 ± 2.0 kg/m² and were the youngest, with a median age Me (Q1; Q3)=21 (18; 24) years.

In class 2 (C2), somatoform autonomic symptoms, delusional ideas and dysmorphomania demonstrated strong negative regression coefficients, indicating their lack of contribution to the formation of this class. In C2, notably low frequencies are observed for core ED symptoms such as fears of eating, weight gain, or loss of control; dysmorphophobic concerns regarding body size or its parts; and obsessive or overvalued ideas about eating, weight, or body shape (see Table 4). Clinically, this group was characterized by a high incidence of difficulties falling asleep, anxiety, apathy, melancholy, and anhedonia. The most commonly prescribed drugs were the antidepressants sertraline, fluvoxamine, and mirtazapine. Quetiapine was the primary antipsychotic, while hydroxyzine is the most commonly used anxiolytic agent. The patients in this class had the highest BMI in the sample (15.5 ± 1.9 kg/m²).

Class 3 (C3) represents a polymorphic clinical profile with a combination of AN-specific symptoms, affective symptoms, thought disorders, cognitive impairments, and sleep disturbances. Leading symptoms determining the attribution to this class are vomiting, memory disturbances, difficulties falling asleep, and overvalued ideas regarding diet, weight, and body shape. The most common affective

symptoms include melancholy, anhedonia, and mood swings. In addition to the listed symptoms, such AN-specific symptoms as fear of eating / gaining weight / losing control, dysmorphophobia, overvalued ideas about weight and body shape, obsessive thoughts within the ED context were also common. The range of ED-specific symptoms in C3 is more heterogeneous than in C1. Moreover, C3 is characterized by frequent disturbances in the associative thinking. Cognitive impairments — specifically, reduced attentional focus and memory deficits — occur more commonly in this class than in the others. Pharmacologic management typically includes quetiapine, olanzapine, cariprazine, and risperidone. A distinctive feature was the frequent prescription of chlorpromazine, likely due to vomiting as a treatment target, as well as tiapride. Biperiden was actively prescribed to prevent extrapyramidal effects. In this class, the most commonly prescribed antidepressants include fluvoxamine, venlafaxine, mirtazapine, and escitalopram. Hydroxyzine was used more frequently than in the other class. Patients in this class had the highest median age (Me [Q1; Q3]=27.5 [21.3; 31.0] years). A binge-purge pattern was present in 53.8% of patients, and a moderate suicide risk was identified in 23.1%.

Class 4 (C4) was defined by the presence of hypochondriacal concerns, somatoform autonomic symptoms, and apathy, alongside a strong negative contribution of anhedonia, superficial sleep, and obsessive or overvalued ideas concerning eating, weight, or body shape, as well as dysmorphophobia. As in C2, none of the ED-specific symptoms were typical for C4. Clinically, all patients in C4 exhibited hypochondriacal concerns and apathy, and somatoform autonomic symptoms were highly prevalent in this class. Patients typically exhibited obsessive thoughts and delusional ideas outside the ED context. The class was notable for the near-complete absence of most ED-related symptoms and for the absence of anhedonia. Treatment typically included sulpiride, quetiapine, cariprazine, and haloperidol. The most commonly prescribed antidepressants include fluvoxamine and duloxetine. Hydroxyzine was used in one third of cases, and biperiden in one half of the patients. Notably, two patients within this class were diagnosed with an ongoing psychotic episode.

DISCUSSION

This study aimed to identify symptomatically homogeneous subgroups of patients diagnosed with AN, based on clinically significant psychopathological symptoms.

Symptoms explicitly designated by psychiatrists as targets of psychopharmacotherapy were considered clinically relevant. LCA of the psychopathological symptom dataset identified four distinct patient subgroups within the diagnostic category of “anorexia nervosa”. The classification demonstrated high certainty (entropy $R^2=0.908$), high statistical significance of the model ($p<0.0001$), and clear separation between latent groups, as evidenced by a high inter-class dissimilarity index (0.957).

It should be noted that direct comparison of our findings with those of other studies is challenging, because our model was built on results of psychopathological assessment of symptoms by clinicians, whereas previous research typically relied on psychometric scores or ED diagnostic criteria derived from classification systems. No prior study has used a detailed clinical assessment of psychopathological symptoms as the foundation for an empirical classification models.

Each of the four identified classes (C1–C4) was characterized by a distinct constellation of symptoms, predominantly involving either ED-related symptoms or/and affective symptoms. It is noteworthy that among the 115 patients in the sample, ED symptoms were key determinants of class formation only in 68 (59%) patients (C1 and C3). This finding aligns with data from idiographic studies of ED psychopathology, which report that only about 50% of patients with diagnosis of ED exhibit ED-specific symptoms among clinically significant manifestations [8]. Among the remaining 47 patients in our sample (C2 and C4), affective symptoms, somatoform symptoms, and hypochondriacal concerns were the primary determinants of class formation. ED symptoms showed negative regression coefficients, indicating that they did not contribute to class formation.

The ED symptoms that determined patient allocation to C1 and C3 shared a common core — predominantly dysmorphophobic concerns with body shape and fears related to eating, weight gain, or loss of control. However, these two classes diverged markedly in their additional symptom profiles. Patients in C1 were characterized by sensitive ideas of reference (e.g., “others are critically judging me”), whereas patients in C3 exhibited overvalued ideas and obsessive thoughts specifically focused on eating, weight, and body shape. C3 was also notably associated with self-induced vomiting, reflected in the high prevalence (53.8%) of the binge-purge pattern in this class. C1 and C3 also differed substantially in their non-ED-related symptoms. Compared with C1, patients in C3 showed significantly

higher rates of sleep disturbances, associative thinking disturbances, and mood swings. Affective symptoms in C3 were dominated by anxiety, melancholy, and anhedonia, whereas C1 was characterized primarily by anxiety and apathy. Hypochondriacal concerns were absent in C1, but present in one third of C3 patients. These results are consistent with findings from other AN studies confirming that body dissatisfaction and fear of weight gain represent core diagnostic features of AN. Nevertheless, additional ED-related symptoms contribute to individualized symptomatic profiles, helping to explain the clinical heterogeneity among patients with AN [7, 8, 23, 26].

Interestingly, despite extensive literature documenting frequent comorbidity between AN and OCD [4], patients in C1 exhibited no obsessive thoughts unrelated to the ED context, and such symptoms were rarely reported in C3 (11.1%). At the same time, both C1 and C3 patients presented with obsessive thoughts directly related to ED context. In C4, patients exhibited obsessive thoughts unrelated to the ED context and ED-related symptoms were absent. This observation contrasts with our findings from the M.I.N.I. diagnostic interview, which indicated OCD in 47.5% of C1 and 44.0% of C3 patients in our sample. The obtained contradictory data may point to the importance of identifying the content of obsessive thoughts when assessing the mental state of patients with AN, which is not always possible using standardized questionnaires. These findings highlight the potential for distinguishing between OCD and AN through clinical assessment. Notably, across the entire sample, no compulsive symptoms — the core behavioral manifestations of OCD — were identified as therapeutic targets. This finding contrasts with other studies reporting a strong association between key AN symptoms (e.g., body dissatisfaction and drive for thinness) and compulsions [4].

A high prevalence of negative affect symptoms was observed across all classes, consistent with prior researchers' observations regarding the involvement of affective disorders in shaping the clinical presentation of ED [11, 15, 23, 25, 26]. Anxiety was typical for patients in all four classes, and in C1 patients, it reached the delusional level. Other affective symptoms differed between classes in terms of frequency and contributed differently to class formation. Anhedonia and melancholy were most commonly observed in C2 and C3.

The combination of affective symptoms within classes is also of interest, as it may indirectly indicate differences

in the nature and phenomenological content of the same symptom. For example, apathy was observed in C1, C2, and C4. C2 was distinguished by the prominent presence of melancholy and anhedonia, whereas they were less frequent in C1 and C4. At the same time, C1 was characterized by symptoms of AN, while C4 exhibited delusional ideas unrelated to the ED context, hypochondriacal concerns and somatoform symptoms. This may suggest that apathy in patients of C1 and C4 falls outside the realm of affective disorders. Whereas, patients in C2 and C3 exhibited anxiety, apathy, and anhedonia, combined with sleep disturbances. Additionally, patients in C3 had cognitive impairments such as decreased concentration and memory disorders. Such affective symptoms combination may indicate an affective core of apathy in C2 and C3.

Further we would like to discuss the rationale for the symptom assessment using clinical psychopathological method.

We used the checklist of pharmacotherapy target symptoms as a psychopathological assessment tool, to provide a more detailed description of the clinical condition of patients with AN. According to the literature [7] and our own clinical observations, considerable heterogeneity exists in ED symptoms among patients with the same AN diagnosis. The clinical presentation of these patients often includes symptoms of other mental disorders, which do not fully meet the operational criteria of ICD-10; therefore, no diagnosis other than AN can be assigned. Available psychometric tools for assessing EDs focus more on the patient's behavior than on the mental phenomena, for example, the widely used Eating Disorder Examination (EDE) [44]. Moreover, scales and questionnaires designed to assess EDs do not address comorbid psychopathology, making it necessary to employ multiple assessment tools in research to evaluate the patient's condition comprehensively.

Our symptom-oriented approach is consistent with recent trends in psychiatry. Given the assumption that symptoms, rather than syndromes or even diagnostic categories, are linked to the biological factors underlying mental disorders, increasing attention is being paid to approaches based on symptomatic assessment of patients' mental states [45]. To more accurately determine therapeutic targets and incorporate treatment response into the diagnostic process, using data on the efficacy of psychopharmacotherapy for individual symptoms is proposed [46].

In describing patients' mental states, we found it most appropriate to record individual symptoms based on

clinical psychopathological assessment. We did not intend to assign symptoms to established diagnostic categories. Instead, the set of symptoms served as a mean of comprehensive description for clinical manifestations in patients diagnosed with AN according to ICD-10. Basically, this approach to mental state assessment is trans-diagnostic.

The symptom checklist was developed based on signs assessed in the mental status during routine clinical evaluation [43], and which may serve as targets for psychopharmacotherapy. A similar approach was developed by psychiatrists from the Association for Methodology and Documentation in Psychiatry (AMDP) in the 1960s and was named the AMDP system. The AMDP system includes symptom checklists for documenting psychopathological phenomena and their severity. This tool is used in clinical psychiatry and research, particularly for validating psychometric questionnaires during their development and for evaluating the efficacy of psychopharmacotherapy [47].

One of our objectives in the Psychopathological Symptom Checklist for Patients with AN (symptom checklist) was to distinguish ED-related symptoms from other symptoms.

For example, dissatisfaction with appearance (dysmorphophobia) is a symptom central to EDs but also seen in body dysmorphic disorder or as a feature of depressive or delusional disorders. Dysmorphophobia in our study was assessed in two content-dependent variants and placed in different symptom subgroups: 1) concerns about body size or specific body parts (an ED-related symptom), and 2) dissatisfaction with appearance not related to body size or body parts (a neurotic and somatoform symptom). Notably, dysmorphomania — defined as dissatisfaction with one's appearance reaching delusional levels — was included as a separate item in thought disorders subgroup. In our study, dissatisfaction with appearance outside the ED context did not emerge as a therapeutic target, whereas concerns about the body size or specific body parts were typical of C1 and C3. Dysmorphomania was rare and was mostly reported in C4 patients. Thus, the symptom of dysmorphophobia in AN is limited to concerns regarding body size and do not include other aspects of the appearance. Similar findings were found for obsessive thoughts, which were also differentiated by the content, as we discussed earlier.

Another purpose of the checklist was to assess the varying phenomenological content of ED-related symptoms and to determine how they should be qualified.

For example, symptoms such as “eating concern” (fear of food, preoccupation with food) or “shape concern” and “weight concern” (preoccupation with shape or weight), which are included in one of the main ED questionnaires, EDE [44], as well as in the diagnostic criteria for ED in the ICD-11, were divided into the following symptoms: fear of eating / gaining weight / losing control, obsessive thoughts, and overvalued ideas about food/weight/shape based on several considerations. Firstly, in clinical psychopathology, there is no such concept as “concern/preoccupation”; rather, specific symptoms such as fear, obsessive thoughts, and overvalued ideas are distinguished. Secondly, dividing “concern/preoccupation” into fear, obsessive, and overvalued ideas allows us to determine the psychopathological register and clinical significance of the symptoms, which ultimately implies different therapeutic strategies and clinical prognoses. As a result of our study, obsessive and overvalued ideas regarding food, weight, and body shape were distributed differently across the classes: they were typical for patients in C3, less typical for patients in C1, and not typical for patients in C2 and C4. Fear of eating / weight gain / loss of control was the most common ED-related symptom in C1 and C3. These findings indicate the need to clarify the phenomenological content of “concerns/preoccupation” about food, weight, and body shape in patients with AN.

Combining symptoms such as a fear of food, fear of weight gain, and fear of loss of control into a single symptom may not be fully justified in terms of clinical reality, as a given patient might not exhibit all three (which indicates that these symptoms might be a different therapeutic targets) [8, 48]. However, we decided to consolidate them under the grouping element of “fear” as a potential therapeutic target for psychopharmacotherapy.

The symptom “delusional level of anxiety” was proposed by us based on clinical observations of AN patients and by analogy with established psychopathological entities (“delusional level of depression”, “OCD with poor insight”). Our rationale was to describe a condition where patients, due to rigidity and high anxiety levels, are entirely overwhelmed by anxious concerns and unresponsive to reassurance, however, phenomenologically these symptoms are closer to intense anxiety than to delusion. Although “delusional level of anxiety” has not been previously described in the literature, clinicians in our study frequently identified it as a therapeutic target: it was present in 48.8% of patients in C1, 29.6% in C3, and 37.5% in C4.

Other findings in the present study also emphasize the importance of delineating phenomenological nuances of patients' clinical states and highlight the advantages of a symptom-based approach to describe the psychopathological profile of AN patients. In addition to the symptom checklist, standard instruments for psychopathological assessment — specifically the M.I.N.I. and the SCL-90-R — were used. However, based on the results of these instruments, the patient classes did not differ significantly from one another, whereas clinically assessed psychopathological symptoms showed significant differences. This may indicate a low sensitivity of these scales with respect to individual aspects of mental state. A characteristic example from our study is the discrepancy between the M.I.N.I. questionnaire results, which indicated the presence of OCD within the sample, and the relatively low prevalence of OCD symptoms outside the ED content when the same patients were evaluated clinically.

The SCL-90-R self-report inventory not only failed to show differences between patient classes in terms of psychopathology but also did not indicate distress (PSDI Me [Q1; Q3]=1.9 [1.5; 2.3]) despite the sample comprising recently hospitalized patients with severe AN, which suggests a high level of distress in these patients due to their symptoms. These findings indicate a low accuracy of self-reporting questionnaires for characterizing the clinical status of patients with AN, largely because these patients tend to have limited self-reflective capacity, that is known from the previous research [49]. However, SCL-90-R questionnaire data are frequently used in building empirical models of EDs [15, 26].

The first limitation of the present study is the use of a checklist as an evaluation tool, developed based on the consensus of nine psychiatrists involved in the study and not subjected to clinical validation or pilot testing. However, there are studies on EDs that employed an identical consensus-based approach to creating a symptom checklist [8].

The obtained data should be interpreted keeping in mind that the described symptoms were the rationale for psychopharmacotherapy prescriptions. This limited the potential set of symptoms in the checklist. Moreover, the absence of a specific clinical symptom as a therapeutic target in a patient does not imply its absence in a particular patient's mental state.

With regard to the more detailed differentiation of ED symptoms commonly used in studies, we did not elaborate

on all cases to avoid overloading the checklist with symptoms that, in essence, represent a single therapeutic target (e.g., grouping fear of eating, weight gain, and loss of control into one target symptom, as discussed above). At the same time, we identified dysmorphic ideas as a distinct symptom, separated from the fear of eating, weight gain, or loss of control due to the high likelihood that different therapeutic strategies will be required, consistent with recommendations from earlier studies [50].

Potential objections may arise from the fact that patients were prescribed psychopharmacotherapy, despite the lack of evidence of its efficacy in AN [51]. However, there has been a growing discussion recently about prescribing pharmacotherapy based on specific symptoms rather than diagnoses [46]. The absence of data for psychopharmacotherapy effectiveness in AN patients might be attributed to the fact that clinical approaches to symptom evaluation and response to treatment are not consistently implemented in studies assessing the efficacy of pharmacological interventions. In our study, describing patients based on treatment-target symptoms can be considered a strength, as it demonstrates the potential of a clinical-psychopathological approach to identifying pharmacotherapy targets in AN. This may be useful for future research on the efficacy of psychopharmacotherapy.

This study has several noteworthy strengths. First, the sample consisted exclusively of individuals with AN who were treated under uniform clinical conditions. Second, the primary method of evaluating patients' mental states was clinical psychopathological assessment conducted by qualified psychiatrists with expertise in EDs. This method differentiates the study from others where empirical models were built on data obtained from patients' self-reporting or psychometric scales. Third, the clinical method enabled an individualized and nuanced evaluation of each patient's mental state, incorporating multiple clinical nuances and ensuring a comprehensive assessment.

The development of personalized approaches is a priority in mental health [52]. Our study allowed identification of key treatment-target symptoms in AN patients, as well as their combinations, which may be important for a better understanding of the psychopathology of AN, greater personalization of therapeutic strategies, and more precise diagnostics.

Moreover, we developed and applied an original tool based on the clinical psychopathological method — a checklist of psychopathological symptoms, which can be used in future

research. The advantages of this tool are: 1) unification of clinical assessment due to the checklist format; 2) the possibility of identifying clinically significant symptoms by determining the treatment-target symptoms; 3) it can be used to collect information on the use of a specific drug to treat a specific symptom. The limitation of this approach is the essential role of a psychiatrist trained in clinical psychopathology, which may not be available in some countries [33, 53].

Future research may verify the identified patient classes on a larger sample size or in different clinical settings. Studies of biological markers in patients may also be required to determine common biological factors within the classes. It would be useful to follow-up mental state changes during treatment and the response to treatment in patients of different classes in future studies. The psychopathological assessment tool we proposed can be used in further research on the response to therapy in AN patients.

CONCLUSION

Four empirical phenotypes with unique symptomatic profile were identified within the diagnostic category of “anorexia nervosa” based on a comprehensive clinical psychopathological assessment. Unique symptomatic profile of each class encompassed both core ED symptoms and general psychopathological symptoms. We proposed an original tool for assessing clinically relevant psychopathological symptoms in patients with AN.

The results highlight the importance of detailed psychopathological qualification of symptoms. Attribution of overlapping clinical manifestations in AN patients to specific phenomena allowed us to identify key differences between patient groups. This approach opens prospects for a more accurate diagnosis and more personalized therapy for AN.

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Supplementary data

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References

- 6B80 Anorexia Nervosa [Internet]. In: ICD-11 for Mortality and Morbidity Statistics. Geneva: World Health Organization; c2025 [cited 2025 September 2]. Available from: <https://icd.who.int/browse/2025-01/mms/en#263852475>
- Calvo-Rivera MP, Navarrete-Páez MI, Bodoano I, Gutiérrez-Rojas L. Comorbidity Between Anorexia Nervosa and Depressive Disorder: A Narrative Review. *Psychiatry Investig.* 2022;19(3):155–163. doi: 10.30773/pi.2021.0188
- Hambleton A, Pepin G, Le A, et al. Psychiatric and medical comorbidities of eating disorders: findings from a rapid review of the literature. *J Eat Disord.* 2022;10(1):132. doi: 10.1186/s40337-022-00654-2
- Levinson CA, Zerwas SC, Brosf LC, et al. Associations between dimensions of anorexia nervosa and obsessive-compulsive disorder: An examination of personality and psychological factors in patients with anorexia nervosa. *Eur Eat Disord Rev.* 2019;27(2):161–172. doi: 10.1002/erv.2635
- Muratore AF, Attia E. Psychopharmacologic Management of Eating Disorders. *Curr Psychiatry Rep.* 2022;24(7):345–351. doi: 10.1007/s11920-022-01340-5
- Keel PK, Brown TA. Update on course and outcome in eating disorders. *Int J Eat Disord.* 2010;43(3):195–204. doi: 10.1002/eat.20810
- Levinson CA, Vanzhula I, Brosf LC. Longitudinal and personalized networks of eating disorder cognitions and behaviors: targets for precision intervention a proof of concept study. *Int J Eat Disord.* 2018;51(11):1233–1243. doi: 10.1002/eat.22952
- Levinson CA, Hunt RA, Keshishian AC, et al. Using individual networks to identify treatment targets for eating disorder treatment: a proof-of-concept study and initial data. *J Eat Disord.* 2021;9(1):147. doi: 10.1186/s40337-021-00504-7
- Wildes JE, Forbush KT, Markon KE. Characteristics and stability of empirically derived anorexia nervosa subtypes: towards the identification of homogeneous low-weight eating disorder phenotypes. *J Abnorm Psychol.* 2011;122(4):1031–1041. doi: 10.1037/a0034676
- Bulik CM, Flatt R, Abbaspour A, Carroll I. Reconceptualizing anorexia nervosa. *Psychiatry Clin Neurosci.* 2019;73(9):518–525. doi: 10.1111/pcn.12857
- Bulik CM, Sullivan PF, Kendler KS. An empirical study of the classification of eating disorders. *Am J Psychiatry.* 2000;157(6):886–895. doi: 10.1176/appi.ajp.157.6.886
- Keel PK, Fichter M, Quadflieg N, et al. Application of a latent class analysis to empirically define eating disorder phenotypes. *Arch Gen Psychiatry.* 2004;61(2):192–200. doi: 10.1001/archpsyc.61.2.192
- Swanson SA, Horton NJ, Crosby RD, et al. A latent class analysis to empirically describe eating disorders through developmental stages. *Int J Eat Disord.* 2014;47(7):762–772. doi: 10.1002/eat.22308
- Goldschmidt AB, Wonderlich SA, Crosby RD, et al. Latent profile analysis of eating episodes in anorexia nervosa. *J Psychiatr Res.* 2014;53:193–199. doi: 10.1016/j.jpsychires.2014.02.019
- Solmi M, Collantoni E, Meneguzzo P, et al. Network analysis of specific psychopathology and psychiatric symptoms in patients with eating disorders. *Int J Eat Disord.* 2018;51(7):680–692. doi: 10.1002/eat.22884
- Smith KE, Crosby RD, Wonderlich SA, et al. Network analysis: An innovative framework for understanding eating disorder psychopathology. *Int J Eat Disord.* 2018;51(3):214–222. doi: 10.1002/eat.22836
- Forbush KT, Swanson TJ, Chen Y, et al. Generalized network psychometrics of eating-disorder psychopathology. *Int J Eat Disord.* 2022;55(11):1603–1613. doi: 10.1002/eat.23801
- Bryant E, Marks P, Griffiths K, et al. Treating the individual: moving towards personalised eating disorder care. *J Eat Disord.* 2025;13(1):63. doi: 10.1186/s40337-025-01246-6
- Sinha P, Calfee CS, Delucchi KL. Practitioner's Guide to Latent Class Analysis: Methodological Considerations and Common Pitfalls. *Crit Care Med.* 2021;49(1):e63–e79. doi: 10.1097/CCM.00000000000004710
- Crow SJ, Swanson SA, Peterson CB, et al. Latent structure analyses of eating disorder diagnoses: Critical review of results and methodologic issues. In: Striegel-Moore RH, Wonderlich SA, Walsh T, Mitchell JE, editors. *Developing an Evidence-based Classification of Eating Disorders: Scientific Findings for DSM-5.* Arlington: American Psychiatric Association; 2011. p. 103–120.
- Wildes JE, Forbush KT, Hagan KE, et al. Characterizing severe and enduring anorexia nervosa: An empirical approach. *Int J Eat Disord.* 2017;50(4):389–397. doi: 10.1002/eat.22651
- Jennings KM, Bodell LP, Crosby RD, et al. Mixture Modeling to Characterize Anorexia Nervosa: Integrating Personality and Eating Disorder Psychopathology. *J Am Psychiatr Nurses Assoc.* 2021;27(3):231–239. doi: 10.1177/1078390319862029

23. Monteleone AM, Cascino G. A systematic review of network analysis studies in eating disorders: Is time to broaden the core psychopathology to non specific symptoms. *Eur Eat Disord Rev.* 2021;29(4):531–547. doi: 10.1002/erv.2834
24. Punzi C, Petti M, Tieri P. Network-based methods for psychometric data of eating disorders: A systematic review. *PLoS One.* 2022;17(10):e0276341. doi: 10.1371/journal.pone.0276341
25. Cusack CE, Vanzhula IA, Sandoval-Araujo LE, et al. Are central eating disorder network symptoms sensitive to item selection and sample? Implications for conceptualization of eating disorder psychopathology from a network perspective. *J Psychopathol Clin Sci.* 2024;133(1):48–60. doi: 10.1037/abn0000865
26. Solmi M, Collantoni E, Meneguzzo P, et al. Network analysis of specific psychopathology and psychiatric symptoms in patients with anorexia nervosa. *Eur Eat Disord Rev.* 2019;27(1):24–33. doi: 10.1002/erv.2633
27. Haynos AF, Utzinger LM, Lavender JM, et al. Subtypes of Adaptive and Maladaptive Perfectionism in Anorexia Nervosa: Associations with Eating Disorder and Affective Symptoms. *J Psychopathol Behav Assess.* 2018;40(4):691–700. doi: 10.1007/s10862-018-9672-8
28. Zimmerman M. The value and limitations of self-administered questionnaires in clinical practice and epidemiological studies. *World Psychiatry.* 2024;23(2):210–212. doi: 10.1002/wps.21191
29. Carter JC, Aimé AA, Mills JS. Assessment of bulimia nervosa: a comparison of interview and self-report questionnaire methods. *Int J Eat Disord.* 2001;30(2):187–192. doi: 10.1002/eat.1071
30. Wolk SL, Loeb KL, Walsh BT. Assessment of patients with anorexia nervosa: interview versus self-report. *Int J Eat Disord.* 2005;37(2):92–99. doi: 10.1002/eat.20076
31. Bradford A, Meyer AND, Khan S, et al. Diagnostic error in mental health: a review. *BMJ Qual Saf.* 2024;33(10):663–672. doi: 10.1136/bmjqs-2023-016996
32. Fairburn CG, Beglin SJ. Assessment of eating disorders: interview or self-report questionnaire? *Int J Eat Disord.* 1994;16(4):363–370.
33. Ritunnano R, Papola D, Broome MR, Nelson B. Phenomenology as a resource for translational research in mental health: methodological trends, challenges and new directions. *Epidemiol Psychiatr Sci.* 2023;32:e5. doi: 10.1017/S2045796022000762
34. Kyzar EJ, Denfield GH. Taking subjectivity seriously: towards a unification of phenomenology, psychiatry, and neuroscience. *Mol Psychiatry.* 2023;28(1):10–16. doi: 10.1038/s41380-022-01891-2
35. Larsen RR, Maschião LF, Piedade VL, et al. More phenomenology in psychiatry? Applied ontology as a method towards integration. *Lancet Psychiatry.* 2022;9(9):751–758. doi: 10.1016/S2215-0366(22)00156-0
36. Silva EBF, Teles MFRP, de Castro NLES, et al. Phenomenological approach to eating disorders: a scoping review. *Front Psychol.* 2025;16:1547214. doi: 10.3389/fpsyg.2025.1547214
37. Gregertsen EC, Mandy W, Serpell L. The Egosyntonic Nature of Anorexia: An Impediment to Recovery in Anorexia Nervosa Treatment. *Front Psychol.* 2017;8:2273. doi: 10.3389/fpsyg.2017.02273
38. Voswinkel MM, Rijkers C, van Delden, JJM, van Elburg AA. Externalizing your eating disorder: a qualitative interview study. *J Eat Disord.* 2021;9(1):128. doi: 10.1186/s40337-021-00486-6
39. Jaspers K. [General psychopathology]. Moscow: KoLibri: Azbuka-Attikus; 2020. Russian.
40. Stanghellini G, Broome MR. Psychopathology as the basic science of psychiatry. *Br J Psychiatry.* 2014;205(3):169–170. doi: 10.1192/bjp.bp.113.138974
41. Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J Clin Psychiatry.* 1995;59 Suppl 20:22–33;quiz 34–57.
42. Tarabrina NV. [Workshop on the psychology of post-traumatic stress]. St. Petersburg: Piter; 2001. Russian.
43. [The method of examination of a patient with mental disorders] [Internet]. St. Petersburg: Pervyj Sankt-Peterburgskij gosudarstvennyj medicinskij universitet imeni akademika I.P. Pavlova; c2025 [cited 2025 Nov 9]. Russian. Available from: <https://www.s-psy.ru/obucenie/kurs-psihiatrii/5-kurs-lecebnyj-fakultet/kuracia-bolnyh/posobie-metodika-obsledovania-bolnogo>
44. Fairburn CG, Cooper Z, O'Connor ME. Eating Disorder Examination (Edition 16.0D). In: Fairburn CG. *Cognitive Behavior Therapy and Eating Disorders.* New York: Guilford Publications; 2008. p. 265–308.
45. Moriarity DP, Perkins ER, Joyner KJ. Hierarchical Phenotyping of Psychopathology: Implications and Opportunities for Precision Psychiatry when Biology Could be Associated with both Symptoms and Syndromes. *Biol Psychiatry.* 2025;S0006-3223(25)01149-7. doi: 10.1016/j.biopsych.2025.04.015
46. Seifert R, Schirmer B, Seifert J. How pharmacology can aid in the diagnosis of mental disorders. *Naunyn Schmiedebergs Arch Pharmacol.* 2025;398(2):1099–1110. doi: 10.1007/s00210-024-03413-z
47. Stieglitz RD, Haug A, Fährdrich E, et al. Comprehensive Psychopathological Assessment Based on the Association for Methodology and Documentation in Psychiatry (AMDP) System: Development, Methodological Foundation, Application in Clinical Routine, and Research. *Front Psychiatry.* 2017;8:45. doi: 10.3389/fpsyg.2017.00045
48. Askew AJ, Peterson CB, Crow SJ, et al. Not all body image constructs are created equal: Predicting eating disorder outcomes from preoccupation, dissatisfaction, and overvaluation. *Int J Eat Disord.* 2020;53(6):954–963. doi: 10.1002/eat.23277
49. Springfield CR, Bonfils KA, Chernov NV, et al. The paradoxical moderating effects of metacognition in the relationships between self-esteem, depressive symptoms, and quality of life in anorexia and bulimia. *Consort Psychiatr.* 2023;4(2):6–20. doi: 10.17816/CP6139
50. Levitt DH. Drive for thinness and fear of fat: separate yet related constructs? *Eat Disord.* 2003;11(3):221–234. doi: 10.1080/10640260390218729
51. Himmerich H, Lewis YD, Conti C, Mutwalli H, et al.; WFSBP Task Force on Eating Disorders. World Federation of Societies of Biological Psychiatry (WFSBP) guidelines update 2023 on the pharmacological treatment of eating disorders. *World J Biol Psychiatry.* 2023:1–64. doi: 10.1080/15622975.2023.2179663
52. Insel TR. The NIMH research domain criteria (RDoC) project: precision medicine for psychiatry. *Am J Psychiatry.* 2014;171(4):395–397. doi: 10.1176/appi.ajp.2014.14020138
53. Chakraborty N. The importance of embedding psychopathology and phenomenology in clinical practice and training in psychiatry. *BJPsych Advances.* 2020;26(5):287–295. doi: 10.1192/bja.2020.

Moderating Effect of Metacognition on the Relationship between Perfectionism, Body Image Disturbance, and Body Mass Index in Anorexia Nervosa: A Cross-Sectional Study

Модерирующий эффект метапознания на взаимосвязь перфекционизма, нарушения образа тела и индекса массы тела при нервной анорексии: поперечное исследование

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Original research

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ABSTRACT

BACKGROUND: Despite theoretical concepts about the key role of perfectionism in the formation of the symptoms of anorexia nervosa (AN), the aspects of the mutual influence between body mass index (BMI), perfectionism, and body image in patients with AN remain insufficiently studied or contradictory. Studying integrative cognitive processes, such as metacognition, may reveal new mechanisms of perfectionism's influence on the clinical manifestations of AN.

AIM: The assessment of the moderating effect of metacognition on perfectionism associated with BMI and body image in patients with AN.

METHODS: A cross-sectional study was conducted involving patients with AN who were undergoing inpatient treatment. Perception of one's own body was assessed using the Body Image Questionnaire. Perfectionism was assessed using the Multidimensional Perfectionism Scale. The level of metacognition of patients was assessed using the Metacognition Assessment Scale-Abbreviated, which evaluates Self-reflectivity, Understanding the other's mind, Decentration, and Mastery (the ability to develop adaptive strategies for coping and behaviour regulation). BMI was also recorded.

RESULTS: A total of 130 patients were examined. At a Mastery score of ≥ 4 higher perfectionism scores were associated with an increase in BMI, and at a Mastery level of ≤ 1 a higher level of perfectionism was associated with decreasing of BMI. Even with minimal Self-reflectivity scores (≥ 2), the negative effect of perfectionism on body image was evident. Body image disturbance was positively correlated with perfectionism. No correlations were found between BMI and perfectionism and between BMI and body image disturbance.

CONCLUSION: The effect of perfectionism on body image disturbance and BMI in patients with AN depends on the magnitude of Self-reflectivity and Mastery. The obtained data indicate the necessity of incorporating psychotherapy aimed at the development of metacognition in patients with AN.

АННОТАЦИЯ

ВВЕДЕНИЕ: Несмотря на теоретические концепции о ключевой роли перфекционизма в формировании симптомов нервной анорексии (НА), вопросы взаимного влияния индекса массы тела (ИМТ), перфекционизма и образа тела при НА остаются недостаточно изученными или противоречивыми. Анализ интегративных когнитивных процессов, таких как метапознание, может выявить новые механизмы влияния перфекционизма на клинические проявления НА.

ЦЕЛЬ: Оценка модулирующего влияния метапознания на ассоциацию перфекционизма с ИМТ и образом собственного тела у пациентов с НА.

МЕТОДЫ: Проведено поперечное исследование с участием пациентов с НА, находившихся на стационарном лечении. Восприятие собственного тела оценивалось с помощью «Опросника образа собственного тела», перфекционизм — с помощью «Многомерной шкалы перфекционизма» (Multidimensional Perfectionism Scale, MPS). Уровень метапознания пациентов определяли по «Сокращенной шкале метапознания» (Metacognition Assessment Scale-Abbreviated, MAS-A), измеряющей саморефлексию, понимание других, децентрацию и мастерство (способность к выработке адаптивных стратегий совладания и регуляции поведения). Дополнительно регистрировался ИМТ.

РЕЗУЛЬТАТЫ: Обследовано 130 пациентов. При уровне мастерства ≥ 4 баллов более высокие показатели перфекционизма были ассоциированы с увеличением ИМТ, тогда как при уровне мастерства ≤ 1 балла более высокая выраженность перфекционизма была связана со снижением ИМТ. Даже при минимально выраженной саморефлексии (≥ 2 баллов) выявлено негативное влияние перфекционизма на образ тела. Нарушение восприятия своего тела положительно коррелировало с перфекционизмом. При этом значимых корреляций между ИМТ и перфекционизмом, а также между ИМТ и нарушением образа тела обнаружено не было.

ЗАКЛЮЧЕНИЕ: Влияние перфекционизма на нарушение образа тела и на динамику ИМТ у пациентов с НА опосредовано выраженностью саморефлексии и мастерства. Полученные данные указывают на необходимость подключения психотерапии, направленной на развитие метапознания у данной категории пациентов.

Keywords: *anorexia nervosa; perfectionism; metacognition; body image disturbance; body image disturbance*

Ключевые слова: *нервная анорексия; перфекционизм; метапознание; нарушение образа тела; индекс массы тела*

INTRODUCTION

Anorexia nervosa (AN) is a mental disorder that, according to the definition of the International Classification of Diseases, 11th revision (ICD-11), is characterised by a significant decrease in body weight (body mass index (BMI) $< 18.5 \text{ kg/m}^2$), which is not due to the unavailability of food or another medical condition. Such conditions include: persistent restrictive eating, usually associated with a pronounced fear of weight gain; excessive concerns about weight and shape, manifested in overestimation of

the importance of low body weight or incorrect perception of low body weight as normal or even excessive [1]. Thus, according to the modern definition of AN, low BMI and body image disturbance are among the key features of AN with BMI possibly being regarded as a key integral indicator characterising the clinical severity of AN [1] and body image disturbance as a key psychological component that determines the progression of the disorder [2].

Although eating disorders (ED), in particular AN, are associated with many psychological factors, for example

low self-esteem and emotional dysregulation [3], one of the most important psychological factors associated with ED is perfectionism [4–6]. According to the classical transdiagnostic cognitive-behavioural model of ED by Fairburn et al. [4], perfectionism is one of the four key cognitive-behavioural mechanisms underlying ED, in particular AN. Specifically, it causes strict adherence to unrealistic standards of eating, weight, appearance, and exercise.

Later research confirms this concept [5–6]. In particular, the results of a meta-analysis by Dahlenburg et al. showed a significantly higher level of perfectionism in patients with AN compared to patients with other mental disorders and participants without diagnosed disorders [7]. In particular, when distinguishing “adaptive” perfectionism (regarded as the normal, “healthy” variant) and “maladaptive” perfectionism (the “pathological” variant), the authors identified a significant association of AN with higher rates of both maladaptive and adaptive perfectionism compared to participants without diagnosed disorders.

There are a number of research papers demonstrating the association of perfectionism with body image dissatisfaction in people without diagnosed mental disorders [8–10]. However, we did not find published works that focused on the evaluation of perfectionism linked with body image disturbance in patients with AN.

Some studies have shown association of BMI and perfectionism in adults without diagnosed mental disorders. In particular, a study by Ekici et al., 2024 [11], showed that BMI was a significant factor associated with the level of perfectionism which was evaluated using the Frost Multidimensional Perfectionism Scale (FMPS). This was based on the construction of a linear regression model, although it did not directly correlate with BMI. In an earlier study by Bernabéu-Brotóns and Marchena-Giráldez, 2022 [12], the level of perfectionism assessed using the Multidimensional Perfectionism Scale (MPS) was negatively correlated with BMI. A comparable negative correlation was also found in a Halimi et al., 2000, conducted on a sample of women with AN [13]. On the contrary, in a study Morgan-Lewis et al., 2019 [14], conducted on a sample of children and adolescents with ED, most of whom were patients with AN, BMI was positively correlated with the level of perfectionism. However, it is worth noting that this parameter in this study was assessed using the Eating Disorders Inventory-2 Perfectionism scale (EDI-P). Thus, although the existing literature data suggest an

association between BMI and perfectionism, including in AN, the direction of this association remains unclear and may depend, among other things, on the characteristics of psychometric tools used for assessing perfectionism and on the diagnostic composition of the sample.

However, the very association of perfectionism and clinical indicators (in the case of AN, BMI and body image disturbance) can also be mediated by the influence of other psychological constructs of a higher order. In particular, studies have included demonstrations of the following: the moderating effects of self-efficacy [15], the persistence on the association of perfectionism and the severity of depressive symptoms [16], self-esteem on the association of perfectionism and symptoms of avoidant/restrictive food intake disorder [17], self-compassion on the association of perfectionism and anger, aggression, and hostility [18]. These aforementioned factors have demonstrated that their moderating effect are associated with metacognition [19–22].

Metacognition is a process of thinking about one’s own thoughts, controlling and regulating them, which may include attitudes to habitual thought processes, tracking mistakes, and forming a sense of the integrity of the individual, both with regard to oneself and others [23]. Previous studies have demonstrated the association of a number of metacognitive features in patients with AN, in particular negative beliefs about anxiety and beliefs about the need to control one’s own thoughts [24]. In our previous study, we identified a moderating effect of some components of metacognition, namely Self-reflectivity and Mastery (the ability to comprehend psychosocial difficulties and subsequently apply the knowledge about oneself and others obtained during metacognitive processes to choose the most effective response to them), on the association of depressive symptoms and assessment of quality of life in patients with ED [25]. In a later study by Palmeri et al. an association between the level of perfectionism and a number of metacognitive features, (in particular positive beliefs about anxiety and beliefs about the need to control one’s own thoughts), was also found in patients with ED [26].

Thus, the features of metacognition are associated with ED including AN, on the one hand, and on the other hand, with differences in the levels of perfectionism. In addition, one can assume that metacognitive features can be factors that moderate the association of perfectionism with the clinical aspects of AN: BMI and one’s body image. However, we did not find any published works on the moderating effect

of metacognition on the association of perfectionism and clinical characteristics of AN. Therefore, the purpose of this study was to assess the moderating effect of metacognition on the association between perfectionism BMI and body image in patients with AN.

METHODS

Study design

A cross-sectional study was conducted.

Setting

This study included patients admitted to the Clinic for Eating Disorders of the Mental-health clinic No. 1 named after N.A. Alexeev (Moscow) from April 2023 to December 2024.

Participants

The study included all patients with a diagnosis of AN (F50.0 according to the ICD-10) admitted to the Clinic for Eating Disorders (inpatient hospital), who gave voluntary informed consent to participate in the study.

Non-inclusion criteria were hospitalisation for less than seven days and refusal to participate in the study.

Variables

BMI and body image disturbance were used as markers to assess the severity of AN.

Perfectionism was considered to be an etiological factor of AN, a stable fundamental personality trait of patients that contributes to the development and perpetuation of AN.

The level of metacognition was used as an indicator of the patient's cognitive ability to integratively assess the surrounding world and themselves in it, i.e., perception of oneself and others, the development of adaptive behavioural strategies, and the ability to change behaviour depending on changing circumstances and external conditions.

Measurement

The examination was carried out during the first 7 days of inpatient treatment.

The diagnosis of AN was made using the clinical and psychopathological method in accordance with the ICD-10 criteria. BMI was calculated using the formula $BMI = \text{weight (kg)} / \text{height}^2 \text{ (m)}$.

Body image perception was assessed using the Body Image Questionnaire (BIQ) [27]. This is a self-assessment questionnaire designed specifically to assess body image

disturbance in patients with ED. It includes 16 statements assessing body satisfaction, emotional judgment of one's appearance, behavioural strategies related to the body, and comparing oneself to other people. Each statement was rated by patients on a four-point scale (0 — "never", 1 — "sometimes", 2 — "often", 3 — "always"). Higher values reflect a negative body image, a tendency to avoid social contact due to appearance, and intense comparison between oneself and others. A score of 13 and above indicates a pronounced dissatisfaction with one's own body (sensitivity — 0.75 and specificity — 0.74). The maximum score on the scale is 48.

Perfectionism was assessed using the MPS, developed by Hewitt and Flett [28] as adapted by Gracheva [29]. This includes 45 statements split into three subscales: 1) "Self-oriented perfectionism" (striving to meet ideal personal standards), where the maximum score is 81; 2) "Others-oriented perfectionism" (excessive demands on others), where the maximum score is 51; and 3) "Socially prescribed perfectionism" (perception of society's pressure to comply with ideals), where the maximum score is 75. MPS is a self-assessment questionnaire. The answers to the questions were recorded on a 7-point Likert scale (from "strongly disagree" to "strongly agree"). The total score for each subscale is calculated by summing the responses to the relevant items, where higher values indicate the magnitude of each of the three types of perfectionism. The integral indicator of perfectionism — the total score on all items of the scale (where the maximum is 221 points) — is also taken into account. The normative values of the integral indicator of perfectionism for the Russian population lie in the range from 160 to 204 points.

To assess the level of metacognition of patients, an abbreviated scale of metacognition (Metacognition Assessment Scale-Abbreviated, MAS-A) [30] was used; it consists of four subscales: "Self-reflectivity", "Understanding the other's mind", "Decentration", and "Mastery". To assess metacognition, patients underwent a semi-structured Indiana Psychiatric Illness Interview (IPII) [31], during which patients described their lives and understanding of mental illness. Based on the information received, the researcher scored the patients on each subscale according to the MAS-A instruction. Scores range from 0 to 9 for the "Self-reflectivity" and "Mastery" subscales, 0 to 7 for the "Understanding the other's mind", and 0 to 3 for the "Decentration" subscale. In these, higher scores reflect a greater magnitude of the assessed abilities.

The study used Russian-language versions of IPII and MAS-A previously used to assess the level of metacognitive abilities in patients of a Russian sample [25].

The metacognition study was conducted by medical psychologists of the Mental-health clinic No. 1 named after N.A. Alexeev, who were trained to use the scale and interpret the examination results.

Study size

A preliminary calculation of the sample size was not carried out, however, at least 100 patients were planned to be included in the study.

Bias

The study was planned, hypothesised, and conceptualised by researchers not involved in the patient examination, and the researchers involved in the patient examination were not informed about the study hypotheses. This eliminated the possibility of distorting the results of scaling to fit the hypothesis and formulating research hypotheses based on the results of patient examination. Statistical data processing was carried out by a researcher who was not involved in the collection of material, nor planning the study, nor formulating the hypothesis. Therefore it excluded the possibility of distortion of the results of data processing to fit the study hypotheses.

Statistical analysis

Statistical data processing was carried out using IBM SPSS Statistics v. 27.0 (IBM Corp., USA) with the PROCESS macro for the Johnson-Neyman procedure [32]. During the verification of the distribution of quantitative variables for normality using the Shapiro-Wilk test, the distribution of most of the variables (with the exception of BMI and MPS scores) was found to be non-normal, and therefore non-parametric statistical criteria were used in the further analysis. Correlations between the studied variables were evaluated using the Spearman correlation test. To assess the moderating effect of metacognition on the association of perfectionism with BMI and BIQ scores, multiple linear regression models were constructed with the inclusion of scores for each of the MAS-A and MPS subscales, as well as the interaction between these factors. Models with overall significance (p -value for F-test) <0.01 were selected for further interpretation. The influence of factors and their interaction was considered significant at $p<0.01$. The threshold value of the moderating factor (MAS-A subscale), at which the

significance of the association changed, was assessed using the Johnson-Neyman procedure ($p<0.05$). To visualise the interaction of factors, graphs of the dependence of BMI or BIQ scores on perfectionism indicators at different levels of metacognition indicators (3 levels: the 16th, 50th and 84th percentiles) were constructed.

Ethical considerations

The study was approved by the local ethics committee of the Mental-health clinic No. 1 named after N.A. Alexeev (Report No. 2 dated March 9, 2023). All patients signed a voluntary informed consent form to participate in the study.

RESULTS

Participants

The study sample consisted of 130 patients diagnosed with AN who were admitted to the Clinic for Eating Disorders from April 2023 to December 2024 and met the inclusion criteria of the study. The majority of participants ($n=125$, 96.2%) were female. The median age was Me (Q1; Q3)=22 (19; 26) years.

Assessment of the scale and questionnaire results is presented in Table 1.

Correlations between perfectionism, body image disturbance, metacognition, and BMI

When constructing the correlation matrix, significant positive correlations of all subscales of perfectionism with a negative attitude to one's own body on the BIQ scale were revealed (Table 2). Significant correlations of moderate strength were noted with Others-oriented

Table 1. Indicators of perfectionism, metacognition, and body image disturbance in the sample

Indicator	Me (Q1; Q3)
BMI kg/m ²	14.7 (13.15; 16.4)
BIQ	19 (10; 28)
MAS-A	
Self-reflectivity (0–9)	3 (2; 5)
Understanding the other's mind (0–7)	3 (2; 4)
Mastery (0–9)	2 (1; 3)
Decentration (0–3)	1 (1; 2)
MPS	
Self-oriented perfectionism (max. 81)	69 (53; 81)
Others-oriented perfectionism (max 51)	45.5 (35.75; 57.25)
Socially prescribed perfectionism (max 75)	52.5 (41.75; 64)
Integral scale (normal range 160–204)	166 (135.5; 194)

Note: BIQ — Body Image Questionnaire; BMI — Body Mass Index; MAS-A — Metacognition Assessment Scale-Abbreviated; Me — median; MPS — Multidimensional Perfectionism Scale.

Table 2. Correlations between perfectionism, body image disturbance, metacognition, and BMI

Indicators	BMI	1	2	3	4	5	6	7	8
1. BIQ	0.04	–	–	–	–	–	–	–	–
2. MAS-A-S	0.127	-0.213*	–	–	–	–	–	–	–
3. MAS-A-O	0.178*	-0.197*	0.482**	–	–	–	–	–	–
4. MAS-A-M	0.249**	-0.168	0.515**	0.728**	–	–	–	–	–
5. MAS-A-D	-0.033	-0.145	0.329**	0.381**	0.397**	–	–	–	–
6. MPS-SOP	-0.069	0.268**	-0.022	-0.029	-0.121	0.125	–	–	–
7. MPS-OOP	-0.045	0.545**	-0.043	-0.125	-0.183**	-0.055	0.510**	–	–
8. MPS-SPP	-0.030	0.478**	0.037	-0.023	-0.050	0.081	0.804**	0.762**	–
9. MPS-IS	-0.030	0.478**	0.037	-0.023	-0.050	0.081	0.804**	0.762**	0.845**

Note: The table shows Spearman correlation coefficients. * $p < 0.05$; ** $p < 0.01$. BIQ — Body Image Questionnaire; BMI — Body Mass Index; MAS-A-D — MAS-A-Decentration; MAS-A-O — MAS-A-Understanding the Other’s Mind; MAS-A-M — MAS-A-Mastery; MAS-A-S — MAS-A-Self-Reflectivity; MPS-IS — Integral Scale; MPS-OOP — MPS-Others-Oriented Perfectionism; MPS-SOP — MPS-Self-Oriented Perfectionism; MPS-SPP — MPS-Socially Prescribed Perfectionism.

Table 3. Influence of perfectionism and metacognition indicators and their interactions on BMI and body image

Variable	Coefficient B [95% CI]	Standard error	t	p
BMI (R²=0.12, F=5.259, p=0.002)				
Constant	17.52 [14.403; 20.638]	1.5746	11.1271	<0.0001
MPS-Integral Scale	-0.023 [-0.042; -0.004]	0.0094	-2.4492	0.0158
MAS-A-M	-1.0195 [-2.013; -0.026]	0.5017	-2.0322	0.0444
Interaction (change R ² =0.062)	0.009 [0.003; 0.015]	0.0031	2.8978	0.0045
BMI (R²=0.135, F=6.183, p=0.0006)				
Constant	17.594 [14.982; 20.206]	1.3192	13.3369	<0.0001
MPS-OOP	-0.086 [-0.142; -0.03]	0.0283	-3.0273	0.003
MAS-A-M	-0.929 [-1.753; -0.105]	0.4161	-2.2328	0.0274
Interaction (change R ² =0.08)	0.0312 [0.013; 0.05]	0.0094	3.3145	0.0012
BIQ (R²=0.21, F=10.778, p<0.0001)				
Constant	26.762 [11.839; 41.685]	7.537	3.5508	0.0005
MPS-SOP	-0.052 [-0.274; 0.171]	0.1123	-0.4602	0.6462
MAS-A-S	-6.372 [-10.219; -2.525]	1.9429	-3.2796	0.0014
Interaction (change R ² =0.049)	0.078 [0.021; 0.135]	0.0285	2.7311	0.0073

Note: BIQ — Body Image Questionnaire; BMI — Body Mass Index; CI — confidence interval; MAS-A — Metacognition Assessment Scale-Abbreviated; MAS-A-M — MAS-A-Mastery; MAS-A-S — MAS-A-Self-Reflectivity; MPS — Multidimensional Perfectionism Scale; MPS-OOP — MPS-Others-Oriented Perfectionism; MPS-SOP — MPS-Self-Oriented Perfectionism.

perfectionism and Socially prescribed perfectionism ($p=0.545$ and $p=0.478$, respectively). The level of “Self-reflectivity” and “Understanding the other’s mind” on the MAS-A scale was slightly negatively correlated with a “Negative attitude towards one’s own body” on the BIQ scale. “Mastery” and “Understanding the other’s mind” MAS-A subscale scores were positively correlated with BMI, however, the correlation strength was weak ($p=0.249$ and $p=0.178$, respectively).

Moderating effect of metacognition on the interaction of perfectionism with body image disturbance and BMI

During the construction of multiple linear regression models, a significant influence of the level of perfectionism on BMI was revealed when Mastery was included in the model as a moderating factor. Here, a significant influence of the level of perfectionism on the BIQ score under the influence

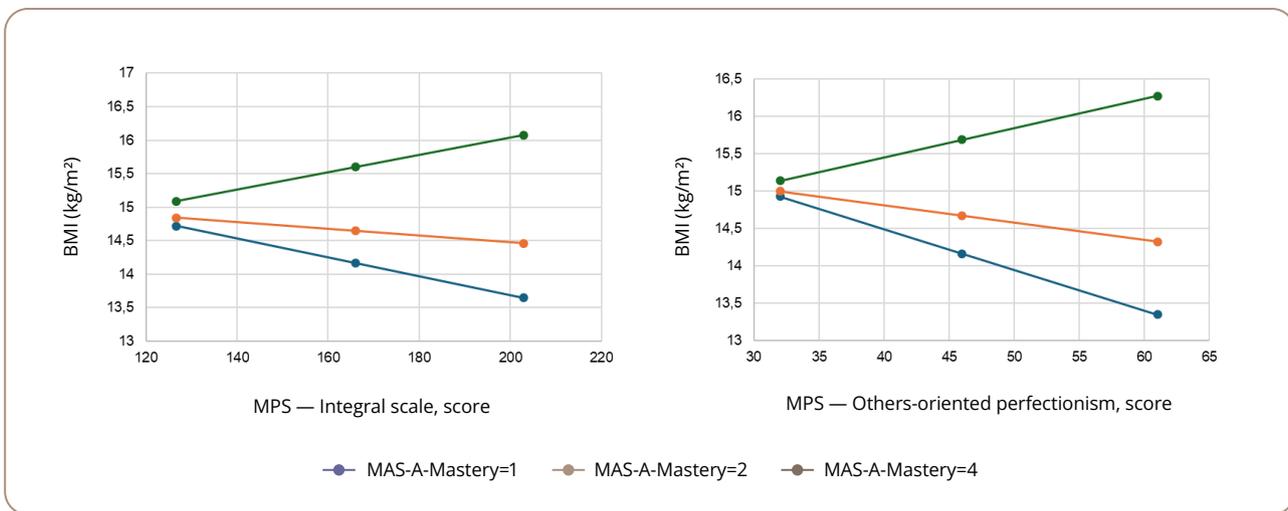


Figure 1. Moderating effect of the MAS-A-Mastery score on the association of the Multidimensional Perfectionism Scale score and the body mass index value.

Note: BMI — Body Mass Index; MAS-A — Metacognition Assessment Scale-Abbreviated; MPS — Multidimensional Perfectionism Scale.

Source: Chernov et al., 2025.

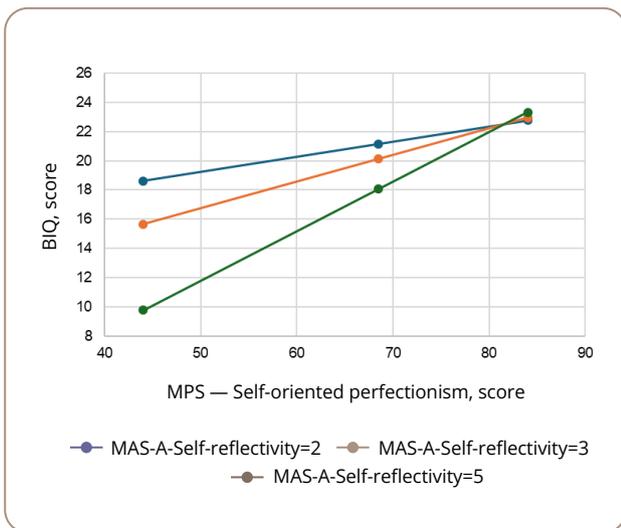


Figure 2. Moderating effect of the MAS-A-Self-reflectivity score on the association of the Multidimensional Perfectionism Scale score and the Body Image Questionnaire score.

Note: BIQ — Body Image Questionnaire; MAS — Metacognition Assessment Scale-Abbreviated; MPS — Multidimensional Perfectionism Scale.

Source: Chernov et al., 2025.

of self-reflectivity and mastery as moderating factors was observed (Table 3, Figure 1 and Figure 2). The results of constructing multiple linear regression models with a level of statistical significance from 0.01 to 0.05 are presented in Table S1 in the Supplementary.

Using the Johnson-Neyman technique, a significant association of the integral scale of perfectionism and BMI

was noted at Mastery values below 1.076 (30.9% of the sample) and above 3.956 (16.2% of the sample). Similar results were obtained during the construction of the model with the inclusion of the factors of Mastery and Others-oriented perfectionism: a significant association of Others-oriented perfectionism with BMI was noted at Mastery values below 1.748 (30.9% of the sample) and above 3.8312 (16.2% of the sample). An increase in the level of perfectionism is associated with a decrease in BMI at low MAS-A-Mastery (1 or less), but at higher values (4 or more) it is associated with an increase in BMI (Figure 1, Tables S2 and S3 in the Supplementary).

When constructing a model with the inclusion of Self-oriented perfectionism, a significant association of Self-oriented perfectionism with the BIQ score was noted at Self-reflectivity values >2.2316 (65.3% of the sample) (Figure 2, Table S4 in the Supplementary). This model demonstrates that at a high level of Self-reflectivity and a low level of perfectionism there is a lower intensity of body image disturbance, but with an increase in the level of perfectionism on these subscales the intensity of negative body image increases at Self-reflectivity scores of 2 or higher.

DISCUSSION

Metacognition had a moderating effect on the association between perfectionism and BMI and body image disturbance, while the direction of this association depended on the

magnitude of the individual components of metacognition. At Mastery scores of ≥ 4 , higher Others-oriented perfectionism scores were associated with an increase in BMI, and at Mastery scores of ≤ 1 , a higher level of Others-oriented perfectionism was associated with lower BMI. Even with minimally pronounced Self-reflectivity (≥ 2), the negative effect of Self-oriented perfectionism on body image was evident.

At the same time, no significant correlation was found between BMI and perfectionism, which contrasts with some studies where significant associations were identified [11–14]. Disturbance of body image positively correlated with all manifestations of perfectionism, which is consistent with data from previous studies in non-clinical samples [8–10].

It has been shown that Others-oriented perfectionism can have the opposite effect on BMI depending on the patient's ability to respond effectively to the situation (Mastery). It can become "malignant" and contribute to a decrease in BMI in patients with low adaptation skills, while contributing to an increase in BMI in patients with good adaptation skills. This observation can be explained by the patient's ability to direct their attention away from their own imperfections to the imperfections of the people around them, which in turn lessens fixation on their own weight.

We can put forward several hypotheses to explain this connection. First, when others do not meet the perfectionist standards of appearance or behaviour, this causes frustration and anxiety in patients with low Mastery as they perceive this as a lack of support for their strict beliefs, which increases self-criticism and restrictive eating, reducing BMI. For example, a patient may experience stress if their significant others do not support their dietary practices, leading to increased control over the body as a way to compensate. Second, perceptions of others' imperfections may reflect their own perfectionist beliefs about themselves, increasing anxiety as patients perceive others as weak, unable to control their weight and diet, and a demonstration of the need to stay fit. This process can strengthen fixation on control of their appearance, which also contributes to a decrease in BMI. On the contrary, at high levels of Mastery mentalization allows patients to be more flexible about expectations from others, re-evaluating them as unrealistic, which synchronizes with the transformation of their own perfectionist standards. High adaptive skills lessen the role of perfectionism as a key life management strategy, allowing patients to use

alternative coping strategies such as setting realistic goals or managing emotions, which reduces the need for weight control and promotes healthier eating behaviours, and increasing BMI [9, 33]. These findings are consistent with studies emphasising the role of metacognitive processes in improving psychosocial functioning and emotional regulation, and confirm the potentially adaptive role of perfectionism in the presence of effective regulatory mechanisms [34].

At the same time, under the influence of a minimum level of Self-reflectivity, Self-oriented perfectionism leads to body image disturbance.

We suggest that this type of perfectionism encourages patients with AN to set unrealistic standards for their appearance, which increases Self-criticism and body dissatisfaction. At a minimal level of Self-reflectivity, patients are able to be aware of their shortcomings, but do not have sufficient metacognition skills to critically re-evaluate these beliefs or reduce their emotional impact. This leads to fixation on the negative aspects of the body image, which is confirmed by high BIQ scores. Our data are consistent with current research. Studies of metacognitive processes confirm that limited Self-reflectivity, especially in the form of rumination, contributes to fixation on the negative aspects of body image and intensifies the symptoms of AN [35, 36]. In addition, research emphasises that Self-oriented perfectionism increases self-criticism and body dissatisfaction, which is manifested in a pronounced preoccupation with body image [37].

Overall, patients in the study showed low levels of metacognition across all MAS-A subscales, limiting their ability to cope with the challenges of recovering from AN. Low Self-reflectivity, Understanding the other's mind, Decentration, and low Mastery can hinder effective re-evaluation of perfectionist ideas and social expectations, as well as emotional management, which exacerbates symptoms of AN, such as body image disturbance and restrictive eating. In addition, perfectionism indicators in our sample were in the average range, which differs from studies that found a stronger association of perfectionism with AN symptoms, BMI, and body perception when perfectionism scores in the sample were high [6].

The main limitation of the study was the use of self-assessment questionnaires to evaluate the level of perfectionism and body image disturbance. Although both questionnaires were tested in the Russian-speaking population, the use of self-assessment questionnaires in

patients with AN, especially in cases of acute manifestations of the disorder, may not show reliable results due to the tendency of patients to downplay the severity of their symptoms. In particular, lower rates of perfectionism in our study compared to other AN studies may be associated with additional factors affecting the quality of filling out self-assessment questionnaires, such as physical and psychological exhaustion of patients, low motivation to participate in the study, and a tendency to conceal the clinical picture [38].

Our findings demonstrate the links between perfectionism, metacognition, body image disturbance, and BMI in patients with AN and open up a number of questions requiring further investigation.

One key issue is establishing the causal relationship between perfectionism, body image disturbance, and BMI. It is unclear whether perfectionism is the cause of body image disturbance that lead to restrictive eating and decreased BMI, or whether low BMI associated with malnutrition reinforces perfectionist tendencies and body image disturbance through neurobiological and psychological mechanisms. For example, perfectionism can motivate strict dietary practices, thus reducing BMI, but malnutrition, as shown in studies, increases cognitive distortions, including preoccupation with the body, which in turn reinforces perfectionism [39]. Perfectionism is closely linked with anxiety, depression, and low self-esteem, which are comorbid symptoms of AN and can modulate the interaction between BMI, perfectionism, and body image [25]. It is unclear whether perfectionism itself is an independent predictor of body image disturbance and BMI disorders, or its effect is mediated by emotional factors. For example, anxiety can heighten the perception of social pressure associated with Socially prescribed perfectionism, which increases preoccupation with the body, while depression can exacerbate the rumination associated with Self-reflectivity.

CONCLUSION

The association between perfectionism and body image disturbance and BMI in patients with AN depends on the magnitude of Self-reflectivity and the ability to develop adaptive strategies for coping and regulating behaviour (Mastery). The obtained data indicate the necessity of incorporating psychotherapy aimed at the development of metacognition in patients with AN. The target of this psychotherapy may be Self- and Others-oriented

perfectionism as a factor that affects key clinical indicators in AN — body image disturbance and BMI — depending on the magnitude of Self-reflectivity and Mastery.

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Supplementary data

Supplementary material to this article can be found in the online version by doi:

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References

1. 6B80 Anorexia Nervosa [Internet]. In: ICD-11 for Mortality and Morbidity Statistics. Geneva: World Health Organization; c2025 [cited 2025 September 28]. Available from: <https://icd.who.int/browse/2025-01/mms/en#263852475>
2. Cornelissen PL, Tovée MJ. Targeting body image in eating disorders. *Curr Opin Psychol*. 2021;41:71–77. doi: 10.1016/j.copsyc.2021.03.013
3. Zanella E, Lee E. Integrative review on psychological and social risk and prevention factors of eating disorders including anorexia nervosa and bulimia nervosa: seven major theories. *Heliyon*. 2022;8(11):e11422. doi: 10.1016/j.heliyon.2022.e11422
4. Fairburn CG, Cooper Z, Shafran R. Cognitive behaviour therapy for eating disorders: a “transdiagnostic” theory and treatment. *Behav Res Ther*. 2003;41(5):509–528. doi: 10.1016/s0005-7967(02)00088-8
5. Vervaeke M, Puttevels L, Hoekstra RHA, et al. Transdiagnostic vulnerability factors in eating disorders: A network analysis. *Eur Eat Disord Rev*. 2021;29(1):86–100. doi: 10.1002/erv.2805
6. Delaquais CP, Godart N, Barry C, et al. Perfectionism, self-esteem, and affective symptoms in anorexia nervosa subtypes: A network analysis of French inpatients. *J Clin Psychol*. 2024;80(8):1852–1875. doi: 10.1002/jclp.23698
7. Dahlenburg SC, Gleaves DH, Hutchinson AD. Anorexia nervosa and perfectionism: A meta-analysis. *Int J Eat Disord*. 2019;52(3):219–229. doi: 10.1002/eat.23009
8. Welch E, Miller JL, Ghaderi A, Vaillancourt T. Does perfectionism mediate or moderate the relation between body dissatisfaction and disordered eating attitudes and behaviors? *Eat Behav*. 2009;10(3):168–175. doi: 10.1016/j.eatbeh.2009.05.002
9. Hicks RE, Kenny B, Stevenson S, Vanstone DM. Risk factors in body image dissatisfaction: gender, maladaptive perfectionism, and psychological wellbeing. *Heliyon*. 2022;8(6):e09745. doi: 10.1016/j.heliyon.2022.e09745
10. Wade TD, Tiggemann M. The role of perfectionism in body dissatisfaction. *J Eat Disord*. 2013;1:2. doi: 10.1186/2050-2974-1-2
11. Ekici EM, Yildirim Z, Erdem S. Understanding the role of perfectionism in adult expectations of dietary restriction and thinness. *Gulhane Med J*. 2024;66(4):203–210. doi: 10.4274/gulhane.galenos.2024.16046
12. Bernabéu-Brotóns E, Marchena-Giráldez C. Emotional Eating and Perfectionism as Predictors of Symptoms of Binge Eating Disorder: The Role of Perfectionism as a Mediator between Emotional Eating and Body Mass Index. *Nutrients*. 2022;14(16):3361. doi: 10.3390/nu14163361
13. Halmi KA, Sunday SR, Strober M, et al. Perfectionism in anorexia nervosa: variation by clinical subtype, obsessiveness, and pathological eating behavior. *Am J Psychiatry*. 2000;157(11):1799–1805. doi: 10.1176/appi.ajp.157.11.1799
14. Morgan-Lowes KL, Clarke PJF, Hoiles KJ, et al. The relationships between perfectionism, anxiety and depression across time in paediatric eating disorders. *Eat Behav*. 2019;34:101305. doi: 10.1016/j.eatbeh.2019.101305
15. Zhang B, Cai T. Moderating effects of self-efficacy in the relations of perfectionism and depression. *Studia Psychologica*. 2012;54(1):15–21.
16. Zhang J, Liu L, Wang W. The Moderating Role of Grit in the Relationship Between Perfectionism and Depression Among Chinese College Students. *Front Psychol*. 2021;12:729089. doi: 10.3389/fpsyg.2021.729089
17. Chaaya R, Hallit R, Malaeb D, et al. Moderating effect of self-esteem between perfectionism and avoidant restrictive food intake disorder among Lebanese adults. *BMC Psychiatry*. 2024;24(1):325. doi: 10.1186/s12888-024-05762-8
18. Abdollahi A, Gardanova ZR, Ramaiah P, et al. Moderating Role of Self-Compassion in the Relationships Between the Three Forms of Perfectionism with Anger, Aggression, and Hostility. *Psychol Rep*. 2023;126(5):2383–2402. doi: 10.1177/00332941221087911
19. Kleka P, Brycz H, Zięba M, Fanslau A. Longitudinal study of metacognition's role in self-efficacy and hope development. *Sci Rep*. 2024;14(1):29379. doi: 10.1038/s41598-024-80180-0
20. Sun PP, Wang C, Teng LS. The Role of Well-Being and Grit in Metacognitive Self-Regulation Among Language Teachers: Partial Least Squares Structural Equation Modeling. *Int J Appl Linguist*. 2025;35(4):1883–1896. doi: 10.1111/ijal.12711
21. Rader L, Forster SD, Gauggel S, et al. Take a step back to see your own value: on the role of metacognition in self-esteem regulation. *Front Psychol*. 2025;16:1530008. doi: 10.3389/fpsyg.2025.1530008
22. Hochheiser J, Lundin NB, Lysaker PH. The Independent Relationships of Metacognition, Mindfulness, and Cognitive Insight to Self-Compassion in Schizophrenia. *J Nerv Ment Dis*. 2020;208(1):1–6. doi: 10.1097/NMD.0000000000001065
23. Moritz S, Lysaker PH. Metacognition — What did James H. Flavell really say and the implications for the conceptualization and design

- of metacognitive interventions. *Schizophr Res.* 2018;201:20–26. doi: 10.1016/j.schres.2018.06.001
24. Palmieri S, Mansueto G, Ruggiero GM, et al. Metacognitive beliefs across eating disorders and eating behaviours: A systematic review. *Clin Psychol Psychother.* 2021;28(5):1254–1265. doi: 10.1002/cpp.2573
 25. Springfield CR, Bonfils KA, Chernov NV, et al. The paradoxical moderating effects of metacognition in the relationships between self-esteem, depressive symptoms, and quality of life in anorexia and bulimia. *Consort Psychiatr.* 2023;4(2):6–20. doi: 10.17816/CP6139
 26. Palmieri S, Sassaroli S, Ruggiero GM, et al. Perfectionism in patients with eating disorders: The role of metacognitive beliefs and repetitive negative thinking. *Clinical Psychology & Psychotherapy.* 2024;31(1):e2954. doi: 10.1002/cpp.2954
 27. Skugarevskii OA, Sivukha SV. [Body image: developing an assessment tool]. *Psikhologicheskii zhurnal.* 2006;(2):40–48. Belarus.
 28. Hewitt PL, Flett GL. Perfectionism in the self and social contexts: conceptualization, assessment, and association with psychopathology. *J Pers Soc Psychol.* 1991;60(3):456–470. doi: 10.1037//0022-3514.60.3.456
 29. Gracheva II. [Adaptation of “multidimensional perfectionism scale” technique by P. Hewitt and G. Flett]. *Psikhologicheskii zhurnal.* 2006;27(6):73–81. Russian.
 30. Lysaker PH, Chernov N, Moiseeva T, et al. Metacognition Assessment Scale--Abbreviated; Russian Version (MAS-A) [Database record] [Internet]. APA PsycTests. c2020 [cited 2025 November 12]. doi: 10.1037/t79885-000. Available from: <https://psycnet.apa.org/doiLanding?doi=10.1037%2Ft79885-000>
 31. Lysaker PH, Clements CA, Plascak-Hallberg CD, et al. Indiana Psychiatric Illness Interview (IPII) [Database record]. APA PsycTests. c2002 [cited 2025 November 12]. doi: 10.1037/t79888-000. Available from: <https://psycnet.apa.org/doiLanding?doi=10.1037%2Ft79888-000>
 32. Hayes, A. F., & Rockwood, N. J. (2017). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behaviour research and therapy*, 98, 39–57. doi: 10.1016/j.brat.2016.11.001
 33. Rothschild-Yakar L, Stein D, Goshen D, et al. Mentalizing Self and Other and Affect Regulation Patterns in Anorexia and Depression. *Front Psychol.* 2019;10:2223. doi: 10.3389/fpsyg.2019.02223
 34. Esben S, Sorensen P. The role of metacognitive beliefs versus meta-emotion beliefs in disordered eating. *Australian Psychologist.* 2023;58(24):1–11. doi: 10.1080/00050067.2023.2181685
 35. Quattropiani MC, Lenzo V, Faraone C, et al. The role of Metacognition in eating behavior: an exploratory study. *Mediterranean Journal of Clinical Psychology.* 2016;4(3). doi: 10.6092/2282-1619/2016.4.1213
 36. Smith KE, Mason TB, Lavender JM. Rumination and eating disorder psychopathology: A meta-analysis. *Clin Psychol Rev.* 2018;61:9–23. doi: 10.1016/j.cpr.2018.03.004
 37. Stackpole R, Greene D, Bills E, Egan SJ. The association between eating disorders and perfectionism in adults: A systematic review and meta-analysis. *Eat Behav.* 2023;50:101769. doi: 10.1016/j.eatbeh.2023.101769
 38. Howard LM, Olson AK, Pitz BN, Heron KE. The Role of Denial in Eating Disorder Development, Assessment, and Treatment. In: Patel VB, Preedy VR, editors. *Eating Disorders.* Cham: Springer; 2023. p. 367–383.
 39. Davenport E, Rushford N, Soon S, McDermott C. Dysfunctional metacognition and drive for thinness in typical and atypical anorexia nervosa. *J Eat Disord.* 2015;3:24. doi: 10.1186/s40337-015-0060-4
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Psychotherapy Training Among Psychiatrists in Russia: A Cross-Sectional Study

Опыт обучения психотерапии в практике российских врачей-психиатров: поперечное исследование

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Original research

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ABSTRACT

BACKGROUND: Access to psychotherapeutic interventions and the standardization of psychotherapy training within psychiatric training worldwide remain a global challenge. In Russia, psychotherapy training has developed considerably since its introduction in the early 20th century. However, its integration into psychiatry training programs remains inconsistent, with variations across institutions.

AIM: To explore the experiences of psychiatry trainees and early career psychiatrists (ECPs) in Russia with psychotherapy education, and to assess their views on potential areas for improvement.

METHODS: A cross-sectional survey was conducted using the World Psychotherapy Survey questionnaire, which was translated into Russian. The survey gathered data on psychotherapy training experiences, supervision, and demographic characteristics.

RESULTS: Data were obtained from 223 psychiatrists and psychiatry trainees across 38 Russian cities. There was a strong interest in psychotherapy training, with 88 (39.5%) participants already certified or undergoing training, while 100 (44.8%) planned future training. However, only 69 (30.9%) reported that their psychiatry training programs included mandatory psychotherapy courses. Supervision opportunities were limited, and many respondents funded the training themselves. The majority ($n=200$; 89.7%) supported the inclusion of psychotherapy training into the psychiatry training programs, with cognitive-behavioral therapy and psychodynamic therapy being the most preferred modalities.

CONCLUSION: Psychotherapy training is highly relevant to psychiatry trainees and ECPs in Russia, yet gaps in supervision and inconsistent integration into the psychiatry training programs need to be addressed. Revising educational programs to include mandatory psychotherapy training could align Russian psychiatric education with international standards and enhance the quality of mental health care.

АННОТАЦИЯ

ВВЕДЕНИЕ: Существует глобальная проблема, связанная с доступностью психотерапевтических вмешательств и гармонизацией обучения психотерапии в рамках подготовки врачей-психиатров во всем мире. В России обучение психотерапии значительно эволюционировало с момента ее появления в начале 20 века. Тем не менее процесс интеграции обучения психотерапии в образовательные программы по психиатрии проходит непоследовательно и варьируется в разных учебных заведениях.

ЦЕЛЬ: Изучить мнения и практический опыт российских ординаторов и молодых врачей-психиатров в отношении обучения психотерапии, выявить существующие пробелы в образовательной системе и оценить предложения специалистов по ее оптимизации.

МЕТОДЫ: Было проведено поперечное исследование с использованием опросника «Всемирное исследование Психотерапии» (World Psychotherapy Survey), переведенного на русский язык. В ходе исследования собирали сведения об опыте обучения психотерапии, данные о супервизии и демографические характеристики участников.

РЕЗУЛЬТАТЫ: Данные были получены от 223 врачей-психиатров и ординаторов, обучающихся по специальности «психиатрия», из 38 российских городов. Респонденты проявили заинтересованность в обучении психотерапии: на момент опроса 88 (39,5%) участников уже завершили или проходили обучение, а 100 (44,8%) участников планировали пройти подготовку в будущем. Однако только 69 (30,9%) респондентов сообщили, что в их учебную программу по психиатрии входили обязательные курсы изучения психотерапии. Возможности супервизии были ограничены, при этом многие участники самостоятельно оплачивали свое обучение. Большинство респондентов ($n=200$; 89,7%) поддержали включение обучения психотерапии в учебные программы по психиатрии, при этом наиболее предпочтительными направлениями оказались когнитивно-поведенческая терапия и психодинамическая терапия.

ЗАКЛЮЧЕНИЕ: Психотерапия — востребованная программа среди российских молодых врачей-психиатров и ординаторов, обучающихся по специальности «Психиатрия». Однако существующие пробелы в организации супервизии и фрагментарное включение этих курсов в программы ординатуры требуют системного решения. Пересмотр образовательных программ с целью включения обязательного обучения психотерапии мог бы привести российское психиатрическое образование в соответствие с международными стандартами и повысить качество психиатрической помощи.

Keywords: *psychotherapy training; mental health education; supervision; early career psychiatrists; psychiatry residency*

Ключевые слова: *обучение психотерапии; образование в области психического здоровья; супервизия; молодые врачи-психиатры; ординатура по психиатрии*

INTRODUCTION

Psychotherapy plays a crucial role in mental health care, offering effective, evidence-based interventions for a wide range of psychiatric conditions. Despite its importance, access to worldwide psychotherapeutic interventions remains limited [1]. In Russia, psychotherapy has historically

been regarded as a component of psychiatric care for individuals with mental health disorders. The origins of psychotherapy training in the country date back to the late 19th and early 20th centuries, when initial studies in the field were conducted within psychiatric clinics and institutions. In the 1920s, the first institutes dedicated

to teaching the fundamentals of psychotherapy were established. During this time, despite facing considerable criticism and censorship, significant emphasis was placed on psychoanalysis and other international schools of psychotherapy [2].

A major impetus for the development of psychotherapy in the country — then the USSR — emerged in the 1960s and 1970s with the creation of specialized psychotherapy departments in medical institutes and universities. In 1966, the first department of psychotherapy was established in Moscow at the Central Institute for Advanced Training of Doctors, followed by similar departments in other cities [3]. In 1985, psychotherapy was officially recognized as a medical specialty, with the legal requirement that only physicians could qualify as a psychotherapist in Russia.

In Russia, the term “residency” is used to describe postgraduate training; however, for the sake of consistency with the English-language literature, the term “psychiatry training” will be used in this article. For several decades, becoming a psychotherapist required completing six years of general medical education followed by two-year postgraduate training in psychiatry (the possibility of a one-year internship in psychiatry was discontinued in 2016). Psychiatrists were then required to complete a four-month advanced training course at a state educational institution and pass a certification examination. Private educational centers also offered longer, sometimes multi-year training programs, but these could not provide a state-recognized employment certificate.

In 2003, legislation expanded access to psychotherapy training: physicians with a basic medical degree (general medical education for six years in adult or pediatric medicine) but without psychiatric education could now enter such programs. Psychiatry training itself is currently regulated by the federal state educational standard of higher education 31st August 2020 (the latest version approved by the order of the Ministry of Science and Higher Education of the Russian Federation on 16th October 2023). Under this framework, psychotherapy training may be included as either a mandatory or elective component. In addition to physicians, other mental health professionals — such as psychologists, social workers, and special education teachers — can receive advanced training in psychotherapy methods through public or private programs, but they cannot be officially certified as psychotherapists.

Internationally, approaches to psychotherapy training within psychiatry programs vary considerably. Differences in

training standards and resources pose significant challenges to achieving consistent, high-quality psychotherapy education worldwide [4]. A key issue is the lack of international standardization in the incorporation of psychotherapeutic skills into psychiatry training [4]. In Europe, the main barriers to accessing psychotherapy training include difficulty taking time away from clinical duties, shortage of supervisors, and a lack of funding [5]. A World Psychiatric Association (WPA) survey of 47 countries found that only 59% of member countries require mandatory psychotherapy training as part of psychiatry training [4].

Traditionally, psychiatry trainees have shown a strong interest in psychotherapy training, with many choosing to specialize in psychiatry to gain psychotherapy skills for future practice [6]. In a 2019 survey, 34% of early career psychiatrists (ECPs) in Russia already held psychotherapy certification [7]. Nevertheless, as psychopharmacological treatments for mental health disorders have become more widespread, the availability of psychotherapy services and training has declined in many centers worldwide [4]. Supporting professional development and improving the occupational well-being of mental health care providers are among the key objectives of the Early Career Psychiatrists’ Council of the Russian Society of Psychiatrists (RSP ECPC) [8].

In recent years, the WPA Early Career Psychiatrists Section has launched an initiative to examine the integration of psychotherapy training into psychiatry training programs [9–13]. This study has involved active participation from low- and middle-income countries (LMICs) [9–13], while results from high-income countries (HICs) have yet to be published. This study aimed to explore the experiences of psychiatry trainees and ECPs in Russia with psychotherapy education, and to assess their views on potential areas for improvement.

METHODS

Study design

This cross-sectional study was conducted by the RSP ECPC and the members of the Commission for Young Scientists and Specialists of the Russian Society of Psychiatrists.

Data collection methods

Data were collected using the World Psychotherapy Survey questionnaire, developed by the Early Career Psychiatrists Section of the World Psychiatric Association and previously used in other countries [9–13]. The original questionnaire was translated into Russian and supplemented with an additional

section on psychotherapy training outside the psychiatry training program, in order to reflect the organizational differences between psychiatry and psychotherapy training in Russia. The translation was conducted independently by two psychiatrists who spoke English and Russian using a double back-translation technique. In cases of disagreement, a third team member was consulted to reach a consensus.

The questionnaire comprised three sections: (1) psychotherapy training within psychiatry training; (2) psychotherapy education; and (3) demographic information. The questionnaire contained 21 multiple-choice and open-ended questions. The Russian version of the questionnaire used in this study is available in the Supplementary Appendix 1, and the English back-translation in Appendix 2.

After translation, the questionnaire was piloted with 10 psychiatry trainees. The pilot involved them completing the survey and identifying any unclear questions so that the wording could be clarified or revised. No issues were identified, and the survey did not require any modifications.

Sample characteristics

Psychiatrists and psychiatry trainees were invited to participate in the study. Because the Ministry of Health does not publish statistics on the number of psychiatry trainees and ECPs, it was not possible to calculate a sample size or response rate. Participants were eligible if they met the following criteria: (1) currently working or training in psychiatry or addiction psychiatry, or graduated in psychiatry and worked as psychotherapists; (2) aged over 18 years; and (3) sufficient knowledge of the Russian language to understand the questionnaire. Psychiatry trainees were defined as individuals enrolled in psychiatry training at the time of the survey. ECPs were defined according to the RSP ECPC criterion: board-certified psychiatrists aged 40 years or younger. Psychiatrists who did not meet these criteria were categorized as senior psychiatrists. This classification allowed for a more detailed examination of how attitudes toward psychotherapy training change with increased experience in psychiatry.

Survey administration

The survey was administered online via Google Forms. Settings were configured to ensure that no personally identifiable information (e.g., email or IP addresses) was collected, thereby safeguarding respondent anonymity. The option to restrict multiple responses from the same

user through account-based authorization was not enabled, as this could have excluded participants without a Google account. At the time of the study, alternative international online platforms with multiple-response prevention features were blocked in Russia by rights holders and therefore could not be used.

The questionnaire was distributed between June and September 2023. A link to the survey was shared through the RSP ECPC online platforms (email newsletter, and official Telegram channel), via the 27 heads of the RSP ECPC regional offices and promoted at scientific and educational events for ECPs in Russia.

Statistical analysis

Data analysis was conducted using Jamovi software (version 2.3.28.0). The Shapiro–Wilk test for normality and Levene’s test for homogeneity of variances were applied to determine appropriate methods of variance analysis. Categorical variables were presented as absolute numbers and percentages (*n*, %). Discrete and continuous variables were summarized by median and interquartile range (Q1; Q3). Pearson’s χ^2 test was used to compare qualitative data. The Mann-Whitney (U) test and Kruskal-Wallis (H) test were used to compare continuous and ordinal variables due to heterogeneity in the data sample. A *p*-value of 0.05 was considered statistically significant.

Ethical considerations

The survey ensured confidentiality and did not collect any personally identifiable information (e.g., names, dates or places of birth, addresses or passport data). All participants provided voluntary informed consent electronically before completing the questionnaire. This study was approved by the Russian Society of Psychiatrists (RSP). No additional ethics committee approval was required for this study.

RESULTS

Respondent characteristics

A total of 223 participants completed the questionnaire, 164 (73.5%) of whom were women. Participants’ ages ranged from 22 to 75 years, with a median age of 29 years (Q1=25; Q3=37). Respondents’ psychiatry training was distributed across 38 cities in Russia, with the largest numbers from Moscow (*n*=87), St. Petersburg (*n*=46), Omsk (*n*=12), Chita (*n*=10), Tyumen (*n*=8), and Ryazan (*n*=8).

Demographic characteristics, psychotherapy training experience, and current professional status of psychiatry

trainees, ECPs, and senior psychiatrists are presented in Table 1. Some respondents (40 ECPs and 11 senior psychiatrists) worked both as psychotherapists and psychiatrists. Psychotherapy was more frequently included in psychiatry training for current trainees, whereas senior psychiatrists were less likely to report prior psychotherapy training experiences. No significant differences were observed between groups regarding the mandatory or optional inclusion of psychotherapy education within psychiatry training programs.

Psychiatry trainees and ECPs were more likely to have studied psychotherapy theory, with substantially less experience in practical training or personal therapy as part of their education. They also had more frequent access to supervision, although actual supervision experience did not differ between the groups.

Main findings

Respondents' psychotherapy training experiences outside psychiatry training are summarized in Table 2. Overall, respondents expressed strong interest in psychotherapy training, with only 33 (14.8%) reporting that they did not plan to pursue psychotherapy training. The most frequently reported specialized psychotherapy training was in cognitive-behavioral therapy (CBT) and psychodynamic approaches. More than half of ECPs and psychiatry trainees had paid for psychotherapy training themselves or planned to do so. Just under half of respondents ($n=107$; 48.0%) had received personal psychotherapy.

In the absence of comprehensive national statistics on the number of psychotherapists working in Russia's public and private healthcare sectors, Figure 1 illustrates the relationship between respondents' age and years of

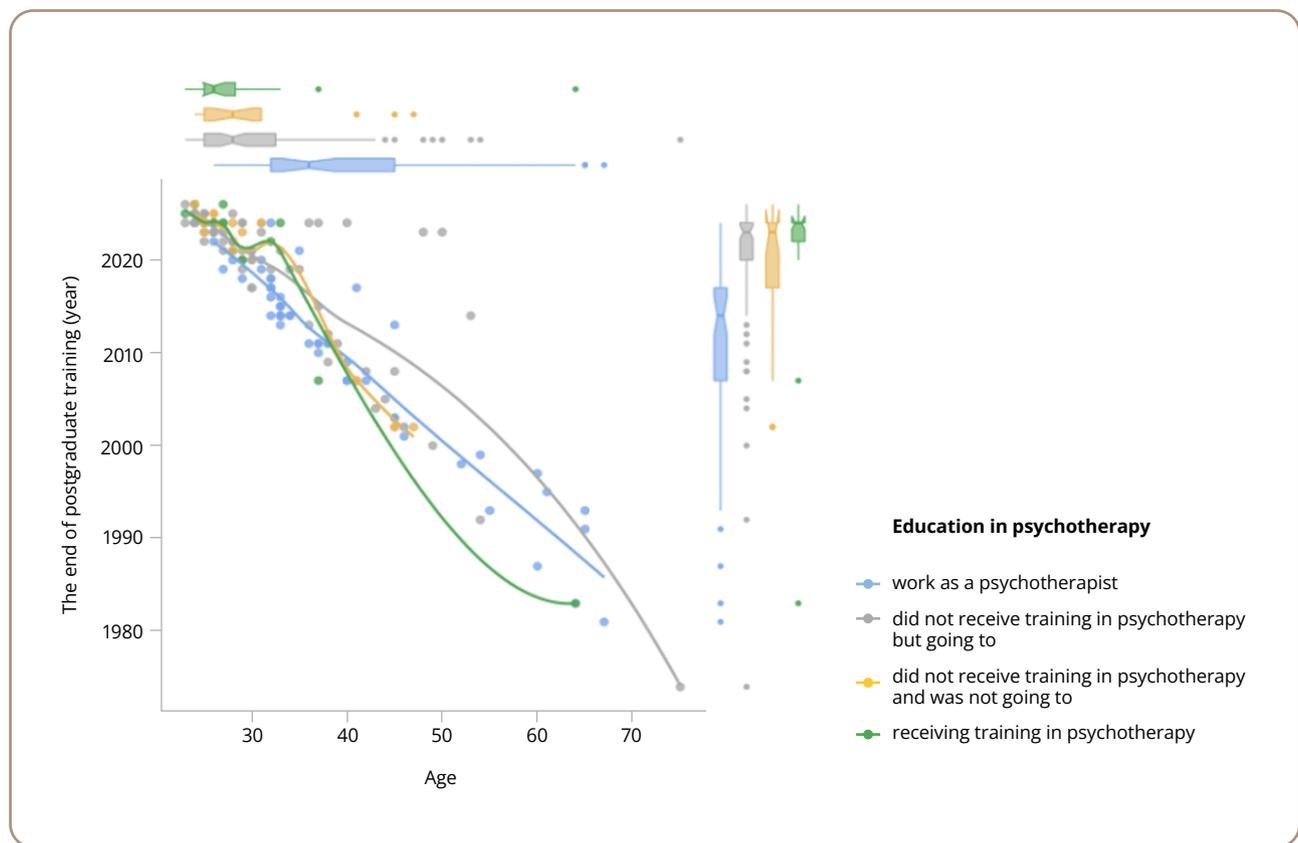


Figure 1. Distribution of respondents with different educational status in psychotherapy according to their age and the year of postgraduate training fulfillment.

Note: The density distribution of certification/education status in psychotherapy depending on the age of respondents — along the upper edge of the figure; density distribution of certification/education status in psychotherapy depending on the year of psychiatry training — on the right edge of the figure. Dots on the diagram represent individual respondents, depending on their age and year of psychiatric training. Lines on the diagram show the distribution trends of respondents with different psychotherapeutic education depending on age and year of psychiatric training.

Source: Chumakov et al., 2025.

Table 1. Characteristics of study participants

Variables	Psychiatry trainees, n=83*	ECPs, n=96	Senior psychiatrists, n=44	p-value	Missing data, n=223
Female sex, n (%)	66 (79.5%)	67 (69.8%)	31 (70.5%)	$\chi^2=2.43$; df=2; $p=0.296$	None
Age, years	25 (24; 26)	30 (28; 33)	48 (45; 56)	$\chi^2=147$; df=2; $p<0.001$	None
Duration of employment after certification in psychiatry, years	NA	5 (3; 10)	22 (17; 30)	$\chi^2=68.8$; df=2; $p<0.001$	23 (10.3%)
Occupational employment**, n (%)					
Psychiatry specialists	NA	85 (88.5%)	31 (70.5%)	$\chi^2=6.95$; df=1; $p=0.008$	None
Psychotherapy specialists	NA	40 (41.7%)	22 (50.0%)	$\chi^2=0.85$; df=1; $p=0.357$	
Child and adolescent psychiatry specialists	NA	16 (19.3%)	5 (11.4%)	$\chi^2=0.665$; df=1; $p=0.415$	
Psychiatry training curriculum, n (%)					
Psychotherapy is (was) included	59 (71.1%)	50 (52.1%)	23 (52.3%)	$\chi^2=7.74$; df=2; $p=0.021$	None
Psychotherapy is (was) not included	24 (28.9%)	46 (47.9%)	21 (47.7%)		
Course requirement, n (%)					
Psychotherapy as a mandatory course	31 (37.3%)	26 (27.1%)	12 (27.3%)	$\chi^2=0.101$; df=2; $p=0.951$	94 (42.2%)
Psychotherapy as an optional course	28 (33.7%)	21 (21.9%)	11 (25.0%)		
Type of psychotherapy education**, n (%)					
Theoretical	39 (47.0%)	42 (43.8%)	8 (18.2%)	$\chi^2=11.0$; df=2; $p=0.004$	100 (44.8%)
Practical	15 (18.1%)	6 (6.3%)	13 (29.5%)	$\chi^2=13.5$; df=2; $p=0.001$	
Personal psychotherapy	4 (4.8%)	3 (3.1%)	6 (13.6%)	$\chi^2=6.32$; df=2; $p=0.04$	
Modalities of psychotherapy education during psychiatry training**, n (%)					
Cognitive-behavioral therapy	38 (45.8%)	35 (36.5%)	17 (38.6%)	$\chi^2=1.68$; df=2; $p=0.433$	110 (49.3%)
Psychodynamic psychotherapy	20 (24.1%)	20 (20.8%)	10 (22.7%)	$\chi^2=0.275$; df=2; $p=0.871$	
Family therapy	16 (19.3%)	12 (12.5%)	8 (18.2%)	$\chi^2=1.68$; df=2; $p=0.432$	
Interpersonal psychotherapy	13 (15.7%)	10 (10.4%)	6 (13.6%)	$\chi^2=1.1$; df=2; $p=0.576$	
Psychodrama	6 (7.2%)	6 (6.3%)	4 (9.1%)	$\chi^2=0.36$; df=2; $p=0.833$	
Other	2 (2.4%)	12 (12.5%)	1 (2.3%)	$\chi^2=8.96$; df=2; $p=0.011$	
Access to supervision, n (%)					
Yes	71 (85.5%)	72 (75.0%)	30 (68.2%)	$\chi^2=5.63$; df=2; $p=0.06$	None
No	12 (14.5%)	24 (25.0%)	14 (31.8%)		
Participation in supervisions, n (%)					
Mandatory	3 (3.6%)	3 (3.1%)	2 (4.5%)	$\chi^2=3.19$; df=4; $p=0.527$	32 (14.3%)
Optional	34 (41.0%)	46 (47.9%)	19 (43.2%)		
Don't know	39 (47.0%)	30 (31.3%)	15 (34.1%)		
Supervisions' duration, hours, n (%)					
>100	2 (2.4%)	4 (4.2%)	3 (6.8%)	$\chi^2=16.5$; df=6; $p=0.011$	39 (17.5%)
50-100	3 (3.6%)	11 (11.5%)	3 (6.8%)		
<50	1 (1.2%)	8 (8.3%)	4 (9.1%)		
It is difficult to answer	71 (85.5%)	54 (56.3%)	20 (45.5%)		

Note: *two subjects were trainees over 40 years old; **multiple-choice option. ECPs — early-career psychiatrists; NA — not applicable.

Table 2. Psychotherapy education experience

Variables	Psychiatry trainees, n=83*	ECPs, n=96	Senior psychiatrists, n=44	p-value	Missing data, n=223
Status of psychotherapy education, n (%)					
Certified psychotherapists	0	39 (40.6%)	23 (52.3%)	$\chi^2=59.3$; df=6; $p<0.001$	None
Continuing their training in psychotherapy	12 (14.5%)	12 (12.5%)	2 (4.5%)		
Are planning to train in psychotherapy	56 (67.5%)	36 (37.5%)	10 (22.7%)		
Do not plan to train in psychotherapy	15 (18.0%)	9 (9.4%)	9 (20.5%)		
Modalities of psychotherapy training**, n (%)					
Cognitive-behavioral therapy	23 (27.7%)	37 (38.5%)	22 (50.0%)	$\chi^2=6.37$; df=2; $p=0.041$	109 (48.9%)
Psychodynamic psychotherapy	3 (3.6%)	16 (16.6%)	16 (36.4%)	$\chi^2=23.43$; df=2; $p<0.001$	
Family therapy	6 (7.2%)	13 (13.5%)	14 (31.8%)	$\chi^2=14.0$; df=2; $p<0.001$	
Interpersonal psychotherapy	5 (6.0%)	11 (11.5%)	8 (18.2%)	$\chi^2=4.51$; df=2; $p=0.105$	
Psychodrama	2 (2.4%)	8 (8.3%)	7 (15.9%)	$\chi^2=7.56$; df=2; $p=0.023$	
Other	4 (4.8%)	13 (13.5%)	3 (6.8%)	$\chi^2=4.46$; df=2; $p=0.108$	
Satisfaction with their psychotherapy competencies, n (%)					
Very satisfied	3 (3.6%)	15 (15.6%)	10 (22.7%)	$\chi^2=4.04$; df=6; $p=0.672$	140 (62.8%)
Satisfied	4 (4.8%)	15 (15.6%)	7 (15.9%)		
Neither satisfied nor dissatisfied	2 (2.4%)	13 (13.5%)	7 (15.9%)		
Not satisfied	1 (1.2%)	6 (6.3%)	0 (0%)		
Type of psychotherapy training institution, n (%)					
Public training institution	6 (7.2%)	22 (22.9%)	13 (29.5%)	$\chi^2=6.39$; df=4; $p=0.172$	140 (62.8%)
Private training institution	4 (4.8%)	18 (18.8%)	3 (6.8%)		
Both public and private training institutions	0	11 (11.5%)	6 (13.6%)		
Psychotherapy education fee payment (based on experience or training plans), n (%)					
Fully paid by the trainee	49 (59.0%)	56 (58.3%)	15 (34.1%)	$\chi^2=12.86$; df=6; $p=0.045$	None
By the hospital or the training institution	9 (10.8%)	14 (14.6%)	10 (22.7%)		
Fully paid by the government	10 (12.0%)	4 (4.2%)	5 (11.4%)		
Partially paid by the trainee and another source	15 (18.1%)	22 (22.9%)	14 (31.8%)		
Personal psychotherapy experience, n (%)					
Yes	36 (43.4%)	51 (53.1%)	20 (45.5%)	$\chi^2=1.84$; df=2; $p=0.399$	None
No	47 (56.6%)	45 (46.9%)	24 (54.5%)		

Note: *two subjects were trainees over 40 years old; **multiple-choice option. ECPs — early career psychiatrists.

postgraduate training, differentiated by psychotherapy education status. The density distribution of certification and education status in psychotherapy along the upper edge of the figure indicates that psychotherapy education in Russia is most often completed after the age of 35. The density distribution along the right edge of the figure shows that specialists qualified to provide psychotherapeutic supervision were most numerous among specialists who completed their training from 1990 to 2020, with a peak from 2008 to 2018.

The vast majority of respondents ($n=200$; 89.7%) supported incorporating psychotherapy training into psychiatry training programs (Table 3), with psychiatry trainees expressing this view most frequently. Respondents most frequently selected CBT, psychodynamic therapy, and family therapy as their preferred modalities for training. Across all groups, 117 psychiatrists (52.5%) felt that psychotherapy training should be mandatory as part of psychiatry training programs.

DISCUSSION

This study demonstrated a strong interest in psychotherapy training among psychiatrists in Russia at various stages of their careers. It found that 35% of the surveyed ECPs and psychiatry trainees had already received psychotherapy

training in addition to their core psychiatry education or were undergoing such training at the time of the survey. An additional 51% of ECPs and psychiatry trainees reported intentions to pursue psychotherapy training in the future. While 59% showed that a psychotherapy course was included in their psychiatry training, only 31% reported it was mandatory, reflecting variation in curricular planning across universities in Russia.

These findings also indicate that psychiatrists in Russia most often complete psychotherapy training after the age of 35. This delay may be attributed to the additional years required for subspecialty training, or to the need for ECPs to prioritize work experience in psychiatry before pursuing further qualifications. Another key motivation for pursuing additional psychotherapy education after training in psychiatry is the need to obtain certification, as mandated by Russian legislation, to practice as a psychotherapist in Russia. A recent survey of ECPs in Russia found that the most important professional values among mental health specialists were job opportunities, intellectual stimulation, and work-life balance [14]. In Russia, practitioners trained in psychotherapy are often motivated by aspirations for professional development, social recognition and financial stability, factors not always

Table 3. Inclusion of psychotherapy in the psychiatry training program

Variables	Psychiatry trainees, $n=83^*$	ECPs, $n=96$	Senior psychiatrists, $n=44$	p -value	Missing data, $n=223$
Psychotherapy should be incorporated into the psychiatry training curriculum, n (%)					
Yes	79 (95.2%)	85 (88.5%)	36 (81.8%)	$\chi^2=5.79$; $df=2$; $p=0.055$	None
No	4 (4.8%)	11 (11.5%)	8 (18.2%)		
Modality of psychotherapy to be included in psychiatry training**, n (%)					
Cognitive-behavioral therapy	45 (54.2%)	49 (51.0%)	11 (25.0%)	$\chi^2=10.91$; $df=2$; $p=0.004$	93 (41.7%)
Psychodynamic psychotherapy	8 (9.6%)	14 (14.6%)	2 (4.5%)	$\chi^2=3.34$; $df=2$; $p=0.188$	
Family therapy	5 (6.0%)	10 (10.4%)	6 (13.6%)	$\chi^2=2.15$; $df=2$; $p=0.341$	
Interpersonal psychotherapy	3 (3.6%)	9 (9.4%)	5 (11.4%)	$\chi^2=2.15$; $df=2$; $p=0.341$	
Third wave of cognitive-behavioral therapy	5 (6.0%)	7 (7.3%)	1 (2.3%)	$\chi^2=1.39$; $df=2$; $p=0.498$	
Other	10 (12.0%)	23 (24.0%)	7 (15.9%)	$\chi^2=4.44$; $df=2$; $p=0.108$	
Requirement to include a psychotherapy course in psychiatry training, n (%)					
Mandatory	42 (50.6%)	57 (59.4%)	20 (45.5%)	$\chi^2=2.14$; $df=2$; $p=0.3433$	30 (13.5%)
Optional	29 (34.9%)	28 (29.2%)	17 (38.6%)		

Note: *two subjects were trainees over 40 years old; **multiple-choice option. ECPs —early career psychiatrists.

sufficiently considered in curriculum development [14]. More than half of ECPs combine multiple professional roles (e.g., psychiatrist and psychotherapist), citing either financial necessity (51.5%) or academic and professional interests (25.0%) [7].

Compared with findings from the World Psychotherapy Survey, Russia appears to lag behind most other countries in integrating psychotherapy into psychiatry training, except for Nigeria (53%) [11] whose respondents were less likely to report that psychotherapy training was included in their psychiatry training program. Fewer respondents from Russia reported receiving psychotherapy education during psychiatry training compared with their counterparts from Turkey (68%) [10], Nepal (73%) [12], Brazil (86%) [9], and Iran (98%) [13]. The proportion of mandatory psychotherapy training as part of psychiatry programs was also lower in Russia compared with other countries, where rates were higher: 48% in Nigeria [11], 68% in Nepal [12], 77% in Brazil [9] and 91% in Iran [13]. The need for ECPs and psychiatry trainees to self-fund additional psychotherapy training was also reported in other countries, ranging from 41% in Brazil [9] to 56% in Turkey [10]. Across Europe, a survey on psychotherapy training and practice revealed that in most countries, additional fees are required, with psychiatry trainees often having to pay out of pocket. Lack of funding was identified as one of the main barriers to accessing psychotherapy training [5]. These findings align with a previous World Psychiatric Association survey of 47 countries, which found that only 59% required mandatory psychotherapy education during psychiatry training, with lower provision in LMICs compared to HICs [4].

This study also revealed limited access to supervision among psychiatry trainees and ECPs in Russia. Supervision is an integral part of a psychotherapists' professional development, providing opportunities for structured reflection and refinement of practice [15]. A shortage of qualified supervisors has previously been identified as a barrier to psychotherapy training [5].

The broader social and legal context also shapes psychotherapy in Russia. Although legislation formally recognizes psychotherapy as a medical specialty, societal stigma remains a major barrier to its acceptance and utilization. For example, a survey of residents in one region of Russia revealed low awareness and high stigma toward psychotherapy, with only 23.7% of respondents demonstrating an understanding of psychotherapists' work, while between 65.3% and 75.2% expressed negative

attitudes towards psychotherapists, treatment methods, and psychotherapy institutions [16]. This issue is compounded by the use of the term "psychotherapist" by psychologists, which does not comply with Russian legislation and creates further public confusion of this role, often influenced by portrayals in films and literature [17].

Although psychotherapy training is not yet universally available in Russia, it should be regarded as an essential goal. Such training equips clinicians with the skills to manage transference and countertransference and to foster effective patient engagement. Online modalities of training and supervision offer promising avenues for integrating psychotherapy training into undergraduate and postgraduate psychiatry curricula [18]. According to the WPA document *Principles and Priorities for a Framework for Training Psychiatrists*, basic psychotherapy training should be included among the core competencies in the first year of psychiatry training, followed by advanced psychotherapy training in the second year [19]. The latest WPA Position Statement on High Quality Post-Graduate Training in Psychiatry [20] and the European Union of Medical Specialists Section of Psychiatry Charter Training in Psychotherapy [21] both emphasize the inclusion of theoretical and practical exposure to psychotherapy, including supervised practice. These recommendations are consistent with this study's findings: 90% of respondents supported the inclusion of psychotherapy in the psychiatry training curriculum, with 53% advocating that it be mandatory. However, one barrier to integrating mandatory psychotherapy training into psychiatry programs in Russia may be the relatively short duration of residency (2 years), which is shorter than the WPA's recommended minimum training period [4]. CBT, psychodynamic, and family therapy were selected as their preferred psychotherapy modalities by respondents, thereby reflecting international trends [4].

This study identified two patterns of attitudes toward psychotherapy among ECPs and psychiatry trainees: "negative" and "positive" (see Figure 1). The "positive" group consisted of ECPs and psychiatry trainees who had not yet received psychotherapy training but planned to do so, as well as those who had already completed such training in psychotherapy at the time of the study. The "negative" group was composed mainly of younger respondents (aged 25–35), most of whom had completed their training between 2018 and 2023. In contrast, older respondents (over 40 years) who did not consider psychotherapy as an

extension of their professional competencies or who had not already undergone additional training were almost absent. This suggests the emergence of more “biologically oriented” professionals among ECPs, or a similar category of “biologically oriented” middle-aged physicians is losing interest in participating in professional activity surveys creating a blind spot in our research sample. Sociopolitical factors after 2020, including the impact of the COVID-19 pandemic, may have also influenced attitudes toward psychotherapy [22–24].

This study has several limitations. It employed a cross-sectional design, with a relatively small sample size, and may be subject to selection bias. Psychiatrists who are less interested in psychotherapy may also have been less inclined to participate in the study. Although respondents were drawn from various regions of Russia, representation of psychiatry training outside major cities (Moscow and Saint Petersburg) was limited — a pattern also noted in other studies of ECPs in Russia [7]. Moreover, while the accessibility of training opportunities was a central focus, the quality of psychotherapy education was not assessed.

The findings of this study should be interpreted with caution because of the sample’s relatively small size and limited diversity. Because the sample is not nationally representative, the results cannot be generalized to all psychiatrists in Russia. The proportion of women in this study (73.5%) aligns closely with the Ministry of Health statistics indicating that women constitute approximately 71% of all Russian physicians. Finally, because this study focused specifically on psychiatry trainees and ECPs, its conclusions apply primarily to this subgroup rather than to the broader psychiatric workforce.

CONCLUSION

Psychotherapy training remains relevant and in demand among psychiatrists in Russia. This study identified a significant gap in supervisory experience among ECPs. Revising educational programs to include psychotherapy as a mandatory course in psychiatry training would bring psychiatry education in Russia in line with international standards and may also increase the interest and motivation in psychotherapy training among psychiatry trainees and ECPs. Broader efforts to raise awareness of psychotherapy could help improve the overall quality of psychiatric care. Addressing these challenges will require sustained engagement and commitment from the psychiatric community.

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Supplementary data

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References

- Schaffler Y, Probst T, Jesser A, et al. Perceived Barriers and Facilitators to Psychotherapy Utilisation and How They Relate to Patient's Psychotherapeutic Goals. *Healthcare (Basel)*. 2022;10(11):2228. doi: 10.3390/healthcare10112228
- Lemeshko CA, Babin SM, Semenova NV, et al. Psychoanalytic psychotherapy in the Russian Federation. *Psychoanal Psychother*. 2022;36(4):331–346. doi: 10.1080/02668734.2021.1978527
- Babin SM, Sluchevskaya SF. [Postgraduate education in psychotherapy in St. Petersburg: the past, present and future challenges]. *Obozrenie psikiatrii i medicinskoj psihologii imeni V.M. Behtereva*. 2014;(1):104–109. Russian.
- Ng RMK, Hermans MHM, Belfort E, et al. A worldwide survey on training provisions for psychiatric trainees in WPA member associations. *Int Rev Psychiatry*. 2020;32(2):98–113. doi: 10.1080/09540261.2019.1648241
- Fiorillo A, Luciano M, Giacco D, et al. Training and practice of psychotherapy in Europe: results of a survey. *World Psychiatry*. 2011;10(3):238. doi: 10.1002/j.2051-5545.2011.tb00064.x
- Tavakoli S. The place of psychotherapy in contemporary psychiatry. *Iran J Psychiatry Behav Sci*. 2014;8(4):1–6.
- Chumakov EM, Gvozdetsky AN, Vasilchenko KF, et al. [Characteristics and determinants of professional burnout among early career psychiatrists in Russia — results of a cross-sectional study]. *Obozrenie psikiatrii i medicinskoj psihologii imeni V.M. Behtereva*. 2022;56(1):63–78. Russian. doi: 10.31363/2313-7053-2022-1-63-78
- Kibitov AA, Chumakov EM, Nechaeva AI, et al. Professional Values and Educational Needs among Mental Health Specialists in Russia: Survey Results. *Consort Psychiatr*. 2022;3(3):36–45. doi: 10.17816/CP184
- Belinati Loureiro V, Ratzke R, Nogueira Dutra JC, et al. Psychotherapy training in Brazil: Experiences of psychiatric trainees and early career psychiatrists. *Medicine (Baltimore)*. 2023;102(50):e35388. doi: 10.1097/MD.00000000000035388
- Kaya H, Tasdelen R, Ayik B, et al. Psychotherapy training in Turkey: Experience of early career psychiatrists. *J Clin Psychiatry*. 2023;26(2):84–90. doi: 10.5505/kpd.2023.70487
- Adiukwu FN, Adedapo OO, Ojeahere MI, et al. Psychotherapy training in postgraduate psychiatry training in Nigeria — Are we doing enough? *Glob Ment Health (Camb)*. 2024;11:e41. doi: 10.1017/gmh.2024.32
- Rai Y, Karki U, Pinto da Costa M. Psychotherapy training in Nepal: views of early career psychiatrists. *BJPsych Int*. 2021;18(2):E6. doi: 10.1192/bji.2020.50
- Eissazade N, Shalbafan M, Eftekar Ardebili M, et al. Psychotherapy training in Iran: A survey of Iranian early career psychiatrists and psychiatric trainees. *Asia Pac Psychiatry*. 2021;13(1):e12434. doi: 10.1111/appy.12434
- Ilgov VI, Grebennikova VM. [Accounting in the system of additional vocational education career orientations of future psychotherapists]. *Kazanskij pedagogicheskij zhurnal*. 2020;(4):58–65. Russian. doi: 10.34772/KPJ.2020.141.4.008
- Babin SM, Bocharov VV, Vasilyeva AV, et al. [The significance of supervision in psychotherapy of lingering forms of neurotic disorders]. *Obozrenie psikiatrii i medicinskoj psihologii imeni V.M. Behtereva*. 2012;(2):26–34. Russian.
- Golenkov AV, Demakova TA, Safronov SA, et al. [Results of the populational survey about psychotherapists and psychotherapeutic care]. *Psikhicheskoe zdorov'e*. 2013;11(12):23–28. Russian.
- Makhnach AV. [Current issues in professional selection and job training in psychotherapy]. *Konsul'tativnaya psikhologiya i psikhoterapiya*. 2011;19(2):192–219. Russian.
- Bhugra D, Smith A, Ventriglio A, et al. World Psychiatric Association-Asian Journal of Psychiatry Commission on Psychiatric Education in the 21st century. *Asian J Psychiatr*. 2023;88:103739. doi: 10.1016/j.ajp.2023.103739
- Belfort E, Lopez-Ibor MI, Hermans M, et al. WPA Recommendations: Principles and Priorities for a Framework for Training Psychiatrists [Internet]. Geneva: World Psychiatric Association; 2017 [cited 17 March 2025]. Available from: https://www.wpanet.org/_files/ugd/e172f3_9e614f64a8ee4675b8b3dedbc6488686.pdf
- Ng R, Allan J, Levin S, et al. WPA Position Statement on High Quality Post-Graduate Training in Psychiatry [Internet]. Geneva: World Psychiatric Association; 2023 [cited 17 March 2025]. Available from: https://www.wpanet.org/_files/ugd/842ec8_49b83926f73a49b3b85b62a6549071a5.pdf?lang=fr
- European Union of Medical Specialists, Section of Psychiatry. Charter on Training of Medical Specialists in the EU: Training Requirements for the Speciality of Psychiatry [Internet]. London: European Union of Medical Specialists; 2024 [cited 17 March 2025]. Available from: https://www.europsy.net/app/uploads/2024/07/ETR_UEMS_2024.pdf
- Tapoi C, de Filippis R, Di Lodovico L, et al. 10th EPA Summer School on Research 2021: sharing experience of the first online edition — Issues in training. *Inf Psychiatr*. 2022;98(6):469–474. doi: 10.1684/ipe.2022.2443
- Sorokin MY, Kasyanov ED, Rukavishnikov GV, et al. Behavioral and emotional reactions of the Russian population to the beginning of the COVID-19 pandemic: an on-line survey results. *Psychiatr Danub*. 2021;33(3):386–392. doi: 10.24869/psyd.2021.386
- Radionov DS, Sorokin MY, Karavaeva TA, et al. [COVID-19 vaccination readiness among Russian-speaking residents in Russia, Belarus and Kazakhstan in 2020–2022: a scoping review]. *Ekologiya cheloveka*. 2023;30(2):83–99. Russian. doi: 10.24869/psyd.2021.386

Neurophysiological Markers of Emotional Stimuli Processing in Schizophrenia and Schizoaffective Disorder

Нейрофизиологические маркеры обработки эмоциональных стимулов при шизофрении и шизоаффективном расстройстве

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Original research

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ABSTRACT

BACKGROUND: Schizophrenia and schizoaffective disorder significantly affect the cognitive and emotional functioning of patients. Establishing reliable neurophysiological markers as objective assessment tools can increase diagnostic accuracy and improve outcomes.

AIM: To identify neurophysiological correlates of impaired facial expression perception in patients with schizophrenia and schizoaffective disorder, and to develop a diagnostic model based on these markers.

METHODS: The study included 86 participants: 26 with schizophrenia, 26 with schizoaffective disorder, and 34 healthy volunteers. The study recorded electrical brain activity in response to stimuli with faces showing happy, fearful, and neutral expressions using a 128-channel electroencephalographic system. The P100, N170, P200, and P300 components were analyzed. Logistic regression and ROC analysis were used to develop a diagnostic model.

RESULTS: We developed a diagnostic model that differentiates patients with schizophrenia and schizoaffective disorder from healthy participants. The model achieved 73.3% sensitivity and 80% specificity.

CONCLUSION: The findings demonstrate the diagnostic value of evoked potentials and support their application as a supplementary objective diagnostic tool.

АННОТАЦИЯ

ВВЕДЕНИЕ: Шизофрения и шизоаффективное расстройство — заболевания, значительно влияющие на когнитивное и эмоциональное функционирование пациентов. Установление надежных нейрофизиологических маркеров в качестве объективных оценочных инструментов может повысить точность диагностики и улучшить исходы.

ЦЕЛЬ: Выявить нейрофизиологические корреляты нарушения восприятия лицевой экспрессии у пациентов с шизофренией и шизоаффективным расстройством и построить на основе этих маркеров диагностическую модель.

МЕТОДЫ: В исследование были включены 86 испытуемых: 26 пациентов с шизофренией, 26 — с шизоаффективным расстройством и 34 здоровых добровольца. Электрическую активность мозга в ответ на стимулы с лицами, выражающими радость, страх и нейтральные эмоции, регистрировали с использованием 128-канальной электроэнцефалографической системы. Анализировали компоненты P100, N170, P200, P300. Для построения диагностической модели применяли методы логистической регрессии и ROC-анализ.

РЕЗУЛЬТАТЫ: Разработана диагностическая модель, дифференцирующая пациентов с шизоаффективным расстройством и шизофренией от здоровых испытуемых, с высокой чувствительностью (73,3%) и специфичностью (80%).

ЗАКЛЮЧЕНИЕ: Полученные данные свидетельствуют о диагностической значимости вызванных потенциалов и подтверждают обоснованность их применения в качестве дополнительного объективного метода диагностики.

Keywords: *schizophrenia; schizoaffective disorder; evoked potentials; facial affect; electroencephalography; differential diagnosis*

Ключевые слова: *шизофрения; шизоаффективное расстройство; вызванные потенциалы; лицевая экспрессия; электроэнцефалография; дифференциальная диагностика*

INTRODUCTION

Despite advances in neuroscience, the diagnosis of schizophrenia and schizoaffective disorder still relies primarily on clinical interviews and observation of the patient's behavior. While valuable, this approach is limited by subjectivity and by reliance on the clinician's expertise. In particular, in a landmark study by Beck et al. [1], the diagnostic agreement of two psychiatrists' judgments in an independent assessment of 153 patients was only 54%. Similar results were reported by Copeland et al. [2]: 64% of American psychiatrists and 54% of British psychiatrists independently diagnosed schizophrenia in the same patient, highlighting the influence of the diagnosis on national and professional characteristics. The limited reproducibility is also confirmed by recent meta-analyses: in a comparison of structured and unstructured diagnostic interviews, the level of consistency estimated using the kappa coefficient of agreement (κ) was only 0.41, indicating moderate reliability [3]. These findings underscore the need to develop objective and standardized diagnostic tools based on biomarkers, including neurophysiological measures.

Many imaging and laboratory methods (such as magnetic resonance imaging, computed tomography, and positron emission tomography, as well as biochemical and genetic markers) lack sufficient sensitivity and specificity to serve as reliable diagnostic tools [4]. For example, a meta-analysis of genome-wide association studies of mental disorders identified numerous genetic loci associated with multiple psychiatric disorders. However, the sensitivity and specificity of individual genetic markers are often limited, as many

show low predictive power and are not disorder-specific [5]. Although many studies of biochemical markers in mental disorders have been published, they often show considerable heterogeneity and limited statistical power. Reported sensitivity and specificity vary across populations and tools, and frequently remain unsatisfactory, preventing markers' translation into clinical practice [6].

With advances in artificial intelligence and statistical tools, interest in evoked potentials as an objective neurophysiological measure of sensory, cognitive, and emotional processing has been renewed in recent years [7, 8]. Given that disorders of social cognition, in particular facial expression recognition, are typical of schizophrenia and schizoaffective disorder [9, 10], using facial affect depicting different emotions during evoked potential recording represents a promising research approach. Despite a growing body of research, most studies in this area have focused on individual evoked potential components within highly controlled cognitive paradigms. These protocols often fail to capture the complexity of social information processing in real-world contexts, reducing their validity and limiting their clinical applicability [11, 12]. Most existing studies either restrict samples to patients with schizophrenia or analyze schizophrenia and schizoaffective disorder as identical conditions without dividing them into different groups in the analysis.

This study sought to address these limitations by analyzing the characteristics of four evoked potentials (P100, N170, P200, P300) in response to facial stimuli showing different emotions.

The aim was to identify neurophysiological correlates of impaired facial expression perception in patients with schizophrenia and schizoaffective disorder, and to develop a diagnostic model based on these markers.

METHODS

Study design

A cross-sectional, comparative study was conducted.

Setting

The study was conducted from 2019 to 2024 at the Moscow Research Institute of Psychiatry, a branch of the V. Serbsky National Medical Research Centre of Psychiatry and Narcology of the Ministry of Health of the Russian Federation.

Participants

Inclusion criteria: right-handed native Russian speakers aged 18–50 years (scoring +9 to +24 on the modified Annett Hand Preference Questionnaire). The first clinical group included patients diagnosed with schizophrenia (F20.x). The second group included patients diagnosed with schizoaffective disorder (F25.x) according to the Russian translation of the International Classification of Diseases, 10th revision (ICD-10) clinical descriptions and diagnostic guidelines. Control group inclusion criteria required no personal or first-degree family history of mental disorders, along with scores below 6 on the Prodromal Questionnaire-16 (PQ-16) and the Quick Inventory of Depressive Symptomatology Self-Reported version (QIDS-SR).

Exclusion criteria:

- patients who had undergone electroconvulsive therapy within the past year, or if they had severe behavioral disorders (aggression, threat to self or others), severe organic damage to the central nervous system, traumatic brain injury with loss of consciousness;
- patients with concomitant psychiatric diagnoses, unadjusted visual disturbances, and severe motor disorders;
- participants with epileptiform activity or marked rhythmic abnormalities (types 4 and 5 according to Zhirmunskaya's classification [13]) were excluded as were those unable to continue due to lack of cooperation or who withdrew from the study.

Non-inclusion criteria: participants with severe somatic disorders or chronic somatic diseases in the decompensation stage.

Measurements

The Positive and Negative Syndrome Scale (PANSS) was used to assess the clinical condition of the patients [14]. The absence of mental disorders in the control group was assessed with two screening tools, PQ-16 [15] and QIDS-SR [16], followed by a clinical interview. Handedness was assessed using the Annett Hand Preference Questionnaire [17] adapted by Hohlov and Burova [18].

Neuroleptic agent toxicity was measured on the day of electroencephalography (EEG). Patient antipsychotic doses were recalculated to chlorpromazine equivalents using the defined daily doses method [19].

Scalp EEG activity was recorded using a 128-channel Geodesics system (EGI, USA). The signal was digitized at a frequency of 500 Hz in the range from 0 to 200 Hz; the vertex was used as a reference electrode. The stimuli were presented on a Dell OG302H monitor with a 17-inch screen, a 75 Hz refresh rate, and a resolution of 1280x1280 px.

The experimental task for classifying emotional expressions was structured into three separate blocks. In each block, the participants viewed images of faces with different emotional expressions, and were asked to identify the emotion using a two-button response panel. The first block contained 20 happy and 20 neutral faces; the second block contained 20 fearful and 20 neutral faces; and the third block contained 20 happy and 20 fearful faces. In each block, the number of male and female images was equal. The images were presented in pseudo-random order, so that photographs of actors expressing the same type of emotion were not repeated more than twice in a row. The stimuli appeared against a black background, in the center of the screen. Each stimulus remained on screen for up to 5,000 ms or until the participant responded. The interstimulus interval was randomly varied between 2,000 and 2,500 ms. The order of the blocks was randomized after 10 participants passed the test.

Electrophysiological data processing

EEG data were processed in NetStation 4.4 (EGI, USA). The primary signal filtration was carried out in the 1–15 Hz band, after which the data were segmented in the interval from 100 ms before the beginning of presentation of the

stimulus to 600 ms after the presentation. Epochs were classified into three conditions: happy, frightened, and neutral facial expressions. Artefact segments were removed to eliminate interference. Signal averaging was performed separately for each category of stimuli, including only trials with correct responses. Data were re-referenced to the average, including the 129th electrode (vertex). The baseline was also adjusted for the pre-stimulus interval to eliminate possible slow-wave drift. Further data processing was carried out in Excel: the electrical activity in channels 3, 23, 65, 90, 129 (corresponding approximately to channels F3, F4, P3, P4, Cz) were extracted. The interval from 0 to 600 ms from the moment of presentation of the image was analyzed. Evoked potentials were identified manually by visual inspection, and peak amplitudes were measured using the peak-to-peak method.

Stimulus material

The stimulus material was drawn from the Karolinska Directed Emotional Faces database [20] as adapted by Goeleven [21]. Stimuli included 120 photographic portraits of actors demonstrating expressions of fear, joy, as well as neutral facial expressions (Figure 1).

Statistical analysis

Data were analyzed in the R software environment (version 4.1.3) using the packages dplyr, rstatix, ROCR, and gtsummary. Results were visualized with ggplot2. Descriptive statistics for quantitative parameters were presented as the mean and standard deviation when distributions were approximately normal. Otherwise, the

median and interquartile range were used. Normality was assessed using the Shapiro–Wilk test.

Electrophysiological parameters were compared between the three study groups by analysis of variance for independent samples, and the subsequent pairwise analysis employed Tukey's honestly significant difference test.

Logistic regression was used to assess the prognostic significance of evoked potential parameters in belonging to the clinical or control group; the results were confirmed by ROC analysis. The study sample was randomly divided into training and test samples at a ratio of 7:3 using a pseudo-random number generator with a seed value of 2004. Training data were used to construct two logistic regression models, in both of which the dependent variable was the presence or absence of the disorder (schizophrenia or schizoaffective disorder).

In the first stage of model construction, predictors included wave parameters that showed statistically significant differences between the control group and at least one clinical group. Parameters that differed between schizophrenia and schizoaffective disorder were excluded at this stage. The second model included only components that differed significantly from both the schizophrenia group and the schizoaffective disorder group. Non-significant predictors were removed from both models stepwise using the 'step()' function. The Akaike Information Criterion (AIC) values were compared for the two obtained optimal models, and the one with the lower AIC value was selected as the final model. The predicted probabilities obtained from the final model for the test sample were evaluated using ROC analysis. The area under the curve was calculated



Figure 1. Example of stimulus material: a happy expression on the left (image F01HA), a neutral expression in the center (image F03NE), a frightened expression on the right (image M35AF).

Source: Lundqvist et al., 1998 [20].

reflecting the classification quality. The optimal probability cutoff point, above which the observations were classified as belonging to the disorder group, was also selected. Based on this, the accuracy, sensitivity, specificity, and prognostic value of positive and negative results of the model were calculated.

Ethical considerations

All participants provided written informed consent before participating. The Informed Consent Form was approved by the Local Ethics Committee of the V. Serbsky National Medical Research Centre of Psychiatry and Narcology of the Ministry of Health of the Russian Federation (Minutes No. 29/1 dated March 02, 2019). The study was conducted in accordance with the Good Clinical Practice (GCP) requirements established by the National Standard of the Russian Federation (GOST R 52379-2005).

RESULTS

Participants

The study included 86 participants who were assigned to three groups: patients with schizophrenia, patients with schizoaffective disorder, and the control group. There were no significant differences in sex or age between the groups ($p=0.9$). Characteristics of the sample are presented in Table 1.

Psychometric parameters and their comparisons are presented in Table 2. The clinical groups differed in their PANSS total score ($p<0.001$), which was higher in the group of patients with schizophrenia ($79.7\pm 14.3 > 62.7\pm 9.7$). Patients with schizophrenia also had higher mean scores on individual subscales: Positive (18.0 ± 4.7 vs. 14.2 ± 4.4 ; $p=0.005$), Negative (22.5 ± 6.2 vs. 14.9 ± 3.5 ; $p<0.001$), and General Psychopathology (39.3 ± 7.5 vs. 33.5 ± 6.6 ; $p=0.006$).

Table 1. Clinical and epidemiological characteristics of the study groups

Characteristic	Patients with schizophrenia (n=26)	Patients with SAD (n=26)	Control group (n=34)	p
Age (years)	27.5 (22.0; 34.8)	27.5 (21.3; 35.8)	25.0 (24.0; 26.8)	0.9
Sex (female) (%)	46.1	61.5	50.0	0.9
Duration of disease with the prodrome (years)	11.5 (7.0; 18.0)	11.5 (5.3; 15.0)	—	0.6
Duration of disease from the first episode (years)	5.5 (3.0; 10.8)	4.0 (2.0; 11.5)	—	0.4
Age of onset of the prodrome (years)	14.0 (11.0; 17.8)	15.5 (13.0; 20.3)	—	0.2
Interval between the prodrome and the first episode (years)	4.0 (1.5; 7.0)	5.0 (2.0; 8.8)	—	0.8
Age of onset of the first episode (years)	20.0 (19.0; 25.5)	23.0 (18.0; 25.0)	—	0.5
Number of psychotic episodes (abs.)	3.0 (2.0; 3.0)	2.0 (1.3; 3.0)	—	0.13
Chlorpromazine equivalent	586.6 (377.7; 749.8)	450.0 (254.6; 587.4)	—	0.045

Note: The median (interquartile range) is shown for all quantitative data. SAD — schizoaffective disorder.

Table 2. Comparison of Positive and Negative Syndrome Scale scores

PANSS scale	Patients with schizophrenia	Patients with SAD	p-value
Total score, M±SD	79.7 ± 14.3	62.7 ± 9.7	<0.001
Subscale P (score), M±SD	18.0 ± 4.7	14.2 ± 4.4	0.005
Subscale N (score), M±SD	22.5 ± 6.2	14.9 ± 3.5	<0.001
Subscale G (score), M±SD	39.3 ± 7.5	33.5 ± 6.6	0.006

Note: G — General Psychopathology subscale; M — mean value; N — Negative subscale; P — Positive subscale; PANSS — Positive and Negative Syndrome Scale; SAD — schizoaffective disorder; SD — standard deviation.

Group differences in evoked potential

Data from the comparative analysis of wave parameters are presented in Table S1 (in the Supplementary). Analysis of the P100 peak parameters revealed significant differences in its latency in the left hemisphere in response to stimuli with fearful facial expressions between patients with schizophrenia and schizoaffective disorder ($p=0.015$). The differences in these parameters between patients with schizophrenia and the control group demonstrated a statistical trend ($p=0.096$). P100 latency varied across groups: it was lowest in patients with schizoaffective disorder (85.7 ± 22.5 ms), highest in patients with schizophrenia (101.5 ± 19.0 ms), and intermediate in the control group (94.9 ± 14.2 ms). After adjusting for multiple comparisons, no other significant differences in P100 wave parameters were found between the groups (including all right hemisphere wave parameters).

Differences were found in the parameters of the N170 component. In response to fearful faces, peak latency in the left hemisphere was highest in patients with schizophrenia (155.2 ± 17.5 ms), significantly differing from that in patients with schizoaffective disorder (136.9 ± 23.7 ms; $p=0.012$) and in healthy subjects (144.8 ± 15.7 ms; $p=0.03$). N170 latencies diverged between patients with schizoaffective disorder and schizophrenia, with the control group showing intermediate values. Differences were also observed in response to fearful faces ($p=0.0006$) in terms of peak amplitudes in the left hemisphere between patients with schizophrenia (-7.4 ± 4.7 μ V) and the control group (-9.0 ± 5.2 μ V).

Significant differences between the groups were also noted when analyzing P200 values. In the left hemisphere, in response to neutral faces, the control group showed the highest amplitude (18.1 ± 7.5 μ V), which differed both from the amplitude in patients with schizophrenia (11.3 ± 6.3 μ V; $p=0.002$) and from that in patients with schizoaffective disorder (12.2 ± 6.2 μ V; $p=0.005$). In the right hemisphere, in response to the same stimuli, differences in amplitude were also found between the groups ($p=0.018$); however, they were limited only to the comparison of the control group (20.0 ± 9.0 μ V) and patients with schizoaffective disorder (14.2 ± 6.7 μ V).

The largest number of group differences was observed in P300 measures. In response to fearful faces, left hemisphere P300 latency was significantly higher in patients with schizophrenia (370.0 ± 38.4 ms) than in patients with schizoaffective disorder (334.1 ± 41.8 ms; $p=0.009$) and the control group (313.3 ± 33.0 ms; $p<0.0001$).

Significant differences between the groups ($p<0.0001$) were also observed in response to neutral faces: patients with schizophrenia showed a significantly prolonged latency (377.7 ± 35.9 ms) compared with the control group (334.3 ± 37.1 ms). The same findings were obtained in response to happy faces: the latency in patients with schizophrenia (370.9 ± 42.0 ms) exceeded the values in patients with schizoaffective disorder (338.4 ± 48.8 ms; $p=0.015$) and in the control group (311.4 ± 43.0 ms; $p<0.0001$). No significant differences in P300 amplitude were found in the left hemisphere. At this stage, previously divergent latency patterns disappeared. Schizophrenia patients retained the highest latencies; however, schizoaffective disorder patients shifted towards greater latencies, and the control group showed the lowest latencies.

In the right hemisphere, P300 latency response to fearful faces was significantly higher in patients with schizophrenia (364.0 ± 39.7 ms) than in the control group (316.8 ± 35.6 ms; $p<0.0001$). Similar differences were also observed in response to neutral faces (375.6 ± 33.1 ms vs. 334.1 ± 35.2 ms; $p<0.0001$) and happy faces (368.5 ± 36.2 ms vs. 311.8 ± 41.0 ms; $p<0.0001$). In addition, differences were observed between the control group (311.8 ± 41.0 ms) and patients with schizoaffective disorder (338.7 ± 41.7 ms; $p=0.03$), as well as between the two clinical groups ($p=0.015$), with the highest latencies in schizophrenia patients. Differences in P300 amplitude in the right hemisphere were revealed only in response to happy faces: between patients with schizophrenia (2.8 ± 1.8 μ V) and patients with schizoaffective disorder (4.7 ± 2.7 μ V; $p=0.012$), as well as between patients with schizophrenia and the control group (4.5 ± 2.7 μ V; $p=0.012$).

Thus, in the group of patients with schizophrenia, the components of early sensory processing (P100 and N170) measured in the left hemisphere in response to fearful faces were characterized by the highest values of latency, while the lowest latency was observed in patients with schizoaffective disorder. In other words, early-stage responses in the clinical groups followed opposite patterns. The P200 component in the control group showed the highest amplitudes in both hemispheres in response to neutral faces. At the stage of late cognitive processing, represented by the P300 component, the divergent pattern disappeared: both clinical groups showed prolonged latencies compared to the control group, regardless of emotion type. Significant group differences in P300 latency were observed across all stimulus types and in both hemispheres. Detailed

pairwise comparisons of evoked potentials are presented in Table S1 in the Supplementary.

Main results

Correlations between Positive and Negative Syndrome Scale symptoms and evoked potentials

Correlations were assessed between psychopathological symptom severity and evoked potential parameters (latency and amplitude of all components) (Figure 2). Several significant relationships were established. A weak positive correlation was observed between the latency of the P300 component in the left ($r_s=0.39$; $p=0.004$) and right ($r_s=0.32$; $p=0.02$) hemispheres in response to neutral faces and subscale P scores. Similar associations were observed between the latency of the P300 component in the left ($r_s=0.28$; $p=0.04$) and right ($r_s=0.29$; $p=0.04$) hemispheres and the severity of negative symptoms (N). In addition, P300 latency in response to neutral faces positively correlated with indicators of general psychopathological symptoms (G) both in the left ($r_s=0.33$; $p=0.01$) and the right ($r_s=0.34$; $p=0.01$)

hemispheres. The PANSS total score also showed a weak positive correlation with P300 latency in both hemispheres: left ($r_s=0.38$; $p=0.006$) and right ($r_s=0.38$; $p=0.006$).

Diagnostic model

Based on pairwise comparisons of evoked potentials, several predictors were selected for the first complete model. These included: N170 amplitude in the left hemisphere in response to neutral faces; P200 latency component in the left hemisphere in response to neutral faces; P200 latency in the right hemisphere in response to neutral faces; P200 amplitude in the right hemisphere in response to neutral faces; and P300 latency in the left hemisphere in response to fearful faces. For the second model, predictors were P200 amplitude in the left hemisphere in response to neutral faces and P300 latency in the left hemisphere in response to happy faces. The AIC value was 71.7 for the first complete model and 66.4 for the second model. After removing part of the predictors from both models using stepwise regression (the step function), the AIC of

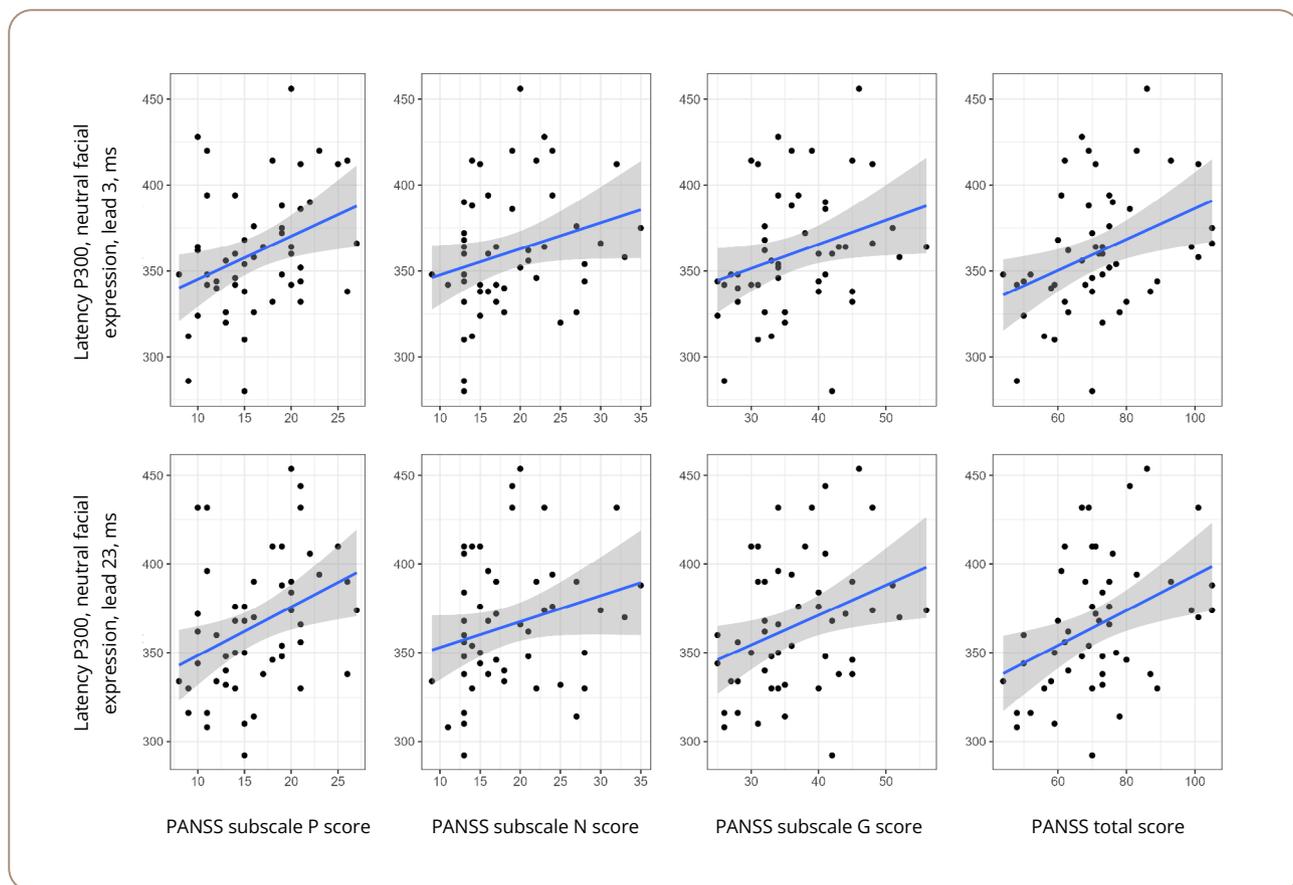


Figure 2. Scatter plot of P300 wave parameters with Positive and Negative Syndrome Scale scores.

Source: Spektor et al., 2025.

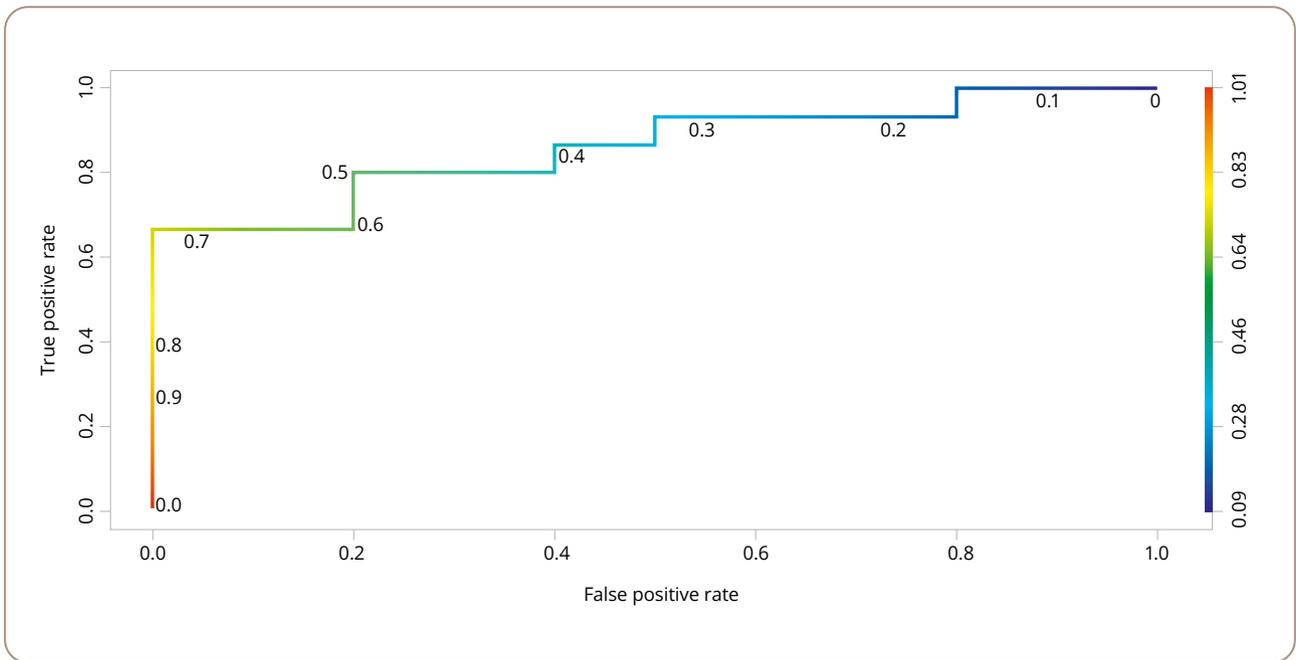


Figure 3. ROC curve of the logistic regression model estimates.

Source: Spektor et al., 2025.

Table 3. Parameters of the optimal logistic regression model

Parameter	Estimated coefficient of the logistic regression equation	Z score	Standard error	p-value
Free term	-6.1	-2.1	2.9	0.036
P200, LH, ampl.	-0.13	-2.61	0.05	0.009
P300, RH, lat.	0.02	2.8	0.009	0.005

Note: ampl. — amplitude; lat. — latency; LH — left hemisphere; RH — right hemisphere. Z — standardized regression coefficient.

the first model decreased to 67.1, while the AIC of the second model remained equal to 66.4. Based on these data, the second model was chosen for further analysis, since its composition of predictors did not change after the transformation. The predictors of the final model and their statistical assessment are presented in Table 3.

The predicted probabilities obtained from the model for the test sample ($n=25$) were assessed using ROC analysis (Figure 3). The Area Under the Curve (AUC) was 0.86. The optimal probability value was set at 0.5. According to this value, the participants in the test sample were classified as 'affected' or 'healthy'. Predictions were compared with actual status to construct contingency tables and calculate true positive, true negative, false positive, and false negative classifications (Table 4).

Table 4. Contingency table of the subject status and regression model prediction results

Clinical assessment results	Regression model prediction result		Total
	Affected	Healthy	
Affected	11 (TP)	4 (FN)	15
Healthy	2 (FP)	8 (TN)	10
Total	13	12	25

Note: FN — false negative; FP — false positive; TN — true negative; TP — true positive.

The contingency table was used to calculate the sensitivity (1), specificity (2), positive predictive value (PPV) (3), and negative predictive value (NPV) (4).

$$\text{Sensitivity} = \frac{TP}{TP+FN} = \frac{11}{15} = 73.3\% \quad (1)$$

$$\text{Specificity} = \frac{TN}{TN+FP} = \frac{8}{10} = 80\% \quad (2)$$

$$\text{PPV} = \frac{TP}{TP+FP} = \frac{11}{13} = 84.6\% \quad (3)$$

$$\text{NPV} = \frac{TN}{TN+FN} = \frac{8}{12} = 66.7\% \quad (4)$$

Thus, the final model predicted the disorder with high sensitivity, specificity, and positive predictive value.

Using maximum likelihood estimation, the logistic regression equation was derived as follows:

$$y = \frac{1}{1 + e^{(6.1 + 0.13 \times P200 - 0.02 \times P300)}}$$

Where y is the probability of impaired facial emotion processing associated with schizophrenia and schizoaffective disorder; $e \approx 2.718$ (Euler's number); P200 is the amplitude of the P200 component in the left hemisphere in response to a stimulus representing a neutral facial expression; P300 is the latency of the P300 component in the left hemisphere in response to a stimulus depicting happy faces.

DISCUSSION

In the early stages of sensory processing of stimuli (P100, N170), latency shifts occurred in opposite directions across patient groups: schizophrenia patients showed significant prolongation, whereas schizoaffective disorder patients showed shortening; the control group showed intermediate results. The divergent pattern may indicate qualitative differences in sensory and early cognitive processing in different psychotic disorders. Prolongation of latency in patients with schizophrenia may reflect disturbances in the initial processing of visual information, including changes in the automatic processes of detecting social and emotional signals. Shortened latencies in patients with schizoaffective disorder may indicate hyperresponsiveness or excessive sensory sensitivity to emotionally charged stimuli, which may be related to affective dysregulation characteristic of this disorder. This hypothesis is supported by data on differences in the activation patterns of the limbic structures in patients with affective and non-affective psychoses in the perception of emotional faces [22, 23]. Additional studies indicate different degrees of involvement of the amygdala, insula, and visual cortex in the processing of social stimuli in different clinical groups [24, 25]. The identified pattern of multidirectional differences formed the basis of a previously published study, in which we attempted to classify patients based on neurophysiological profiles. This allowed us to identify potential subtypes within schizophrenia spectrum disorders that contradict the conventional clinical classification and have a more pronounced neurophysiological homogeneity [26].

Group differences were also observed in P200 measures. In the control group, the P200 amplitude in response to stimuli displaying neutral faces was highest, which may

reflect a high level of automatic detection of potentially significant emotional signals. By contrast, both clinical groups showed reduced amplitudes, most pronounced in patients with schizophrenia, suggesting a dysfunction in processing stimuli that do not have a clear emotional valence. This is consistent with data on decreased neurophysiological reactivity to ambivalent or weak social signals in patients with psychotic disorders, including passive perception paradigms and emotion recognition tests [27, 28]. Reduced P200 amplitude may represent an early stage in the pathogenesis of impaired social perception, preceding changes in the cognitive interpretation of social stimuli observed at later stages (P300).

In the P300 epoch, differences from controls were more clear-cut: patients with schizophrenia and schizoaffective disorder had a significant increase in latencies in both hemispheres, which probably reflected changes in the cognitive processing of significant stimuli and the emotional response to them. These findings are fully consistent with data on P300 slowing in patients with schizophrenia [29].

The key findings of this study were the construction of a logistic regression model. Significant predictors included P200 amplitude in the left hemisphere in response to neutral faces and P300 latency in the right hemisphere in response to happy faces. This model demonstrated a high diagnostic value, discriminating between patients with schizophrenia or schizoaffective disorder and healthy individuals with relatively high sensitivity, specificity, and positive predictive values. The area under the ROC curve (AUC=0.86) confirms the high discriminative capacity of the model, which is comparable to the results of modern studies that used evoked potentials and machine learning [30]. The derived logistic equation yields a final value (y) ranging from 0 to 1. If (y) reaches or exceeds 0.5, it indicates the presence of an information processing disorder related to the perception of facial affect and reaching a level that differentiates patients with schizoaffective disorder and schizophrenia from healthy individuals.

Correlation analysis showed weak but statistically significant associations between P300 latency and PANSS symptom scores, including the Positive, Negative, and General subscales. This indicates that P300 latency has some sensitivity to symptom severity. However, regardless of the severity of symptoms (high or low PANSS scores), the P300 latency in patients consistently exceeded the values observed in the control group. These associations likely reflect the variability within the clinical groups, but do not

reduce the overall diagnostic value. In contrast, a sustained increase in P300 latency may be an independent marker of impaired processing of socially relevant information in psychoses.

The study has several limitations, including the small sample size and the need for validation in independent cohorts. The effect of drug therapy on the parameters of evoked potentials requires further investigation, although some data indicate the insensitivity of the topology and parameters of the evoked potentials P100 [25], N170 [25], P200 [31], P300 [32] to drug therapy. These aspects warrant further research.

CONCLUSION

The study demonstrated that P200 amplitude and P300 latency have high diagnostic value for differentiating patients with schizophrenia and schizoaffective disorder from healthy individuals. The developed logistic regression model showed good accuracy (AUC=0.86), confirming the potential of evoked potentials as an objective tool in clinical practice. These findings highlight the importance of further studies to validate the method in larger samples.

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Supplementary data

Supplementary material to this article can be found in the online version:

Table S1: 10.17816/CP15717-145791

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References

1. Beck AT, Ward CH, Mendelson M, et al. Reliability of psychiatric diagnoses: 2. A study of consistency of clinical judgments and ratings. *Am J Psychiatry*. 1962;119(4):351-357. doi: 10.1176/ajp.119.4.351
2. Copeland JR, Kelleher MJ, Kellett JM, et al. Diagnostic Differences in Psychogeriatric Patients in London and New York: United Kingdom – United States Diagnostic Project. *Can Psychiatr Assoc J*. 1974;19(3):267-271. doi: 10.1177/070674377401900305
3. Rocha Neto H, Moreira ALR, Hosken L, et al. Inter-Rater Reliability between Structured and Non-Structured Interviews Is Fair in Schizophrenia and Bi-polar Disorders – A Systematic Review and Meta-Analysis. *Diagnostics (Basel)*. 2023;13(3):526. doi: 10.3390/diagnostics13030526

4. Cai XL, Xie DJ, Madsen KH, et al. Generalizability of machine learning for classification of schizophrenia based on resting-state functional MRI data. *Hum Brain Mapp.* 2020;41(1):172–184. doi: 10.1002/hbm.24797
5. Mallard TT, Karlsson Linnér RK, Grotzinger AD, et al. Multivariate GWAS of psychiatric disorders and their cardinal symptoms reveal two dimensions of cross-cutting genetic liabilities. *Cell Genomics.* 2022;2(6):100140. doi: 10.1016/j.xgen.2022.100140
6. Berk M. Biomarkers in psychiatric disorders: status quo, impediments and facilitators. *World Psychiatry.* 2023;22(2):174–176. doi: 10.1002/wps.21071
7. Fedotov IA, Shustov DI. [The meaning of event-related potentials P50 and P300 in diagnosis and therapy of psychosis: a systematic review of meta-analyses]. *Social'naja i klinicheskaja psihijatrija.* 2024;34(1):78–86. Russian. doi: 10.34757/0869-4893.2024.34.1.007
8. Fedotov IA, Shustov DI, Kudinov DD, et al. [Cognitive evoked potentials for sensory filtering (n100, p200), semantic phrase processing (n400), performance monitoring and feedback, and facial expression processing and steady-state auditory evoked potentials in psychosis: a systematic review of meta-analyses]. *Social'naja i klinicheskaja psihijatrija.* 2025;35(1):53–61. Russian.
9. Karjakina MV, Shmukler AB. [Cognitive deficit heterogeneity in patients with schizophrenia and schizophrenic spectrum disorders]. *Social'naja i klinicheskaja psihijatrija.* 2021;31(3):13–20. Russian.
10. Murashko AA. [Neurophysiological peculiarities of face perception in schizophrenia spectrum disorders]. *Social'naja i klinicheskaja psihijatrija.* 2018;28(3):87–91. Russian.
11. Gao Z, Zhao W, Liu S, et al. Facial Emotion Recognition in Schizophrenia. *Front Psychiatry.* 2021;12:633717. doi: 10.3389/fpsy.2021.633717
12. Mewton P, Dawel A, Miller EJ, et al. Meta-analysis of Face Perception in Schizophrenia Spectrum Disorders: Evidence for Differential Impairment in Emotion Face Perception. *Schizophr Bull.* 2024;51(1):17–36. doi: 10.1093/schbul/sbae130
13. Zhirmunskaja EA, Losev VS. [Systems of description and classification of human electroencephalograms]. Moscow: Nauka; 1984. Russian.
14. Kay SR, Fiszbein A, Opler LA. The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophr Bull.* 1987;13(2):261–276. doi: 10.1093/schbul/13.2.261
15. Loewy RL, Bearden CE, Johnson JK, et al. The prodromal questionnaire (PQ): preliminary validation of a self-report screening measure for prodromal and psychotic syndromes. *Schizophr Res.* 2005;77(2-3):141–149. doi: 10.1016/j.schres.2005.03.007
16. Rush AJ, Trivedi MH, Ibrahim HM, et al. The 16-Item Quick Inventory of Depressive Symptomatology (QIDS), clinician rating (QIDS-C), and self-report (QIDS-SR): a psychometric evaluation in patients with chronic major depression. *Biol Psychiatry.* 2003;54(5):573–583. doi: 10.1016/s0006-3223(02)01866-8
17. Annett M. A classification of hand preference by association analysis. *Br J Psychol.* 1970;61(3):303–321. doi: 10.1111/j.2044-8295.1970.tb01248.x
18. Hohlov NA, Burova AV. [Modification of the questionnaire by M. Annett to assess functional asymmetry: standardization and psychometric characteristics]. *Aprobacija.* 2014;(8):65–73. Russian.
19. Leucht S, Samara M, Heres S, et al. Dose Equivalents for Antipsychotic Drugs: The DDD Method. *Schizophr Bull.* 2016;42(Suppl 1):S90–S94. doi: 10.1093/schbul/sbv167
20. Lundqvist D, Flykt A, Öhman A. *The Karolinska Directed Emotional Faces.* Stockholm: Karolinska Institute; 1998.
21. Goeleven E, De Raedt R, Leyman L, et al. The Karolinska Directed Emotional Faces: A validation study. *Cognition & Emotion.* 2008;22(6):1094–1118. doi: 10.1080/02699930701626582
22. Kebets V, Favre P, Houenou J, et al. Fronto-limbic neural variability as a transdiagnostic correlate of emotion dysregulation. *Transl Psychiatry.* 2021;11(1):545. doi: 10.1038/s41398-021-01666-3
23. Gangl N, Conring F, Federspiel A, et al. Resting-state perfusion in motor and fronto-limbic areas is linked to diminished expression of emotion and speech in schizophrenia. *Schizophrenia (Heidelb).* 2023;9(1):51. doi: 10.1038/s41537-023-00384-7
24. Pinkham AE, Penn DL, Perkins DO, et al. Emotion perception and social skill over the course of psychosis: A comparison of individuals “at-risk” for psychosis and individuals with early and chronic schizophrenia spectrum illness. *Cogn Neuropsychiatry.* 2007;12(3):198–212. doi: 10.1080/13546800600985557
25. Fakra E, Salgado-Pineda P, Delaveau P, et al. Neural bases of different cognitive strategies for facial affect processing in schizophrenia. *Schizophr Res.* 2008;100(1-3):191–205. doi: 10.1016/j.schres.2007.11.040
26. Spektor VA, Mnacakanjan EV, Spektor ED, et al. [Schizophrenia classification based on neurophysiological measures]. *Social'naja i klinicheskaja psihijatrija.* 2024;34(3):23–32. Russian.
27. Campanella S, Montedoro C, Streele E, et al. Early visual components (P100, N170) are disrupted in chronic schizophrenic patients: an event-related potentials study. *Neurophysiol Clin.* 2006;36(2):71–78. doi: 10.1016/j.neucli.2006.04.005
28. Horan WP, Hajcak G, Wynn JK, et al. Impaired emotion regulation in schizophrenia: evidence from event-related potentials. *Psychol Med.* 2013;43(11):2377–2391. doi: 10.1017/s0033291713000019
29. Hamilton HK, Mathalon DH, Ford JM. P300 in schizophrenia: Then and now. *Biol Psychol.* 2024;187:108757. doi: 10.1016/j.biopsycho.2024.108757
30. Saha A, Park S, Geem ZW, et al. Schizophrenia Detection and Classification: A Systematic Review of the Last Decade. *Diagnostics (Basel).* 2024;14(23):2698. doi: 10.3390/diagnostics14232698
31. Horley K, Gonsalvez C, Williams L, et al. Event-related potentials to threat-related faces in schizophrenia. *Int J Neurosci.* 2001;107(1-2):113–130. doi: 10.3109/00207450109149761
32. Turetsky BI, Dress EM, Braff DL, et al. The utility of P300 as a schizophrenia endophenotype and predictive biomarker: clinical and socio-demographic modulators in COGS-2. *Schizophr Res.* 2015;163(1-3):53–62. doi: 10.1016/j.schres.2014.09.024

Conscious Self-Regulation and Psychological Well-Being in Students Experiencing Stress: A Cross-Sectional Study

Связь осознанной саморегуляции и психологического благополучия студентов в условиях стресса: поперечное исследование

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Original research

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ABSTRACT

BACKGROUND: Stress-induced mental disorders have been increasingly reported in young people worldwide. This trend highlights the need to assess stress levels in students and to identify resources to overcome stress. The role of conscious self-regulation in this process remains insufficiently studied.

AIM: To evaluate the role of conscious self-regulation in maintaining the psychological well-being of students in relation to acute, chronic, and perceived stress.

METHODS: Students from secondary vocational and higher education institutions participated in the survey. V.I. Morosanova's Self-Regulation Profile Questionnaire, the Well-Being Manifestations Measurement Scale, the Acute and Chronic Stress questionnaire, and the Perceived Stress Scale questionnaire were used.

RESULTS: The sample comprised 2,189 students in 13 cities. The conscious self-regulation score was found to be negatively correlated with the scores for all types of stress (r ranged from -0.13 to -0.48 , $p \leq 0.001$) and positively correlated with psychological well-being ($r=0.55$, $p \leq 0.001$). In a multivariate regression analysis, conscious self-regulation was associated with higher psychological well-being ($\beta=0.26$) after the model included indicators of acute, chronic, and perceived stress (β values ranged from -0.26 to -0.13).

CONCLUSION: Conscious self-regulation mitigates the negative impact of acute, chronic, and perceived stress on students' psychological well-being.

АННОТАЦИЯ

ВВЕДЕНИЕ: Рост распространенности психических расстройств стрессовой этиологии среди молодежи отмечается повсеместно. В этих условиях существует запрос на оценку стресса у студентов и выявление значимых ресурсов его преодоления. При этом роль осознанной саморегуляции в данном контексте изучена недостаточно.

ЦЕЛЬ: Изучение роли осознанной саморегуляции и психологического благополучия у студентов в связи с острым, хроническим и воспринимаемым стрессом.

МЕТОДЫ: В исследовании приняли участие студенты средних специальных и высших учебных заведений. Использованы опросники «Стиль саморегуляции поведения», «Шкала проявлений психологического благополучия», «Острый и хронический стресс» и «Шкала воспринимаемого стресса».

РЕЗУЛЬТАТЫ: Опрошено 2189 студентов в 13 городах. Выявлена отрицательная корреляция оценки осознанной саморегуляции с оценками всех видов стресса (r от $-0,13$ до $-0,48$, $p \leq 0,001$) и положительная — с оценкой психологического благополучия ($r=0,55$, $p \leq 0,001$). По данным многофакторного регрессионного анализа осознанная саморегуляция была связана с более высокой оценкой психологического благополучия ($\beta=0,26$) даже при включении в модель показателей острого, хронического и воспринимаемого стресса (β от $-0,26$ до $-0,13$).

ЗАКЛЮЧЕНИЕ: Осознанная саморегуляция достижения целей ограничивает негативное воздействие стресса (острого, хронического, и воспринимаемого) на психологическое благополучие студентов.

Keywords: *students; conscious self-regulation; psychological well-being; perceived stress; acute stress; chronic stress*

Ключевые слова: *студенты; осознанная саморегуляция; психологическое благополучие; воспринимаемый стресс; острый стресс; хронический стресс*

INTRODUCTION

Contemporary society is marked by high uncertainty, instability, and tension. In this context, the problem of stress and limited resources to overcome it becomes particularly important. Both Russian [1] and foreign [2] researchers report an increase in stress levels in young people, especially among students. Academic stress has been shown to exceed students' coping capacity [3], which negatively affects the quality of life [4], physical and mental health [5], academic performance [6, 7], and psychological well-being [8, 9]. In addition to academic stressors, students are exposed to a wide range of economic and political factors and difficulties in forming personal relationships [10]. As a result, the prevalence of psychological and emotional disorders, suicidal behavior, and somatic diseases among young people is increasing steadily [11, 12].

An important psychological resource for achieving life goals is conscious self-regulation, defined as a high-level regulatory mechanism and a reflexive mechanism by which a person initiates, organizes, and sustains their activity in order to solve problems [13]. Conscious self-regulation is realized through cognitive-operational competencies (planning a goal, identifying key conditions for its achievement, programming a sequence of actions, evaluating the result, and comparing it with the planned one) and personality-regulatory competencies (flexibility, reliability, perseverance, responsibility, initiative), for

planning goals, modeling significant conditions for their achievement, planning action sequences, evaluating and adjusting their results [13]. The system of these competencies is a mechanism for the mobilization and integration of all the cognitive, emotional, personal resources of the individual aimed at achieving set goals [10]. Their development level has a considerable impact on the success, consistency, productivity, and the outcomes of actions a person trying to achieve goal-directed behavior [10]. It has also been shown that the higher the level of self-regulation, the more effectively individuals cope with self-organization challenges when solving various tasks and overcoming anxiety caused by situations involving uncertainty [14, 15].

A high level of self-regulation mitigates the negative impact of stressors on coping strategies and academic performance [16, 17]. Self-regulation has been shown to mediate the effects of stress on well-being: under high stress, the ability to self-regulate helps maintain well-being and reduces its adverse effects [18–20]. Stress levels also affected the relationship between self-regulation and psychological well-being in students. Moderate stress can be associated with a more objective assessment of factors that support coping, while high or low stress levels lead to underestimating or overestimating the difficulties [21]. However, the mediating role of self-regulation has been studied in relation to perceived [18–20] and self-imposed

stress [22], which increase tension through behaviors such as procrastination, perfectionism, excessive self-criticism, problem-solving avoidance, negative thinking, and creating excessive demands and obligations. Self-regulation of eating behavior [23] and mindfulness practices implemented through mobile applications [24] have also been identified as mediators in maintaining well-being during stress.

No studies were found on the relationship between self-regulation and psychological well-being in students experiencing acute and chronic stress. Previous studies of these types of stress have demonstrated their impact on students' quality of life, particularly regarding aspects of physical health [21, 25]. We hypothesized that high levels of acute and chronic stress are associated with difficulties in self-regulation, which leads to impairment of psychological well-being.

This study aimed to evaluate the role of conscious self-regulation in maintaining the psychological well-being of students in relation to acute, chronic, and perceived stress. The following objectives of the survey were identified:

- to analyze the relationship of conscious self-regulation and psychological well-being with the experience of acute, chronic, and perceived stress;
- to compare the levels of conscious self-regulation and psychological well-being in groups of students with different stress levels;
- to study the relationship of conscious self-regulation with the psychological well-being of students when controlling stress levels.

METHODS

Study design

The study was conducted using a cross-sectional design.

Setting

The survey was conducted in November 2024 across 13 Russian cities in 9 secondary vocational and 10 higher education institutions (Appendix 1 in the Supplementary). The survey sample was assembled according to the state project assignment and in collaboration with regional educational organizations. First, cities were selected to ensure broad geographical representation — from the western region of Kaliningrad to the Far East (Petropavlovsk-Kamchatsky and Khabarovsk) — and to include both megacities and medium-sized cities. Such a territorial distribution minimizes the risk of systematic error resulting

from the local context. Then, in each city, educational institutions were chosen within a wide range of profiles and specializations, from culture and the humanities to engineering, medicine, and pedagogy.

Sample characteristics

The survey included first-, second-, and third-year students of secondary vocational and higher education institutions who attended classes on the day of the survey and completed the questionnaires in full. No formal exclusion or non-inclusion criteria were predefined.

The selection of junior students of the higher education institutions and students of secondary vocational institutions for participation in the survey was because of their difference from older students in the maturity of psychological and personal resources. This manifests itself in greater vulnerability, difficulties in adaptation, and difficulties in dealing with educational and life situations [26]. Junior students demonstrate lower levels of psychological well-being compared to senior students. This can be seen in lower satisfaction with life, less developed self-regulation, personal growth, and environmental management skills; and less clear goals in life [27].

Data collection methods

The survey used questionnaires with screening forms in Russian and validated on student samples.

Assessment of conscious self-regulation

The initial version of the V.I. Morosanova's Self-Regulation Profile Questionnaire developed in Russian comprises an instruction and a set of 28 statements [28]. Respondents express their attitude to the statements using five responses (Appendix 2 in the Supplementary). These are then processed on seven subscales (four for each scale): "Planning of goals", "Modeling of significant conditions for achieving goals", "Programming actions", "Evaluating results", "Flexibility", "Reliability", and "Perseverance". The total conscious self-regulation score is achieved by summing up the scores for all subscales. Scores may range from 28 to 140. Cronbach's alpha for the questionnaire reaches 0.85 for the total scale score and ranges from 0.64 to 0.78 across the subscales [28].

Assessment of psychological well-being

The Well-Being Manifestations Measurement Scale assessed the hedonistic and eudemonistic aspects of students' psychological well-being [29]. The scale was adapted in

Russian and validated on a sample of Russian students [30]. The incentive version of the questionnaire comprised an instruction and a set of 25 statements. Respondents were asked to assess their condition over the past month using four statement options. Responses were processed on the following six subscales: "Control of self and events" (4 statements), "Happiness" (5 statements), "Sociability" (4 statements), "Social involvement" (4 statements), "Self-esteem" (4 statements), and "Mental balance" (4 statements). The total psychological well-being score is calculated by summing up the scores for all subscales. Scores may range from 25 to 125. Cronbach's alpha for the subscales of the adapted questionnaire ranges from 0.77 to 0.88, and is 0.95 for the total well-being score [29].

Assessment of acute and chronic stress

The presence and severity of stress was assessed using the Acute and Chronic Stress questionnaire developed in Russian (Appendix 3 in the Supplementary). The questionnaire included two scales: "Acute stress" and "Chronic stress" [31]. For the acute stress scale, the initial version of the questionnaire comprised an instruction and 12 statements forming six subscales (two statements for each subscale): "Physiological discomfort", "Cognitive tension", "Emotional tension", "Difficulties in communication", "Difficulties in behavior/performance", and "Overall well-being". Respondents were offered four options. The total acute stress score was calculated by totaling the scores for all subscales. Scores may range from 12 to 48. Cronbach's alpha ranges from 0.57 to 0.75 for the questionnaire subscales and is 0.83 for the total acute stress score [31].

For the chronic stress scale, the initial version of the questionnaire comprised an instruction and 18 statements forming six subscales (three statements for each subscale): "Anxiety", "Depression", "Aggression", "Asthenia", "Physiological discomfort", and "Sleep disorders". Respondents were offered four options. The total chronic stress score was calculated by summing up the scores for all subscales. Scores may range from 18 to 72. Cronbach's alpha ranges from 0.68 to 0.76 for the questionnaire subscales and is 0.89 for the total chronic stress score [31].

Assessment of perceived stress

Perceived stress was assessed using the Perceived Stress Scale (PSS-10) [32]. The questionnaire was adapted in Russian and validated on a sample of adults (aged 18–78

years) [33]. The initial version of the PSS-10 questionnaire comprised an instruction and 10 statements forming two subscales: "Distress" (6 statements) and "Stress coping level" (4 statements). Respondents were offered five options. The total overall perceived stress score was calculated by totaling the scores on the subscales. Scores may range from 0 to 40. Cronbach's alpha values were 0.85 for the distress scale, 0.76 for the stress coping level scale, and 0.83 for the total score [33].

Survey administration

The survey was conducted on the Testograh platform¹ during the time allocated for scheduled activities, under the supervision of a teacher. No special training or instruction was given to the teachers. Access to the questionnaires was provided individually, via a direct link to the project page. The page could be accessed from any device available to the participants (smartphone, tablet, laptop). The survey was cross-sectional. To exclude repeated completion of the survey, the algorithms of the Testograh platform did not allow survey completion via the same link twice. The completion time was not limited. Completing the questionnaires took about 20 minutes (the actual completion time was not recorded).

Questionnaires were presented in the following sequence: V.I. Morosanova's Self-Regulation Profile Questionnaire, the Well-Being Manifestations Measurement Scale, the Acute and Chronic Stress questionnaire, and the Perceived Stress Scale. After the questionnaires were completed, the Testograh platform system carried out automatic verification of the completeness of the entered data to ensure that all questionnaire items were completed. If missing responses were detected, the system returned the respondent to this point. After the survey, the received responses were automatically saved in the protected Testograh platform cloud database.

Statistical analysis

Analysis of distribution normality, basic statistical calculations, and cluster analysis were performed using JASP 0.19.3 (The JASP Team, The Netherlands), and regression analysis was conducted using STATISTICA version 8.0 (StatSoft, USA).

The distribution normality test was performed using the Shapiro-Wilk test. The distribution of all quantitative parameters was non-normal. As a result, the quantitative characteristics are described using the arithmetic mean

¹ Available from: <https://www.testograf.ru/>

(standard deviation), median (Q1; Q3), minimum and maximum values.

The relationship of quantitative characteristics was studied using correlation analysis with the calculation of the Spearman correlation coefficient (r). Correlation coefficients in the range from 0 to ± 0.30 indicated a weak correlation; ± 0.31 – 0.69 , a moderate correlation; ± 0.70 – 1.00 , a strong correlation [34].

The total sample was divided into stress groups using k-means cluster analysis. Clusters were formed based on calculated Euclidean distances to minimize intra-cluster variance and maximize inter-cluster differences. The total acute, chronic, and perceived stress scores were selected as variables for clustering. Based on the results of the analysis of variance, a three-cluster solution was selected, with each stress type contributing significantly ($p \leq 0.001$); the clusters were formed over three iterations. The ANOVA test was used to compare self-regulation and psychological well-being scores between clusters.

A stepwise linear regression analysis was performed to examine the relationship between conscious self-regulation and students' psychological well-being while accounting for stress levels. The psychological well-being of students (the total score) was used as the dependent variable. The following parameters were independent variables (predictors): the total conscious self-regulation score, as well as the total acute, chronic, and perceived stress scores. Regression analysis was carried out in stages: in the first stage, only one predictor (the most significant one) was included in the model; at each subsequent stage, new variables were added to the model. The selection of predictors was carried out automatically, using the stepwise selection algorithm, which made it possible to determine the contribution of each of the variables to the explanation of the variance of the dependent variable. This approach ensured consistent model construction, starting with the most relevant predictors and allowing comparison of results across different combinations.

Adjusted R^2 was used for model estimation and comparison, because simple R^2 always increases when new variables are added. Due to the correlation of independent variables, a multicollinearity test was performed with the calculation of the variance inflation factor (VIF) and tolerance. At $VIF < 5$, we assumed that multicollinearity was absent or minimal and the variable was acceptable for inclusion in the model; $VIF 5$ – 10 meant that multicollinearity was possible and caution was required when interpreting the results;

$VIF > 10$ indicated strong multicollinearity, which required exclusion of the variable. Threshold values for tolerance: < 0.1 showed a strong multicollinearity, the predictor was excluded; 0.1 – 0.2 meant that inclusion of the variable in the model was acceptable, but the interpretation required caution; > 0.2 indicated low multicollinearity [35, 36].

Ethical considerations

The survey was approved by the Commission on Research Ethics of the Federal Research Center of Psychological and Interdisciplinary Studies (Minutes No. 7 dated January 31, 2024). Potential survey participants were informed about the aim of the survey and that the survey was anonymous (anonymization is performed by the Testograph platform system by replacing data with digital IDs) and voluntary. Before starting the survey, consent was required to proceed to the survey page.

RESULTS

Respondent characteristics

The survey sample included 2,189 people (who completed all questionnaires in full), including 1,289 students from 9 secondary vocational institutions, with a mean age of 17.66 (SD 1.32) years, 56.1% of whom were females, including first- ($n=521$, 23.8%), second- ($n=541$, 24.7%), and third-year students ($n=227$, 10.5%). The remaining 900 students from 10 universities, with a mean age of 19.56 (SD 1.62) years, 65.1% of whom were females, including first- ($n=285$, 13.0%), second- ($n=592$, 27.0%), and third-year students ($n=23$, 1.1%).

The description of the results of the conscious self-regulation, psychological well-being, and stress assessments in students is presented in Table 1.

Main findings

The results of the correlation analysis indicate significant relationships between the stress, self-regulation, and psychological well-being scores (Table 2). Of particular interest is the moderate negative correlation between self-regulation scores and both chronic and acute stress, as well as the positive correlation with psychological well-being. The strongest relationship was found between the psychological well-being score and the acute stress score. A correlation analysis of the "Conscious self-regulation" and "Psychological well-being" subscales with the acute, chronic, and perceived stress subscales showed that all psychological well-being subscales were negatively correlated with all

Table 1. Characteristics of conscious self-regulation, psychological well-being, and perceived, chronic and acute stress in students

Parameters	Mean value (SD)	Median (Q1; Q3)	Min, score	Max, score
Conscious self-regulation	90.4 (15.0)	90 (80; 100)	42	140
Psychological well-being	93.0 (20.0)	94 (78; 108)	25	125
Perceived stress	22.2 (7.3)	22 (17; 27)	6	40
Chronic stress	31.5 (10.5)	22 (23; 37)	18	72
Acute stress	19.6 (6.7)	18 (14; 23)	12	48

Note: SD — standard deviation.

Table 2. Correlation of self-regulation, psychological well-being, and stress scores in students

Parameters	1	2	3	4	5
Conscious self-regulation	—	—	—	—	—
Perceived stress	-0.13	—	—	—	—
Chronic stress	-0.46	0.53	—	—	—
Acute stress	-0.47	0.44	0.78	—	—
Psychological well-being	0.55	-0.23	-0.53	-0.62	—

Note: For all correlation coefficients (r), $p < 0.001$.

chronic stress subscales and with the “Distress” perceived stress subscale, and positively correlated with the “Stress coping level” subscale. All self-regulation subscales were negatively correlated with the stress subscales across all types, except for the Programming actions subscale, which was found to be unrelated to anxiety and depression scores (Appendix 4 in the Supplementary).

Conscious self-regulation and psychological well-being in relation to stress level

At the next stage of data analysis, cluster analysis was used as an additional method to study the sample. The total acute, chronic, and perceived stress scores were used as variables for clustering. According to the results of cluster analysis for the variable “Acute stress”, the intergroup variance was 55,762.2 (df=2) and the intragroup variance was 29,471.7; the F-test value was 1,827.7; $p = 0.001$. For the variable “Chronic stress”, the intergroup variance was 166,787.1 (df=2) and the intragroup variance was 41,927.5; $F = 3,842.7$; $p = 0.001$. For the variable “Perceived stress”, the intergroup variance was 63,060.2 and the intragroup variance was 39,662.6; $F = 1,535.9$; $p = 0.001$. Three clusters were identified. To determine the similarities and differences between the clusters, Euclidean distances between the centers of the clusters were calculated. The minimum distance was observed between Cluster 2 and Cluster 3:

Euclidean distance=8.4 (the square of the distance is 71.2). The distance between Cluster 1 and Cluster 2 was 11.4 (the square of the distance is 129.1). The most pronounced difference was found between Cluster 1 and Cluster 3: Euclidean distance=19.6 (the square of the distance is 383.8). Thus, Cluster 1 and Cluster 3 represent the most distinct groups in terms of stress scores, while Cluster 2 is between them. On this basis, clusters were designated according to the stress level as “low” (Cluster 1), “medium” (Cluster 2), and “high” (Cluster 3) (Table 3). Students with high stress levels had lower self-regulation and psychological well-being scores (Table 4).

Relationship between conscious self-regulation and psychological well-being under stress

In the first stage of the regression analysis, the “Chronic stress” variable was included in the model, which explains 47% of the variance (R^2) in psychological well-being. In the second stage, the “Acute stress” variable was added, which increased the explained variance to 52%. Adding the “Perceived stress” variable to the model increased the R^2 value to 54%. In the fourth stage, the “Conscious self-regulation” variable was added, which increased the explained variance to 58%. Thus, each added variable contributed significantly to explaining the variance of the dependent variable. For all independent variables, the

Table 3. Stress scores in the clusters

Parameters	Stress levels (clusters) , mean (SD)		
	Low (Cluster 1)	Medium (Cluster 2)	High (Cluster 3)
Perceived stress	15.1 (4.7)	23.1 (3.7)	31.4 (4.3)
Chronic stress	22.8 (3.9)	30.9 (6.2)	46.6 (8.0)
Acute stress	14.6 (2.4)	19.2 (4.5)	28.4 (6.4)

Note: SD — standard deviation.

Table 4. Distribution of conscious self-regulation and psychological well-being scores in groups of students with different stress levels

Parameters	Stress levels (clusters), mean (SD)			F	p*
	Low, n=769 (35.1%)	Medium, n=956 (43.7%)	High, n=464 (21.2%)		
Conscious self-regulation					
Planning of goals	13.9 (3.7)	12.3 (3.6)	10.9 (3.9)	71.1	0.001
Programming actions	14.6 (3.4)	14.1 (3.1)	13.9 (3.5)	6.8	0.001
Modeling of significant conditions for achieving goals	14.8 (2.5)	12.9 (2.8)	11.6 (2.9)	180.6	0.001
Evaluation of results	12.4 (4.2)	11.3 (3.8)	10.7 (3.8)	24.7	0.001
Flexibility	14.3 (3.0)	13.0 (3.2)	11.8 (3.6)	80.6	0.001
Reliability	13.5 (3.5)	10.2 (3.3)	7.9 (3.3)	363.2	0.001
Perseverance	16.0 (2.9)	14.4 (2.9)	12.9 (3.5)	150.4	0.001
Total conscious self-regulation score	99.4 (13.9)	88.2 (12.4)	80.0 (13.7)	291.4	0.001
Psychological well-being					
Self-esteem	17.4 (2.9)	14.4 (2.9)	11.7 (3.4)	533.2	0.001
Mental balance	17.1 (2.9)	14.0 (3.0)	10.7 (3.4)	612.2	0.001
Social involvement	16.7 (3.5)	14.0 (3.0)	11.9 (3.7)	345.3	0.001
Sociability	17.7 (2.8)	15.8 (2.9)	14.3 (3.2)	219.4	0.001
Control of self and events	17.3 (2.9)	14.1 (2.8)	11.7 (3.2)	589.4	0.001
Happiness	21.5 (3.8)	17.6 (3.7)	13.1 (4.2)	715.0	0.001
Total well-being score	107.6 (16.1)	90.0 (14.7)	73.4 (16.2)	787.3	0.001

Note: *p-value calculated using the ANOVA test. F — Fisher’s F-test; SD — standard deviation.

estimated VIF multicollinearity varied in the range from 1.3 to 3.0 and the tolerance varied from 0.26 to 0.74 (Table 5).

DISCUSSION

The severity of stress symptoms in students was found to be associated with the level of conscious self-regulation and a decrease in psychological well-being. Conscious self-regulation was shown to mitigate stress (acute, chronic, and perceived) on the psychological well-being of Russian students.

The issue of severe stress among students remains relevant due to the increase in emotional and academic

pressure, as well as changes in the social environment. Monitoring by the Institute of Psychology of the Russian Academy of Sciences revealed a high level of anxiety and depression among young people aged 18-24 years amid ongoing military conflict [37], and a survey involving more than 21,000 students showed that about a fifth of students face emotional and behavioral problems related to stress [38]. In the reported survey, stress manifestations were observed in one in four students (high-stress cluster), which is comparable to the results of other studies [39, 40].

We found a negative correlation between conscious self-regulation, psychological well-being scores and chronic

Table 5. Association of stress and conscious self-regulation scores with the psychological well-being of students: results of regression analysis

Stage	Predictor	β	Standard error	t	p	Statistics of multicollinearity	
						Tolerance	VIF
1	Adjusted R²=0.47 (p<0.001), F(1, 2)=1,702.3						
	Intercept	—	—	130.8	<0.001	—	—
	Chronic stress	-0.69	0.01	-41.3	<0.001	—	—
2	Adjusted R²=0.52 (p<0.001), F(2, 2)=1,020						
	Intercept value	—	3.01	33.6	<0.001	—	—
	Chronic stress	-0.43	0.03	-16.2	<0.001	0.38	2.42
	Acute stress	-0.35	0.02	-13.4	<0.001	0.38	2.42
3	Adjusted R²=0.54 (p<0.001), F(3, 2)=844.3						
	Intercept	—	—	36.6	<0.001	—	—
	Chronic stress	-0.30	0.03	-9.9	<0.001	0.37	2.66
	Acute stress	-0.33	0.03	-12.9	<0.001	0.38	2.64
	Perceived stress	-0.16	0.03	-6.6	<0.001	0.75	1.31
4	Adjusted R²=0.58 (p<0.001), F(4, 2)=651.8						
	Intercept	—	—	37.3	<0.001	—	—
	Chronic stress	-0.26	0.03	-8.9	<0.001	0.26	3.03
	Acute stress	-0.26	0.02	-10.6	<0.001	0.37	2.68
	Perceived stress	-0.13	0.02	-5.7	<0.001	0.69	1.44
	Conscious self-regulation	0.26	0.02	15.0	<0.001	0.74	1.35

Note: β — standardized beta coefficient; F — Fisher's F-test; R² — coefficient of determination; t — t statistic for the regression coefficient; VIF — variance inflation factor.

and acute stress scores. This result is consistent with results obtained in other studies of students from different countries [16, 41]. They showed that students with a high level of self-regulation experience less stress, and psychological interventions aimed at developing self-regulation skills reduce stress manifestations [42]. In addition, a high level of self-regulation predicts a decrease in the perception of both stress and its symptoms, and low self-regulation acts as a vulnerability factor, increasing the risk of stress manifestations [16]. Self-regulation decreases the severity of stress both directly and indirectly through various moderators: self-efficacy of students [43] and perceived social support [24].

The results obtained in the survey are consistent with the data reported [18–20]. In particular, self-regulation and self-compassion were shown to mediate the association between academic stress and psychological well-being, decreasing the negative impact of perceived stress [18]. Self-regulation mediates the impact of perceived stress on the psychological well-being of young people: the

higher the level of self-regulation, the weaker the negative correlation between stress and well-being [20]. Students with low self-regulation skills are more likely to have psychological well-being problems, especially in the context of high stress and poor mental health [19]. Thus, the results obtained regarding perceived stress fully coincide with the conclusions of these studies on the important role of self-regulation in minimizing the negative effects of stress on the psychological well-being of students. With regard to acute and chronic stress, the survey demonstrated for the first time that conscious self-regulation limits the negative impact of these types of stress on the well-being of students.

According to our data, the contribution of self-regulation to the psychological well-being of students under acute and chronic stress is twice as high as that of perceived stress. These findings suggest that conscious self-regulation can be regarded as a mechanism for coping with acute and chronic stress, along with other psychological factors such as optimism, self-efficacy, and vitality [44]. It has been

previously shown for perceived stress that effective self-regulation strategies [16] and feedback [45] helped to overcome anxiety, deficits in self-control, and burnout in students [46]. However, these effects have not been sufficiently studied in the Russian sample, since the focus of Russian studies has traditionally been on stress-coping styles [41, 47]. The possible decrease in self-regulation due to the impact of stress and the efforts made to overcome it should be taken into account as well [48]. This is termed “ego depletion” [49]. In this case, psychological well-being can become a resource for self-regulation. It was demonstrated that students with high well-being (as opposed to those with low well-being) used positive reappraisal, support-seeking, and planning strategies [50].

Considering conscious self-regulation as a factor limiting the negative impact of stress (acute, chronic, and perceived) on the psychological well-being of Russian students extends the scope of the analysis of psychological resources that contribute to overcoming stress states and maintaining well-being. This is because the self-regulation construct covers not only cognitive competencies, such as the planning of goals, modeling of significant conditions, programming actions, and evaluation of results, but also personality properties (flexibility, reliability, perseverance, responsibility). The latter are important contributors to effectively overcoming negative emotional states and ensuring progress towards goals [13].

The cross-sectional survey design does not allow for the establishment of causal relationships between the analyzed variables, although it provides grounds for hypotheses about the impact of conscious self-regulation on psychological well-being under stress.

The representativeness of the survey sample and, as a result, the generalizability of the findings also need to be considered in the context of possible limitations. One of them is the use in the survey of a “convenience” sample of junior students, which limits the generalizability of the obtained findings.

Another limitation of this survey is that only self-report tools were used for data collection. This approach creates difficulties in differentiating anxiety from objective stress indicators. There are no scales in the tools used to assess socially desirable responses, which is also a limitation of this survey. Statistical intervals for “low”, “medium”, and “high” values were employed for assessing the level of stress in students. The tools used in the survey have not been used in clinical practice and do not have criteria.

The method of regression analysis used in this survey helps assess the association of independent variables with a dependent variable, but longitudinal studies are required to draw conclusions about causal relationships. Interpretation of the multicollinearity diagnostics is somewhat ambiguous. Some sources suggest strict criteria for its assessment, such as the JASP guidelines, while others recommend considering milder thresholds for VIF and tolerance [36]. This should be considered when interpreting the results.

CONCLUSION

The survey revealed and clarified the relationship between the indicators of acute, perceived, and chronic stress with that of psychological well-being and conscious self-regulation in Russian students. Stress is negatively correlated with students’ psychological well-being, as well as with conscious self-regulation. The positive relationship between self-regulation and psychological well-being was confirmed. Significant differences were demonstrated in the levels of self-regulation and psychological well-being in students with different stress levels. Conscious self-regulation and the three types of stress studied were found to make significant oppositional contributions to the psychological well-being of students, with self-regulation making a positive contribution and stress having a negative one. The role of conscious self-regulation as a resource for maintaining psychological well-being under different types of stress was demonstrated in students.

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Supplementary data

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References

1. Fomina TG, Filippova EV, Burmistrova-Savenkova AV, Morosanova VI. [Stress in the educational environment and its impact on academic success and psychological wellbeing of students]. *Nacional'nyj psihologicheskij zhurnal*. 2024;19(4):148–160. Russian. doi: 10.11621/npj.2024.0410
2. Ibda H, Wulandari TS, Abdillah A, et al. Student academic stress during the COVID-19 pandemic: a systematic literature review. *Int J Publ Health Sci*. 2023;12(1):286–295. doi: 10.11591/ijphs.v12i1.21983
3. Cobo-Rendón R, Pérez-Villalobos MV, Páez-Rovira D, Gracia-Leiva M. A longitudinal study: Affective wellbeing, psychological wellbeing, self-efficacy and academic performance among first-year undergraduate students. *Scand J Psychol*. 2020;61(4):518–526. doi: 10.1111/sjop.12618
4. Dela Cruz PJ, Aquino AM, Curioso M, et al. The impact of stress to the quality of life of the college students during the COVID-19 pandemic. *Psychol Educ Multidisc J*. 2022;2(3):196–211. doi: 10.5281/zenodo.662615
5. Ruthig JC, Hanson BL, Pedersen H, et al. Later life health optimism, pessimism and realism: psychosocial contributors and health correlates. *Psychol Health*. 2011;26(7):835–853. doi: 10.1080/08870446.2010.506574
6. Konrad T, Lisnyj KT, Gillani N, et al. Factors associated with stress impacting academic success among post-secondary students: A systematic review. *J Am Coll Health*. 2023;71(3):851–861. doi: 10.1080/07448481.2021.1909037
7. Alsalhi AH, Almigbal TH, Alsalhi HH, Batais MA. The relationship between stress and academic achievement of medical students in King Saud University: A cross-sectional study. *Kuwait Med J*. 2018;50(1):60–65.
8. Ribeiro JJS, Pereira R, Freire IV, et al. Stress and quality of life among university students: A systematic literature review. *Health Professions Education*. 2018;4(2):70–77. doi: 10.1016/j.hpe.2017.03.002
9. Popova TA, Semerikova PA. [Subjective well-being, psychological safety and strategies for overcoming students' stress]. *Vestnik Permskogo gosudarstvennogo gumanitarno-pedagogicheskogo universiteta*. Serija No. 1, Psihologicheskie i pedagogicheskie nauki. 2023;(1):51–57. Russian. doi: 10.24412/2308-717X-2023-1-51-57
10. Morosanova VI, Bondarenko IN, Dolivec SS. [Academic stress and psychological resources for achieving educational goal]. *Obrazovanie i nauka*. 2025;27(2):108–134. Russian. doi: 10.17853/1994-5639-2025-2-108-134
11. Lew B, Huen J, Yu P, et al. Associations between depression, anxiety, stress, hopelessness, subjective well-being, coping styles and suicide in Chinese university students. *PLoS One*. 2019;14(7):e0217372. doi: 10.1371/journal.pone.0217372
12. Blinnikova IV, Matiushin VV, Gushchin MV, Lange MD. [Contribution of trait mindfulness in countering acute and chronic stress in medical professionals during COVID-19 pandemic]. *Nacional'nyj psihologicheskij zhurnal*. 2022;4(48):53–64. doi: 10.11621/npj.2022.0406
13. Morosanova VI. [Conscious self-regulation as a metaresource for achieving goals and solving the problems of human activity]. *Vestnik Moskovskogo universiteta*. Serija 14, Psihologija. 2021;(1):3–37. Russian. doi: 10.11621/vsp.2021.01.01
14. Zinchenko YuP, Morosanova VI, Kondratyuk NG, Fomina TG. Conscious self-regulation and self-organization of life during the COVID-19 pandemic. *Psychology in Russia: State of the Art*. 2020;13(4):168–182. doi: 10.11621/pir.2020.0411
15. Garcia D, Jimmefors A, Mousavi F, et al. Self-regulatory mode (locomotion and assessment), well-being (subjective and psychological), and exercise behavior (frequency and intensity) in relation to high school pupils' academic achievement. *PeerJ*. 2015;3:e847. doi: 10.7717/peerj.847
16. de la Fuente J, Amate J, González-Torres MC, et al. Effects of levels of self-regulation and regulatory teaching on strategies for coping with academic stress in undergraduate students. *Front Psychol*. 2020;11:22. doi: 10.3389/fpsyg.2020.00022
17. Hadwin AF, Sukhawathanakul P, Rostampour R, Bahena-Olivares LM. Do self-regulated learning practices and intervention mitigate the impact of academic challenges and COVID-19 distress on academic performance during online learning? *Front Psychol*. 2022;13:813529. doi: 10.3389/fpsyg.2022.813529

18. Shirmohammadi Z, Eftekhari SZ, Talebzadeh SM. Mediating role of perceived academic stress in relationships of self-compassion and self-regulation with academic well-being in female students. *Iran J Health Sci.* 2023;11(1):29–36.
19. Durand-Bush N, McNeill K, Harding M, Dobransky J. Investigating stress, psychological well-being, mental health functioning, and self-regulation capacity among university undergraduate students: is this population optimally functioning? *Canadian Journal of Counselling and Psychotherapy.* 2015;49(3):253–274.
20. Demir S, Çelikkaleli Ö. The mediation role of self-regulation in effect of perceived stress on psychological well-being in emerging adults. *International Innovative Education Researcher.* 2023;3(1):66–101.
21. Ioannou M, Kassianos AP, Symeou M. Coping With Depressive Symptoms in Young Adults: Perceived Social Support Protects Against Depressive Symptoms Only Under Moderate Levels of Stress. *Front Psychol.* 2019;9:2780. doi: 10.3389/fpsyg.2018.02780
22. Yuhuan Z, Pengyue Z, Dong C, et al. The association between academic stress, social support, and self-regulatory fatigue among nursing students: a cross-sectional study based on a structural equation modelling approach. *BMC Med Educ.* 2022;22(1):789. doi: 10.1186/s12909-022-03829-2
23. Lin J, Zahry NR. Relationships among perceived stress, emotional eating, and dietary intake in college students: Eating self-regulation as a mediator. *Appetite.* 2021;163:105215. doi: 10.1016/j.appet.2021.105215
24. Schulte-Frankenfeld PM, Trautwein FM. App-based mindfulness meditation reduces perceived stress and improves self-regulation in working university students: A randomised controlled trial. *Appl Psychol Health Well Being.* 2022;14(4):1151–1171. doi: 10.1111/aphw.12328
25. Boldyreva TA, Shcherbinina OA. [Verification of the thesis on the increase in depressive and alarming trends in the 2010–2020s (using the example of a cohort and longitudinal study)]. *Jeksperimental'naja psihologija.* 2025;18(1):119–137. Russian. doi: 10.17759/exppsy.2025180108
26. Tarasova TV, Ionova MS, Ganyukhina YaG, et al. [Dynamics of psychological indicators of adaptation of students at a university]. *Mir nauki. Pedagogika i psihologija [Internet].* 2021[cited 2025 Aug 15];3(9):[12 p.]. Russian. Available from: <https://mir-nauki.com/PDF/13PSMN321.pdf>
27. Samokhvalova AG, Shipova NS, Tikhomirova EV, Vishnevskaya ON. [Psychological well-being of modern students: typology and targets of psychological help]. *Konsul'tativnaya psihologiya i psihoterapiya.* 2022;30(1):29–48. Russian. doi: 10.17759/cpp.2022300103
28. Morosanova VI, Kondratyuk NG. [V.I. Morosanova's "Self-regulation profile questionnaire — SRPQM 2020"]. *Voprosy psihologii.* 2020;4:155–167. Russian.
29. Massé R, Poulin C, Dassa C, et al. The structure of mental health: Higher-order confirmatory factor analyses of psychological distress and well-being measures. *Social Indicators Research.* 1998;45(1):475–504. doi: 10.1023/A:1006992032387
30. Fomina TG, Bondarenko IN. [Validation of the well-being manifestations measurement scale (WBMMMS) on a sample of Russian students]. *Vestnik Moskovskogo universiteta. Serija 14, Psihologija.* 2024;47(2):243–264. Russian. doi: 10.11621/LP-24-2
31. Morosanova VI, Zinchenko YP. [Short questionnaire of acute and chronic stress: development and validation]. *Sibirskiy psikhologicheskij zhurnal.* 2024;(94):6–22. Russian. doi: 10.17223/17267080/94/1
32. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behavior.* 1983;24(4):385–396.
33. Zolotareva AA. [Psychometric properties of the Russian version of the perceived stress scale (PSS-4, 10, 14)]. *Klinicheskaja i spetsial'naja psihologija.* 2023;12(1):18–42. Russian. doi: 10.17759/cpse.2023120102
34. Dancy CP, Reidy J. *Statistics without maths for psychology.* 4th ed. Harlow: Pearson Prentice Hall; 2007.
35. Kim JH. Multicollinearity and misleading statistical results. *Korean J Anesthesiol.* 2019;72(6):558–569. doi: 10.4097/kja.19087
36. O'Brien RM. A Caution Regarding Rules of Thumb for Variance Inflation Factors. *Quality & Quantity.* 2007;41(5):673–690. doi: 10.1007/s11135-006-9018-6
37. Nestik TA. [The influence of military conflicts on the psychological state of society: promising areas of research]. *Sotsial'naya psihologiya i obshchestvo.* 2023;14(4):5–22. Russian. doi: 10.17759/sps.2023140401
38. Basyuk VS, Malykh SB, Tikhomirova TN. [Federal network of psychological services of educational institutions of higher education: concept, priorities and development resources]. *Psikhologicheskaya nauka i obrazovanie.* 2022;27(6):4–18. Russian. doi: 10.17759/pse.2022270601
39. Ma H, Zou JM, Zhong Y, Li J, He JQ. Perceived stress, coping style and burnout of Chinese nursing students in late-stage clinical practice: A cross-sectional study. *Nurse Educ Pract.* 2022 Jul;62:103385. doi: 10.1016/j.nepr.2022.103385
40. Olson N, Oberhoffer-Fritz R, Reiner B, Schulz T. Stress, student burnout and study engagement - a cross-sectional comparison of university students of different academic subjects. *BMC Psychol.* 2025 Mar 24;13(1):293. doi: 10.1186/s40359-025-02602-6
41. Habibu ML, Lawal US, Zubairu Z, Sain ZH. Effectiveness of Self-Regulation Techniques in Reducing Stress among Nursing Students in Kaduna, Nigeria. *African Journal of Humanities and Contemporary Education Research.* 2024;14(1):307–320. doi: 10.62154/ts051935
42. Hj Ramli NH, Alavi M, Mehrinezhad SA, Ahmadi A. Academic stress and self-regulation among university students in Malaysia: Mediator role of mindfulness. *Behav Sci (Basel).* 2018;8(1):12. doi: 10.3390/bs8010012
43. Arabzadeh M, Nikdel F, Kadivar P, et al. The relationship of self-regulation and self-efficacy with academic stress in university students. *International Journal of Education and Psychology in the Community.* 2012;2(2):102–113.
44. Sabouripour F, Roslan S, Ghiami Z, Memon MA. Mediating role of self-efficacy in the relationship between optimism, psychological well-being, and resilience among Iranian students. *Front Psychol.* 2021;12:675645. doi: 10.3389/fpsyg.2021.675645
45. Bulut O, Cutumisu M, Aquilina AM, Singh D. Effects of digital score reporting and feedback on students' learning in higher education. *Frontiers in Education.* 2019;4:65. doi: 10.3389/educ.2019.00065
46. Ansari S, Khan I, Iqbal N. Association of stress and emotional well-being in non-medical college students: A systematic review and meta-analysis. *J Affect Disord.* 2025;368:200–223. doi: 10.1016/j.jad.2024.09.029
47. Kononov AN, Novikova AS. [Features of experiencing and coping with exam stress of students of psychological and medical fields of study]. *Nauchnyj rezul'tat. Pedagogika i psihologija obrazovanija.* 2023;9(2):129–145. Russian. doi: 10.18413/2313-8971-2023-9-2-0-10
48. Tomas N, Poroto A. The interplay between self-regulation, learning flow, academic stress and learning engagement as

predictors for academic performance in a blended learning environment: A cross-sectional survey, *Heliyon*. 2023;9(11):e21321. doi: 10.1016/j.heliyon.2023.e21321

49. Baumeister RF, André N, Southwick DA, Tice DM. Self-control and limited willpower: current status of ego depletion

theory and research. *Curr Opin Psychol*. 2024:101882. doi: 10.1016/j.copsyc.2024.101882

50. Freire C, Ferradás MD, Valle A, et al. Profiles of psychological well-being and coping strategies among university students. *Front Psychol*. 2016;7:1554. doi: 10.3389/fpsyg.2016.01554
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Neurorehabilitation of Visual Neglect: A Narrative Review of Approaches from A.R. Luria to Modern Clinical Protocols

Нейрореабилитация пациентов со зрительным неглектом: нарративный обзор эволюции идей от А.Р. Лурии до современных клинических протоколов

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Review

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ABSTRACT

BACKGROUND: Various methods of rehabilitation for patients with neglect syndrome have been developed in cognitive neuropsychology. In contrast, this issue has not been a central focus in Luria's neuropsychological rehabilitation.

AIM: The aim of this study is to provide a comparative analysis of A.R. Luria's methods for restoring higher mental functions (HMF) and existing approaches within the cognitive paradigm for rehabilitating patients with left-sided spatial neglect. These approaches will be evaluated based on concepts of "bottom-up" and "top-down" attention processes.

METHODS: The search for studies was conducted in the electronic databases PubMed, Scopus, Web of Science, and eLIBRARY.RU for the period from 1984 to 2024. Sources were included in the review if they contained information on techniques for overcoming left-sided visual neglect and assessing their effectiveness. The review considered publications across all study designs.

RESULTS: Based on an analysis of 56 publications, this study presents the first comparison between modern rehabilitation methods for left-sided neglect and A.R. Luria's methods for restoring HMF. This synthesis has enabled a refinement of the existing taxonomy of methods for restoring HMF, leading to the proposal of a novel methodology, which focuses on "expanding/correcting the capabilities of the leading afferentation of the functional system (directed correction)".

CONCLUSION: It is evident that the extant methodologies for addressing left-sided visual neglect are deficient in terms of efficacy. The most efficacious methods are those aimed at restructuring the functional system and based on arbitrariness and mediation, which largely correlates with "top-down" attention processes.

АННОТАЦИЯ

ВВЕДЕНИЕ: В когнитивной нейропсихологии разработаны различные методы реабилитации пациентов с синдромом неглекта. Вместе с тем в луриевской нейропсихологической реабилитации этот вопрос не находился в центре внимания.

ЦЕЛЬ: Сопоставить пути восстановления высших психических функций, предложенные А.Р. Лурией, с современными подходами когнитивной реабилитации пациентов с левосторонним пространственным игнорированием, в основе которых лежат представления о восходящих (bottom-up) и нисходящих (top-down) процессах внимания.

МЕТОДЫ: Поиск работ проводили в электронных базах данных PubMed, Scopus, Web of Science, eLIBRARY.RU за период с 1984 по 2024 г. Источники включали в обзор, если в них присутствовали сведения о техниках преодоления левостороннего зрительного неглекта и оценке их эффективности. При отборе публикаций тип исследования не учитывали.

РЕЗУЛЬТАТЫ: На основе анализа 56 исследований, включенных в обзор, впервые сопоставили методы реабилитации левостороннего неглекта и путей восстановления высших психических функций в концепции Лурии. Результатом стала ревизия систематики восстановительных подходов с выделением нового направления, ориентированного на расширение/коррекцию возможностей ведущей афферентации функциональной системы (направленная коррекция).

ЗАКЛЮЧЕНИЕ: Ни один из существующих методов преодоления левостороннего зрительного неглекта не является лидирующим по своей эффективности. Наилучшие результаты показывают методы, направленные на перестройку функциональной системы и опирающиеся на произвольность и опосредованность, что во многом соотносится с нисходящими процессами внимания (top-down).

Keywords: *left-sided visual neglect; ignoring; neuropsychological rehabilitation; psychophysiological rehabilitation; ways to restore impaired cognitive functions; A.R. Luria*

Ключевые слова: *левосторонний зрительный неглект; игнорирование; нейропсихологическая реабилитация; психофизиологическая реабилитация; пути восстановления нарушенных высших психических функций; А.Р. Лурия*

INTRODUCTION

Neglect syndrome (NS) is a psychoneurological disorder characterized by the inability to respond to stimuli presented on the opposite side of the affected hemisphere [1]. NS may result from cerebrovascular accidents (stroke), traumatic brain injury, and brain damage of other etiologies [2]. It is a relatively common and disabling consequence of stroke and is more pronounced in patients with right hemisphere damage [3]. Right-sided neglect is significantly less common (24%) than left neglect (33–85%) [2].

International studies on rehabilitation methods for patients with NS tend to analyze this disorder as an attention impairment consisting of bottom-up and top-down processes [4]. The proposed approaches to the rehabilitation of patients with NS are based on these processes [5, 6].

The top-down processes rely on the patients' conscious, voluntary involvement. They direct attention towards the space opposite the affected hemisphere [7]. Such methods based on top-down processes may be difficult to apply in cases of severe NS [8].

Bottom-up processes draw on remaining mechanisms of neural plasticity. They influence physiological functions through sensory stimulation, environmental changes, or motor adaptation, bypassing potential regulatory deficits [9].

Currently available methods for NS are based on top-down or bottom-up frameworks or combine elements of both [10]. By contrast, traditional Russian neuropsychological rehabilitation has mainly focused on overcoming aphasic speech disorders rather than NS. Therefore, comparing international NS rehabilitation with the Russian paradigm for restoring higher mental functions (HMF) is an important task.

This comparison is necessary because Russian and international neuropsychology differ in how they understand the mechanisms underlying mental function recovery. In addition, Russian neuropsychologists face difficulties in applying rehabilitation tools developed abroad for patients with left visual neglect.

The aim of this study is to provide a comparative analysis of A.R. Luria's approach for restoring HMF and existing approaches within the cognitive paradigm for rehabilitating patients with left-sided spatial neglect. These approaches will be evaluated based on concepts of "bottom-up" and "top-down" attention processes.

METHODS

Eligibility criteria

The review included peer-reviewed articles that met the following criteria:

- reported on an intervention for left-sided visual neglect and contained an objective assessment of the intervention's effectiveness;
- analyzed changes in NS over time following the use of specific rehabilitation interventions;
- published in English, Russian, German, and French;
- encompassed any study design, including clinical studies, meta-analyses, systematic reviews, and original research articles.

Studies were excluded from the review if they contained data involving patients with NS combined with psychotic symptoms, aphasia, or developmental disorders.

Information sources

The search was conducted in the PubMed, Scopus, Web of Science, and eLIBRARY.RU electronic databases. The search period ran from 1984 to 2024. The lower time threshold was chosen because rehabilitation practice at that time began to shift from isolated methods to a combined approach integrating functional (cognitive) and holistic (social) strategies [11].

Search strategy

The search query included the following keywords in Russian and English (as well as their combinations): "neglect syndrome", "rehabilitation of spatial neglect", "unilateral disregard", "prism adaptation", "visual search", "transcranial magnetic stimulation", "stroke", "hemineglect", "motor neglect", "neglect", "personal neglect", "representational neglect", "sensory neglect", "unilateral spatial neglect",

"neurorehabilitation", "neuropsychological rehabilitation", "visuospatial neglect", and "treatment outcome".

The search query was formulated by G.K.S. and D.D.T. and approved by all co-authors.

Selection process

Primary screening was performed by reviewing article titles and abstracts and making a preliminary assessment of their eligibility. Articles that passed this stage underwent full-text analysis to determine whether they met the inclusion and exclusion criteria. Three authors (G.K.S., D.D.T., V.A.P.) independently screened the articles, with subsequent confirmation by two additional authors (A.M.B., E.V.V.). Disagreements were resolved by three authors (M.S.K., A.A.S., N.A.V.).

The database search found 139 articles. After screening titles and abstracts, 73 publications were considered potentially relevant. Following full-text review, 56 publications met the eligibility criteria and were included in the final analysis.

Data analysis

The authors used a descriptive approach, involving analysis and evaluation of publications that reported on the effectiveness of rehabilitation methods for patients with NS.

No risk-of-bias assessment was performed, as this was not required for the aims of our narrative review.

RESULTS

Luria's approaches for restoring HMF

Approaches to restoring cognitive functions have long been discussed in the scientific literature [12–14]. In his monographs, Luria [15–17] identified three main approaches: disinhibition of the suppressed functional system (FS), substitution (vicariation), and fundamental rearrangement of impaired activity. These pathways require a careful study of their mechanisms and interrelations in patient rehabilitation [15].

We analyzed Luria's pathways for restoring HMF and modern rehabilitation tools to develop the following classification (Table 1).

Rearrangement of the FS structure and change in the level of its functioning can occur together [18, 19]. For example, the use of external cues involves the application of an additional afferent element, which at the same time serves as a sign, allowing a switch in the function of the FS from an involuntary level to a voluntary one.

Table 1. Classification of approaches for restoring higher mental functions

Recovery	Recovery type	Description
Physiological	Spontaneous	Disappearance of “systemic shock” or diaschisis without intervention by specialists; spontaneous vicariation.
	Targeted	Diaschisis disappears under medical or other targeted physiological influence.
Psychological	Spontaneous	Compensatory mechanisms unconsciously used by the patient.
	Targeted	Correction of the afferentation existing in the psychological FS. Rearrangement of the FS structure: an intra-system rearrangement, with the use of FS elements that have already been used in it, or an intersystem rearrangement (the missing element of the FS is replaced by a new one that has not been previously used in this FS). Change in the level (voluntary, involuntary) of the FS functioning.

Note: FS — functional system.

Rehabilitation methods for patients with NS based on international concepts of bottom-up and top-down attention can be theoretically and methodologically justified within the Russian paradigm.

Understanding these methods within Luria’s framework will allow Russian neuropsychologists to understand better the mechanisms underlying NS intervention. This may contribute to a more appropriate application of these methods.

Rehabilitation methods aligned with Luria’s disinhibition pathway

The pathway of FS disinhibition was first described by Monakov, who identified the mechanism of diaschisis [12].

Inhibited functions can be recovered through different approaches: pharmacological or physiological interventions that affect neurotransmitter metabolism and restore synaptic conduction, or by changing the mental attitudes of the individual [14].

The mechanism underlying FS disinhibition suggests that this pathway belongs to both targeted and spontaneous pathways of restoring HMF. In both cases, the FS has the same constituent elements [16].

Transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) are commonly used non-invasive brain stimulation methods [20, 21].

TMS enables direct stimulation of cortical neurons. The physiological mechanism underlying the therapeutic efficacy of TMS involves long-term potentiation, which forms the basis of neuroplasticity [22]. However, there is no consensus on how long the exposure should last to induce plastic changes in the nervous system [9].

The efficacy of TMS and tDCS was assessed using a meta-analysis that analyzed 12 studies involving 168 subjects [23]. Most patients had their first right-hemisphere stroke

with cortical lesions. All studies were conducted in the subacute phase (4 weeks to 6 months), except for one study conducted in the acute phase (less than 4 weeks) [23]. Three studies used tDCS, and nine employed repetitive transcranial magnetic stimulation (rTMS). These studies evaluated the severity of NS with different outcomes. The most used tests were the Line Bisection Test and the Behavioral Inattention Test (BIT) [24].

According to the study evidence, tDCS tended to reduce the severity of NS, although the results were inconsistent, while TMS had a positive effect on NS [21, 22]. One study also examined the combined use of tDCS and neck muscle vibration, which may help correct subjective vertical orientation in patients with NS [25, 26]. However, there is a need for further studies with larger samples to clarify the role of non-invasive brain stimulation in the management of NS.

Because these methods are purely physiological, distinguishing top-down and bottom-up processes within the psychological process of attention is not appropriate.

Thus, TMS can be compared with a targeted physiological disinhibition of the brain’s FS. In clinical practice, this method is important for optimizing the functional state of neuronal networks involved in simultaneous attention.

Rehabilitation methods aligned with Luria’s rearrangement pathway

Top-down processes

Top-down approaches used internationally in NS rehabilitation align well with the FS rearrangement pathway according to Luria [15–17]. These methods focus on the patient’s conscious, voluntary acquisition of new ways to carry out actions. Currently, they are central to NS management, as physiological methods alone can create the basis for simultaneous attention but cannot restore the

psychological process itself. Each of the methods presented below has shown effectiveness, but none is optimal.

1. Visual scanning training.

Visual scanning training involves training the patient to turn the head and trunk toward the neglected side [27]. The method aims to improve spatial scanning by reorienting the egocentric reference system, which is most used by psychologists in rehabilitative care [28]. It requires precise instructions: the examiner asks the patient to find the left edge of the page marked with a wide red line before reading the next line [25]. A reference point is thus created, and the patient learns to navigate in space and scan the visual field from left to right during tasks such as reading and writing.

Despite its frequent use in clinical practice, several randomized controlled trials have evaluated its efficacy [27, 29–32]. The studies that showed improvements in visuospatial search parameters were limited to paper-and-pencil tests [30, 32]. Long-term outcomes were not recorded to confirm sustained improvements. Some studies showed limited transfer of training effects to patients' daily functioning [29, 32, 33].

2. The “spotlight” strategy.

Within the “spotlight” strategy, patients focus on specific stimuli (similar to using a light in a dark room) while neglecting others [34–36]. Here, attention is conceptualized as a spotlight that can switch from place to place just as a beam of light moves across a dark room [36].

3. The “lighthouse” strategy.

This method is a continuation of the previous strategy. It uses a visual metaphor in which patients imagine themselves as a lighthouse, with their eyes and head as a beam of light that must “illuminate” the space from right to left [37]. This mental representation helps to encourage patients to scan their surroundings systematically, thereby improving attention to the side of neglect [38]. This approach requires patients to have a certain capacity for abstraction and associative memory [37].

Training in visual scanning using the “lighthouse” and “spotlight” strategies illustrates intra-system rearrangements within Luria's framework.

Bottom-up processes

Methods based on bottom-up attention processes align with the FS rearrangement pathways in Luria's framework [14–16]. Such methods focus on activating involuntary levels of attention.

As with top-down attention, individual bottom-up methods are not central to the neuropsychological rehabilitation of patients with NS. However, they can be used as supplements to top-down approaches in clinical practice.

1. Vestibular stimulation.

Modern methods of vestibular stimulation include caloric and galvanic vestibular stimulation. Caloric vestibular stimulation usually involves the instillation of cold water into the ear opposite the affected hemisphere [39]. Galvanic vestibular stimulation applies a weak electric current on the mastoid processes of the temporal bone [40].

Vestibular stimulation is based on the relationship between neural structures involved in vestibular and spatial processing and an impaired spatial reference system, including the bodily reference system [39]. This is supported because the subjective orientation of the body is shifted to the right in patients with left NS. This involves additional afferentations (intra-system rearrangement in Luria's framework).

The efficacy of these methods was evaluated in a meta-analysis of 17 studies that included 180 patients with stroke-related NS [41]. Results showed no significant differences between the effects of galvanic vestibular stimulation and placebo conditions, whereas caloric vestibular stimulation showed significant improvements in NS symptoms compared with pre-stimulation findings [41].

2. Optokinetic stimulation.

Optokinetic stimulation represents intra-system rearrangement within Luria's rehabilitative framework. In this procedure, the patient follows stimuli moving from right to left across the screen with their eyes. Kerkhoff et al. [42] showed that this stimulation decreases the auditory manifestations of NS.

In this procedure, the eye movements are guided by instructions, which alters their psychological structure. The study by Leontiev and Zaporozhets [43] revealed the relationship between the characteristics of the movement and the way the task is set. Voluntary movements that are similar in their geometry and anatomy [43] will be performed differently if the subjects have different tasks. When such movements are incorporated into another meaningful voluntary task, they can become automated.

3. External cues.

Another method of rehabilitation is using external cues, which draw the patient's involuntary attention to the side of spatial neglect [44, 45]. External cues include visual, auditory, and cutaneous kinesthetic (limb activation method)

cues [46]. The examiner uses bright objects located on the left as visual cues [5]. Non-verbal auditory cues, such as sound signals, are initially presented on the right side of space to capture attention [42]. Gradually, the signal moves to the left side, causing the patient to direct their eyes to the left involuntarily. Pilot studies have shown that auditory cues can reduce NS symptoms [47].

A similar auditory cue is used in the limb activation method [28, 33, 48]. A sound-producing device is attached to one of the left limbs. The device can operate in two modes: emitting sounds at fixed intervals regardless of limb movement [33, 48], or activating when the limb remains unused for an extended period. Rehabilitation with this method was associated with reduced NS symptoms across personal, peripersonal, and locomotor space [47–49]. Following treatment, improvements in peripersonal space and overall motor function of the left limbs continued for 18–24 months [48, 49].

External cues that add an afferent element and shift the FS to a more voluntary level can be interpreted, within Luria's rehabilitative framework, as part of the FS rearrangement pathway.

4. Use of biofeedback (neurofeedback).

Rehabilitation outcomes are more effective if neuropsychological and neurobiological methods are more integrated [50]. For example, the “neurofeedback” method is based on the finding that the function of the frontoparietal control network in the right hemisphere is impaired in NS [51]. This method activates the network during cognitive tasks using feedback from electroencephalography and real-time functional magnetic resonance imaging. Improved visuospatial search was demonstrated in patients undergoing this procedure [52].

Using neurofeedback is possible because of an intra-system rearrangement, as it increases the level of voluntariness.

Rehabilitation methods for expanding or adjusting the leading afferent input of the functional system

1. Prism adaptation.

Rossetti et al. [53] used wide-field prismatic lenses that shifted the patient's field of view by 10 degrees to the right. Patients wore the prismatic glasses and performed tasks involving pointing to visual targets on both sides of their body's midline. The position of the head was stabilized with a chin rest and controlled by the investigators to minimize

movement. The duration of training with prismatic lenses varied from 2 to 5 minutes. Results were recorded before and after the training. Prism adaptation produced significant improvements in midline pointing tasks and in classical paper-and-pencil neuropsychological tests assessing NS. These improvements persisted for at least 2 hours after the lenses were removed [54].

A randomized controlled study [55] assessed the long-term sensorimotor and therapeutic effects of prism adaptation. Although patients showed significant sensorimotor changes after prism adaptation, these improvements did not result in sustained repetitions in functional independence in daily life. Prism adaptation effectively decreases the manifestations of NS in the short term. However, a more intensive and prolonged intervention is required for long-term therapeutic results.

Studies have also shown that NS symptoms are temporarily reduced after prism adaptation. However, the therapeutic effect often disappears after a few weeks [56]. One explanation for this short-lived effect is that prism adaptation promotes a spatial attention shift, increasing exploratory eye movements toward the neglected side. However, it does not produce lasting changes in visual perception on that side [57]. Prism adaptation can temporarily improve the patient's orientation on the side of neglect, but does not profoundly affect the cognitive perception of this area [58].

2. Eye patching.

The method involves placing a bandage over the intact half of the patient's visual field on their glasses or using half-occluded sunglasses [59–61]. These devices use a transparent or shaded lens to reduce visual stimuli from the intact field of view. The procedure is based on Franz's ideas, which propose that these conditions direct patients with left NS to attend to the left half of their visual field [62]. By occluding the right half of the visual field, information is prevented from reaching the intact left hemisphere. This promotes greater involvement of intact regions of the damaged right hemisphere in task performance [59, 61].

The results confirm the positive influence of the method regarding head turns and spontaneous eye movements to the left neglected side [25, 39].

3. Mirror therapy.

This method involves placing a mirror along the patient's midline, creating the illusion of movement of the paretic and/or neglected limb [59, 63–65]. The intact limb “performs”

Table 2. Comparison of pathways for restoring higher mental functions with neglect syndrome rehabilitation methods

A.R. Luria's pathways for restoring		Methods
Rehabilitation methods aligned with Luria's disinhibition pathway		Non-invasive brain stimulation: TMS and tDCS
Rehabilitation methods aligned with Luria's rearrangement pathway	Top-down processes	Visual scanning training The "spotlight" strategy The "lighthouse" strategy
	Bottom-up processes	Vestibular stimulation (CVS and GVS) Optokinetic stimulation External cues Use of biofeedback (neurofeedback)
Rehabilitation methods for expanding or adjusting the leading afferent input of the functional system		Prism adaptation Eye patching Mirror therapy

Note: CVS — caloric vestibular stimulation; FS — functional system; GVS — galvanic vestibular stimulation; tDCS — transcranial direct current stimulation; TMS — transcranial magnetic stimulation.

various tasks [64–66]. The illusion is thought to activate motor areas of the damaged right hemisphere, since illusions activate the same part of the brain as real movements [67]. Mirror therapy was originally used in the rehabilitation of patients with paresis but was later applied to those with motor NS [63, 65].

Systematization of NS rehabilitation methods and their comparison with Luria's pathways for restoring HMF

The methods described above and presented in integrative classification within Luria's framework for restoring HMF are shown in Table 2.

Most of the methods presented above can be used in a virtual environment. This is not a new rehabilitation tool, but a technology that can increase the diversity of stimuli [68], reach more patients per unit of the examiner's working time, and decrease the costs of rehabilitation personnel [69]. However, the evidence confirming the effectiveness of this tool does not suggest its practical value [70].

DISCUSSION

A meta-analysis comparing the efficacy of various rehabilitation methods in patients with NS included 37 randomized controlled studies [10]. It did not reveal the efficacy of any specific rehabilitation methods because of small sample sizes, lack of objectivity, assessments of the generalization of gained skills, and longitudinal studies [10]. However, combining methods for the rehabilitation of patients with NS was more effective than any of the methods alone [8, 10, 70–73].

Among rehabilitation methods conventionally used in NS, the publication by Cicerone et al. [74] is noteworthy. Based

on 10 studies on NS rehabilitation, the authors conclude that visual scanning training (standard level) is the preferable option. Recommended methods include microcomputer exercises, limb activation techniques, and mirror therapy, which are used as complementary tools, increasing the effectiveness of visual scanning training. Using electronic technologies in visual scanning training is possible. According to the authors, the primary method of rehabilitation is the visual scanning strategy. Other methods can only supplement it and are not recommended as separate tools, which is explained because improved functioning is associated with compensation [74]. The authors conclude that the top-down pathway is the most effective one in the cognitive rehabilitation of patients with NS [74]. Compensation is a directed, conscious attempt to overcome the deficit, which is consistent with Luria's idea of FS rearrangement [16, 17].

The main limitation of our review is the 40-year span of publications analyzed. This limitation is because of changes in the perception of neurological rehabilitation in the late 1980s. The period is characterized by the gradual introduction of both methods consistent with the functional and holistic approaches to rehabilitation [11].

In addition, the studies included in the review were noticeably heterogeneous, as the diagnostic methods varied significantly. Participant samples differed in terms of rehabilitation phase (acute, subacute, etc.), tools employed, and duration of the rehabilitation process. Some investigators did not adhere to the principle of monotherapy: in several publications, rehabilitation was limited to a single method being evaluated, while in others, patients were simultaneously treated with other therapeutic interventions in a hospital setting.

These differences could affect the representativeness and homogeneity of results.

CONCLUSION

Current rehabilitation methods for NS are diverse and are commonly categorized into bottom-up and top-down approaches. Each has its advantages and limitations. A combined approach that can offset these limitations and provide a comprehensive approach to rehabilitation is preferable for rehabilitative training.

To better understand these rehabilitation methods, they were compared with Luria's pathways for restoring impaired HMF, and a classification of psychophysiological and neuropsychological methods was developed. However, despite a large number of studies, their efficacy and superiority are still a matter of debate. Future studies should be conducted with larger samples, under stricter control, with an assessment of skill generalization, and over longer follow-up periods. The choice of specific methods should be guided by the patient's condition, individual characteristics, and the rehabilitation goals set by specialists. Thus, integrating various methods of rehabilitation for patients with NS does not guarantee optimal recovery of social adaptation and functional independence. In conclusion, none of the discussed methods of rehabilitation in NS should be regarded as the most effective. This highlights the need to find the most effective strategy for combining the above methods and developing new ones, for example, specialized training programs including Luria's restorative training elements.

All NS rehabilitation methods reviewed here have practical significance, as integrating physiological and psychological approaches may improve research practice and speed up recovery during the early stages of rehabilitation. The highest efficacy was shown for the methods associated with the FS rearrangement involving voluntariness and mediation, which is largely related to top-down attention.

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References

- Vallar G. Spatial hemineglect in humans. *Trends Cogn Sci*. 1998;2(3):87–97. doi: 10.1016/s1364-6613(98)01145-0
- Dobrokhotova TA, Bragina NN, Zaitsev OS, et al. [Unilateral spatial agnosia]. Moscow: Kniga Ltd; 1996. Russian.
- Moore MJ, Milosevich E, Mattingley JB, et al. The neuroanatomy of visuospatial neglect: A systematic review and analysis of lesion-mapping methodology. *Neuropsychologia*. 2023;180:108470. doi: 10.1016/j.neuropsychologia.2023.108470
- Corbetta M, Shulman GL. Spatial neglect and attention networks. *Annu Rev Neurosci*. 2011;34:569–599. doi: 10.1146/annurev-neuro-061010-113731
- Marshall RS. Rehabilitation approaches to hemineglect. *Neurologist*. 2009;15(4):185–192. doi: 10.1097/NRL.0b013e3181942894
- Qi F, Nitsche MA, Ren X, et al. Top-down and bottom-up stimulation techniques combined with action observation treatment in stroke rehabilitation: a perspective. *Front Neurol*. 2023;14:1156987. doi: 10.3389/fneur.2023.1156987
- Gilbert CD, Li W. Top-down influences on visual processing. *Nat Rev Neurosci*. 2013;14(5):350–363. doi: 10.1038/nrn3476
- Carter AR, Barrett AM. Recent advances in treatment of spatial neglect: networks and neuropsychology. *Expert Rev Neurother*. 2023;23(7):587–601. doi: 10.1080/14737175.2023.2221788
- Gammeri R, Iacono C, Ricci R, et al. Unilateral Spatial Neglect After Stroke: Current Insights. *Neuropsychiatr Dis Treat*. 2020;16:131–152. doi: 10.2147/NDT.S171461
- Azouvi P, Jacquin-Courtois S, Lauauté J. Rehabilitation of unilateral neglect: Evidence-based medicine. *Ann Phys Rehabil Med*. 2017;60(3):191–197. doi: 10.1016/j.rehab.2016.10.006
- Ben-Yishay Y, Rattok J, Lakin P, et al. Neuropsychological rehabilitation: Quest for a holistic approach. *Semin Neurol*. 1985;5(3):252–259. doi: 10.1055/s-2008-1041522
- von Monakow C. [Localisation in the cerebrum and functional deterioration due to cortical lesions]. Wiesbaden: JF Bergmann; 1914. German.
- Asratyan EA. [On the principle of relative plasticity of the nervous system]. *Trudy Gosudarstvennogo instituta mozga im. V.M. Bekhtereva*. 1939;11:172–183. Russian.
- Goldstein K. *Aftereffects of brain injuries in war: their evaluation and treatment*. New York: Grune & Stratton; 1942.
- Luria AR. *Traumatic aphasia: its syndromes, psychology, and treatment*. Berlin: Walter de Gruyter & Co; 1970.
- Luria AR. *Restoration of function after brain injury*. New York: MacMillan; 1963.
- Mecacci L. Luria's first steps in neuropsychology. *Cortex*. 2024;181:133–139. doi: 10.1016/j.cortex.2024.10.003
- Baulina ME, Skvortsov AA, Kovyazina MS, et al. Luria's Approach to the Restoration of Speech in Aphasia and the International Classification of Functioning, Disability and Health (ICFDH). *Psychology in Russia: State of the Art*. 2019;12(1):118–128. doi: 10.11621/pir.2019.0109
- Allilaire JF, Widlocher D. [Etiopathogenic aspects of inhibition. Psychodynamic approach to inhibition]. *Encephale*. 1978;4(5 Suppl):473–480. French.
- Kesikburun S. Non-invasive brain stimulation in rehabilitation. *Turk J Phys Med Rehabil*. 2022;68(1):1–8. doi: 10.5606/tftrd.2022.10608
- Lefaucheur JP, Antal A, Ayache SS, et al. Evidence-based guidelines on the therapeutic use of transcranial direct current stimulation (tDCS). *Clin Neurophysiol*. 2017;128(1):56–92. doi: 10.1016/j.clinph.2016.10.087
- González-Rodríguez B, Serradell-Ribé N, Viejo-Sobera R, et al. Transcranial direct current stimulation in neglect rehabilitation after stroke: a systematic review. *J Neurol*. 2022;269(12):6310–6329. doi: 10.1007/s00415-022-11338-x
- Fan J, Li Y, Yang Y, et al. Efficacy of Noninvasive Brain Stimulation on Unilateral Neglect After Stroke: A Systematic Review and Meta-analysis. *Am J Phys Med Rehabil*. 2018;97(4):261–269. doi: 10.1097/PHM.0000000000000834
- Polejaeva E, Woods AJ. Behavioral inattention test (BIT). In: Kreutzer JS, DeLuca J, Caplan B, editors. *Encyclopedia of Clinical Neuropsychology*. Cham: Springer; 2018. p. 542–544. doi: 10.1007/978-3-319-57111-9_9134
- Singh-Curry V, Husain M. Rehabilitation in practice: Hemispatial neglect: approaches to rehabilitation. *Clin Rehabil*. 2010;24(8):675–684. doi: 10.1177/0269215509357851
- Millot S, Beis JM, Pierret J, et al. Innovative Therapy Combining Neck Muscle Vibration and Transcranial Direct Current Stimulation in Association with Conventional Rehabilitation in Left Unilateral Spatial Neglect Patients: HEMISTIM Protocol for a Randomized Controlled Trial. *Brain Sci*. 2023;13(4):678. doi: 10.3390/brainsci13040678
- Baker BJ, Bennison AM, Rohde KJ, et al. Effectiveness of visual scanning training at reducing left neglect: a systematic review. *Open Access J Neurol Neurosurg*. 2019;10(2):15–25. doi: 10.19080/OAJNN.2019.10.555781
- Priftis K, Passarini L, Pilosio C, et al. Visual Scanning Training, Limb Activation Treatment, and Prism Adaptation for Rehabilitating Left Neglect: Who is the Winner? *Front Hum Neurosci*. 2013;7:360. doi: 10.3389/fnhum.2013.00360
- Luukkainen-Markkula R, Tarkka IM, Pitkänen K, et al. Rehabilitation of hemispatial neglect: A randomized study using either arm activation or visual scanning training. *Restor Neurol Neurosci*. 2009;27(6):663–672. doi: 10.3233/RNN-2009-0520
- van Kessel ME, Geurts AC, Brouwer WH, et al. Visual Scanning Training for Neglect after Stroke with and without a Computerized Lane Tracking Dual Task. *Front Hum Neurosci*. 2013;7:358. doi: 10.3389/fnhum.2013.00358
- van Wyk A, Eksteen CA, Rheeder P. The effect of visual scanning exercises integrated into physiotherapy in patients with unilateral spatial neglect poststroke: a matched-pair randomized

- control trial. *Neurorehabil Neural Repair*. 2014;28(9):856–873. doi: 10.1177/1545968314526306
32. Spaccavento S, Cellamare F, Cafforio E, et al. Efficacy of visual-scanning training and prism adaptation for neglect rehabilitation. *Appl Neuropsychol Adult*. 2016;23(5):313–321. doi: 10.1080/23279095.2015.1038386
 33. Robertson IH, North N. Spatio-motor cueing in unilateral left neglect: the role of hemispace, hand and motor activation. *Neuropsychologia*. 1992;30(6):553–563. doi: 10.1016/0028-3932(92)90058-t
 34. Robertson IH, Tegnér R, Tham K, et al. Sustained attention training for unilateral neglect: theoretical and rehabilitation implications. *J Clin Exp Neuropsychol*. 1995;17(3):416–430. doi: 10.1080/01688639508405133
 35. Manly T. Cognitive rehabilitation for unilateral neglect: review. *Neuropsychol Rehabil*. 2002;12(4):289–310. doi: 10.1080/0960201044000101
 36. Winson R, Wilson BA, Bateman A, editors. *The brain injury rehabilitation workbook*. New York: Guilford Publications; 2016.
 37. Niemeier JP. *The Lighthouse Strategy: use of a visual imagery technique to treat visual inattention in stroke patients*. *Brain Inj*. 1998;12(5):399–406. doi: 10.1080/026990598122511
 38. Kovyazina MS, Varako NA, Stepanov GK, et al. [Theoretical foundations for the use of the lighthouse strategy in the rehabilitation of patients with neglect syndrome]. *Lurian Journal*. 2024;5(3):8–28. Russian. doi: 10.15826/Lurian.2024.5.3.1
 39. Karnath HO, Dieterich M. Spatial neglect – a vestibular disorder? *Brain*. 2006;129(Pt 2):293–305. doi: 10.1093/brain/awh698
 40. Dlugaiczyk J, Gensberger KD, Straka H. Galvanic vestibular stimulation: from basic concepts to clinical applications. *J Neurophysiol*. 2019;121(6):2237–2255. doi: 10.1152/jn.00035.2019
 41. Wheeler C, Smith LJ, Sakel M, et al. A systematic review of vestibular stimulation in post-stroke visual neglect. *Neuropsychol Rehabil*. 2025;35(2):408–440. doi: 10.1080/09602011.2024.2338603
 42. Kerkhoff G, Keller I, Artinger F, et al. Recovery from auditory and visual neglect after optokinetic stimulation with pursuit eye movements—transient modulation and enduring treatment effects. *Neuropsychologia*. 2012;50(6):1164–1177. doi: 10.1016/j.neuropsychologia.2011.09.032
 43. Leontiev AN, Zaporozhets AV. [Restoring movement: psychophysiological study of hand function restoration after injury]. Moscow: Sovetskaya nauka; 1945. Russian.
 44. Duncan J. Selective attention and the organization of visual information. *J Exp Psychol Gen*. 1984;113(4):501–517. doi: 10.1037//0096-3445.113.4.501
 45. Posner MI, Walker JA, Friedrich FJ, et al. Effects of parietal injury on covert orienting of attention. *J Neurosci*. 1984;4(7):1863–1874. doi: 10.1523/JNEUROSCI.04-07-01863.1984
 46. Turgut N, Möller L, Dengler K, et al. Adaptive Cueing Treatment of Neglect in Stroke Patients Leads to Improvements in Activities of Daily Living: A Randomized Controlled, Crossover Trial. *Neurorehabil Neural Repair*. 2018;32(11):988–998. doi: 10.1177/1545968318807054
 47. Schenke N, Franke R, Puschmann S, et al. Can auditory cues improve visuo-spatial neglect? Results of two pilot studies. *Neuropsychol Rehabil*. 2021;31(5):710–730. doi: 10.1080/09602011.2020.1727931
 48. Robertson IH, McMillan TM, MacLeod E, et al. Rehabilitation by limb activation training reduces left-sided motor impairment in unilateral neglect patients: A single-blind randomised control trial. *Neuropsychol Rehabil*. 2002;12(5):439–454. doi: 10.1080/09602010244000228
 49. Kaufmann BC, Cazzoli D, Bartolomeo P, et al. Auditory spatial cueing reduces neglect after right-hemispheric stroke: A proof of concept study. *Cortex*. 2022;148:152–167. doi: 10.1016/j.cortex.2021.12.009
 50. Shipkova KM, Bulygina VG. [Neuropsychological and neurobiological basis for the recovery of higher brain functions. Modularity VS theory of system and dynamic localization of functions]. *Vestnik Moskovskogo universiteta. Seriya 14. Psikhologiya*. 2023;46(3):166–188. Russian. doi: 10.11621/LPJ-23-32
 51. Gouret A, Le Bars S, Porssut T, et al. Advancements in brain-computer interfaces for the rehabilitation of unilateral spatial neglect: a concise review. *Front Neurosci*. 2024;18:1373377. doi: 10.3389/fnins.2024.1373377
 52. Saj A, Pierce JE, Ronchi R, et al. Real-time fMRI and EEG neurofeedback: A perspective on applications for the rehabilitation of spatial neglect. *Ann Phys Rehabil Med*. 2021;64(5):101561. doi: 10.1016/j.rehab.2021.101561
 53. Rossetti Y, Rode G, Pisella L, et al. Prism adaptation to a rightward optical deviation rehabilitates left hemispatial neglect. *Nature*. 1998;395(6698):166–169. doi: 10.1038/25988
 54. Li J, Li L, Yang Y, et al. Effects of Prism Adaptation for Unilateral Spatial Neglect After Stroke: A Systematic Review and Meta-Analysis. *Am J Phys Med Rehabil*. 2021;100(6):584–591. doi: 10.1097/PHM.0000000000001598
 55. Rode G, Lacour S, Jacquin-Courtois S, et al. Long-term sensorimotor and therapeutical effects of a mild regime of prism adaptation in spatial neglect. A double-blind RCT essay. *Ann Phys Rehabil Med*. 2015;58(2):40–53. doi: 10.1016/j.rehab.2014.10.004
 56. Székely O, Ten Brink AF, Mitchell AG, et al. No short-term treatment effect of prism adaptation for spatial neglect: An inclusive meta-analysis. *Neuropsychologia*. 2023;189:108566. doi: 10.1016/j.neuropsychologia.2023.108566
 57. Bourgeois A, Turri F, Schnider A, et al. Virtual prism adaptation for spatial neglect: A double-blind study. *Neuropsychol Rehabil*. 2022;32(6):1033–1047. doi: 10.1080/09602011.2020.1864412
 58. Overman MJ, Binns E, Milosevich ET, et al. Recovery of Visuospatial Neglect with Standard Treatment: A Systematic Review and Meta-Analysis. *Stroke*. 2024;55(9):2325–2339. doi: 10.1161/STROKEAHA.124.046760
 59. Tavaszi I, Nagy AS, Szabo G, et al. Neglect syndrome in post-stroke conditions: assessment and treatment (scoping review). *Int J Rehabil Res*. 2021;44(1):3–14. doi: 10.1097/MRR.0000000000000438
 60. Sugimoto S, Fujino Y. Neglected-Field Eye Patching Improves Visual Inattention in Hemispatial Neglect: A Case Study. *Prog Rehabil Med*. 2017;2:20170012. doi: 10.2490/prm.20170012
 61. Machner B, Könemund I, Sprenger A, et al. Randomized controlled trial on hemifield eye patching and optokinetic stimulation in acute spatial neglect. *Stroke*. 2014;45(8):2465–2468. doi: 10.1161/STROKEAHA.114.006059
 62. Varako NA. [The emergence of neurorehabilitation. The first rehabilitation programmes]. *Vestnik vosstanovitel'noj mediciny*. 2014;(2):76–83. Russian.
 63. Zhang Y, Xing Y, Li C, et al. Mirror therapy for unilateral neglect after stroke: A systematic review. *Eur J Neurol*. 2022;29(1):358–371. doi: 10.1111/ene.15122
 64. Barbara JB, Anna MB, Kelly JR, et al. Effectiveness of Visual Scanning Training at Reducing Left Neglect: A Systematic Review. *Open Access J Neurol Neurosurg*. 2019;10(2):555781.

doi: 10.19080/OAJNN.2019.10.555781

65. Gandhi DB, Sterba A, Khatter H, et al. Mirror Therapy in Stroke Rehabilitation: Current Perspectives. *Ther Clin Risk Manag.* 2020;16:75–85. doi: 10.2147/TCRM.S206883
 66. Fong KNK, Ting KH, Zhang X, et al. The Effect of Mirror Visual Feedback on Spatial Neglect for Patients after Stroke: A Preliminary Randomized Controlled Trial. *Brain Sci.* 2023;13(1):3. doi: 10.3390/brainsci13010003
 67. Matsumoto N, Nakai R, Ino T, et al. Brain activity associated with the rubber foot illusion. *Neurosci Lett.* 2020;721:134820. doi: 10.1016/j.neulet.2020.134820
 68. Matys-Popielska K, Popielski K, Sibilska-Mroziewicz A. Study of the Possibility of Using Virtual Reality Application in Rehabilitation among Elderly Post-Stroke Patients. *Sensors (Basel).* 2024;24(9):2745. doi: 10.3390/s24092745
 69. Zinchenko YuP, Menshikova GYa, Bayakovskiy YuM, et al. [Virtual reality technology in the context of world and national psychology: methodological aspects, achievements and prospects]. *Nacional'nyj psikhologicheskij zhurnal.* 2010;(2):64–71. Russian.
 70. Cavedoni S, Cipresso P, Mancuso V, et al. Virtual reality for the assessment and rehabilitation of neglect: where are we now? A 6-year review update. *Virtual Real.* 2022;26(4):1663–1704. doi: 10.1007/s10055-022-00648-0
 71. Shaikh MT, Younas U, Irshad I, et al. Rehabilitation of hemispatial neglect in stroke. *J Pak Med Assoc.* 2022;72(4):779–781. doi: 10.47391/JPMA.22-32
 72. Barrett AM, Houston KE. Update on the Clinical Approach to Spatial Neglect. *Curr Neurol Neurosci Rep.* 2019;19(5):25. doi: 10.1007/s11910-019-0940-0
 73. Guilbert A. Clinical assessment of unilateral spatial neglect dissociations and heterogeneities: A narrative synthesis. *Neuropsychology.* 2023;37(4):450–462. doi: 10.1037/neu0000841
 74. Cicerone KD, Goldin Y, Ganci K, et al. Evidence-Based Cognitive Rehabilitation: Systematic Review of the Literature From 2009 Through 2014. *Arch Phys Med Rehabil.* 2019;100(8):1515–1533. doi: 10.1016/j.apmr.2019.02.011
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Research Trends on Smoking, Depression, and Anxiety: Bibliometric Analysis

Актуальные тенденции взаимосвязи курения, депрессии и тревоги в научных исследованиях: библиометрический анализ

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Review

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ABSTRACT

BACKGROUND: Smoking, along with mental illnesses such as depression and anxiety, represents a major public health concern. Bibliometric analysis offers a distinct perspective on the connections between these conditions.

AIM: To conduct a bibliometric analysis using network visualization mapping to explore research on smoking, depression, and anxiety.

METHODS: A literature search was performed using PubMed, Scopus, and Lens. The search used keywords “smoking”, “nicotine dependence”, “anxiety”, and “depression”. Data were extracted and analyzed using bibliometric indicators, including publication and citation trends, leading countries and organizations, influential authors, journals, and frequently occurring keywords. Network visualization mapping was performed by using VOSviewer software.

RESULTS: A total of 138 papers were selected and reviewed based on the predefined eligibility criteria. These papers were published between 1991 and 2024. The analysis highlighted key trends: publications peaked in 2013 with 10 papers, while citations were highest in 2008 with 549. The most influential organizations were the Department of Preventive Medicine, University of Southern California, and the Department of Psychiatry, New York University School of Medicine. Naomi Breslau was identified as the most influential author, and *Nicotine and Tobacco Research* as the leading journal. The most frequently occurring keywords were “smoking”, “depression”, and “anxiety”, and “nicotine dependence”.

CONCLUSION: This bibliometric analysis identified the scholarly impact and characteristics of publications and provides researchers and policymakers with baseline data to guide research strategies on smoking and mental health.

АННОТАЦИЯ

ВВЕДЕНИЕ: Курение и психические заболевания, в частности депрессия и тревожное расстройство, являются серьезными проблемами общественного здоровья. Библиометрический анализ вносит уникальный вклад в установление связи между курением, депрессией и тревогой.

ЦЕЛЬ: Выполнить библиометрический анализ с построением карт сетевой визуализации для исследования взаимосвязи курения, депрессии и тревоги в научной литературе.

МЕТОДЫ: Провели поиск литературы в базах PubMed, Scopus и Lens с использованием ключевых слов: «курение», «никотиновая зависимость», «тревога», «депрессия». Из отобранных публикаций извлекли данные и проанализировали с помощью таких библиометрических показателей, как динамика публикаций и цитирований; ведущие страны и организации; наиболее влиятельные авторы, журналы и часто встречающиеся ключевые слова. Для построения и визуализации сетей применяли программное обеспечение VOSviewer.

РЕЗУЛЬТАТЫ: В соответствии с заданными критериями включения в анализ вошли 138 статей, опубликованных в период с 1991 по 2024 г. Проведенный анализ выявил следующие тенденции: пик публикационной активности пришелся на 2013 г. (10 статей), тогда как максимальное число цитирований (549) зафиксировано в 2008 г. Согласно анализу, наиболее влиятельными организациями были признаны кафедра профилактической медицины Университета Южной Калифорнии и кафедра психиатрии Медицинской школы Нью-Йоркского университета. Naomi Breslau заняла первую позицию среди авторов по влиятельности, а журнал *Nicotine and Tobacco Research* лидировал среди научных журналов. Анализ ключевых слов выявил преобладание следующих терминов: «курение», «депрессия», «тревога» и «никотиновая зависимость».

ЗАКЛЮЧЕНИЕ: Данный библиометрический анализ взаимосвязи курения, депрессии и тревоги предоставляет исследователям и органам, формирующим политику в сфере здравоохранения, систематизированную основу для формирования приоритетных направлений научных исследований в области психического здоровья и курения.

Keywords: *bibliometric analysis; anxiety; depression; nicotine dependence; smoking*

Ключевые слова: *библиометрический анализ; тревога; депрессия; никотиновая зависимость; курение*

INTRODUCTION

Tobacco consumption is a global health concern, responsible for over 8 million deaths annually¹. Cigarette smoking is the most common form of tobacco use worldwide. Smoking is considered a chronic nicotine dependence disorder that contributes to numerous non-communicable diseases (NCDs) [1] and to disabilities affecting physical and mental health [2, 3]. According to the World Health Organization 2021 factsheet, tobacco use is closely linked to a range of mental health issues. Smoking is twice as prevalent among individuals with mental illness². Together, mental illness and smoking represent two prevalent and debilitating conditions that pose a significant public health challenge.

Existing literature shows an association between smoking, depression and anxiety. There are several hypotheses about this association. One hypothesis is that smoking serves as a form of “self-medication” for sadness or negative mood, whereby symptoms of depression and anxiety may increase the likelihood of smoking. Another hypothesis suggests that smoking itself may lead to depression and anxiety

by altering an individual’s neurocircuitry and increasing susceptibility to environmental stressors. The relationship may also be bidirectional, with occasional smoking used to relieve symptoms but ultimately exacerbating them over time [4]. Because nicotine has a short half-life and quickly triggers withdrawal symptoms (including mood disturbances), smokers may misinterpret the short-term relief as a genuine anxiolytic effect [4, 5].

Bibliometric analysis (BA) allows researchers to investigate the development of a discipline over time and to identify new areas within the field [6]. According to the BIBLIO guideline³, BA is defined as “a review of all full published papers that appear in biomedical journals and includes all types of evidence, such as descriptive studies, observational studies, experimental studies, qualitative studies, and systematic reviews in order to account for every single existing piece of evidence. BA excludes electronic publications ahead of print since the final publication dates are not known” [7]. The academic impact of research is commonly assessed by citation counts [8]. BA is considered the key technique

¹ WHO report on the global tobacco epidemic, 2023: protect people from tobacco smoke. Geneva: World Health Organization 2023. Available from: <https://www.who.int/publications/i/item/9789240077164>

² The vicious cycle of tobacco uses and mental illness—a double burden on health. Available from: <https://www.who.int/europe/news/item/08-11-2021-the-vicious-cycle-of-tobacco-use-and-mental-illness-a-double-burden-on-health>

³ Available from: <https://systematicreviewsjournal.biomedcentral.com/articles/10.1186/s13643-023-02410-2/tables/3>

in performing citation analysis [9]. BA also provides an overview of the relationship among studies through graphical representations, tables, network diagrams, typically using specialized software [10]. Systematic review and meta-analysis are the traditional methods of reviewing and evaluating the literature. A systematic review involves the structured collection, organization, and appraisal of existing literature [11]. However, this process is time-consuming, and the number of studies analyzed is limited and susceptible to bias, raising the risk of excluding important evidence [12]. In meta-analysis, the investigator summarizes empirical evidence on relationships between variables, while uncovering associations not directly examined in existing studies [6]. Hence, meta-analysis is a compelling method, but it is limited in the studies' nature and breadth that can be analyzed. Compared with traditional approaches such as systematic review and meta-analysis, BA can reduce bias and yield a broader and more informative overview of the literature [13].

Existing bibliometric studies on smoking and mental illness are limited in scope and highlight several key research gaps. For example, a significant portion of current research [14] has focused exclusively on Australia and on the co-occurrence of physical illness with serious mental disorders. As a result, this study lack a global perspective and treat smoking as one of many physical health issues rather than a specific area of focus. In addition, other studies [15, 16] have addressed mental illness as a single broad category. This approach hinders a detailed understanding of the research landscape for specific, high-prevalence comorbidities like depression and anxiety, making it difficult to pinpoint research trends and needs in these areas. To address these gaps, we conducted a BA using network visualization mapping to examine research on smoking, depression, and anxiety. Specifically, the study identifies trends in research publications and keywords, influential researchers, highly cited works, and leading research organizations in this field.

METHODS

Data sources

The literature was searched using PubMed, Scopus, and Lens.

Search strategy

The search was based on the keywords "smoking", "nicotine dependence", "depression", and "anxiety" in the title, abstract

or other publication fields. Boolean operators (AND, OR) were used to combine these terms effectively. The search was limited to English-language publications and was conducted up to August 2024. To ensure research quality, only original research articles and review papers were included.

The search strategies are as below:

- PubMed: ("smoke"[MeSH Terms] OR "smoke"[All Fields] OR "smoke s"[All Fields] OR "smoked"[All Fields] OR "smokes"[All Fields] OR "smoking"[MeSH Terms] OR "smoking"[All Fields] OR "smokings"[All Fields] OR "smoking s"[All Fields]) AND ("tobacco use disorder"[MeSH Terms] OR ("tobacco"[All Fields] AND "disorder"[All Fields]) OR "tobacco use disorder"[All Fields] OR ("nicotine"[All Fields] AND "dependence"[All Fields]) OR "nicotine dependence"[All Fields]) AND ("depress anxiety"[Journal] OR "arch depress anxiety"[Journal] OR ("depression"[All Fields] AND "anxiety"[All Fields]) OR "depression anxiety"[All Fields]);
- Scopus: TITLE-ABS-KEY (smoking AND nicotine AND dependence AND depression AND anxiety);
- Lens: smoking AND (nicotine AND (dependence AND (depression AND anxiety))).

Time period

No time restrictions were placed on the literature selection.

Eligibility criteria

Inclusion criteria:

- papers published in English;
- observational studies conducted on human participants;
- narrative and systematic reviews, editorials and conference papers.

Exclusion criteria:

- studies that included participants who were pregnant or had systemic comorbidities;
- studies examining the association between parental smoking and offspring outcomes.

Data refinement

Two authors (P.S. and Z.M.) independently screened the papers retrieved from the electronic searches. Based on eligibility criteria, both authors independently conducted a full-text appraisal, compared their assessments, discussed any discrepancies, and reached a final decision. Inter-rater

reliability was assessed using kappa statistics, yielding a value of 0.89, which indicates strong agreement between the authors.

For data extraction, the following parameters were entered into a pre-formatted sheet: authors' names, publication year, author affiliation, publication trends (frequency of publications per year from the first included paper), title and paper type (original research, review, editorial, conference paper), keywords, and citation counts. Citation counts were recorded from publication up to August 2024, using citation metrics from the Scopus database. The impact factor was based on the journal's homepage and CiteScore (Scopus).

Data synthesis

Data analysis involved constructing bibliometric networks for the selected papers. Bibliometric indicators were selected to address the research questions (Table 1). The analysis considered several aspects, including publication and citations trends, leading countries and organizations (based on first author affiliation), influential authors, journals, and frequently occurring keywords.

Descriptive analysis was conducted for proportions and means, as applicable. The Statistical Package for the Social Science (SPSS, version 23, IBM Corp., USA) was used for all analyzes. VOSviewer software⁴ (version 1.6.18) was used to construct and visualize the bibliometric networks. These networks can be constructed based on influential authors, journals, the top-cited papers, and co-occurrence patterns of keywords.

RESULTS

Descriptive findings

A total of 3,259 papers were retrieved from PubMed ($n=488$), Scopus ($n=824$), and Lens ($n=1,947$). Of these, 381 duplicates were removed. A further 2,329 non-English papers or those not meeting eligibility criteria were excluded. The titles and descriptions of the remaining 549 papers were manually extracted. An additional 411 papers were excluded based on study descriptions, leaving 138 papers for the final analysis (Figure 1 and Table S1 in the Supplementary).

Schematic map and trend

The selected papers were published between 1991 and 2024 (Table 2). Figure 2 shows publications over time. Nine papers were published in both 2008 and 2012, while publication peaked in 2013 with 10 papers. On average, 4.76 papers were published per year. There were a total of 110 original research papers. Between 1991 and 2024, publications came from 32 countries, led by the United States of America ($n=66$), followed by the United Kingdom ($n=10$) (Figure 3). The total 138 papers received a total of 5,115 citations. The average number of citations per paper is 37.07. The highest annual citation count was recorded in 2008 ($n=549$). The citation trends are presented in Figure 4.

Tabulation and summarizing the findings

The most cited authors

In total, 479 authors contributed to the literature on smoking, depression, and anxiety. The top five influential authors were identified based on average citations per

Table 1. Bibliometric indicators and its significance

Indicators	Significance
What is the publication trend?	To determine publication volume to predict the future trend.
What type of papers are published on smoking, depression, and anxiety?	To help identify paper types to assist the researcher in identifying future research directions.
Which countries lead in the publication of research on smoking, depression, and anxiety?	To help understand which country is concentrating more on smoking, depression, and anxiety.
Who are the most influential authors and which journals contributing the most articles on smoking, depression, and anxiety?	To help researchers find specific studies, methods, and material to conduct high-quality research. Also, to help select journals for future publication.
What are the leading organizations for research on smoking, depression, and anxiety?	To help researchers select institutions, universities, or organizations.
What is the keyword and citation network of smoking, depression, and anxiety?	To be an easy search method for future researchers.

⁴ Available from: <https://www.vosviewer.com>

Table 2. Descriptive statistics of selected papers

Variables	Outcomes
Total number of selected papers	138
Timespan	1991–2024
Total number of journals	95
Minimum- maximum paper published in a year	1–10
Average papers published per year	4.76
Type of paper: original research review editorial conference paper	110 (79.71%) 23 (16.67%) 3 (2.17%) 2 (1.45%)
Papers published in total number of countries	32
Total citations	5,115
Average citations per paper	37.07
Average citations per year per paper	1.28
Authors	479
Papers per Author	28.81
Authors per paper	3.47
Total keywords	1,105
Author’s keywords	188

paper (Table 3). Figure 5 presents the co-citation network of authors with 112 clusters, 1,179 links, and a total link strength of 1,205. Groups of authors in the citation map are represented by clusters of the same color. Naomi Breslau was the most influential author, with six publications totaling 711 citations and an average of 118.5 citations per paper. The network shows that Naomi Breslau has 16 links and a total link strength of 18.

The most influential journals

A total of 95 journals reported papers on smoking, depression, and anxiety. The network of 95 journals is shown in Figure 6. *Nicotine and Tobacco Research* published 10 papers, which received a total of 816 citations, averaging 81.60 citations per paper (Table 4).

The most influential organizations

A total of 134 organizations reported their work on smoking, depression, and anxiety. The top three organizations are presented in Table 5. The Department of Preventive Medicine at the University of Southern California, the Keck School of Medicine, Los Angeles, California, and the Department of Psychiatry, New York University School of Medicine rank first among the three papers.

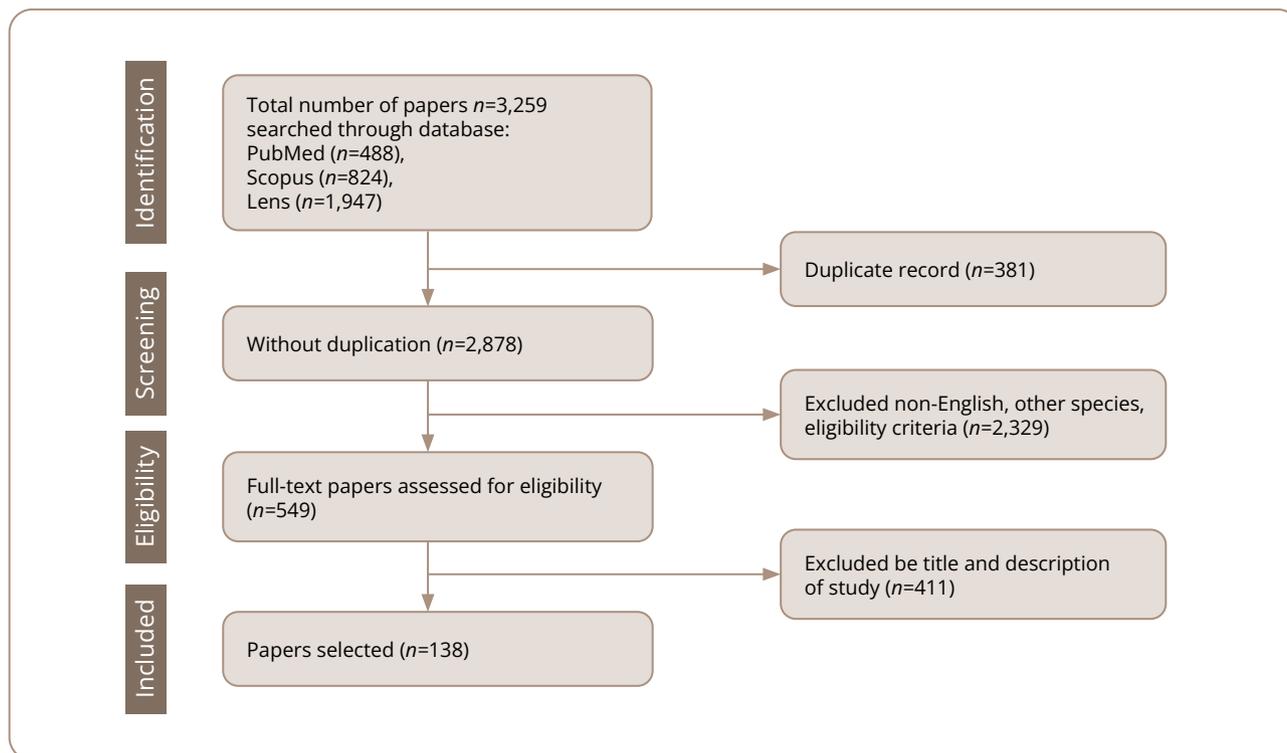


Figure 1. Flow diagram for selection of papers.

Source: Parkar et al., 2025.

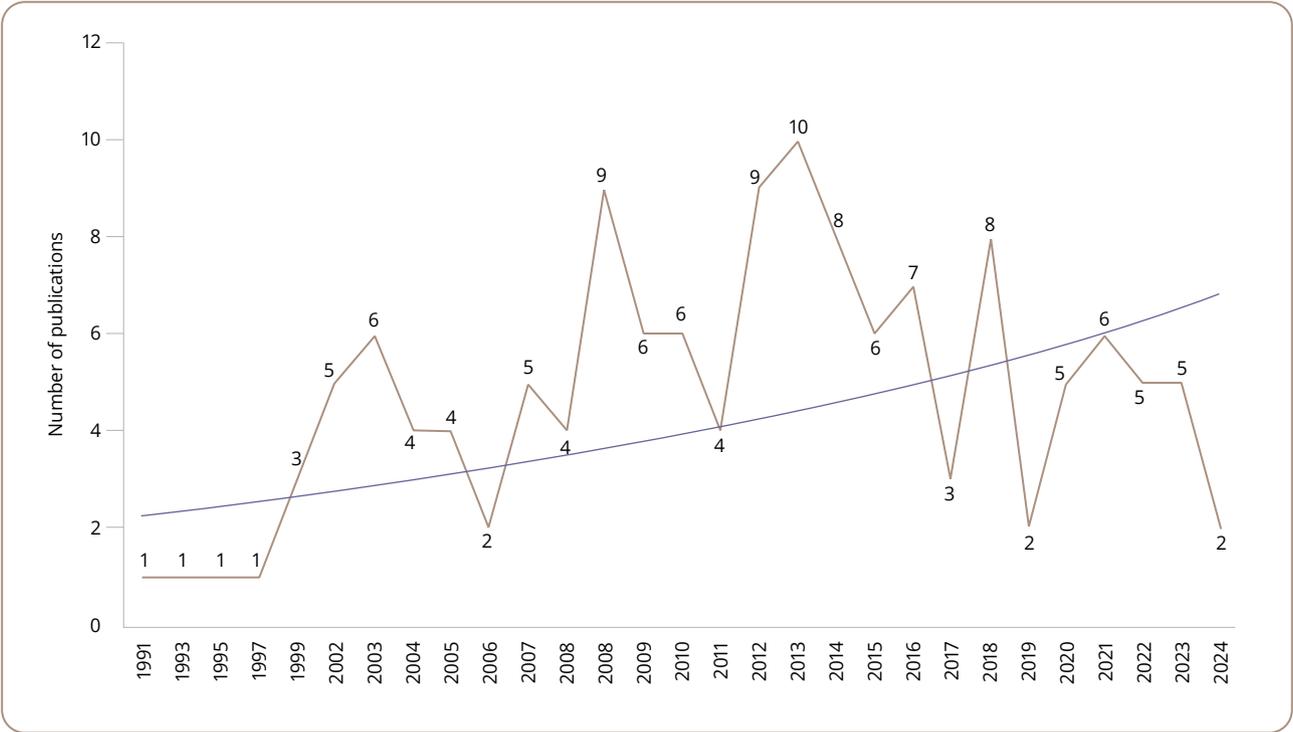


Figure 2. Publication trends.

Source: Parkar et al., 2025.

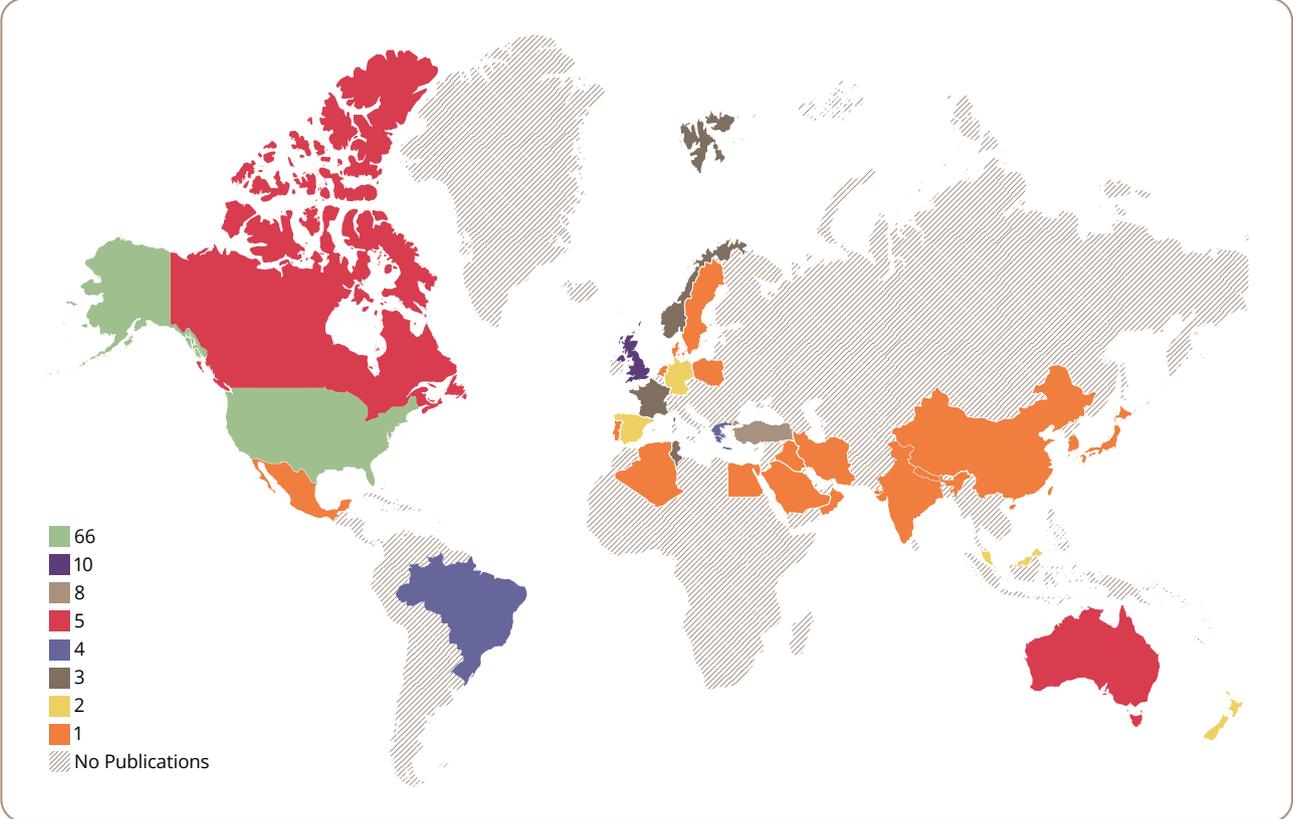


Figure 3. Publication countries.

Source: Parkar et al., 2025.

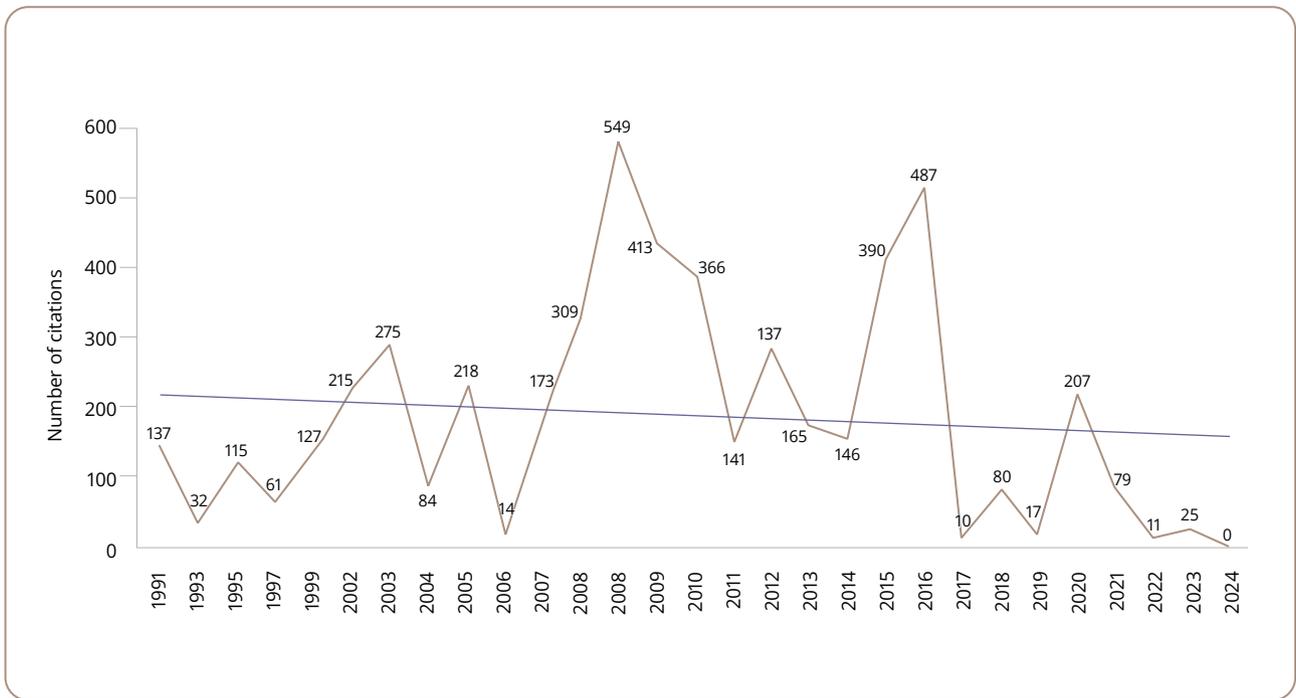


Figure 4. Trends in paper citations.

Source: Parkar et al., 2025.

The most cited papers

Figure 7 presents the citation network of the 138 papers. Table 6 shows the top 10 cited papers. The paper titled “The Association of Cigarette Smoking with Depression and Anxiety: A Systematic Review,” published in 2017 by Fluharty et al. [4] is the most cited paper having 363 citations.

Keywords analysis

A co-occurrence network analysis of the keywords was conducted. A total of 118 keywords were identified. For visualization, mapping of keywords with a minimum occurrence of 2 threshold 41 words were distributed in four clusters, as shown in Figure 8. There were 193 links, with a total link strength of 349. The first cluster (red) includes 12 words with “smoking” the most frequent (n=59), linked 33 times with a total link strength of 101. The second cluster (green) includes 11 words with “nicotine dependence” the most frequent (n=23), with 24 links and a total link strength of 59. The third cluster (blue) included 10 words with “smoking cessation” the most frequent (n=15), having 17 links and a total link strength of 33. The fourth cluster (pink) includes eight words with “cigarette smoking” the most frequent (n=3), having eight links and a total link strength of 9. The interaction between the nodes influences smoking behaviors, dependence levels, and cessation

outcomes. The node characteristics show the smoking attributes to the frequency of smoking, duration, and level of dependence. The link strength reflects the relationship between nodes.

DISCUSSION

The present BA provides novel insights into research trends, influential authors, journals, and organizations related to smoking, depression, and anxiety. BAs typically focus on quantitative indicators such as highly cited authors, journals, articles, and countries that have significantly shaped the research domain of smoking, depression, and anxiety [17]. Additionally, analyzing depression and anxiety together in relation to smoking may be more resource-efficient, as it avoids duplication and allows for a more comprehensive examination of smoking’s impact on mental health. Furthermore, a combined analysis can capture these complex relationships more effectively than separate analyzes.

Fluctuating trends were observed in the number of yearly publications. During the initial years, the publications were minimal. A gradual increase occurred between 2012 and 2017. This trend is consistent with previous findings [15, 16]. Publications peaked in 2013 with 10. From 2020 to 2023, publications remained steady. By August 2024,

Table 3. Top five influential authors based on the published papers and average citation per paper

Rank*	Author	Published papers	Total citations	Average citation per paper	Average citations per year per paper
1st	Naomi Breslau	6	711	118.5	4.62
2nd	Adam Matthew Leventhal	5	291	58.2	6.77
3rd	Michael J Zvolensky	4	297	74.25	5.60
3rd	Reene D Goodwin	4	104	26	1.89
3rd	Richard Hébert	4	2	0.5	0.03
5th	Nicola Lindson	3	165	55	15.00

Note: *In the ranking, authors having an equal number of papers were given similar ranks and the subsequent position in the rank was skipped.

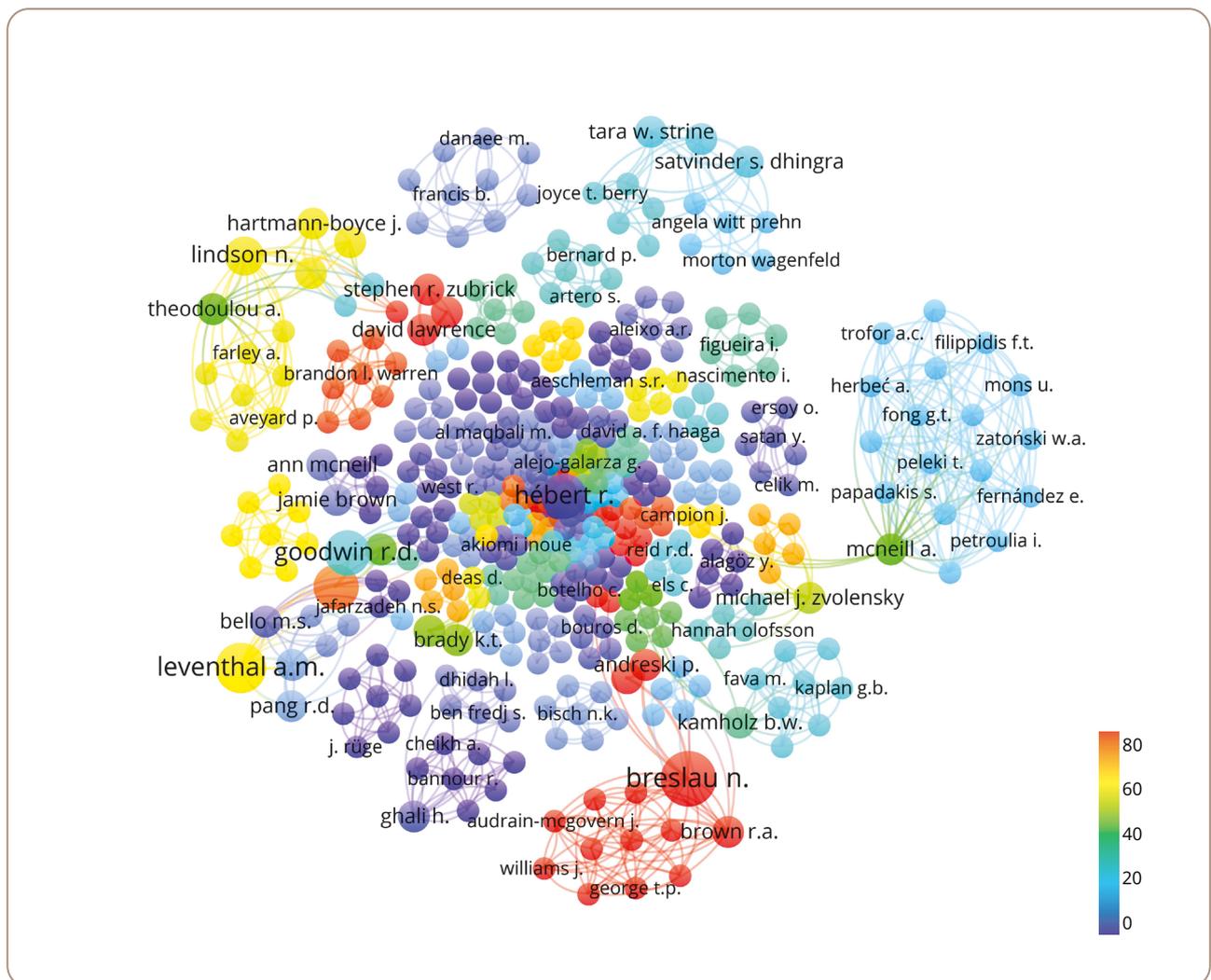


Figure 5. Network visualization map of author co-citations.

Note: Each node on the map represents an author; the size of the circle reflects the number of articles published by them. Cool colors represent fewer average citations than warm colors. Total clusters — 112; items — 479; links — 1,179; total link strength — 1,205.

Source: Parkar et al., 2025.

Table 4. Top five most influential journals based on the published papers and average citation per paper

Rank*	Journal	Published papers	Total citations	Average citation per paper	Publisher	Impact factor**
1st	<i>Nicotine and Tobacco Research</i>	10	816	81.60	Oxford University Press	4.7 (2022)
2nd	<i>Addictive Behaviors</i>	7	180	25.71	Elsevier	4.4 (2023)
3rd	<i>Addiction</i>	4	237	59.25	Wiley	6.10 (2022)
3rd	<i>Cochrane Database of Systematic Reviews</i>	4	379	94.75	Wiley	8.4 (2023)
3rd	<i>Journal of Dual Diagnosis</i>	4	33	8.25	Taylor & Francis	2.2 (2022)
5th	<i>American Journal on Addictions</i>	3	71	23.67	Wiley	3.7 (2022)
5th	<i>BMC Public Health</i>	3	232	77.33	BioMed Central	4.5 (2022)
5th	<i>Drug and Alcohol Dependence</i>	3	27	9.00	Elsevier	4.2 (2023)
5th	<i>Journal of Psychiatric Research</i>	3	108	36.00	Elsevier	4.8 (2023)

Note: *Journals with the same number of papers were assigned the same rank, and the subsequent rank was skipped. **The impact factor was based on the journal's homepage and CiteScore (Scopus).

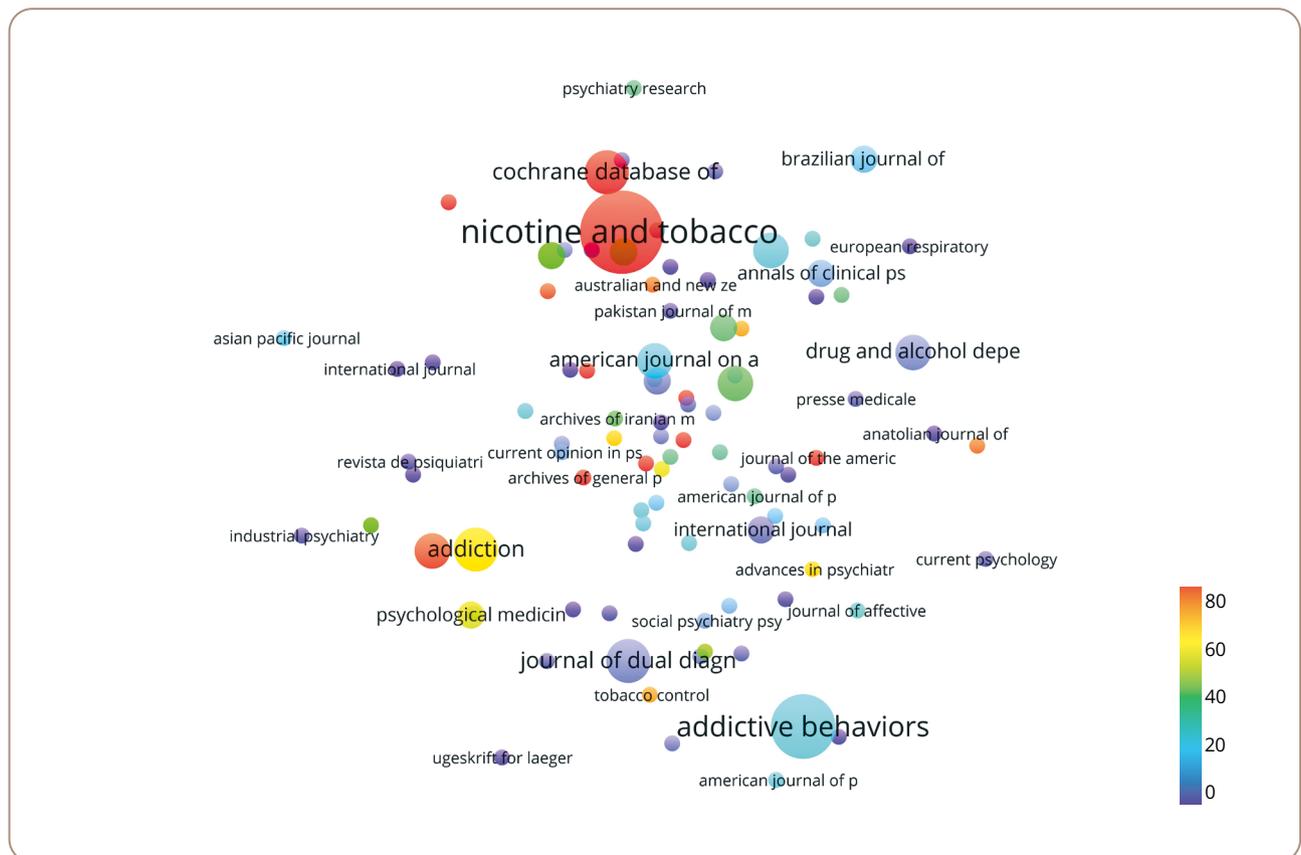


Figure 6. Network visualization map of influential journals.

Note: Cool colors represent lesser average citations than warm colors. Total clusters — 95; items — 95.

Source: Parkar et al., 2025.

Table 5. Top three most influential organizations based on the published papers

Rank*	Organization	City, State	Country	Published papers
1st	Department of Preventive Medicine, University of Southern California, Keck School of Medicine	Los Angeles, California	United States of America	3
1st	Department of Psychiatry, New York University School of Medicine	New York	United States of America	3
3rd	Department of Epidemiology, Mailman School of Public Health, Columbia University	New York	United States of America	2
3rd	Department of Psychology, Queens College, City University of New York	New York	United States of America	2
3rd	Department of Sociology and Human Geography, University of Oslo	Oslo	Norway	2
3rd	Laboratório De Pânico E Respiração, Instituto De Psiquiatria, Universidade Federal Do Rio De Janeiro	Rio De Janeiro	Brazil	2
3rd	National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention	Atlanta	United States of America	2
3rd	Va Boston Healthcare System and Boston University School of Medicine	Boston	United States of America	2
3rd	Respiratory Department, Sotiria Hospital	Athens	Greece	2

Note: *In the ranking, organizations having an equal number of papers were given similar ranks, and the subsequent position in the rank was skipped.

only two publications had been recorded as the year was just beginning when the data collection began. Given the urgent need to understand the association between smoking and NCD — with particular emphasis on mental illness, especially depression — the number of publications is expected to increase in the coming years. Increasing research publications on smoking and depression can enhance our understanding, guide interventions, and ultimately improve public health outcomes.

The distribution of publication types provides valuable insights into ongoing research on the relationship between smoking, depression, and anxiety. Of the publications, 79.71% were original research. The original papers were in the form of descriptive studies, with a limited focus on interventional studies. Similar findings were observed by Metse et al. [15]. Intervention-focused research suggested a recent surge in the adoption of clinical trials, although progress in translating this research into practice has remained limited [16]. Only 16.67% of the publications were review papers, indicating that future research will be driven by the need to address identified gaps or resolve contradictory findings. Editorials accounted for just 2.17% of the publications, indicating that, despite the strength of

the empirical work, there has been relatively little scholarly commentary, potentially limiting theoretical development and policy guidance in this field.

Geographically, North America contributed 71 papers (51.45%), with the majority coming from the United States of America (47.82%). Europe ranked second, contributing 29 papers (21.01%), led by the United Kingdom (7.25%). This country-level pattern of publication is consistent with the findings of Rinaldi et al. [16]. Countries with a high prevalence of smoking, depression, and anxiety often experience a significant public health burden related to these issues within their populations⁵. However, when certain regions or demographic groups within a country exhibit a high burden but limited corresponding research output, it indicates a critical knowledge gap. This difference is frequently due to a complex interplay of factors, including insufficient research funding, poor research infrastructure, and a lack of knowledge or prioritization of these specific health concerns [27]. In our analysis, very few papers originated from Asian nations. This suggests that international funding and scientific collaboration are crucial, especially for Asian nations with high rates of tobacco use.

⁵ The vicious cycle of tobacco uses and mental illness-a double burden on health.

Available from: <https://www.who.int/europe/news/item/08-11-2021-the-vicious-cycle-of-tobacco-use-and-mental-illness-a-double-burden-on-health>

Table 6. Top ten most cited papers

Rank	Author (Year)	Title	Journal	Citations*
1st	Fluharty et al. (2017) [4]	The Association of Cigarette Smoking with Depression and Anxiety: A Systematic Review	<i>Nicotine and Tobacco Research</i>	363
2nd	Ziedonis et al. (2008) [18]	Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health report	<i>Nicotine and Tobacco Research</i>	310
3rd	Hughes et al. (2007) [19]	Antidepressants for smoking cessation	<i>Cochrane Database of Systematic Reviews</i>	214
4th	Leventhal et al. (2015) [20]	Anxiety, depression, and cigarette smoking: A transdiagnostic vulnerability framework to understanding emotion-smoking comorbidity	<i>Psychological Bulletin</i>	204
5th	Lawrence et al. (2009) [21]	Smoking and mental illness: results from population surveys in Australia and the United States	<i>BMC Public Health</i>	202
6th	Picciotto et al. (2002) [22]	Effect of nicotine and nicotinic receptors on anxiety and depression	<i>Neuroreport</i>	167
7th	Moylan et al. (2012) [23]	Cigarette smoking, nicotine dependence and anxiety disorders: A systematic review of population-based, epidemiological studies	<i>BMC Medicine</i>	159
8th	Breslau et al. (1991) [24]	Nicotine Dependence, Major Depression, and Anxiety in Young Adults	<i>Archives of General Psychiatry</i>	137
9th	Tidey et al. (2015) [25]	Smoking cessation and reduction in people with chronic mental illness	<i>BMJ (Online)</i>	130
10th	McKenzie et al. (2010) [26]	Association of adolescent symptoms of depression and anxiety with daily smoking and nicotine dependence in young adulthood: Findings from a 10-year longitudinal study	<i>Addiction</i>	128

Note: *Citation counts were recorded from publication up to August 2024, using citation metrics from the Scopus database.

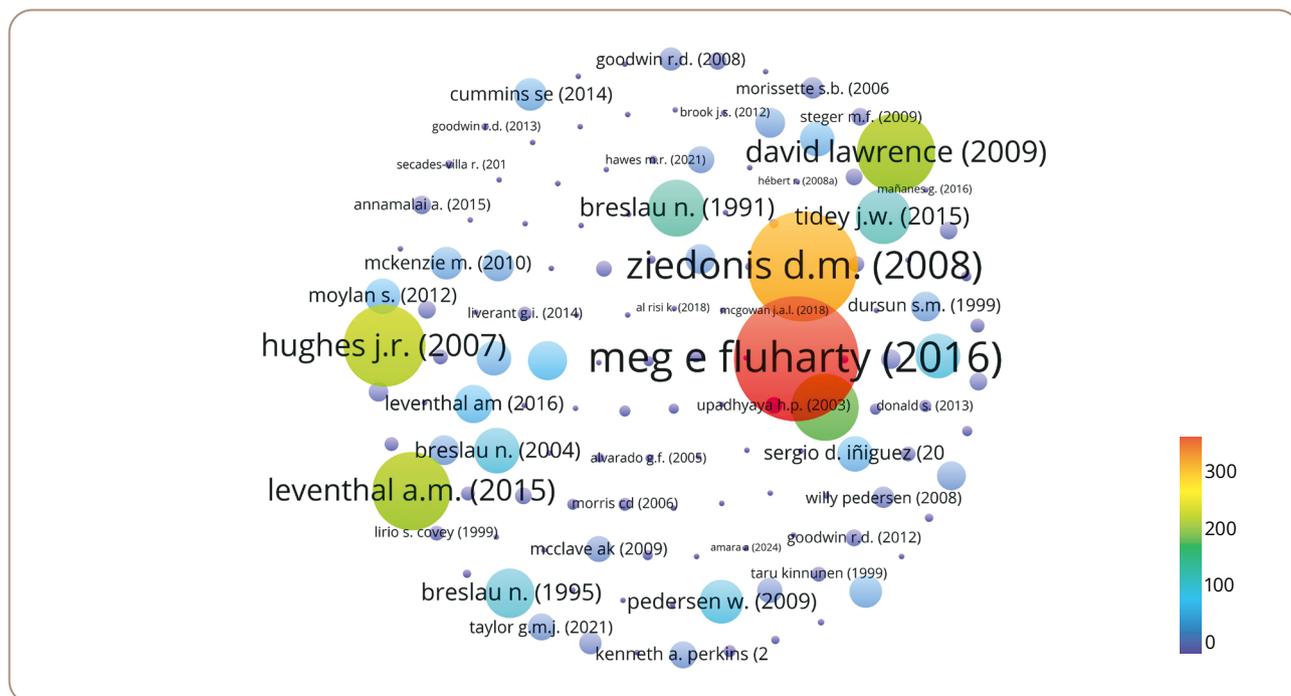


Figure 7. Network visualization map of top cited papers by authors.

Note: Cool colors represent fewer average citations than warm colors. Total clusters — 138; items — 138.

Source: Parkar et al., 2025.

published in 2017 by Fluharty et al. [4] and has 363 citations. This paper systematically reviewed the association between smoking and depression and anxiety in longitudinal studies. It reported considerable variation in the associations between smoking, depression, and anxiety. The second most cited paper was “Tobacco Use and Cessation in Psychiatric Disorders: National Institute of Mental Health Report” by Ziedonis et al. [18] which has received 310 citations since its publication in 2008. This review examined tobacco use, nicotine dependence, and smoking cessation among individuals with mental disorders, particularly those with anxiety, depression, or schizophrenia.

The three frequently occurring words were smoking ($n=59$), nicotine dependence ($n=23$), and smoking cessation ($n=15$). These keywords highlight the need for further research, as these words form the core link between smoking, depression, and anxiety. Shared keywords with similar research are represented by linking lines. For example, the term “smoking (in red)” (for the author’s keywords in Figure 8) is part of the words depression, anxiety, tobacco, prevalence, Fagerstrom scale, etc. The width of the lines connecting keywords to nodes is proportional to the strength of their co-occurrence. Cluster analysis of these keywords provides a complex relationship and cluster dynamics which can lead to targeted interventions and support strategies. Examining keywords and citation networks provides a comprehensive, data-driven overview of the research domain related to smoking, depression, and anxiety. This approach enables the identification of central concepts and the clarification of interactions among sub-concepts [28]; researchers can assess changes in focus, terminology, and scholarly communication practices.

The BA provides an integrated and up-to-date overview of research activity. However, because of limited or incomplete results in published work, often shaped by differing journal guidelines, evidence cannot be generated. The BA often addresses these issues by systematizing the consolidation of various research in similar fields [29].

To our knowledge, this is the second study to use BA with network visualization mapping in the fields of smoking, depression, and anxiety following the study by Rinaldi et al. [16]. This study identified the scholarly impact and characteristics of publications on smoking and mental illness through BA. These findings can inform researchers in developing research strategies to address smoking and mental health-related issues. This study also highlights key bibliometric indicators — such as top

journals, organizations, and keywords — that reaffirm the interconnectedness of these research areas.

The results of this study should be interpreted with caution, as they have some limitations. First, the BA was limited to English-language papers under PubMed, Scopus, and Lens. As a result, non-English publications and papers in non-indexed journals were excluded, meaning the findings may not fully represent all research on smoking, depression, and anxiety. However, these search engines are the largest and may contribute to achieving reliable results. Second, only studies conducted among human participants were considered. This choice reflects the fact that findings from human studies are more directly applicable to clinical practice, and that the complex interactions among smoking, depression, and anxiety are difficult to replicate in animal models. Third, this study did not include a country-level distribution of publications. Acknowledging this omission provides transparency and indicates a direction for future research. A separate analysis of country-level publication patterns could offer valuable insights into global research trends, collaboration, and knowledge exchange.

Another limitation is that self-citations were not excluded during citation analysis. Self-citation may create a bias for both authors and journals. Lastly, the search relied on broad and complex definitions of smoking, depression, and anxiety. This makes it difficult to achieve 100% coverage of the papers. However, every effort was made to include all pertinent published work with a minimum of irrelevant literature.

Future BA should include related subject areas, using new search terms such as smoking and co-morbid substance use disorders, and other psychiatric disorders to be analyzed and investigated for future lines of research. Longitudinal BA could track the evolution of research on smoking, depression, and anxiety over time. Such analysis would help identify shifting trends, emerging topics, and enduring research themes. Integrating BA with a meta-analytical approach will help to synthesize quantitative data from multiple studies on the relationship between smoking, depression, and anxiety. Future work could also explore how interventions, such as smoking cessation programs and mental health treatments, shape the research landscape on smoking, depression, and anxiety.

CONCLUSION

This was the first bibliometric study on smoking, depression, and anxiety using network visualization mapping. Despite

its limitations, this study provides researchers and policymakers with baseline data on smoking and mental illness. Building on these insights and future directions, researchers can advance the understanding of the complex interplay between smoking, depression, and anxiety, leading to improved interventions, policies, and outcomes in public health and mental health research.

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Supplementary data

Supplementary material to this article can be found in the online version:

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References

1. Hahad O, Beutel M, Gilan DA, et al. The association of smoking and smoking cessation with prevalent and incident symptoms of depression, anxiety, and sleep disturbance in the general population. *J Affect Disord*. 2022;313:100–109. doi: 10.1016/j.jad.2022.06.083
2. Pawlina MM, Rondina RdeC, Espinosa MM, et al. Depression, anxiety, stress, and motivation over the course of smoking cessation treatment. *J Bras Pneumol*. 2015;41:433–439. doi: 10.1590/S1806-37132015000004527
3. Hahad O, Daiber A, Michal M, et al. Smoking and Neuropsychiatric Disease-Associations and Underlying Mechanisms. *Int J Mol Sci*. 2021;22(14):7272. doi: 10.3390/ijms22147272
4. Fluharty M, Taylor AE, Grabski M, et al. The Association of Cigarette Smoking with Depression and Anxiety: A Systematic Review. *Nicotine Tob Res* 2017;19(1):3–13. doi: 10.1093/ntr/ntw140
5. Tiwari RK, Sharma V, Pandey RK, et al. Nicotine Addiction: Neurobiology and Mechanism. *J Pharmacopuncture*. 2020;23(1):1–7. doi: 10.3831/KPI.2020.23.001
6. Donthu N, Kumar S, Mukherjee D, et al. How to conduct a bibliometric analysis: An overview and guidelines. *J Bus Res*. 2021;133(5):285–296. doi: 10.1016/j.jbusres.2021.04.070
7. Montazeri A, Mohammadi S, M. Hesari P, et al. Preliminary guideline for reporting bibliometric reviews of the biomedical literature (BIBLIO): a minimum requirement. *Syst Rev*. 2023;12(1):239. doi: 10.1186/s13643-023-02410-2
8. Iftikhar PM, Ali F, Faisaluddin M, et al. A Bibliometric Analysis of the Top 30 Most-cited Articles in Gestational Diabetes Mellitus Literature (1946–2019). *Cureus*. 2019;11(2):e4131. doi: 10.7759/cureus.4131
9. Shuaib W, Khan M, Shahid H, et al. Bibliometric analysis of the top 100 cited cardiovascular articles. *Am J Cardiol*. 2015;115(7):972–981. doi: 10.1016/j.amjcard.2015.01.029
10. Manoj Kumar L, George RJ, P SA. Bibliometric Analysis for Medical Research. *Indian J Psychol Med*. 2023;45(3):277–282. doi: 10.1177/02537176221103617
11. Palmatier RW, Houston MB, Hulland J. Review articles: Purpose, process, and structure. *J Acad Mark Sci*. 2018;46(2):1–5. doi: 10.1007/s11747-017-0563-4
12. Brika SKM, Algamdi A, Chergui K, et al. Quality of Higher Education: A Bibliometric Review Study. *Front Educ*. 2021;6:666087. doi: 10.3389/educ.2021.666087
13. Mulet-Forteza C, Genovart-Balaguer J, Merigó JM, et al. Bibliometric structure of IJCHM in its 30 years. *Int J Contemp Hosp Manag*. 2019;31(12):4574–4604. doi: 10.1108/IJCHM-10-2018-0828
14. Happell B, Galletly C, Castle D, et al. Scoping review of research in Australia on the co-occurrence of physical and serious mental illness and integrated care. *Int J Ment Health Nurs*. 2015;24(5):421–438. doi:10.1111/inm.12142
15. Metse AP, Wiggers JH, Wye PM, et al. Smoking and Mental Illness: A Bibliometric Analysis of Research Output Over Time. *Nicotine Tob Res*. 2017;19(1):24–31. doi: 10.1093/ntr/ntw249
16. Rinaldi MR, Hardika J. Exploring Global Research Trends on Smoking and Mental Health: A Bibliometric Analysis. *Jurnal*

- Ekonomi Kependudukan dan Keluarga. 2025;2(1):73–90. doi: 10.7454/jekk.v2i1.06
17. Aria M, Cuccurullo C. Bibliometrix: an Rtool for comprehensive science mapping analysis. *J Informetr.* 2017;11(4):959–975. doi: 10.1016/j.joi.2017.08.007
 18. Ziedonis DM, Hitsman B, Beckham JC, et al. Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health report. *Nicotine Tob Res.* 2007;10(12):1691–1715. doi: 10.1080/14622200802443569
 19. Hughes JR, Stead LF, Lancaster T. Antidepressants for smoking cessation. *Cochrane Databases Syst Rev.* 2002;(1):CD000031. doi: 10.1002/14651858.CD000031
 20. Leventhal AM, Zvolensky MJ. Anxiety, depression, and cigarette smoking: a transdiagnostic vulnerability framework to understanding emotion-smoking comorbidity. *Psychol Bull.* 2015;141(1):176–212. doi: 10.1037/bul0000003
 21. Lawrence D, Mitrou F, Zubrick SR. Smoking and mental illness: results from population surveys in Australia and the United States. *BMC Public Health.* 2009;9:285. doi: 10.1186/1471-2458-9-285
 22. Picciotto MR, Brunzell DH, Caldarone BJ. Effect of nicotine and nicotinic receptors on anxiety and depression. *Neuroreport.* 2002;13(9):1097–1106. doi: 10.1097/00001756-200207020-00006
 23. Moylan S, Jacka FN, Pasco JA, et al. Cigarette smoking, nicotine dependence and anxiety disorders: a systematic review of population-based, epidemiological studies. *BMC Med.* 2012;10:123. doi: 10.1186/1741-7015-10-123
 24. Breslau N, Kilbey M, Andreski P. Nicotine dependence, major depression, and anxiety in young adults. *Arch Gen Psychiatry.* 1991;48(12):1069–1074. doi: 10.1001/archpsyc.1991.01810360033005
 25. Tidey JW, Miller ME. Smoking cessation and reduction in people with chronic mental illness. *BMJ.* 2015;351:h4065. doi: 10.1136/bmj.h4065
 26. McKenzie M, Olsson CA, Jorm AF, et al. Association of adolescent symptoms of depression and anxiety with daily smoking and nicotine dependence in young adulthood: findings from a 10-year longitudinal study. *Addiction.* 2010;105(9):1652–1659. doi: 10.1111/j.1360-0443.2010.03002.x
 27. Atal I, Trinquart L, Ravaud P, et al. A mapping of 115,000 randomized trials revealed a mismatch between research effort and health needs in non-high-income regions. *J Clin Epidemiol.* 2018;98:123–132. doi: 10.1016/j.jclinepi.2018.01.006
 28. Chen C. *CiteSpace: A Practical Guide for Mapping Scientific Literature.* New York: Nova Science Publishers; 2017.
 29. Ellegaard O, Wallin JA. The bibliometric analysis of scholarly production: how great is the impact? *Scientometrics.* 2015;105(3):1808–1831. doi: 10.1007/s11192-015-1645-z
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Erratum to “Duration Matters: Anticonvulsant Therapy Linked to Bone Loss in Interim Cross-Sectional Study” (Consortium PSYCHIATRICUM, 2025, Volume 6 Issue 2, doi: 10.17816/CP15553)

Ошибка в статье «Длительность терапии антиконвульсантами как фактор риска потери костной ткани: промежуточные результаты наблюдательного кросс-секционного исследования» (Consortium PSYCHIATRICUM, 2025, Т. 6, № 2, doi: 10.17816/CP15553)

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Erratum | Сообщение об ошибке

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In the article “Duration Matters: Anticonvulsant Therapy Linked to Bone Loss in Interim Cross-Sectional Study” by Natalia Sivakova et al., published in Consortium PSYCHIATRICUM journal (Volume 6 Issue 2), errors were identified that require correction.

On page 10, in the RESULTS section, the tabular data was incorrectly presented as:

- The study included 100 adult patients with epilepsy aged 21–60 years (Me=29.0; interquartile range (IQR): 25.0; 43.3) instead of (Me=36.0; interquartile range (IQR): 29.0; 43.0);
- The control group included 58 somatically healthy volunteers aged 22–60 years (Me=29; IQR: 25; 43) instead of (Me=29.0; IQR: 25.0; 43.3).

The publisher has corrected the electronic version of the published article and updated it on the journal's website (both PDF and HTML). The editorial team of the journal hopes that the mistakes could not significantly affect the perception and interpretation of the published work by readers, and should not become the reason for retraction. The editorial team and authors apologize to the readers for the mistakes made.

В статье Н.А. Сиваковой и соавт. «Длительность терапии антиконвульсантами как фактор риска потери костной ткани: промежуточные результаты наблюдательного кросс-секционного исследования», опубликованной в журнале Consortium PSYCHIATRICUM (Том 6 Выпуск 2), была допущена ошибка в указании табличных данных в тексте.

На стр. 10, в разделе РЕЗУЛЬТАТЫ были некорректно указаны табличные показатели:

- В исследование было включено 100 взрослых пациентов с эпилепсией в возрасте 21–60 лет (Me=29.0; interquartile range (IQR): 25.0; 43.3) вместо (Me=36.0; interquartile range (IQR): 29.0; 43.0);
- В контрольную группу вошли 58 соматически здоровых добровольцев в возрасте 22–60 лет (Me=29; IQR: 25; 43) вместо (Me=29.0; IQR: 25.0; 43.3).

Издательство внесло изменения в электронную версию опубликованной статьи, заменила ее на сайте журнала (PDF и HTML). Редакция журнала надеется, что допущенные ошибки не могли существенно повлиять на восприятие и интерпретацию читателями опубликованной работы и не должны быть причиной ретракции произведения. Редакция и авторский коллектив приносят извинения читателям за допущенные ошибки.

Keywords: *erratum; epilepsy; bone mineral density; osteoporosis; osteopenia; densitometry; anticonvulsants*

Ключевые слова: *ошибки; эпилепсия; минеральная плотность костной ткани; остеопороз; остеопения; денситометрия; антиконвульсанты*

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