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Turkish Journal of Psychiatry (Türk Psikiyatri Derg) is the scientific journal of Turkish Association of Nervous and Mental Health. The journal has been published four times a year in March, June, September and December, on a subscription bases since 1990. Turkish Journal of Psychiatry is indexed in PubMed, Index Medicus, TUBITAK Tıp, Psych-Info, Türkiye Atıf Dizini and has been ranked in Social Science Citation Index (SSCI) since 2005.

Turkish Journal of Psychiatry is a peer-reviewed journal that covers studies on clinical psychiatry, psychopathology, psychiatric epidemiology, psychiatric treatments (psychotherapy, psychopharmacology and the other somatic treatments), and imaging, neurophysiology and psychiatric genetics. The journal also covers child and adolescent mental health, psychology, psychiatric nursing. Target audience of the journal consists of physicians, professionals working on mental health (psychologists, psychological counselor, nurses, social workers..) and researchers.

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Meltzer HY, Lowy MT (1986) Neuroendocrine function in psychiatric disorders. *American Handbook of Psychiatry*, 2nd ed., vol. 8, PA Berger, HKH Brodie (Ed), New York . Basic Books Inc, p. 110-117.

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Towards a New Era in Science, Education, and Clinical Practice: The Promise of Artificial Intelligence in Psychiatry



Arda BAĞCAZ 

The interest to Artificial Intelligence (AI) in medicine, and psychiatry in particular is growing rapidly given its potentially groundbreaking impact. This interest is evident by the consistently increasing number of publications; simply search PubMed with the terms AI and Medicine or AI and Psychiatry and see the significant rise over the last five years. Within the scope of this editorial, let's take a look at the promises of AI in psychiatry, with specific references to the articles published in this issue of the Journal (Ballı et al. 2024, Ince Guliyev and Ucok 2024, Ozden 2024, Ozer 2024).

AI enables a comprehensive analysis of speech content, behavioral data, neuroimaging, genetic, and other biological findings. Thus, it can help reevaluate the traditional classification systems in psychiatry, help transition to more accurate diagnostic systems, and lead to the advancement of personalized medicine, such as determining individually appropriate interventions and selecting the best possible drugs and doses (Ballı et al. 2024). These technical advancements may represent a significant leap; we may be able to witness improvements which could be accomplished only by combining the effort of many generations, in a much shorter period of time.

Another field in which we may see major developments is education. We are in the beginning of a new era in medical education. Technologies capable of handling a heavy workload in this field are coming into our lives. With the tools developed, it may be possible to change teaching and learning

styles, reveal individual student needs with “personalized education” as in the concept of “personalized medicine”, create learning environments based on needs, and even plan a career with AI-supported consultancy applications (Nagi et al. 2023).

AI technologies offer great potential to assist psychiatrists in their clinical practice. Large Language Models, which analyze complex data such as emotions, thoughts, and behavioral tendencies from conversations, can provide novel screening tests for psychiatric disorders, or practical algorithms for evaluating and managing psychiatric emergencies, such as suicide risk (Ballı et al. 2024). These are only a few examples of potential advancements in clinical practice. Even changes in psychotherapy methods may occur with the emergence of possibilities to identify critical content that humans/therapists may not be able to recognize during the sessions (Ozden 2024).

Let us not forget about the potential developments in the field of publishing. AI can boost efficiency by accessing data, compiling information, producing output, and suggesting priority areas on which research should focus by discovering gaps in big data. It will make our jobs easier at every level of the research process, from conceptualization to data analysis, article writing, review, and publication. During these processes, redefining the duties and obligations of researchers, authors, referees, and editors seems inevitable.

Current AI applications are not without flaws. Biases in algorithms, concerns about data privacy, ethical challenges,

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and confabulation of Large Language Models are among the problems discussed (Ballı et al. 2024). AI answers queries using patterns acquired from big datasets (Ballı et al. 2024). Biases in the big data used to train AI may result in erroneous or biased outputs. You can find examples of confabulations, a class of these errors, in Ayhan's editorial which was written by an AI natural language processing application, previously published in the Turkish Journal of Psychiatry (Ayhan 2023). In this issue, Ozer (2024) discusses the hallucination/confabulation phenomenon related to AI. He particularly emphasizes the negative consequences derived from the biases of big data, which comprises a fundamental risk for AI applications (Ozer 2024). Within that context, "education" is a must for achieving accurate outcomes from AI (Ballı et al. 2024). AI training is not limited to a single step, it requires continuity. It also requires an effective consultation (supervision) process and competent consultants (supervisors). Being more cautious about the outcomes of the applications in the early stages seems reasonable. It appears that new horizons can be opened over time as new information is added, AI-supported technologies mature, and experienced AI applications emerge.

One of the most important issues that is addressed in the Turkish Journal of Psychiatry is the adoption of terminology to track these new developments and discuss them on a common ground. It is critical to discuss and thoroughly understand the newly described AI-related phenomena and to name them accurately. Understanding human experiences seems to be necessary to select the most appropriate terms for AI-related phenomena. In that sense, the experience of hallucinations or confabulations in humans as an analogous phenomenon to some algorithm biases in AI technology is discussed by Ince Guliyev and Ucok (2024).

It is projected that advances in AI will transform the way humans work, interact, and live. Then, is it possible that advancements in AI could minimize the time and effort required by psychiatrists by making their jobs easier as physicians, educators, and scientists? The future may include the production of skills and knowledge that humans symbiotically accelerate with "machine intelligence", as well as cultural shifts and the development of novel interactions (Brinkmann et al. 2023). At this point, it becomes apparent that new duties await us, which will reshape the topics and practices we focus on.

AI applications may trigger ethical discussions and require rethinking of how to apply the ethical standards throughout the development and use phases. AI technologies are currently being revised, updated, and developed by various companies. If gender, gender identity, religion, culture, race, or socioeconomic status are not appropriately represented in big

data, it risks perpetuating "real" prejudices and discrimination on an "artificial" scale. If the development of AI is solely directed by the needs of the consumption economy or if the conflict of interests and competition becomes a major factor; a new global challenge may arise for such a highly efficient technology. These processes may confront psychiatrists with entirely new challenges as physicians, scientists, and human rights defenders. We should consider what steps should be taken to prevent these risks. "Possible challenges" must be identified and the responses must be implemented as quickly as possible with a global and dynamic perspective, based on scientific principles (Gurcan et al. 2024). Potential risks are not limited to errors in AI outputs; AI production has extensive economic and environmental costs. Who will use these technologies, how to ensure fair use, and the detrimental effects of technology production on climate change owing to energy requirements are all topics of serious debate (Ueda et al. 2024).

As with the other scientific and technological developments, AI-based applications should follow the ethical guides and the principles of fair use. A new area of responsibility emerges for psychiatrists to ensure that this potentially groundbreaking scientific development provides equal and beneficial opportunities for humanity and avoids creating new power imbalances.

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The Theory of Mind and Psychotic Symptoms Phenomenology in Substance-Induced Psychotic Disorder and Schizophrenia



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ABSTRACT

Objective: The study aimed to determine clinical indicators that could be used to differentiate between patients diagnosed with substance-induced psychotic disorder (SIPD) and patients diagnosed with schizophrenia by comparing their psychotic symptoms and theory of mind (ToM).

Methods: The study included 43 male patients diagnosed with schizophrenia according to DSM-5 criteria and 43 male patients diagnosed with SIPD. The patients were administered the Sociodemographic and Clinical Data Form, Scale for the Assessment of Positive Symptoms (SAPS), Scale for the Assessment of Negative Symptoms (SANS), Psychotic Symptom Evaluation Scale (PSYRATS), and Reading the Mind in the Eyes Test (RMET).

Results: In patients diagnosed with schizophrenia, the scores on SAPS subscales for structural thought disorder and bizarre behavior, as well as SANS total scores, were significantly higher compared to patients diagnosed with SIPD ($z=2.679$, $p=0.007$; $z=2.984$, $p=0.003$; $z=6.916$, $p<0.001$). The scores for recognizing negative and neutral expressions on the RMET were significantly higher in patients with SIPD than in patients with schizophrenia ($z=3.540$; $p<0.001$; $z=4.404$, $p<0.001$). It was found that as the scores on the SANS total and Affect Blunting or Flattening subscale, as well as the scores on the SAPS Bizarre Behavior subscale decrease, the probability of having SIPD increases.

Conclusion: In patients diagnosed with SIPD, there are fewer disorganized and negative symptoms compared to patients diagnosed with schizophrenia. Patients with SIPD can recognize negative and neutral expressions better than patients with schizophrenia. When making a differential diagnosis between SIPD and schizophrenia, as blunting in affect, total negative symptoms, and severity of bizarre behavior decrease, the probability of being diagnosed with SIPD increases relative to the probability of being diagnosed with schizophrenia.

Keywords: Schizophrenia, Substance-Induced Psychosis, Theory Of Mind, Psychotic Symptoms

INTRODUCTION

Psychotropic substance use can lead to various mental disorders, including substance-induced psychotic disorder (SIPD), in individuals (Keshavan & Kaneko, 2013). According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), this diagnosis is characterized by the presence of hallucinations and/or delusions that are thought to be caused by the physiological effects of the substance and cannot be better explained by another psychotic disorder, occurring during or immediately after substance intoxication or withdrawal (American Psychiatric Association, 2013). In the DSM-5 classification, psychotic symptoms in SIPD should not persist for more than 4 weeks. The time criterion for

SIPD differs between the ICD-10 and DSM-5 classifications. According to the ICD-10, psychotic symptoms can persist for up to 6 months after the last substance use. Initially, it is challenging to definitively diagnose SIPD based on these criteria, and longitudinal monitoring is considered necessary to clarify the diagnosis (Beckmann et al. 2019). Some studies have concluded that substance-induced psychotic disorders do not have a specific psychopathology triggered by the substance (Chaudhury et al. 2016). The similarities between SIPD and schizophrenia in terms of positive symptoms, the frequent co-occurrence of substance use with both diseases, and the bidirectional causal relationship between substance use and psychotic symptoms further complicate the diagnostic difficulty

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of SIPD (Wilson et al. 2017) (Aldemir et al. 2018). While the differential diagnosis between SIPD and schizophrenia is challenging, making a proper differential diagnosis is critical for the management and treatment of both disorders (Cambra et al. 2023) (Fiorentini et al. 2021). Many studies have reported that negative and disorganized symptoms are less frequently observed in SIPD compared to schizophrenia, whereas positive symptoms such as delusions and hallucinations are believed to be similar in both disorders (Wilson et al. 2018). Most studies examining the differences in positive symptoms between SIPD and schizophrenia have utilized the Scale for the Assessment of Positive Symptoms (SAPS) and the Positive and Negative Syndrome Scale (PANSS). Both scales evaluate psychotic symptoms in terms of frequency, severity, and impact on the individual's functioning (Erkoç et al. 1991). The Psychotic Symptom Rating Scales (PSYRATS) assess delusions and hallucinations based on various dimensions, including content, duration, and distress severity caused by these symptoms (Haddock et al. 1999).

Theory of Mind (ToM) is defined as the ability to understand the intentions behind others' behaviors, perceive their mental states, and make predictions about their observed actions (Premack & Woodruff, 1978). This ability is associated with emotion recognition (Sebastian et al. 2012). One of the most commonly used tests for assessing this function is the Reading the Mind in the Eyes Test (RMET) (Sprong et al. 2007).

It has been shown that ToM skills are impaired in schizophrenia (Weng et al. 2022), and the performance in ToM tasks is associated with positive, negative, and disorganized symptoms (Brüne, 2005) (Bliksted et al. 2019) (Bora, 2019).

It has been shown that social cognitive functions, such as ToM and emotion recognition, are impaired in individuals with Substance Use Disorder (SUD) and SIPD (Sanvicente-Vieira et al. 2017). A study comparing the social cognitive impairments in individuals with SUD and SIPD reported a higher level of impairment in those with SIPD (Anne et al. 2018). However, research examining ToM abilities in individuals with SIPD is limited.

In our study, positive symptoms in patients diagnosed with SIPD and patients diagnosed with schizophrenia without substance use were compared, including dimensional features, in an attempt to understand the differences in positive symptomatology that are often predicted but not clearly identified through clinical observations. Additionally, the ToM abilities of both groups were investigated. Based on the belief that ToM impairments are a structural characteristic of schizophrenia (Irani et al. 2006) and that there is a relationship between psychotic symptoms and ToM (Brüne, 2005), the ToM abilities and psychotic symptoms were compared in both disorders. The aim was to identify helpful clinical indicators for the differential diagnosis between patients with SIPD and patients with schizophrenia without substance use.

Between September 2020 and January 2021, a total of 43 male patients diagnosed with schizophrenia according to DSM-5 diagnostic criteria, and 43 male patients diagnosed with SIPD who were receiving inpatient treatment at the units affiliated with Istanbul Bakırköy Prof. Dr. Mazhar Osman Mental Health and Neurological Diseases Hospital, aged 18-50 years, were included in the study. The study was approved by the Bakırköy Sadi Konuk Training and Research Hospital Clinical Research Ethics Committee with decision number 2020-18-16 on September 7, 2020. This article is derived from the dissertation entitled "Phenomenological evaluation of the psychiatric symptoms of patients with a diagnosis of psychotic disorder due to pam use and patients with a diagnosis of schizophrenia without pam use and their relationship with theory of mind". The patients were informed about the study and written consent was obtained for their participation. Exclusion criteria were illiteracy, intellectual disability, dementia, and other organic mental disorders that could hinder the effective completion of the research battery. Based on examinations conducted by at least 2 psychiatric specialists, along with old medical records and information obtained from the patients and their relatives, a total of 58 patients admitted with a diagnosis of schizophrenia and 57 patients admitted with a diagnosis of SIPD were evaluated. Patients diagnosed with schizophrenia, whose known duration of illness was less than 10 years and who had not used a psychotropic substance in the last 5 years were included in the sample by verifying their medical records and information obtained from the patients and their relatives.

The patients included in the study were evaluated at an average of 72 hours after admission to avoid potential confusion caused by substance intoxication symptoms. Based on this evaluation, 8 patients diagnosed with SIPD were not included in the study because they continued to experience psychotic symptoms during the 4-week period without psychotropic substance use. Patients diagnosed with psychotic disorders related to cannabinoid, synthetic cannabinoid (SC), methamphetamine (MA), ecstasy, and cocaine use were included in the study. However, 4 patients diagnosed with psychotic disorders related to opioid, inhalant, and alcohol use were not included in the study due to the potential confusion caused by withdrawal and intoxication symptoms in evaluating psychotic symptoms. Among the patients diagnosed with schizophrenia, 4 patients, and among those diagnosed with SIPD, 2 patients were not included in the study as their clinical presentation was characterized by significant mood disturbances rather than psychotic symptoms, suggesting a closer diagnosis to bipolar and related disorders. Patients diagnosed with comorbid psychotic disorders and SUD were excluded based

on their medical records and information obtained from the patients and their relatives. In selecting these patients, it was taken into account that psychotic symptoms persist for a significant period during substance use and after the cessation of withdrawal, and that there are recurrent periods in the course of the illness that are not attributed to substance use. As a result of this evaluation, 7 patients diagnosed with schizophrenia were not included in the study as their medical records, previous test results, and family history indicated that they had used a psychotropic substance at least once in the last 5 years, which could potentially lead to confusion. Four patients diagnosed with schizophrenia were also not included in the study due to their known illness duration being over 10 years.

The hypotheses of the study are as follows;

1. There are differences in the dimensional features of delusions and hallucinations between patients diagnosed with SIPD and patients diagnosed with schizophrenia without psychotropic substance use.
2. Negative and disorganized symptoms are less common in patients diagnosed with SIPD than in patients diagnosed with schizophrenia without psychotropic substance use.
3. The ToM abilities of patients diagnosed with SIPD are better than those of patients diagnosed with schizophrenia without psychotropic substance use.

Instruments

Sociodemographic and Clinical Data Form: Prepared by the authors in line with the objectives of the study and evaluated based on the information obtained from the participants.

Scale for the Assessment of Positive Symptoms (SAPS): SAPS, developed by Andreasen, is a scale designed to measure the level, distribution, and severity of positive symptoms in schizophrenia. It includes four subscales: hallucinations, delusions, bizarre behavior, and positive formal thought disorder, with a total of 34 items (Andreasen 1984a). The Turkish validity and reliability study of the scale was conducted by Erkoç and colleagues (Erkoç 1991a).

Scale for the Assessment of Negative Symptoms (SANS): The SANS, developed by Andreasen, aims to assess the level, distribution, and severity of negative symptoms in schizophrenia. It consists of five subscales: affective flattening, alogia, apathy, anhedonia, and attentive impairment, with a total of 25 items (Andreasen 1984b). The Turkish validity and reliability study of the scale was conducted by Erkoç and colleagues (Erkoç 1991b).

Psychotic Symptom Rating Scale (PSYRATS): It is composed of a semi-structured interview form and a scoring chart developed by Haddock et al. to assess auditory

hallucinations and delusions. It is treated as two separate scales. The Auditory Hallucinations Scale consists of 11 items, while the Delusions Scale consists of 6 items (Haddock et al. 1999). This scale has been adapted to the Turkish sample by O.M. Sevi et al. (Sevi, 2016).

Reading the Mind in the Eyes Test (RMET): The RMET, developed by Baron-Cohen et al. consists of 36 photographs that include only the eye region of actors or actresses (Baron-Cohen et al. 2001). The Turkish validation and reliability study of the test was conducted by Yıldırım et al. After removing 4 items with low internal consistency in the Turkish version, it consists of 32 items (Yıldırım et al. 2011).

In this test, individuals make inferences about the mental state of the person in the picture by looking at images with eyes displaying various expressions. Participants are asked to choose the option that best describes the mental state of the person in the picture from the provided 4 choices. The options do not only include the five basic emotions of fear, sadness, anger, happiness, and disgust, but also encompass complex emotions and intentions. Therefore, the test is considered as an indicator of ToM ability rather than emotion recognition (Bedi et al. 2010).

Statistical Analysis

Statistical analyses were conducted using IBM SPSS Statistics Standard Concurrent User V 26 (IBM Corp., Armonk, New York, USA) statistical software package. Descriptive statistics were reported as the number of units (n), percentage (%), mean $\pm$ standard deviation (mean $\pm$ sd), median (M), minimum (min), maximum (max), and interquartile range (IQR) values. The normal distribution of data for numerical variables was assessed using the Shapiro-Wilk normality test. The homogeneity of variances was evaluated using the Levene test. Group comparisons for numerical variables were performed using independent samples t-test when the data followed a normal distribution, and Mann-Whitney U test when the data did not follow a normal distribution. Pearson chi-square test was used for comparing groups on categorical variables. Variables with $p < 0.25$ in univariate analyses were considered as confounding factors. The interrelationships between scales were examined using Spearman's correlation analysis. The effect of scale scores on schizophrenia was assessed using both univariate and multivariate binary logistic regression, and the final model was determined using the backward Wald elimination method. The predictive performance of scale scores for schizophrenia was evaluated using Receiver Operator Characteristic (ROC) curve analysis. Prior to ROC curve analysis, propensity score matching was conducted to account for confounding factors present in the study. A p -value < 0.05 was considered statistically significant.

RESULTS

Sociodemographic Characteristics of Participants

Our study included 43 male patients diagnosed with schizophrenia and 43 male patients diagnosed with SIPD. The mean age of the SIPD-diagnosed patients was 31.23 ± 4.9 , while the mean age of the schizophrenia-diagnosed patients was 33.5 ± 7.9 . There was no statistically significant difference found in terms of mean age ($t = -1.615$, $p = 0.111$), marital status ($\chi^2 = 4.643$, $p = 0.125$), and education level ($\chi^2 = 5.125$, $p = 0.173$) between the two groups (Table-1).

Assessment of Substance Use Characteristics in Patients Diagnosed with SIPD

The average age of the SIPD patients evaluated in the study was found to be 16.67 ± 28.00 , and the age of substance use initiation among the participants ranged from 6.00 to 28.00. Among the SIPD patients, 26 (60.5%) had a history of MA use, 42 (97.7%) had used cannabinoids, 32 (74.4%) had used SC, 24 (55.8%) had used ecstasy, 39 (93%) had a history

of multiple psychotropic substance use, and 14 (32.6%) had used cocaine (Table-2).

Comparison of Scale Scores Between Groups

In the SIPD group, scores for bizarre behavior and positive formal thought disorder were found to be significantly lower than those in the schizophrenia group ($p = 0.003$, $p = 0.007$). Additionally, in the SIPD group, scores for blunted or flattened affect, alogia, diminished energy and interest, anhedonia, and social withdrawal in the SANS scale were statistically lower compared to the schizophrenia group ($p < 0.001$), while scores for negative affect, neutral affect, and total scores in the RMET scale were statistically higher than those in the schizophrenia group ($p < 0.001$) (Table-3).

Logistic Regression Results for Factors Influencing the Probability of SIPD

Variables with $p < 0.25$ among sociodemographic factors (age, education level, marital status) were considered confounding

Table 1. Comparison of Descriptive Characteristics of the Groups

	Groups		Test Statistics		
	SIPD n=43	Schizophrenia n=43	Test Value	p	Effect Size
Age, (years)					
mean $\pm$ sd	31.2 $\pm$ 4.9	33.5 $\pm$ 7.9	$t = 1.615$	0.111	0.35
min-max	20-45	18-47			
Marital Status, n (%)					
Single	26 (60.5)	35 (81.4)	$\chi^2 = 4.643$	0.125	0.42
Married	12 (27.9)	5 (11.6)			
Divorced/widowed	5 (11.6)	3 (7.0)			
Education Level, n (%)					
Primary school	16 (37.2)	15 (34.9)	$\chi^2 = 5.125$	0.173	0.44
Middle school	23 (53.5)	16 (37.2)			
High school	3 (7.0)	8 (18.6)			
University and above	1 (2.3)	4 (9.3)			

t: Independent sample t-test, χ^2 : Chi-square test
SIPD: Substance-induced psychotic disorder

Table 2. Substance Use Characteristics of Patients Diagnosed with SIPD

	SIPD n=43	Mean $\pm$ Sd.	Min.-Max.
Age of Onset of Substance Use		16.67 $\pm$ 28.00	6.00-28.00
Substance Use Status		n	%
Cannabinoid		42	97.7
Synthetic Cannabinoid (SC)		32	74.4
Ecstasy		24	55.8
Methamphetamine (MA)		26	60.5
Cocaine		14	32.6
Multiple Substance Use		39	93

SD: Standard Deviation, SIPD: Substance-induced psychotic disorder

Table 3. Comparison of Scale Scores by Groups

	Groups				Test Statistics	
	SIPD		Schizophrenia		z value	p value
	M	IQR	M	IQR		
SAPS						
Hallucinations	16.0	12.0	14.0	10.0	1.012	0.312
Delusions	23.0	13.0	24.0	17.0	0.899	0.368
Bizarre Behaviour	5.0	4.0	7.0	6.0	2.984	0.003
Positive Formal Thought Disorder	7.0	6.0	13.0	8.0	2.679	0.007
SAPS, Total	53.0	26.0	58.0	27.0	1.248	0.212
SANS						
Affective Flattening or Blunting	4.0	7.0	18.0	9.0	7.016	<0.001
Alogia	3.0	5.0	12.0	6.0	7.133	<0.001
Unwillingness-Apathy	5.0	3.0	13.0	6.0	7.250	<0.001
Anhedonia-Asociality	8.0	3.0	16.0	6.0	6.679	<0.001
Attention	2.0	3.0	3.0	2.0	2.223	0.026
SANS, Total	23.0	16.0	63.0	23.0	6.916	<0.001
PSYRATS						
Auditory hallucinations	20.0	18.0	21.0	23.0	0.347	0.729
Delusions	17.0	5.0	18.0	6.0	1.648	0.099
PSYRATS, Total	37.0	21.0	42.0	28.0	0.445	0.656
RMET						
Positive Affect	3.0	2.0	3.0	2.0	0.489	0.625
Negative Affect	6.0	2.0	4.0	3.0	3.540	<0.001
Neutral Affect	10.0	5.0	7.0	3.0	4.404	<0.001
RMET, Total	18.0	7.0	14.0	6.0	4.095	<0.001

z: Mann-Whitney U test, p<0.05 value was considered statistically significant., SAPS: Positive Symptoms Evaluation Scale, SANS: Negative Symptoms Evaluation Scale, PSYRATS: Psychotic Symptom Evaluation Scale, RMET: Mind Reading Test from the Eyes, SIPD: Substance-induced psychotic disorder

factors and included in the model as correction factors. Table 4 presents the results of binary univariate logistic regression analysis regarding the factors influencing the risk of SIPD. To determine the final factors affecting the disease condition, two different multivariate binary logistic regression models were constructed, taking into account highly correlated variables (Table-5).

The first model included SAPS; Hallucinations, Bizarre Behavior, Positive Formal Thought Disorder, SANS; Blunted or Flattened Affect, Attention, RMET; Negative Affect, Neutral Affect variables. The Backward Wald method was used to determine the final variables. As a result of Model-1, SAPS Bizarre Behavior and SANS Blunted or Flattened Affect dimensions were found to have an effect on the disease groups. The risk of substance psychosis increases by 1.421 times as the SAPS Bizarre Behavior score decreases by one unit, and by 1.452 times as the SANS Blunted or Flattened Affect score decreases by one unit (Table-5).

In Model-2, SAPS; Hallucinations, Bizarre Behavior, Positive Formal Thought Disorder, SANS Total, RMET Total scores were included in the analysis. The analysis results showed that SAPS Bizarre Behavior and SANS Total scores had an effect on the disease groups. As the SAPS Bizarre Behavior score decreases by one unit, the risk of substance psychosis increases by 1.594 times, and as the SANS Total score decreases by one unit, the risk of substance psychosis increases by 1.146 times (Table-5).

Evaluation of the Performance of Scale Scores in Predicting SIPD Diagnosis through ROC Curve Analysis

Propensity score matching was conducted before performing ROC curve analysis due to the presence of confounding factors in the study. For SAPS Bizarre Behavior, the area under the curve (AUC) value was 0.813, the optimum cut-off point was <7.0, sensitivity was 78.1%, and specificity

Table 4. Binary Univariate Logistic Regression Results for Factors Affecting the Probability of Having a SIPD

	β	SE	Wald Statistics	p	Exp(β)	95% C.I.for exp(β)	
						Lower	Upper
SAPS							
Hallucinations	-0.043	0.035	1.497	0.221	0.958	0.895	1.026
Delusions	0.012	0.029	0.177	0.674	1.012	0.956	1.071
Bizarre Behaviour	0.325	0.111	8.506	0.004	1.384	1.113	1.722
Positive Formal Thought Disorder	0.088	0.048	3.437	0.064	1.092	0.995	1.199
SAPS, Total	0.014	0.014	0.940	0.332	1.014	0.986	1.043
SANS							
Affective Flattening or Blunting	0.346	0.080	18.875	<0.001	1.413	1.209	1.651
Alogia	0.805	0.214	14.123	<0.001	2.236	1.470	3.403
Unwillingness-Apathy	1.994	0.647	9.486	0.002	7.344	2.065	26.118
Anhedonia-Asociality	0.536	0.130	16.948	<0.001	1.708	1.324	2.205
Attention	0.347	0.151	5.302	0.021	1.415	1.053	1.901
SANS, Total	0.125	0.029	18.067	<0.001	1.133	1.070	1.201
PSYRATS							
Auditory hallucinations	-0.006	0.020	0.085	0.770	0.994	0.956	1.034
Delusions	0.045	0.078	0.341	0.559	1.046	0.899	1.218
PSYRATS, Total	-0.006	0.018	0.128	0.721	0.994	0.960	1.029
RMET							
Positive Affect	0.070	0.185	0.143	0.706	1.072	0.746	1.541
Negative Affect	-0.525	0.168	9.726	0.002	0.592	0.426	0.823
Neutral Affect	-0.461	0.134	11.782	0.001	0.630	0.484	0.820
RMET, Total	-0.248	0.076	10.593	0.001	0.780	0.672	0.906

*Adjusted for age, marital status, education level, β : Regression coefficient, SE: Standard error of the regression coefficient, Exp (β): Odds ratio, CI: Confidence Interval, $p < 0.05$ value was considered statistically significant.

Table 5. Multiple Logistic Regression Results for Factors Affecting the Probability of Having SIPD*

	P	Exp(β)	95% C.I. for exp(β)	
			Lower	Upper
Model-1				
Constant	0.035	0.001		
SAPS Bizarre Behaviour	<0.001	1.421	1.194	1.690
SANS Affective Flattening or Blunting	0.043	1.452	1.012	2.084
Model Summary: Hosmer and Lemeshow Goodness of fit $\chi^2=2.764$; p=0.948, Nagelkerke R ² =0.767				
Variables entered on step 1: SAPS Hallucinations, Bizarre Behaviour, Positive Formal Thought Disorder; SANS Affective Flattening or Blunting, Attention, RMET Negative Affect, Neutral Affect				
Elimination method: Backward Wald				
Model-2				
Constant	0.010	0.001		
SAPS Bizarre Behaviour	0.023	1.594	1.066	2.384
SANS Total	<0.001	1.146	1.068	1.230
Model Summary: Hosmer and Lemeshow Goodness of fit $\chi^2=2.600$; p=0.957, Nagelkerke R ² =0.783				
Variables entered on step 1: SAPS Hallucinations, Bizarre Behaviour, Positive Formal Thought Disorder; SANS Total, RMET Total				
Elimination method: Backward Wald				

*Adjusted for age, marital status, education level, β : Regression coefficient, SE: Standard error of the regression coefficient, Exp (β): Odds ratio, CI: Confidence Interval, $p < 0.05$ value was considered statistically significant.

Table 6. Evaluation of Performance in Predicting SIPD with ROC Curve Analysis of Scale Scores

	Cut-off	AUC	95% CI for AUC	p value	Sens	Spec	PPV	NPV
SAPS								
Hallucinations	<17.0	0.772	0.669 - 0.855	<0.001	70.7	75.5	72.5	73.9
Bizarre Behaviour	<7.0	0.813	0.715 - 0.889	<0.001	78.1	71.1	71.1	78.0
Positive Formal Thought Disorder	<6.0	0.786	0.684 - 0.867	<0.001	73.1	71.1	69.8	74.4
SANS								
Affective Flattening or Blunting	<4.0	0.944	0.872 - 0.982	<0.001	97.5	82.2	83.3	97.4
Alogia	<6.0	0.964	0.899 - 0.992	<0.001	97.5	86.6	87.0	97.5
Unwillingness-Apathy	<10.0	0.987	0.934 - 1.000	<0.001	100.0	88.8	89.1	100.0
Anhedonia-Asociality	<8.0	0.934	0.859 - 0.976	<0.001	95.1	84.4	84.8	95.0
Attention	<0.0	0.792	0.691 - 0.872	<0.001	73.1	73.3	71.4	75.0
Total	<43.0	0.943	0.870 - 0.981	<0.001	97.5	80.0	81.6	97.3
RMET								
Negative Affect	>4.0	0.824	0.727 - 0.898	<0.001	75.6	80.0	77.5	78.3
Neutral Affect	>17.0	0.849	0.755 - 0.917	<0.001	63.4	93.3	89.7	73.7
Total	>23.0	0.840	0.746 - 0.910	<0.001	63.4	88.8	83.9	72.7

AUC: Area under the curve; CI: Confidence Interval, Sens: Sensitivity, Spec: Specificity, PPV: Positive predictive value, NPV: Negative predictive value

was 71.1%. For SANS Blunted or Flattened Affect, the AUC value was 0.944, the optimum cut-off point was <4.0, sensitivity was 97.5%, and specificity was 82.2%. For SANS Total, the AUC value was 0.943, the optimum cut-off point was <43.0, sensitivity was 97.5%, and specificity was 80.0%. For SANS Diminished Energy and Interest, the AUC value was 0.987, the optimum cut-off point was <10.0, sensitivity was 100.0%, and specificity was 88.8% (Table-6) (Figure 1).

DISCUSSION

In our study, positive symptoms such as hallucinations and delusions, including their dimensional features, were evaluated in patients diagnosed with SIPD and schizophrenia patients without substance use. These features were compared between the two conditions, and differences in positive symptoms that could not be identified based on clinical observations were explored. Additionally, differences between psychotic symptoms and ToM abilities were examined in both groups, and the relationship between ToM abilities and psychotic symptoms was investigated. The aim was to identify clinical indicators that could assist in distinguishing between the two disorders.

Evaluation of Psychotic Symptoms

When examining the literature, it is apparent that there is still a lack of clarity regarding the differences between SIPD clinic and primary psychotic disorder clinic (McKetin et al. 2017; Inchausti et al. 2022). In a systematic review conducted by Wilson et al. six studies that met the inclusion criteria

were included in a meta-analysis to investigate the clinical differences between SIPD and primary psychotic disorder. According to the findings of this meta-analysis, consistent clinical differences between the two patient groups were not reported (Wilson et al. 2018). However, while there is more consensus regarding differences in negative symptoms between primary psychotic disorder and SIPD, there is less consistency regarding differences in positive symptoms (Compton et al. 2004; Weibell et al. 2013). The lack of consensus in the literature regarding positive symptoms in SIPD can be attributed to several reasons. For example, in SIPD, positive symptoms tend to decline within a short period, and the timing of patient recruitment can greatly influence the results related to positive symptoms. In a study conducted by Dawe et al. it was noted that patients diagnosed with SIPD had similar levels of positive symptoms as those with primary psychotic disorders at the time of hospital admission, but these positive symptoms rapidly declined afterward. Consistent with our study findings, this study also emphasized that individuals diagnosed with SIPD had fewer negative symptoms compared to those diagnosed with primary psychotic disorders (Dawe et al. 2011).

In a study comparing psychotic symptoms between MA Induced Psychotic Disorder and schizophrenia patients, it was found that the total scores of SANS and the sub-scales of Blunted Affect and Alogia were significantly lower in MA Induced Psychotic Disorder patients compared to schizophrenia patients (Tomiyama, 1990). Our study also found that SANS total scores and scores of all sub-scales were higher in the SIPD group, and as scores on the Blunted Affect

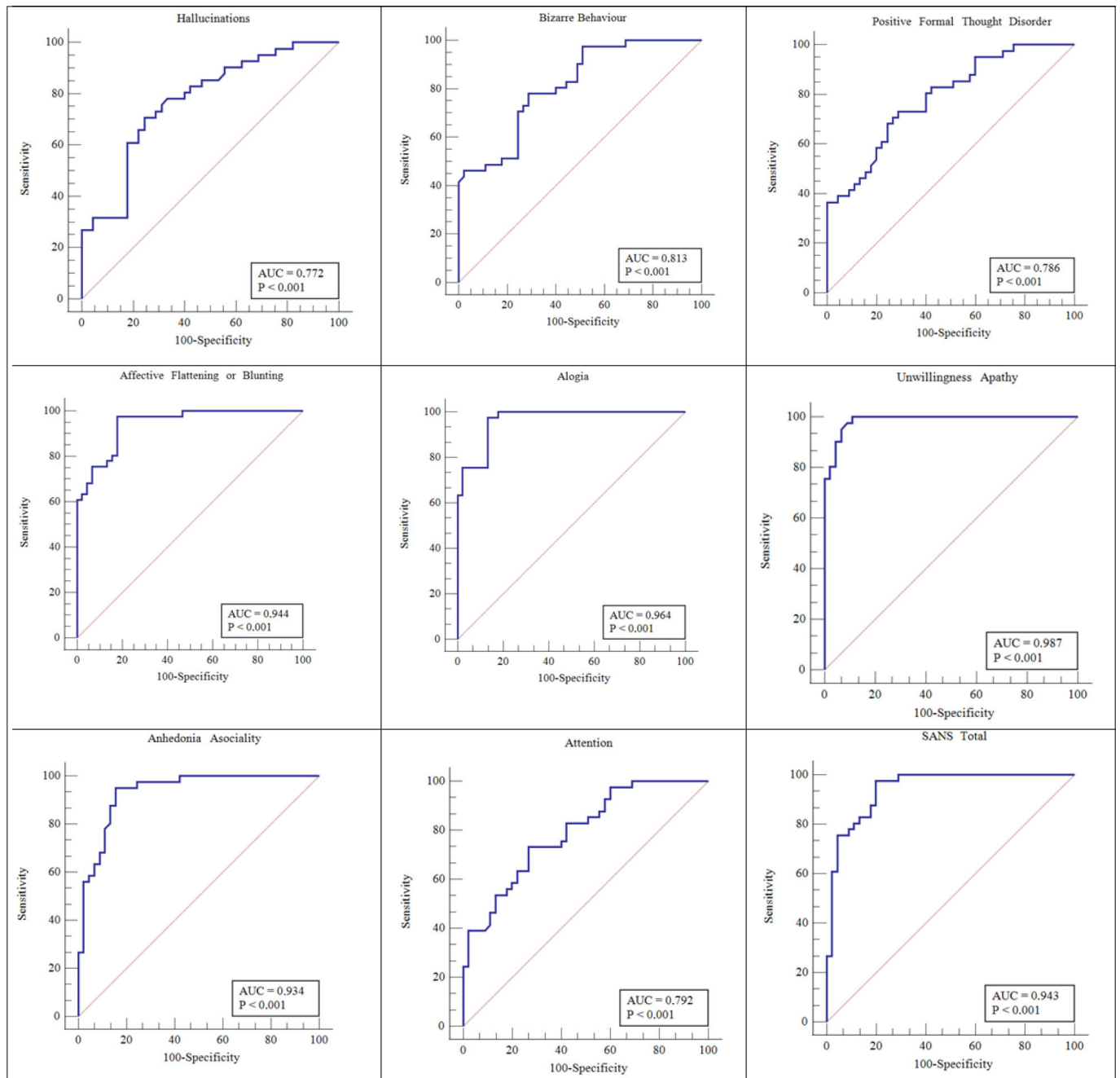


Figure 1. ROC Curve Analysis of Scale Scores of Performance in Predicting SIPD

sub-scale decreased, the risk of having SIPD increased, which is consistent with the findings of that study.

In an observational case-control study involving 238 patients that aimed to investigate the differences between SIPDs and non-SIPDs, individuals in the SIPD group scored significantly higher on positive symptoms, while those with non-SIPDs had higher scores on negative symptoms and severity (Cambra et al. 2023). The higher scores on negative symptom measures in patients with non-SIPDs are consistent with our study. However, it should be noted that our study differs in terms of finding higher positive symptom scores in individuals diagnosed with SIPD, which could be attributed to the evaluation of

positive symptoms using the PANSS scale and the inclusion of patients using opioids and alcohol in the study.

In an epidemiological cohort study that included 544 cases diagnosed with first-episode psychosis, no significant difference was found in terms of positive psychotic symptoms measured by the SAPS between patients diagnosed with SIPDs and those with non-SIPDs (O'Connell et al. 2019). The lack of differences in delusion and hallucination scores and total scores measured by the SAPS is consistent with the findings of our study. However, in our study, patients with schizophrenia had higher scores on the positive formal thought and bizarre behavior subscales. The inclusion of patients with recurrent

episodes in our study was considered a possible reason for this difference. Another study investigating the differential diagnosis between SIPD and schizophrenia also found, in line with our study, that formal thought disorder and bizarre behavior were more prominent in schizophrenia (Rosenthal and Miner, 1997). Variations in the timing of the assessment of SIPD cases, methodological approaches, sample sizes, types of substances used, frequency and quantity of substance use, are seen to be associated with differing results in studies (Dawe et al. 2011). A study conducted in our country compared patients diagnosed with SC induced psychotic disorders and schizophrenia. In this study, consistent with the findings of our research, negative symptoms were found to be lower in psychotic disorders triggered by SC compared to schizophrenia patients, while positive symptoms were similar in both groups (Altintas et al. 2016). The similarity in the profiles of included patients and the high rate of SC use in our study (32 patients used SC, accounting for 74.4%) could explain this similarity. The absence of differences in both SAPS and PSYRATS scale scores for delusions and hallucinations in our study suggests the difficulty in distinguishing between these disorders based solely on delusions and hallucinations.

Evaluation of RMET

In our study, patients diagnosed with SIPD performed better on the RMET compared to patients diagnosed with schizophrenia. Patients with SIPD showed better recognition of negative and neutral eye expressions compared to patients with schizophrenia, and as their recognition performance of negative expressions and neutral expressions increased, the risk of having SIPD also increased. The performance in recognizing positive eye expressions was similar between both groups. While there are numerous studies in the literature investigating the relationship between substance use and ToM impairments or ToM deficits in schizophrenia, studies examining ToM performance in patients with SIPD are limited (Sanvicente-Vieira et al. 2017; Anne et al. 2018). It is still debated whether the ToM impairments in individuals with SIPD are caused by substance use itself or by the psychotic symptoms it induces (Ay et al. 2016). In a study comparing patients with MA-induced psychotic disorders, MA users, and healthy controls, both groups of MA users showed lower performance on the RMET compared to healthy controls, and the decline in performance was greater in MA-induced psychotic disorders compared to participants with MA use disorder (Anne et al. 2018). Similarly, in another study comparing MA users with and without psychotic symptoms and healthy controls in terms of ToM abilities, greater impairments in ToM were found in MA-induced psychotic disorders, but both groups of MA users showed worse emotion recognition abilities compared to healthy controls (Arunogiri et al. 2019). Furthermore, the causal direction of these relationships has not been determined. To

clarify the nature of these longitudinal associations and obtain definitive results, future research with reduced confounding factors and larger samples is needed.

Limitations

One of the limitations of our study is related to the method of sample selection. The information regarding patients' substance use was based on their self-report, statements from their relatives, and medical records without supporting laboratory tests. The fact that patients may not provide accurate information about their substance use and that their relatives may not have sufficient knowledge can be considered as a limitation that restricts reliable data. Furthermore, in this study, the cases were evaluated at an average of 72 hours after their hospitalization. During this period, they were under medication, and different antipsychotic drugs were used. Another limitation of our study is that the ToM abilities of the included cases were evaluated solely using RMET. Additionally, the SIPD cases had varying variables such as the frequency of substance use, route of administration, and dosage, which are the limitations of our study. Furthermore, the potential impact of differences in the duration of psychotic disorders between the groups was not assessed, which is another limitation of our study.

CONCLUSIONS

SIPD diagnosed patients have fewer disorganized and negative symptoms (symptoms of behavioral and thought disorder) compared to patients diagnosed with schizophrenia. There is no difference between the two groups in terms of the severity, content, and dimensional features of delusions and hallucinations. Therefore, it does not seem possible to make a differential diagnosis between the two disorders based on positive symptoms. While SIPD diagnosed patients show better performance in recognizing negative and neutral expressions compared to schizophrenia diagnosed patients, their performance in recognizing positive expressions is similar in both groups. When making a differential diagnosis between SIPD and schizophrenia, the risk of being diagnosed with SIPD increases as blunting of affect, total negative symptoms, and odd behaviors decrease.

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Secondary Traumatic Stress Symptoms in Social Media Users after the February 6, Kahramanmaraş Türkiye Earthquakes: The Relationship with Social Media Addiction, Depression, Anxiety and Stress Symptom Levels



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ABSTRACT

Objective: The content shared on social media may cause secondary traumatic stress (STS) symptoms. The aim of this study is to evaluate the severity of social media related STS and the associated factors in university students who were not directly affected by the February 2023 earthquakes.

Method: In total, 436 university students completed an online survey including the Secondary Traumatic Stress Scale for Social Media Users (STSS-SM), the Bergen Social Media Addiction Scale (BSMAS), the Depression Anxiety Stress Scales (DASS-42), and demographic information and questions regarding social media use preferences after the earthquake.

Results: A large portion of the participants (79.1%) reported that they followed the news about the February 2023 earthquakes on social media instead of other media tools. STS associated with social media addiction, depression, anxiety and stress levels ($r=0.475$ $p<0.001$; $r=0.543$ $p<0.001$; $r=0.583$ $p<0.001$; $r=0.591$ $p<0.001$). Multiple linear regression analysis revealed that, female gender, social media addiction and anxiety levels predicted STS and explained 43.3% of the total variance. STS symptoms were higher in those who followed the earthquake-related news on social media ($t=3.534$ $p<0.001$) and in those who reported that Twitter was their preferred social media platform to access information regarding the earthquake (40.8%; ($t=6.376$ $p=0.002$)).

Conclusion: Social media has been widely used for news gathering following the February 2023 earthquakes. The results of this study reveal that STS in social media users is affected by gender, social media addiction, depression, anxiety, stress levels and social media platform preference.

Keywords: Earthquake, Secondary Trauma, Social Media Addiction, Depression, Anxiety, Traumatic Stress

INTRODUCTION

The consecutive earthquakes of magnitudes of 7.8 and 7.6 that occurred in Türkiye on February 6, 2023 affected a large number of people in a very large area and resulted in over 50,000 deaths (Hussain et al. 2023). It is known that the prevalence of psychiatric disorders such as post-traumatic stress disorder (PTSD), anxiety disorders and major depressive disorder tends to increase after natural disasters that result in major destruction such as earthquakes (Cerdá et al. 2013, Li et al. 2020).

The psychological distress of those who experienced and survived the earthquake is related to direct exposure to this traumatic experience (Neria et al. 2008). Although not being directly exposed to trauma, it has been stated that individuals who witness the traces of trauma after the event or who are indirectly exposed to trauma may also experience stress symptoms (Vukčević Marković and Živanović 2022). This has been defined as secondary traumatic stress (STS) (Vukčević Marković and Živanović 2022). In order for STS to occur, there must be triggering conditions such as empathy with trauma victims, exposure to traumatizing material, and engaging in activities such as therapy sessions where the trauma

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experience is re-enacted (Adams et al. 2006, Choi et al. 2021). In the literature, studies on STS have often been conducted with professionals working in the field of trauma (search and rescue teams, first aid teams and healthcare professionals, etc.) or family members of trauma victims (Greinacher et al. 2019, Setou et al. 2018, Sinclair and Hamill 2007). However, DSM-5 criteria reported that indirectly traumatized family members and professionals who help trauma victims should be considered as PTSD (American Psychiatric Association, 2022). According to DSM-5, the groups included in these studies are now within the scope of PTSD, not STS (Mancini 2019). On the other hand, according to criterion 4A of DSM-5, those who are exposed to the repulsive details of traumatic events through electronic media are excluded from the scope of PTSD (American Psychiatric Association 2022). Therefore, although STS is not defined as a separate diagnostic category in DSM-5, those who are indirectly exposed to trauma only through electronic media can still be considered STS cases since they are not in the scope of PTSD (Mancini 2019).

In today's society, various media channels allow traumatized individuals to easily share their experiences and disaster-related information. Indeed, many previous studies have reported that exposure to disaster-related content through media channels causes secondary trauma symptoms (Ahern et al. 2004, Thompson et al. 2019). Studies conducted especially in those exposed to disaster-related content through television have shown that indirect exposure can cause posttraumatic stress symptoms as much as direct exposure (Jarolmen and Sisco 2005, Holman et al. 2014). It is also found that exposure to trauma through media channels is associated with symptoms of depression and anxiety in some studies (Ahern et al. 2004, Silver et al. 2013, Pfefferbaum et al. 2021).

Social media, which is now as widely used as other media channels, is reported to have 4.76 billion users worldwide in 2023 (wearesocial.com 2023). Türkiye, on the other hand, was reported to be home to 62.55 million social media users in January 2023, equivalent to 73.1 percent of its total population (wearesocial.com 2023). Individuals state that they use social media to connect with others, access news quickly, share information, have fun and for social development (Bekalu et al. 2019). Although some studies have shown positive effects of social media use on mental health, some studies have also reported negative effects such as decreased self-esteem, physical appearance anxiety, eating disorders, decreased life satisfaction, depressive symptoms, and increased suicide risk (Bekalu et al. 2019, Nesi 2020, Sharma et al. 2020). Some researchers have also stated that social media use can be addictive (Andreassen and Pallesen 2014, Andreassen et al. 2017). Spending a lot of time on social media, being overly concerned about social media, acting with a strong motivation to use social media, and using social media in a way that disrupts other social activities have been referred to by different names such as "problematic social

media use" or "social media addiction" (Casale et al. 2023, Mitropoulou et al. 2022). The World Health Organization has emphasized that excessive use of social media has become a public health problem (World Health Organization 2015).

Another problem that social media can cause similar to other media tools is secondary trauma. As with other mass media, it has been reported that exposure to traumatic events or disturbing content on social media platforms can cause trauma (Mancini 2019). In 2014, a study conducted after a ferry accident in Korea reported that social media use was associated with posttraumatic stress symptoms (Park et al. 2018). After natural disasters, social media is used to gather and disseminate information. During the COVID-19 pandemic, social media was widely used for information gathering and dissemination (Merchant and Lurie 2020, Zhu et al. 2020). In two online studies conducted during the pandemic period, social media use was found to be associated with STS (Zhao and Zhou 2020, Zhong et al. 2021). It is known that social media is an effective communication channel used to collect and disseminate information after the earthquake as well as during the pandemic (Peary et al. 2012). It has been observed that the number of studies on secondary trauma related to social media use is much less in the literature (Pfefferbaum et al. 2021). Social media is an area where new research is needed for reasons such as the development of media technology, the formation of new forms and platforms in social media, and the increase in frequency of use (Pfefferbaum et al. 2021, Pfefferbaum et al. 2014).

The successive earthquakes that occurred on February 6, 2023 are an extraordinary disaster that resulted in widespread destruction affecting many provinces in Türkiye. It can be predicted that this natural disaster is likely to affect individuals who are directly affected by the earthquake, as well as those who are exposed to earthquake-related content through social media. Based on this, this study aimed to determine the symptoms of social media-related secondary traumatic stress (STS) in university students who themselves and/or their families were not directly affected by the earthquake and to examine the relationship of the symptom level with social media addiction, anxiety, depression and stress symptom levels.

METHOD

Participants

University students who were not directly affected by the February 6 earthquakes and who received earthquake-related news through media/social media were included in this study. After obtaining ethics committee permission (Kütahya Health Sciences University E-41997688-050.99-91713), the study was conducted online between 01/06/2023-01/09/2023. Consents of the participants were obtained online. In order to reach university students,

invitation messages were shared on popular social media networks used by students. In the invitation message, the purpose and content of the study and that the target group was university students who were not directly affected by the earthquake were stated. In addition, in the online survey, participants were asked whether they were in the earthquake zone during the earthquake and whether their families/relatives were affected by the earthquake. Those who were directly affected by the earthquake and those whose families or relatives were affected by the earthquake were not included in the evaluation. Two dummy questions (attention control items: e.g. "please select '5' for this question") were also included to improve response quality. 452 university students participated in the study, 10 of them were excluded due to stating that they were directly affected by the earthquake, and 6 of them were excluded because they answered the dummy question incorrectly, and the answers of 436 participants were evaluated.

Measures

Sociodemographic Data Form: Participants were administered a sociodemographic data form consisting of questions specially prepared by the authors for this study. Age, gender, history of psychiatric disorder currently being treated, and place of residence were asked. In addition, questions about media use preferences and routines were prepared by analyzing the questions used in similar studies (Jeri-Yabar et al. 2019, Zhao and Zhou 2020, Zhong et al. 2021). The question "Which sources did you primarily prefer to follow the news regarding the earthquake?" was asked to find out the preferred media type to access earthquake-related content. To determine social media use preferences, the question "Which social media platforms do you use?" was asked. More than one answer could be given to this question. In addition, the social media platform preferred to access earthquake-related content was also asked with the question "Which is your primarily preferred social media platform to get information regarding the earthquake?".

In addition to these questions evaluating preference priorities, some social media addiction scales have been used in the medical literature to assess social media use. In addition to duration and frequency, these scales aim to assess other areas such as prioritizing use over other activities (Jeri-Yabar et al. 2019, Zhong et al. 2021, Zhao and Zhou 2020, Casale et al. 2023). Therefore, the Bergen Social Media Addiction Scale was also used to assess social media use in the study.

Bergen Social Media Addiction Scale (BSMAS): A modified version of the Bergen Facebook Addiction Scale, the BSMAS was developed in 2016. It is one of the most widely used scales for the assessment of social media addiction and problematic social media use (Andreassen et al. 2016, Doan et al. 2022, Mitropoulou et al. 2022). It is a five-point Likert-type scale consisting of six items measuring mental occupation, mood

change, conflict, unsuccessful quit attempts, tolerance and withdrawal, which correspond to the basic addiction criteria (Andreassen et al. 2016, Demirci 2019).

The Secondary Traumatic Stress Scale for Social Media Users (STSS-SM): The STSS-SM was developed in 2019. It was created to measure avoidance, arousal and aggression symptoms in people indirectly exposed to traumatic experiences through social media. It is a 17-item five-point Likert-type scale consisting of three sub-dimensions (Mancini, 2019). In 2021, the scale was adapted into Turkish and has a single-factor structure instead of the three-factor structure of the original (Çelik and Altınışık 2019).

The Depression Anxiety Stress Scales (DASS-42): This scale was developed in 1995 and adapted into Turkish in 2010. The DASS-42 is a 42-item, clinically validated scale that includes three subscales designed to measure negative emotional states of depression, anxiety and stress. (Bilgel and Bayram, 2010; Lovibond, 1995). Each subscale consisted of fourteen questions. The scores range between zero and forty-two for each subscale, and the total score can vary between zero and one hundred and twenty-six (Bilgel and Bayram, 2010; Lovibond, 1995). High scores obtained from each of the depression, anxiety and stress dimensions indicate that the level of depression or anxiety or stress symptom is high.

Statistical Analysis

All the statistical analyses were performed using IBM SPSS version 25.0 (SPSS Inc., Chicago, Illinois, USA). Descriptive analyses of sociodemographic data of the participants were given in the form of frequency tables.

When the continuous data of the study were analyzed in terms of normality assumptions, it was determined that the values obtained from the quotients of Skewness and Kurtosis values to their standard errors were within the threshold value range of ± 3.29 and thus showed normal distribution (Mayers 2013). In addition, the data set was also examined in terms of scatter and histogram graphs to check its conformity to normal distribution (Wilcox 2012, Thode 2002). In the evaluation of the normally distributed findings, Pearson correlation analysis, one of the parametric tests, was used to determine the relationship between scale and subscale scores. In addition, independent sample t-test and one-way ANOVA test, which are parametric tests, were applied to determine whether there was a significant difference between the scale and subscales and the sociodemographic data of the participants. In case of a significant difference between the groups, Sidak test, one of the post-hoc tests, was used to determine which groups the significance was between. $p < 0.05$ was considered statistically significant. Univariate and multivariate linear regression analyses were performed to determine the variables predicting secondary traumatic stress (Tabachnick and Fidell 2001).

RESULTS

The results of the analyses related to the comparison of the scale and subdimension scores applied to the participants and various variables are given in Table 2. According to the results of this analysis, women were found to have higher STSS-SM total scores ($t=6.044$ $p<0.001$), BSMAS total scores ($t=3.022$ $p=0.003$), depression ($t=3.214$ $p=0.002$), anxiety ($t=4.401$ $p<0.001$) and stress ($t=5.374$ $p<0.001$) scores than men (Table 2).

Those who reported that they followed earthquake-related news from social media had higher STSS-SM total scores ($t=3.534$ $p<0.001$), BSMAS total scores ($t=3.152$ $p=0.002$), depression ($t=3.324$ $p=0.001$), anxiety ($t=2.161$ $p=0.032$) and stress ($t=2.919$ $p=0.004$) scores than those who followed the news from newspaper/TV/radio.

Those who used Twitter to get information about the earthquake had higher STSS-SM scores compared to the other groups ($t=6.376$ $p=0.002$). According to the results of Sidak Post-Hoc analysis, there is a statistically significant difference between those who use Twitter and those who use Instagram ($p=0.007$) and other platforms ($p=0.011$). In addition, the total scores of Twitter users were found to be higher than the other groups in the BSMAS ($t=6.164$ $p=0.002$) and according to the results of Sidak Post-Hoc analysis, there was a statistically significant difference between those who use Twitter and those who use Instagram ($p=0.004$) and other platforms ($p=0.039$).

When the results of the multivariate model were analyzed, being female ($p<0.001$), total score of the BSMAS ($p<0.001$) and anxiety score ($p<0.001$) were associated with the total score of the STSS-SM. Approximately 43.3% of the total variance of the STSS-SM score is explained by the model.

DISCUSSION

This study shows that STS was associated with social media addiction score, depression, anxiety and stress symptom severity in social media users after the February 2023 earthquake. In addition, according to the multivariate linear regression analysis model; being female, social media addiction score and severity of anxiety symptoms predict STS. In previous studies, it was reported that exposure to media content in wars, terrorist attacks and natural disasters such as earthquakes and tsunamis was associated with secondary trauma symptoms (Holman et al. 2014, Pfefferbaum et al. 2014, Pfefferbaum et al. 2021, Silver et al. 2013, Thompson et al. 2019,). On the other hand, although the results are more heterogeneous, exposure to disaster-related content through various media channels has also been shown to be associated with depression and anxiety symptoms (Pfefferbaum et al. 2021). It is known that post-disaster depression and anxiety symptoms are associated with stress reactions and are often

Table 1. Participant characteristics (n=436)

	n or Median (Min-Max)	% or Mean $\pm$ SD
Age (years)	21.0 (18.0-44.0)	21.24 $\pm$ 2.40
Gender		
Female	340	78.0
Male	96	22.0
Where do you stay?		
At home with family	207	47.5
Dormitory	114	26.1
Home alone or with a roommate	115	26.4
Which sources did you primarily prefer to follow the news regarding the earthquake?		
Social media	345	79.1
Newspaper/TV/radio	91	20.9
Which social media platforms do you use?*		
Twitter	263	60.3
TikTok	78	17.9
YouTube	330	75.7
Instagram	398	91.3
Facebook	50	11.5
WhatsApp	376	86.2
Reddit	23	5.3
Quora	3	0.7
Telegram	100	22.9
Which is your primarily preferred social media platform to get information regarding the earthquake?		
Twitter	178	40.8
TikTok	4	0.9
YouTube	30	6.6
Instagram	174	39.9
Facebook	2	0.5
WhatsApp	42	9.6
Reddit	2	0.5
Telegram	4	0.9

n=Number, Min=Minimum, Max=Maximum, SD=Standard deviation

*Participants could choose multiple responses.

Table 1 shows the frequency distribution of participants' sociodemographic characteristics and various variables.

Table 2. Comparison of Scale Scores According to the Gender and Characteristics of Media Use

		STSS-SM	BSMAS	DASS-42 depression	DASS-42 anxiety	DASS-42 stress
	n	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Gender						
Female	340	54.53±12.61	18.79±5.59	17.86±9.97	14.30±9.61	19.79±10.21
Male	96	44.55±14.72	16.80±5.97	14.42±9.06	9.50±8.80	13.91±9.26
t=		6.044	3.022	3.214	4.401	5.374
p=		<0.001	0.003	0.002	<0.001	<0.001
Which sources did you primarily prefer to follow the news regarding the earthquake?		Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Social media	345	53.51±13.39	18.79±5.62	17.9±10.01	13.71±9.91	19.19±10.42
Newspapers/TV/radio	91	47.87±14.13	16.68±5.86	14.08±8.72	11.49±8.34	15.88±9.40
t=		3.534	3.152	3.324	2.161	2.919
p=		<0.001	0.002	0.001	0.032	0.004
Which is your primarily preferred social media platform to obtain information regarding the earthquake?						
1) Twitter	178	55.1±12.26	19.49±5.41	18.24±10	14.06±9.76	19.83±9.68
2) Instagram	174	50.69±14.51	17.52±5.97	16.40±9.79	12.98±9.89	17.77±10.81
3) Others	84	49.87±14.12	17.63±5.53	16.13±9.63	12.08±8.79	17.19±10.26
F=		6.376	6.164	2.040	1.309	2.614
p=		0.002	0.002	0.131	0.271	0.074
Post-Hoc=		1>2,3	1>2,3	-	-	-

t= Independent Samples Test, F=One Way ANOVA Test, Post-Hoc=Sidak, p<0.05

Table 3. Correlation matrix between STSS-SM, BSMAS and DASS-42 scores (n=436)

		1	2	3	4	5
1- The Secondary Traumatic Stress Scale for Social Media Users (STSS-SM)	r	1				
	p					
2- The Bergen Social Media Addiction Scale (BSMAS)	r	0.475**	1			
	p	<0.001				
3-DASS-42 depression	r	0.543**	0.492**	1		
	p	<0.001	<0.001			
4-DASS-42 anxiety	r	0.583**	0.468**	0.814**	1	
	p	<0.001	<0.001	<0.001		
5-DASS-42 stress	r	0.591**	0.555**	0.848**	0.845**	1
	p	<0.001	<0.001	<0.001	<0.001	

DASS-42: The Depression Anxiety Stress Scales

*Correlation is significant at 0.05 level (Pearson correlation test), **Correlation is significant at 0.01 level (Pearson correlation test)

As seen in Table 3, the relationships between the total and sub-dimension scores of the scales were shown by Pearson correlation analysis.

Table 4. Linear Regression Analysis Results for the Total Score of the STSS-SM

	STSS-SM score													
	Univariate Models							Multivariate Model						
	B	Std. Error	β	t	p	%95 CI		B	Std. Error	β	t	p	%95 CI	
						Lower	Upper						Lower	Upper
Gender (Female)	9.977	1.514	0.302	33.322	<0.001	7.002	12.953	5.662	1.246	0.171	4.543	<0.001	3.212	8.112
BSMAS	1.137	0.101	0.475	11.246	<0.001	0.939	1.336	0.497	0.105	0.208	4.747	<0.001	0.291	0.703
DASS-42 depression	0.755	0.056	0.543	13.460	<0.001	0.644	0.865	0.104	0.102	0.075	1.019	0.309	-.097	0.305
DASS-42 anxiety	0.831	0.055	0.583	14.967	<0.001	0.722	0.940	0.379	0.103	0.266	3.669	<0.001	.176	0.586
DASS-42 stress	0.788	0.052	0.591	15.263	<0.001	0.687	0.890	0.196	0.111	0.147	1.759	0.079	-0.023	0.414
Constant								28.377	1.849	-	15.345	<0.001	24.742	32.012

CI= Confidence interval, R=65.8, R²=43.3, F=65.62, p<0.001

associated with PTSD (Bonanno et al. 2010). Some studies reviewing media effects have also reported that depression and anxiety symptoms are associated with traumatic stress symptoms (Jenness et al. 2016, Pfefferbaum et al. 2021, Thompson et al. 2019). However, some of the studies on the impact of exposure to media content on mental health have focused only on television broadcasts (Pfefferbaum et al. 2019, Pfefferbaum et al. 2021).

79.1% of the students participating in the study reported that they followed the news regarding the February 6 earthquake on social media. The rate of those who reported that they followed other media, such as newspapers, TV, or radio, is much lower. It is known that young adults are more likely to use social media sources to access disaster-related news compared to their use of traditional media (Jones et al. 2016). In a 2013 study conducted after the Boston Marathon bombing, traditional media use was associated with older age, while new media (online news sites and social media channels) use was associated with younger age (Jones et al. 2016). Social media can provide quick access to information and facilitate communication after social traumatizing events. Especially when accurate information from reliable sources is shared in a timely manner, it can serve as a kind of “psychological first aid” (Brown et al. 2021, Taylor et al. 2012). However, although social media provides direct and fast access to information and facilitates communication, it may have some drawbacks (Bekalu et al. 2019, Berryman et al. 2018, Sharma et al. 2020, Sherlock and Wagstaff 2019). Social media users can be exposed to traumatic content directly by seeing the social media posts of the victims and without any censorship. However, studies reviewing the impact of exposure to traumatic content through social media are still scarce.

In an online study conducted with university students after a plane crash in China in which 123 passengers and 9 crew members lost their lives, self-reported frequency of social media use was found to be associated with indirect trauma symptoms (Li et al. 2024). Most studies examining the impact of social media use were conducted during the pandemic period. In 2020, in a study conducted in China aiming to investigate the relationship between social media use related to Covid-19 and mental health, 512 university students were reached online and it was found that the duration of social media use was associated with STS, depression level, anxiety level and negative affect (Zhao and Zhou 2020). In addition, STS was also shown to be associated with depression and anxiety symptom severity. In addition, greater exposure to disaster news through social media was associated with more severe levels of depression for participants with higher levels of the disaster stressor. Similar to this study, social media use was assessed with a social media addiction scale in an online study conducted with residents of Wuhan, the epicenter of the outbreak during the peak of the COVID-19 pandemic,

and social media use was shown to be associated with both depression and STS (Zhong et al. 2021). The results of these studies are consistent with the results of the present study. However, one of the rare studies reporting contradictory results was conducted in Türkiye in the same period and examined the effect of social media use on depression and anxiety levels in cancer patients, but no relationship was found between social media use and symptom levels (Aşut et al. 2024). In addition to the different results arising from the different characteristics of the sample such as being oncology patients and high education level, the fact that whether social media use is at a problematic level has not been examined with a scale may be a limitation of this research.

There are studies showing the relationship of inappropriate use with depression, anxiety and stress levels by examining whether social media use is problematic or not (Glaser et al. 2018, Sharma et al. 2020, Sherlock and Wagstaff 2019, Wolfers and Utz 2022). In addition to spending a lot of time on social media, these harmful effects have been reported to depend on many different variables that characterize the relationship people establish with social media, such as the purpose of social media use and the emotional bond established with social media use (Bekalu et al. 2019, Berryman et al. 2018, Glaser et al. 2018). These variables indicate social media addiction or problematic social media use (Andreassen et al. 2016, Casale et al. 2023). For these reasons, some studies have preferred to use social media addiction scales instead of frequency and duration criteria when evaluating social media use (Jeri-Yabar et al. 2019, Zhong et al. 2021, Zhao and Zhou 2020). In this study, it was preferred to examine the symptoms of social media addiction, and this variable was found to be associated with depression, anxiety, stress levels and stress symptoms secondary to social media use. There are other studies in the literature that support this finding (Andreassen et al. 2016, Jeri-Yabar et al. 2019, Lopes et al. 2022, Mitropoulou et al. 2022).

A total of 40.8% of the participants reported that the social media platform they used to receive information about the February 6 earthquake was Twitter (renamed “X” in July 2023). Secondary traumatic stress scores were higher in this group. Online data platform Statista reported that there were approximately 18 million Twitter users in Türkiye as of January 2023, making Türkiye the seventh country with the highest number of Twitter users (statista.com 2023). Twitter is known as the leading source of breaking news (Vis 2013). This is probably why the Twitter platform was frequently used to receive and share news after the February 6 earthquake (Argın 2023, Tarakcı 2023). However, it has been reported that there can be a lot of misinformation on the platform and news can be distorted to serve a certain purpose (Argın 2023, Youmans and York 2012). Twitter leaves the responsibility for the content of the post to the creator under its terms of service (x.com, Brown et al.

2021). On the other hand, 39.9% of the participants in this study reported using Instagram to access information about the earthquake (most frequently after Twitter). Instagram's community guidelines state that uncensored violent videos and images can be removed (instagram.com). There are criticisms that Twitter's strict policy of leaving responsibility for content in the hands of users may expose users to content with negative effects (Brown et al. 2021). In addition, messages (tweets) about traumatic events may sometimes be reactive and emotionally charged, and sometimes may express frustration with authority (Argın 2023, García Ramírez et al. 2021). All these reasons suggest that Twitter users may show more secondary traumatic stress symptoms compared to other platform users, or those who show secondary traumatic stress symptoms may prefer to use Twitter due to these features of the platform.

Finally, STS scores of female participants were found to be higher and female gender maintained its relationship with STS in the multivariate linear regression analysis model. In similar studies in the literature, it has been reported that women have higher STS levels after disasters (Holman et al. 2014, Thompson et al. 2019, Zhong et al. 2021).

This study has some limitations. First of all, the study was conducted online. Since the symptoms of the participants were collected online with self-report scales, individuals with symptoms at a clinically diagnostic level could not be identified. In addition, the sample consists mostly of female participants. Therefore, gender-related results should be interpreted with caution. Another limitation is that the participants were only university students. It can be assumed that the frequency of social media use and the use of social media for news gathering may be higher in this young group compared to older age groups. Therefore, the findings cannot be generalized to the whole society. Data collection started four months after the earthquake. Although it was a major disaster that remained on the national agenda for a long time, changes in the content and quality of posts over time may have affected the measurements.

Despite the limitations mentioned above, this study has important outcomes. To our knowledge, this is the first study to assess secondary trauma due to social media use after the catastrophic February 2023 earthquakes. In addition to spending a lot of time on social media to measure social media use, symptoms of social media addiction were also examined, including craving for social media use, worrying about social media use, and using social media in a way that disrupts other activities. The results revealed the relationship between the level of traumatic stress secondary to social media and the levels of social media addiction, depression, anxiety and stress symptoms in university students who were not directly affected by the earthquake. The majority of the university students reported that they preferred social media instead

of traditional media to receive news about the earthquake, supporting that social media has become an important part of our lives. The results of the study suggest that more research should be conducted on the subject so that social media can be used in favor of individuals and appropriate policies can be developed, especially after major traumatic events.

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Alexithymia, Anger, Sensitivity to Mild Bodily Sensations and Personality Characteristics of Restless Legs Syndrome Patients: A Case-control Study



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ABSTRACT

Objective: This study aims to assess alexithymia, anger and its expression, sensitivity to bodily sensations, personality, and their relationship with the severity of the disease in patients with Restless Legs Syndrome.

Method: The study included 63 patients diagnosed with Restless Legs Syndrome and 63 age, gender and education matched controls. All participants were given, Toronto Alexithymia Scale, Somatosensory Amplification Scale, The State Trait Anger Scale and Temperament and Character Inventory. The severity of Restless Legs Syndrome was evaluated using the Restless Legs Syndrome Severity Rating Scale.

Results: The trait anger score ($p=0,001$), sensitivity to bodily sensations ($p<0,001$), and the total score of alexithymia ($p<0,001$) were significantly higher in the patient group. Reward dependence in patient group was significantly higher ($p=0,008$). Restless Legs Syndrome severity positively correlated with trait anger level ($r=0,360$; $p=0,015$) and alexithymia total score ($r=0,373$; $p=0,003$). Restless Legs Syndrome severity negatively correlated with self-directedness ($r=-0,323$; $p=0,010$).

Conclusion: We demonstrated that alexithymia, sensitivity to body sensations, and anger was high in restless leg syndrome in Restless Legs Syndrome. Restless Legs Syndrome is linked to physical and mental symptoms and certain personality traits.

Keywords: Anger, Emotions, Personality, Restless Legs Syndrome, Sensations, Temperament

INTRODUCTION

Restless Leg Syndrome (RLS) is a common neurologic disorder characterized by uncomfortable sensations, paresthesia and an urge to move legs (and rarely arms) during sleep or resting (Gossard et al. 2021). According to the epidemiological studies, the prevalence of RLS varies between 5-15% (Trotti 2017, Khacatryan et al. 2022). Although the severity of symptoms in RLS varies from person to person, the ability to fall asleep and maintain sleep is significantly affected (Bollu et al. 2018). It is known that disrupted sleep patterns are a contributing potential factor to the mood and anxiety disorders. It has been proven that RLS is associated with anxiety, depression and some personality traits and negatively affects cognitive functions

and quality of life (Kalaydjian et al. 2009, Rubi 2018, Aydın and Özdemir 2019).

Alexithymia is defined as a decrease in the ability to be aware of one's emotions and defining one's emotions. It also includes externally oriented thinking and reduction in imagination skills (Rosenberg et al. 2020). Impairments in emotional awareness can be seen in patients with psychiatric and neurological diseases and chronic pain (Kumar et al. 2022). Alexithymia, which is used to express mental changes observed in psychosomatic disorders, is thought to be an adaptive regression reaction accompanying psychiatric diseases (Aaron et al. 2019, Hogeveen and Grafman 2021).

The fact that people who consult a doctor with RLS complaints do not describe their current complaints well

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leads to underdiagnosis of the disease. They define their emotions that they cannot express verbally by somatization (Spiegelhalder and Hornyak 2008). Symptoms similar to sleep disturbance, cognitive disorder, tiredness, paresthesia and somatic symptom disorders are frequently seen in RLS cases (Khachatryan et al. 2022). It is known that anger, which is not expressed through denial, is associated with many psychosomatic conditions. It has been shown that in diseases with recurrent and chronic symptoms, individuals have increased sensitivity to bodily sensations and are angry (Toledo et al. 2019, Kumar et al. 2022, Shaygan et al. 2022). Personality traits are an important factor affecting individuals' response to stress for all disorders. Review of the literature shows that high harm avoidance and low self-management are personality profiles associated with mood and susceptibility to chronic diseases (Çakmak et al. 2014, Turkel et al. 2015). RLS has been associated with certain personality traits such as neuroticism, introversion, hysteria, hypochondriasis and psychasthenia, which can increase the risk of developing psychiatric disorders (Kalaydjian et al. 2009).

It is necessary to examine the clinical presentation of RLS, which is common and often accompanied by comorbid psychiatric disorders, symptoms requiring additional intervention in treatment, and various personality traits, and to compare these with findings from previous studies on the general population. In this study, the aim was to determine personality, degree of alexithymia, anger and its expression, sensitivity to bodily sensations and its relations with RLS severity in RLS patients. Determining the psychiatric symptoms and personality traits associated with RLS will contribute to the literature on the disorder and help determine the intervention area in psychotherapeutic approach.

METHOD

Study Design

This study was conducted between 01.05.2023 and 01.08.2023 at the Neurology Outpatient Clinic of the Süleyman Demirel University Research and Practice Hospital with 63 patients diagnosed according to RLS diagnostic criteria and 63 healthy volunteers similar to the patients regarding age, gender, marital status, education, and smoking status-alcohol consumption. The inclusion criteria for the study were over 18 years of age, under 65 years of age, being literate, and agreeing to participate. Those with psychotic disorders/mood disorders with psychotic features, mental retardation, neurological diseases other than RLS and organic mental illnesses that would impair judgment were not included in the study. After the subjects who met the inclusion criteria were informed about the research, those who accepted

to participate in the study signed the Informed Volunteer Consent Form. Each participant underwent a clinical interview, during which structured diagnostic information was collected through face-to-face interviews with a seasoned psychiatrist in the psychiatric department. The research was carried out in accordance with the Declaration of Helsinki and with the approval of the Süleyman Demirel University Clinical Research Ethics Committee (No. 116, April 19, 2022).

Measurement Tools

General and sociodemographic information: The researchers filled out a form of 12 items to patients and healthy volunteers to obtain information about the study's independent variables, such as sociodemographic characteristics and clinical features of the disease duration and medications for RLS. Data was obtained via this form, encompassing several demographic factors such as age, gender, marital status, educational attainment, occupation, smoking and alcohol consumption habits, presence of chronic illness, familial history of RLS, duration of RLS therapy, and drugs used for RLS.

Assessment of RLS: The diagnosis of RLS is mainly based on clinical history. Diagnostic criteria were established by the International Restless Legs Syndrome Study Group (IRLSSG). Patients who meet all criteria are diagnosed with RLS. The IRLSSG diagnostic criteria, revised in 2014, were used by the interviewer to diagnose RLS (Table 1) (Allen et al. 2014).

Evaluation of RLS severity: The disease severity scale (IRLSSG-RS) created by IRLSSG was applied to patients who met RLS diagnostic criteria to evaluate disease severity (IRLSSG 2003). The scale consists of a total of 10 questions rated between 0-4 (0: Not at all, 1: Less severe, 2: Moderately severe, 3: Severe, 4: Very severe). The score obtained in total reflects the severity of the disease. The maximum score is 40, with 1-10 as mild, 11-20 as moderate, 21-30 as severe, and 31-40 as very severe disease. A Turkish validity and reliability study of the scale was conducted, and the Cronbach's alpha internal consistency coefficient was found to be 0.89 (Ay et al. 2019).

Assessment of Alexithymia: The Toronto Alexithymia Scale (TAS), the first validated alexithymia scale, was used in our study. The Likert-type scale consists of 20 questions scored between 1 and 5 (1: Never, 2: Rarely, 3: Sometimes, 4: Frequently, 5: Always). TAS: It consists of three subscales: TAS-1, TAS-2, and TAS-3. The TAS-1 subscale deals with difficulty recognizing and defining emotions; the TAS-2 subscale deals with inadequacy in expressing emotions, and the TAS-3 subscale deals with external-oriented thinking style. High scores indicate a high level of alexithymia (Bagby

Table 1. International Restless Leg Syndrome Study Group RLS Diagnostic Criteria**Basic Diagnostic Criteria**

Often accompanied by uncomfortable and unpleasant sensations in the legs and an irresistible urge to move the legs.
Symptoms are present or worsen during periods of inactivity and rest
Symptoms are relieved or ameliorated by activity such as walking and stretching
Symptoms occur only in the evenings and at night, or are worse than during the day.
These features cannot be considered in relation to other medical or behavioural conditions (e.g. leg cramps, myalgia, arthritis, venous stasis, positional discomfort, leg oedema, habitual foot shaking).

Supporting Criteria

Family history of RLS in first-degree relatives
Response to dopaminergic treatment
Periodic leg movements during wakefulness and sleep

RLS: Restless Leg Syndrome

et al. 1994). A validity and reliability study was conducted in Turkey. The internal consistency examination of the scale and its subscales showed that Cronbach's alpha value was 0.78 for the total scale and varied between 0.57 and 0.80 for the subscales. In addition, confirmatory factor analysis results showed that the scale supported the three-factor structure as in the original, and its internal consistency was sufficient (Güleç et al. 2009).

Assessment Bodily Sensations: The Somatosensory Amplification Scale (SAS) is a 10-item self-rating scale that assesses sensitivity to mild bodily sensations that are unpleasant and bothersome but not pathological. The items consist of unpleasant physical sensations that do not indicate disease. For each item, there are increased scores from 1 to 5, corresponding to the expressions 'not true' and 'completely true.' An amplification score is obtained by summing the scores (Barsky et al. 1988). A study on the scale's Turkish validity and reliability was conducted, and Cronbach's alpha internal consistency coefficient was found to be 0.73 (Güleç and Sayar 2007).

Assessment of Anger: Our study used The State-Trait Anger Expression Inventory (STAXI) to measure anger and expression. It is a four-point Likert-type scale consisting of 34 items. It consists of four dimensions: Trait Anger (TA, ten items), Anger In (AI, eight items), Anger Out (AO, eight items), and Anger Control (AC, eight items). High scores from the TA dimension indicate a high level of anger, high scores from the AI dimension indicate repressed anger, and high scores from the AO dimension suggest that anger can be expressed easily. High scores from the AC dimension indicate that anger is controllable. The scores obtained in each dimension are summed, and the participants' scores are calculated separately for the four dimensions (Spielberger et al. 1983). In the Turkish validity and reliability study of the test, the internal consistency coefficients for the scale were found as follows: 0.79 for the TA dimension, 0.62 for the AI

dimension, 0.78 for the AO dimension, and 0.84 for the AC dimension (Özer 1994).

Assessment of Personality Traits: Temperament and Character Inventory (TCI) is a self-assessment tool consisting of 240 items rated as "true" or "false". TCI consists of seven scales, four temperament scales, and three character scales. Temperament has four dimensions, which are defined as Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD), and Persistence (P). Character has three dimensions: Self-Directedness (SD), Cooperativeness (C), and Self-Transcendence (ST). Subscales are available for all dimensions except P. In temperament, NS has four subscales, HA has four subscales, and RD has three. In the character dimension, SD is divided into five subscales, C into five subscales, and ST into three subscales (Cloninger et al. 1993). The Turkish validity and reliability study of the scale was conducted, and Cronbach's alpha values were between 0.60 and 0.85 in the temperament dimension and 0.82 and 0.83 in the character dimension. The internal consistency, validity, and reliability of the Turkish TCI were found to be at an adaptable level (Kose et al. 2004, Arkar et al. 2006). The sub-dimensions of the TCI and the expression of the high scores are shown in Table 2.

Statistical Analysis

The data were analyzed using SPSS (Statistical Package for the Social Sciences) 26. Normality assumptions of continuous variables were analyzed using the Kolmogorov-Smirnov test, and homogeneity of variance was examined using Levene's test. It was determined that the data did not fit the normal distribution. Descriptive statistics of continuous variables were expressed as median (min-max), mean, and standard deviation, and categorical variables were defined as frequency (n) and percentage (%). Mann-Whitney-U test was used to analyze numerical data with two-level variables. As the data were not normally distributed, the Kruskal-Wallis H test was used for three-level comparisons. In case of a statistically

Table 2. Temperament and Character Inventory Sub-dimensions and Expression of High Scores

Temperament Dimension	
Novelty Seeking (NS)	
NS1 Exploratory excitability	Tendency for excitement and adventure
NS2 Impulsiveness	Quick decision making
NS3 Extravagance	Wasteful behaviour with money, energy and emotions
NS4 Disorderliness	Quick temper, projecting anger, disliking fixed routines and rules
Harm Avoidance (HA)	
HA1 Anticipatory worry	Tendency to anticipate loss and failure
HA2 Fear of uncertain	Inability to tolerate uncertainty or unusual circumstances that are dangerous
HA3 Shyness with strangers	Timidity, reluctance to enter into relationships
HA4 Fatigability	Low energy, easy fatigue
Reward Dependence (RD)	
RD1 Sentimentality	Easy to show emotions
RD2 Attachment	Building warm and lasting social bonds
RD3 Dependence	Needing emotional support and approval from others
Persistence (P)	Dedication to success against frustration and fatigue
Character Dimension	
Self-Directedness (SD)	
SD1 Responsibility	Accepting responsibility for their attitudes and behaviours
SD2 Purposefulness	Target oriented behaviour
SD3 Resourcefulness	Efficiency, productivity and innovation
SD4 Self-acceptance	Recognising and accepting their strengths and weaknesses, self-confidence
SD5 Congruent second nature	Developing harmonious good habits and self-discipline
Cooperativeness (C)	
C1 Social	Accepting people with different behaviours, views and values
C2 Empathy	To be able to put oneself in the place of others
C3 Helpfulness	Enjoyment in serving others
C4 Compassion	Forgiveness even when evil is done
C5 Principled	To adopt ethical principles in social and interpersonal relationships
Self-Transcendence (ST)	
ST1 Self-forgetfulness	Exceeding your own limits
ST2 Transpersonal identification	Willingness to make personal sacrifices
ST3 Spiritual acceptance	Belief in miracles, extrasensory experiences

significant difference between the groups, the Bonferroni correction was applied. Post-hoc analyses were used in the case of a relationship. Spearman's correlation analysis was used to evaluate the relationships between the scales since a normal distribution was not observed. Logistic regression analysis was employed as a form of multivariate analysis. Significant factors identified in univariate analyses, as well as variables with p-values below 0.25 that were not significant, were incorporated into the logistic model (Levy ve Stolte 2000). In all analyses, $p < 0.05$ was accepted as the significant level.

RESULTS

A total of 126 participants, including 81 women (64.3%) and 45 men (35.7%) with a mean age of 39.95 ± 8.11 y (range, 20–57 y) in the study. No significant differences were found between the groups concerning the sociodemographic data (age, gender, smoking status and alcohol consumption, level of education, and marital status) ($p > 0.05$) (Table 3).

Trait anger ($p = 0.001$), anger-in ($p = 0.001$), anger-out ($p = 0.002$), SAS ($p < 0.001$), TAS1 ($p < 0.001$), TAS2

Table 3. Comparison of Socio-demographic Characteristics of Patients and Controls Included in the Study

	Patients n (%)	Control n (%)	p
Age (mean $\pm$ SD) (years)	41.00 $\pm$ 8.90	38.90 $\pm$ 7.11	0.148
Gender			
Female	40 (63.5%)	41 (65.1%)	0.853
Male	23 (36.5%)	22 (34.9%)	
Marital status			
Married	44 (69.8%)	37 (58.7%)	0.193
Single	19 (30.2%)	26 (41.3%)	
Education status			
Middle school	7 (11.1%)	5 (7.9%)	0.074
High school	21 (33.3%)	11 (17.5%)	
University	35 (55.6%)	47 (74.6%)	
Smoking status			
Yes	36 (57.1%)	42 (66.7%)	0.271
No	27 (42.9%)	21 (33.3%)	
Alcohol consumption			
Yes	11 (17.5%)	11 (17.5%)	1.000
No	52 (82.5%)	52 (82.5%)	
Chronic Disease			
Yes	47(74.6%)	38(60.3%)	<0.001
No	16(25.4%)	25(39.7%)	

($p=0.003$), TAS3 ($p=0.002$), TAS total ($p<0.001$) and TCI RD1 ($p=0.008$) averages were significantly higher in patients than in controls. In addition, the mean scores of TCI S1 ($p=0.039$) and TCI S3 ($p=0.002$) were significantly higher in controls than in patients (Table 4). The TCI RD2 was determined to be 0 for all individuals, making it impossible to compare between groups.

The median age of the patients was 40, and the median duration of RLS was two years. A statistically significant difference was found between RLS severity and age ($p=0.048$). The age of patients with severe RLS symptoms was significantly higher than those with mild to moderate symptoms ($p=0.014$). The family members of 17.5% of those diagnosed with RLS also had a diagnosis of RLS. Mostly mothers ($n=12$) of those with a family history of RLS were diagnosed. In addition to RLS, 74.6% of the patients had additional chronic diseases and the most common comorbidities were anemia and rheumatic diseases. It was found that the presence of chronic disease showed a statistically significant difference between the patient and control groups ($p<0.001$).

13.8% ($n=23$) of the patient group were receiving medication for the diagnosis of RLS, and the majority of them were

using dopamine agonists ($n=19$). The RLS severity score was significantly higher in the treatment group than in the non-treatment group ($p=0.001$). The anger trait score was significantly lower in the control group than in the treatment and non-treatment groups ($p=0.006$; $p=0.004$). In the control group, the SAS score was significantly lower than in both the treatment and non-treatment groups (both $p<0.001$). The total TAS score was significantly lower in the control group compared to both the treatment and non-treatment groups (both $p<0.001$). There was no statistically significant difference between the three groups in the sub-dimensions of TCI NS, TCI HA, TCI RD, TCI P, TCI S, TCI C and TCI ST ($p=0.301$; $p=0.811$; $p=0.983$; $p=0.278$; $p=0.088$; $p=0.385$; $p=0.647$). Table 5 shows the comparison of the mean scale scores of the groups receiving treatment for RLS, those not receiving treatment and the control groups.

A moderately positive correlation was found between RLS severity and trait anger score ($r=0.360$; $p=0.015$) and TAS total score ($r=0.373$; $p=0.003$). Table 6 shows the correlation between RLS severity score and scale scores. A moderately negative significant correlation was found with TCI SD ($r=-0.323$; $p=0.010$) (Table 7).

Table 4. Comparison of Mean Scale Scores Between Patients and Healthy Controls

	Patients (n=63)	Control (n=63)	p
	mean $\pm$ SD	mean $\pm$ SD	
TA	21.90 $\pm$ 6.31	18.03 $\pm$ 3.98	<0.001
AI	18.24 $\pm$ 4.38	3.98 $\pm$ 3.25	<0.001
AO	16.79 $\pm$ 4.20	15.46 $\pm$ 3.44	0.002
AC	21.67 $\pm$ 4.68	22.57 $\pm$ 3.93	0.208
SAS	30.30 $\pm$ 8.22	24.40 $\pm$ 6.05	<0.001
TAS1	19.19 $\pm$ 7.34	13.85 $\pm$ 4.96	<0.001
TAS2	12.51 $\pm$ 4.13	10.41 $\pm$ 3.63	0.003
TAS3	19.78 $\pm$ 3.40	17.73 $\pm$ 3.72	0.002
TAS Total	51.48 $\pm$ 11.28	42.00 $\pm$ 9.47	<0.001
TCI SD1	4.38 $\pm$ 2.09	5.19 $\pm$ 1.69	0.039
TCI SD2	5.55 $\pm$ 2.05	5.63 $\pm$ 1.55	0.818
TCI SD3	2.82 $\pm$ 1.49	3.70 $\pm$ 1.54	0.002
TCI SD4	5.25 $\pm$ 2.60	4.90 $\pm$ 2.58	0.582
TCI SD5	8.49 $\pm$ 1.96	8.73 $\pm$ 2.21	0.406
TCI SD	26.52 $\pm$ 7.87	28.16 $\pm$ 6.36	0.302
TCI RD1	7.28 $\pm$ 1.75	6.38 $\pm$ 2.00	0.008
TCI RD3	3.25 $\pm$ 1.87	3.87 $\pm$ 1.69	0.082
TCI RD4	2.00 $\pm$ 1.16	2.36 $\pm$ 1.42	0.132
TCI RD	12.54 $\pm$ 3.35	12.62 $\pm$ 3.50	0.885

TA: Trait Anger, AI: Anger In, AO: Anger Out, AC: Anger Control, SAS: Somatosensory Amplification Scale, TAS: Toronto Alexithymia Scale, TAS1: Toronto Alexithymia Scale-1, TAS2: Toronto Alexithymia Scale-2, TAS3: Toronto Alexithymia Scale-3, TCI SD: Temperament and Character Inventory Self-Directedness, TCI SD1: Temperament and Character Inventory Self-Directedness-1, TCI SD2: Temperament and Character Inventory Self-Directedness-2, TCI SD3: Temperament and Character Inventory Self-Directedness-3, TCI SD4: Temperament and Character Inventory Self-Directedness-4, TCI SD5: Temperament and Character Inventory Self-Directedness-5, TCI RD: Temperament and Character Inventory Reward Dependence, TCI RD1: Temperament and Character Inventory Reward Dependence-1, TCI RD2: Temperament and Character Inventory Reward Dependence-2, TCI RD3: Temperament and Character Inventory Reward Dependence-3, TCI RD4: Temperament and Character Inventory Reward Dependence-4, SD: standard deviation.

Table 5. Comparison of Mean Scale Scores of Groups Receiving and Not Receiving Medication for the Diagnosis of RLS and Control Groups

	Patients	Control (n=63)	p
	Not receiving treatment (n=40) median (min-max)	Receiving treatment (n=23) median (min-max)	
RLS severity score	25 (12-38)	29 (16-38)	-
TA	20.5 (11-39)	23 (14-36)	19 (10-25)
SAS	30 (14-44)	32 (12-46)	25 (14-41)
TAS Total	47 (28-74)	54 (30-74)	41 (26-64)
TCI NS	17 (11-26)	18 (12-25)	19 (6-29)
TCI HA	18.5 (6-31)	16 (9-30)	19 (1-30)
TCI RD	13 (7-21)	13 (6-21)	13 (5-22)
TCI P	6 (2-8)	6 (2-8)	5 (1-8)
TCI SD	29 (12-39)	23 (12-39)	28 (16-41)
TCI C	30 (14-38)	30 (22-39)	30 (10-39)
TCI ST	19 (11-31)	20 (14-30)	19 (3-29)

RLS: Restless Legs Syndrome, TA: Trait Anger, SAS: Somatosensory Amplification Scale, TAS: Toronto Alexithymia Scale, TCI NS: Temperament and Character Inventory Novelty Seeking, TCI HA: Temperament and Character Inventory Harm Avoidance, TCI RD: Temperament and Character Inventory Reward Dependence, TCI P: Temperament and Character Inventory Persistence, TCI SD: Temperament and Character Inventory Self-Directedness, TCI C: Temperament and Character Inventory Cooperativeness, TCI ST: Temperament and Character Inventory Self-Transcendence.

Table 6. Correlation Between RLS Severity and Scale Scores in the Patient Group

		RLS severity	TA	AI	AO	AC	SAS	TAS Total
RLS severity	r	1						
	p							
TA	r	0.360	1					
	p	0.015						
AI	r	0.125	0.525	1				
	p	0.328	<0.001					
AO	r	0.046	0.621	0.438	1			
	p	0.722	<0.001	<0.001				
AC	r	-0.019	-0.409	-0.040	-0.373	1		
	p	0.881	<0.001	<0.001	<0.001			
SAS	r	0.243	0.351	0.364	0.309	-0.119	1	
	p	0.055	<0.001	<0.001	<0.001	0.186		
TAS Total	r	0.373	0.420	0.532	0.265	0.010	0.517	1
	p	0.003	<0.001	<0.001	0.003	0.911	<0.001	

RLS: Restless Legs Syndrome, TA: Trait Anger, AI:Anger In, AO:Anger Out, AC:Anger Control, SAS: Somatosensory Amplification Scale, TAS: Toronto Alexithymia Scale.

Table 7. Correlation Between RLS Severity and Personality Sub-dimensions in the Patient Group

		RLS severity	TCI NS	TCI HA	TCI RD	TCI P	TCI SD	TCI C	TCI ST
RLS severity		1							
TCI NS	r	0.106	1						
	p	0.409							
TCI HA	r	0.180	-0.037	1					
	p	0.158	0.771						
TCI RD	r	-0.220	0.238	-0.200	1				
	p	0.083	0.060	0.116					
TCI P	r	-0.040	-0.332	-0.358	0.044	1			
	p	0.753	0.008	0.004	0.730				
TCI SD	r	-0.323	-0.275	-0.430	-0.008	0.280	1		
	p	0.010	0.029	<0.001	0.953	0.026			
TCI C	r	-0.055	-0.214	0.035	0.142	0.115	0.203	1	
	p	0.669	0.092	0.778	0.268	0.368	0.111		
TCI ST	r	0.150	0.345	-0.035	0.355	-0.117	-0.451	-0.015	1
	p	0.241	0.006	0.787	0.004	0.360	<0.001	0.906	

RLS: Restless Legs Syndrome, TCI NS: Temperament and Character Inventory Novelty Seeking, TCI HA: Temperament and Character Inventory Harm Avoidance, TCI RD: Temperament and Character Inventory Reward Dependence, TCI P: Temperament and Character Inventory Persistence, TCI SD: Temperament and Character Inventory Self-Directedness, TCI C: Temperament and Character Inventory Cooperativeness, TCI ST: Temperament and Character Inventory Self-Transcendence.

Table 8. Logistic Regression Model Summary

	-2log likelihood Cox&Snell	R ²	Neagelkerke R ²
Step 1	126.002	0.320	0.427

Table 9. The Effect of Age, Trait Anger, Toronto Alexithymia Scale Total, Somatosensory Amplification Scale, Temperament and Character Inventory Self-directedness Variables on the Model in the Logistic Regression Model with Restless Legs Syndrome As the Dependent Variable

				%95CI		
	β	SD	p	Exp (β)	Min	Max
Age	0.096	0.032	0.003	1.101	1.033	1.172
TA	0.168	0.054	0.002	1.183	1.064	1.315
TAS	0.078	0.027	0.004	1.081	1.025	1.140
SAS	0.082	0.035	0.020	1.086	1.013	1.164
TCI SD	0.089	0.040	0.028	1.093	1.010	1.182

CI: Confidence Interval, TA: Trait Anger, TAS: Toronto Alexithymia Scale, SAS: Somatosensory Amplification Scale, TCI SD: Temperament and Character Inventory Self-Directedness, SD: standard deviation.

Logistic regression Enter method was used to analyze the effect of the parameters on the control and patient groups. In the analyses, statistically significant values and values very close to significance were added as covariate variables (age, trait anger, SAS, TAS and TCI SD). In our analysis, the Hosmer-Lemeshow test result of $p=0.666$ shows that our model is compatible. According to the summary of the model, the presence of RLS is explained by the scale scores, which are dependent variables, at a rate between 32% and 42.7% (Table 8). It was observed that age, trait anger, SAS, TAS and TCI SD scores were predictive factors for the presence of RLS ($p<0.05$) (Table 9).

DISCUSSION

Alexithymia, which increases sensitivity to bodily sensations, and high anger levels have been observed in RLS. People express their emotions which they cannot verbalize by somatization. The inability of people who consult a doctor with RLS complaints to describe their current complaints well leads to inadequate diagnosis of the disease and inadequate treatment (Spiegelhalder and Hornyak 2008). The aim of this study was to compare the alexithymia, anger, expression of anger, sensitivity to bodily sensations and personality characteristics of patients diagnosed with RLS with healthy controls and to investigate whether there is a relationship between these characteristics and RLS severity. Results of this study show that there is difference in anger, expression of anger, sensitivity to bodily sensations and degree of alexithymia in patients diagnosed with RLS compared to patients without RLS. It also has been shown that there is a relationship between severity of RLS and sensitivity to bodily sensations and anger level. In our study, patients diagnosed with RLS have been associated with certain personal traits.

Alexithymia is reported to be positively associated with a number of somatic symptoms and psychological factors such as somatosensory amplification. In a study which investigated alexithymic characteristics in migraine patients, it was reported that the migraine group was more alexithymic than the control group (Neyal et al. 2004). In another study which investigated alexithymia, anger level and psychological distress in patients diagnosed with myofascial pain syndrome, it was observed that patients scored significantly higher on the difficulty in recognizing emotions subscale of alexithymia compared to the control group (Castelli et al. 2013). In a study investigating the prevalence of alexithymia in fibromyalgia and chronic migraine patients, it was shown that alexithymia was more common in fibromyalgia patients compared to healthy controls (Ghiggia et al. 2022). A meta-analysis shows that the average prevalence of alexithymia in fibromyalgia is 48%. In fibromyalgia, alexithymia was found to be significantly higher and positively correlated with pain

intensity compared to healthy controls and people with other pain-related conditions, especially rheumatoid arthritis (Asgarabad et al. 2023). Although there are studies examining the relationship between chronic pain and psychosomatic symptoms and alexithymia, there are few studies on the frequency of alexithymia in RLS (Yılmaz et al. 2018, Ellmerer et al. 2020, Heim et al. 2022, Sandri et al. 2023). In a study, RLS patients were more alexithymic than healthy controls while no significant relationship was found between RLS severity and degree of alexithymia. (Yılmaz et al. 2018). In another study, alexithymia was shown to be a factor affecting the need to add tone-ups in RLS (Heim et al. 2022). In our study, it has been observed that the patient group had difficulty in defining and expressing their emotions compared to the control group. It has been shown that patients in need of treatment were more alexithymic. Moreover, it has been found that patients who had difficulty in defining and expressing their emotions have higher severity of RLS. The findings suggest that additional interventions to improve the ability of RLS patients to recognize their emotions and express themselves may contribute to treatment.

The finding of significant alexithymia in Parkinson's patients suggests that alexithymia is a condition resulting from dopaminergic insufficiency/dysfunction. Some studies investigating the link between neurobiological changes in Parkinson's disease and alexithymia suggest that the severity of alexithymia is caused by the imbalance of nigrostriatal and mesocorticolimbic dopamine pathways that occur during the course of the disease (Costa et al. 2010, Costa and Caltagirone 2016). It is hypothesized that dopamine dysregulation in the nigrostriatal pathway is also involved in the pathogenesis of RLS. In another study evaluating emotional processes in RLS patients, it was found that patients were more alexithymic and impulsive than the control group. It stands out that these patients have impaired facial emotion recognition, especially for negative emotions such as anger and sadness (Ellmerer et al. 2020). In results of our study, the median disease duration was 2 years and there were no additional patients with Parkinson's disease. It has been shown that patients treated for RLS have more severe symptoms and they have difficulty in defining and expressing their emotions. It has been found that patients treated for RLS have higher level of anger. These results can be interpreted as dopaminergic dysregulation in the chronic process causing neuroplastic changes, which in turn leads to emotional disturbance and impulsivity. However, more comprehensive studies are needed to reveal the dopaminergic pathogenesis in alexithymia.

Studies have shown that there is a correlation between increasing sensitivity to bodily sensations and presence of chronic pain (Boone ve Kim 2019). A study involving patients with migraine revealed a significant increase in their sensitivity to bodily sensations (Cengiz et al. 2019). A

meta-analysis examining hypochondriasis and somatization showed a correlation between increased sensitivity to bodily sensations and somatization (Creed and Barsky 2004). In a study involving 604 patients treated in a psychosomatic diseases clinic, a strong correlation was found between the total number of physical symptoms and perceived psychosocial stress, alexithymia and sensitivity to bodily sensations (Nakao and Takeuchi 2018). As far as we know, there is currently no study investigating sensitivity to bodily sensations in RLS patients. Our study showed that the patient group tended to perceive more normal somatic sensations as intense, harmful and disturbing than the control group and that this increased sensitivity to bodily sensations predicted the disease. However, no significant relationship was found between RLS severity and sensitivity to bodily sensations. The tendency to feel normal bodily sensations as intense and uncomfortable also did not differ between patients who did and did not receive treatment for RLS.

Current research on the level of anger of RLS is limited. A study conducted in China examined a group of young people and their parents to investigate the impact of RLS on quality of life and daily functioning. Findings have shown that individuals with RLS had decreased quality of life, decreased daily functioning, had higher anger levels and experienced outbursts of anger (Zhang 2014). Anger and its expression is seen as one of the important determinants of the progression of somatization. Chronic pain patients often have a high degree of anger suppression and hostility compared to individuals without health problems. This has been shown to be associated with more distinct pain and impairment (Yılmaz et al. 2016). Studies have shown that suppressing anger can increase sensitivity to pain by reducing endogenous opioids (Bruehl et al. 2009, Burns et al. 2015). Inability to express anger has been found to intensify pain by increasing feelings of anger (Burns et al. 2008). Studies comparing fibromyalgia patients with healthy controls have shown that patients internalize their anger more (Sayar et al. 2004). In a study involving individuals with myofascial pain, mean alexithymia and outward anger scores were found to be significantly higher (Castelli et al. 2013). Our study revealed that patients exhibited higher levels of trait anger than controls. Patients have been reported to display their anger by suppressing or externalizing it. However, no significant difference in anger level was found between patients who were treated for RLS and those who were not.

Studies show a relationship between personality dimensions and psychiatric disorders, migraine and fibromyalgia (Naylor et al. 2017). In the literature, there are limited number of studies on personality traits of RLS patients. Our study reveals that people with RLS exhibit high emotional reactivity and show their emotions easily. Compared to control group, they tended to blame others for what happened to them and it is

understood that they felt inadequate and needed help from others when they faced obstacles. It has been shown that the severity of RLS increases as self-management as a character trait decreases in patients. In the analyses, self-management was found to be one of the predictive factors of the disease. A study examining the potential role of personality traits between RLS and psychiatric disorders suggests that neuroticism contributes to the association between RLS and a history of mood disorders (Kalaydjian et al. 2009). In another study on personality traits in RLS, similar to our study, the TCI was used and it was found that individuals with RLS were more cautious and careful but had lower self-management traits compared to controls without RLS (Çakmak et al. 2014).

RLS is not just a disorder of the nervous system, but a disease that significantly affects cognition, mood and functioning. Epidemiologic studies report a 2 to 4 times higher risk of depressive disorders in patients with RLS compared to healthy controls (Hornyak 2010, Happe et al. 2012). It has been shown that as the severity of RLS increases, depression symptoms worsen and quality of life decreases (Fuhs et al. 2014). In the literature, low Self-Management and high Harm Avoidance scores have been consistently reported in psychiatric patients, especially in those with depressive disorders. Harm Avoidance is considered a marker of emotional vulnerability to depression, whereas Self-Management is a marker of executive functioning that protects the individual from depression. However, clinical RLS symptoms such as pain, uneasiness, insomnia are hypothesized to trigger the depression (Melo et al. 2021). However, it seems difficult to explain the relationship between Harm Avoidance and RLS with the data obtained from the TCI. Harm Avoidance has been shown to be associated with the balance of a complex network of neurotransmitters including dopamine and dysfunction of serotonergic activity, while dopaminergic dysfunction is essential in RLS (Yasuno et al. 2001). In a study aiming to evaluate emotional temperament, depressive symptoms and anxiety in RLS patients, the results showed that high scores on emotional character, depression and anxiety scales indicated psychiatric comorbidities in RLS (Başaran and Taş 2022). In a study aiming to evaluate psychological comorbidities in RLS patients, harm avoidance scores expressing fear and anxiety that may arise in the future in the temperament dimension were found to be high in RLS patients (Marconi et al. 2015). In another meta-analysis, a positive correlation was found between the harm avoidance temperament dimension and RLS (Rezaei et al. 2021). Two studies found a strong association between the novelty seeking temperament dimension and parasomnias or sleep-related respiratory problems (Sforza et al. 2002, Perogamvros et al. 2015). In our study, no significant difference was found between patients and controls for harm avoidance and novelty seeking temperament traits.

In our study, it was found that the presence of chronic diseases differed significantly between the patient and control groups. It was shown that RLS patients reported anemia, chronic kidney disease, rheumatic disease, depression and general comorbidities more frequently than controls (Sevim et al. 2004). In one study, it was reported that the prevalence of RLS was higher in patients with comorbidities compared to those without comorbidities and the most common comorbidities in RLS cases were gastroesophageal reflux, anemia and migraine, respectively (Deveci et al. 2012). In another study on the risk factors associated with RLS, it was reported that comorbidities, most commonly anemia, DM and decreased renal function, were significantly more common in RLS patients (Berger et al. 2004). Various mental symptoms have been reported more in the group of patients with RLS and anemia than in the group without anemia (Bae et al. 2021). In our study, it was observed that anemia was the most common chronic disease in the patient group. The results underline the necessity of screening and treating patients with anemia for RLS in order to improve their quality of life.

It would be more accurate to interpret the results we obtained in our study in the light of the limitations of our research. The fact that the study was cross-sectional and the patients were selected from a single center makes it difficult to generalize the subject. Due to the nature of self-assessment questionnaires and the inclusion of personal information in, individuals may have tended to present themselves in a positive light. In the study, psychiatric diseases other than psychotic disorder and mood disorders with psychotic features were not questioned and mental status was not evaluated. In addition, sleep disorders secondary to RLS were not evaluated in patients. To support the current findings, prospective studies with larger samples may better reveal differences between groups.

In conclusion, it is known that RLS is associated with various psychiatric symptoms such as anxiety, alexithymia and anger. These findings affecting the course of the disease are often overlooked by clinicians. In our study, it has been seen that RLS patients have difficulties in defining and expressing their emotions. In addition, patients showed increased levels of anger and a tendency to perceive normal bodily sensations as more intense and disturbing. Due to the high level of alexithymia in RLS and its association with disease severity, therapeutic interventions to help patients recognize and express emotions would be beneficial in the management of psychiatric symptoms in RLS.

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Examining Social Anxiety Symptoms with Early Maladaptive Schemas: The Mediating Role of Mindfulness and Self-Compassion



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ABSTRACT

Objective: This study aims to determine early maladaptive schema domains that significantly predict social anxiety symptoms in university students and to examine whether mindfulness and self-compassion play mediating roles in the correlation of these schema domains with social anxiety symptoms.

Method: 440 students from various departments of universities participated in the study. Liebowitz Social Anxiety Scale, Young Schema Questionnaire-Short Form 3, Five Facets Mindfulness Questionnaire, and Self-Compassion Scale were used to evaluate social anxiety, early maladaptive schema domains, mindfulness, and self-compassion, respectively.

Results: The hierarchical regression analyses demonstrated that maladaptive schemas in the domains of disconnection, impaired autonomy, and unrelenting standards significantly predicted the increase in social anxiety symptoms. It was found that the level of mindfulness mediated the correlations between these three schema domains and social anxiety symptoms. Moreover, self-compassion mediated the correlations between the schema domains of impaired autonomy and unrelenting standards and social anxiety symptoms.

Conclusion: Findings indicate the importance of both specific schema domains and the level of mindfulness and self-compassion in explaining social anxiety symptoms in university students. The results' possible causes and clinical implications were discussed in light of the current literature.

Keywords: Social Anxiety, Early Maladaptive Schemas, Mindfulness, Self-Compassion

INTRODUCTION

The common proposition of cognitive models explaining social anxiety is that individuals experiencing social anxiety have dysfunctional core beliefs about themselves and their correlations with others and that these beliefs are triggered by social environments (Clark and Wells 1995, Heimberg et al. 2010, Hofmann 2007). However, Young et al.'s (2003) schema-oriented approach elaborates the concept of schema in cognitive theory, underlining that early maladaptive schemas are the most important factor that paves the way for psychological problems such as anxiety. According to this approach, early maladaptive schemas arising from basic needs that have not been met since early in life consist of memories, emotions, cognitions, and bodily sensations based on the individual's self and correlations with others and often disrupt the individual's functionality. Young et al. (2003) propose 18 "universal" early maladaptive schemas clustered

under five basic schema domains (see Table 1). Indeed, studies conducted with different cultures and divergent sample groups have provided empirical evidence for the universality of early maladaptive schemas, although early maladaptive schemas might be clustered differently to form schema domains across cultures (e.g., Cecero et al. 2004, Lee et al. 1999). For example, a study comparing Korean and Australian samples of university students (Baranoff et al. 2006) found that similar schema structures were present in both cultures, but these structures were not the same as the schema domains determined by Young (1999). Borges et al. (2020) found a similar structure to the schema domains identified in the original study when studying adolescents in Portugal and Brazil. Supporting the idea that there may be cultural differences in schema clusters, study (Soygüt et al. 2009) conducted with university students to determine early maladaptive schemas and schema domains in Turkey has shown some differences in schema domains, as well as

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some overlaps with the original structure. Taken together, these findings indicate that the schema structures and their relationship with each other may vary across different cultures and samples. The original schemas and schema domains (Young 1999) in comparison to the schemas and schema domains determined in Turkey and referenced in the current study are given in Table 1.

Relevant literature has revealed that early maladaptive schemas are linked to various psychopathologies (e.g., Chen and Chang 2019, Kim et al. 2014, Meneguzzo et al. 2020, Soyaslan and Özcan 2019). However, it is noteworthy that the correlations between social anxiety and early maladaptive schemas are understudied (Boden et al. 2012). The available limited studies have found that early maladaptive schemas or some schema domains, especially disconnection/rejection, impaired autonomy, and other-directedness schema domains (Calvete 2014, Calvete et al. 2018, Eldoğan and Barışkın 2014, Mairet et al. 2014, Orue et al. 2014, Parsons et al. 2017), positively predicted social anxiety (González-Díez et al. 2015, Mairet et al. 2014, Pinto-Gouveia et al. 2006).

Individuals with high social anxiety process themselves as a social object (Clark and Wells 1995) and have significant difficulty objects accepting their inner experiences and thoughts without judging (Clerkin et al. 2017). It is stated that the attention focus of these individuals is mainly on their internal experiences, which leads to a decrease in the awareness of external social cues and interpretation of the external world as threatening (Clark and Wells 1995). Clark and Beck (2010) indicated that individuals with high social anxiety have negative schemas towards threats and danger

triggered in social environments, and it is such a schema activation that brings an increased attentional bias toward the threat and an excessive focus on internal experiences. For these reasons, it might be suggested that individuals with high social anxiety may have low levels of mindfulness. Mindfulness, in its most basic form, means that the individual is open to momentary experiences without judging, and can accept them with awareness (Çatak and Ögel 2010, Sauer et al. 2013). Relevant literature indicates that social anxiety symptoms are more common in individuals with low levels of mindfulness (Clerkin et al. 2017, Rasmussen and Pidgeon 2011, Schmertz et al. 2012). This suggests that increased mindfulness may be a protective factor against psychological problems such as social anxiety.

Self-compassion is another important psychological concept that is thought to protect one from psychological problems. Having its roots in Buddhist philosophy, self-compassion refers to the individuals' ability to approach themselves, their pain, and mistakes without judging, criticizing, or punishing, as well as to the ability to evaluate their experiences as a "human experience" even if they include error, defect, failure, or pain (Neff 2003). Neff (2003) defined self-compassion with three overlapping and complementary components: self-kindness, common humanity, and mindfulness. Individuals with high social anxiety are critical of themselves and feel that other people will be similarly critical of them (Clark and Wells 1995). These individuals also have biased thoughts that they are the only ones who experience the anxiety they feel in social environments. In addition, as their attention is constantly on their internal processes and threat-related environmental

Table 1. Comparison of Schema Domains and Early Maladaptive Schemas

Young (1999)		Soygüt et al. (2009)	
Schema Domains	Early Maladaptive Schemas	Schema Domains	Early Maladaptive Schemas
Disconnection and Rejection	Abandonment Mistrust Emotional Deprivation Defectiveness Social Isolation	Disconnection	Emotional Deprivation Emotional Inhibition Social Isolation/Mistrust Defectiveness
Impaired Autonomy and Performance	Dependence Enmeshment Vulnerability to Harm Failure	Impaired Autonomy	Enmeshment/Dependence Abandonment Failure Pessimism Vulnerability to Harm
Impaired Limits	Entitlement Insufficient Self-Control	Impaired Limits	Entitlement /Insufficient Self-Control
Other-Directedness	Self-Sacrifice Subjugation Approval-Seeking	Other-Directedness	Self-Sacrifice Punitiveness
Overvigilance and Inhibition	Pessimism Emotional Inhibition Unrelenting Standards Punitiveness	Unrelenting Standards	Unrelenting Standards Approval-Seeking

cues, they are less likely to be aware of momentary experiences (Heimberg et al. 2010). These characteristics of social anxiety suggest that individuals with high social anxiety may exhibit a pattern directly opposite to the three components used in the definition of self-compassion. According to an analysis of the pertinent literature, people with low self-compassion have higher levels of social anxiety than people with high self-compassion do (Makadi and Koszycki 2020). They also have greater fears of being judged by others, both favorably and unfavorably (Harwood and Kocovski 2017, Werner et al. 2012).

Among the main goals that the schema theory addresses are guiding individuals to become aware, recognize, and accept themselves, as well as their emotional and physical needs (Young et al. 2003). In its most general form, schema therapy aims to enable individuals to cope with schema-triggering situations more effectively and to accept their experiences as a part of being human. When their schemas are activated, individuals with high social anxiety may bias their internal and external cues, avoid experiences, and make destructive criticisms against themselves for their faults and mistakes (Thimm 2017). It is seen that schema therapy makes room for third-wave therapy concepts such as mindfulness and self-compassion in its conceptualization and application processes (Arntz et al. 2009), and some modes defined by the schema therapy may be evaluated as connected to these concepts. The detached protector mode, for instance, in which individuals cut off contact with themselves to avoid negative emotions and experiences (Arntz and Jacob 2017), is similar to low mindfulness. According to schema theory, individuals may feel empty while in the detached protector mode, are not consciously aware of their inner experiences, and thereby avoid the negative emotions (such as pain, sadness, and grief) that will arise from the negative experiences (Arntz and Jacob 2017). People with high levels of mindfulness can produce reasonable, appropriate, and healthier responses instead of giving automatic, impulsive and ingrained reactions when their schemas are activated (Thimm 2017). Following mindfulness-based interventions, individuals' insight about their schemas increases, and they can better cope with the schema-triggering situations they experience (Roediger 2012).

Similarly, schema therapy aims to enable people to realize their experiential and emotional avoidance and give context-appropriate responses in the face of schema-triggered situations. These responses, which are conceptualized as healthy adult behaviors (Young et al. 2003), qualitatively cover the concept of self-compassion. In cases of mistakes, defects, and shortcomings, the healthy adult side of the person will be able to show the person the compassion and understanding they require and will be able to view the negativity as a human experience. Furthermore, people with low self-compassion have attitudes toward themselves that are similar to attitudes

(e.g., intolerance for errors, being accusatory) observed in situations where the internalized demanding/punitive parent mode is active (Arntz and Jacob 2017).

Overall, one may suppose that mindfulness and self-compassion are concepts to be linked with schemas, and they may help researchers and clinicians to better understand psychopathologies such as social anxiety. Although the associations of mindfulness and self-compassion with social anxiety have been revealed in literature, no previous study has modeled these concepts together with schemas. As a result, the current study seeks to uncover the links between schema domains and social anxiety symptoms in a Turkish sample, as well as to investigate the mediating roles of mindfulness and self-compassion in these correlations. In other words, this research seeks an answer to the question that whether mindfulness and self-compassion are the mechanisms explaining the association of schema domains with social anxiety symptoms. It is expected that as the individuals' scores from early maladaptive schema domains increase, their mindfulness and self-compassion levels will decrease, and thus, an increase in the severity of the social anxiety symptoms will occur.

METHOD

Sample

The sample of the study consists of university students living in Turkey and continuing their education as associate, undergraduate, master's or doctorate students. The criteria for participation in the present study were voluntary participation and studying at a university in Turkey. The exclusion criterion was to have any psychiatric/neurological disorder that would make it difficult to understand or answer the questionnaires. Participants were recruited using convenience and snowball sampling and responded to questionnaires sent via the internet. Initially, 453 people signed up for the study, and 13 participants who declared that they graduated were removed from the data. After the exclusion of the graduates, analyzes were performed on a total of 440 university students with an average age of 23.20 ($SD=4.89$, range 17-46), including 73.9% ($n=325$) women, and 26.1% ($n=115$) men. While 90.4% ($n=395$) of the participants were single, 24.5% ($n=108$) were actively working, 53.4% ($n=235$) had a low-income level (less than 1000TRY/mo), and 19.5% ($n=89$) had received psychological or psychiatric support at some point in their lives for reasons such as exam anxiety, relationship problems, and depressive symptoms, regardless of whether they received a clinical diagnosis or not. Participants completed all questionnaires without missing values.

Instruments

Sociodemographic Information Form: It was designed by the researchers to obtain information about the participant's

age, gender, department, class, university, place of residence, monthly income, employment status and whether they receive psychological or psychiatric support. There are twelve questions in the relevant form.

Liebowitz Social Anxiety Scale (LSAS; Liebowitz 1987): It is a 24-item, 4-point (0=no fear/never avoid, 3=severe fear/usually avoid) scale and consists of two subscales, namely fear/anxiety and avoidance, in which the same questions evaluate the fear/anxiety and avoidance reactions that people may experience in the social interaction and performance environments they encounter. The scale can give a total social anxiety score, and subscales can be evaluated separately as well, and the increase in the scores obtained from the scale indicates an increase in social anxiety symptoms. The LSAS was adapted into Turkish by Soykan et al. (2003). For the convergent validity of the scale, correlations with the Beck Anxiety Inventory were examined, and it was shown that anxiety scores were positively correlated with the social fear/anxiety subscale ($r=0.26$), the avoidance subscale ($r=0.21$) and the whole scale ($r=0.25$). The Cronbach alpha internal consistency coefficients of the scale were determined as 0.96 for the fear/anxiety subscale, 0.95 for the avoidance subscale and 0.98 for the whole scale.

Young Schema Questionnaire-Short Form 3(YSQ-SF3; Young 1999): It is a 90-item, 6-point rating (1=completely untrue of me, 6=describes me perfectly) instrument that evaluates five schema domains and a total of 18 schemas based on the contents of schema therapy. The adaptation study of the scale into Turkish was performed by Soygüt et al. (2009). Early maladaptive schemas and their schema domains determined in the original study and adaptation study are given comparatively in Table 1. In order to evaluate the convergent validity of the scale, the correlations among subscales and psychological symptoms were examined. It was observed that the scale shows significant positive correlations with anxiety, depression, and interpersonal sensitivity. Moreover, findings regarding discriminant validity indicated a significant statistical difference between the clinical and the normal samples in terms of YSQ-SF3's early maladaptive schemas and schema domains. Cronbach's alpha internal consistency coefficients were determined to be between 0.63 and 0.80 for early maladaptive schemas and between 0.53 and 0.81 for schema domains. It was also reported that the test-retest reliability coefficients varied between 0.66 and 0.82 for early maladaptive schemas, and between 0.66 and 0.83 for schema domains.

Five Facets Mindfulness Questionnaire (FFMQ; Baer et al. 2006): It is a 39-item and 5-point rating (1=never true, 5=always true) scale constituted by items from different instruments that measure the mindfulness levels of individuals. It has five sub-dimensions named observing, describing, acting with awareness, nonjudging of inner

experience, and non-reactivity to inner experience. A total score can also be obtained from the scale. The Turkish adaptation study of the scale was carried out by Kinay (2013) with university students. As a result of the factor analysis, the scale revealed a five-factor structure in the Turkey sample as similar to the original scale, apart from the 4th item that loaded on a factor different from that of the original. It was reported that the item-factor loadings of the scale were between 0.38 and 0.79. In addition, the Cronbach alpha coefficients of the sub-dimensions were between 0.67 and 0.85, and the test-retest correlation coefficients were between 0.23 and 0.71.

Self-Compassion Scale (Neff 2003): It is an instrument consisting of 26 items and six sub-dimensions (self-kindness, self-judgment, common humanity, isolation, mindfulness, over-identification) developed to determine the self-compassion levels of individuals. A total score can be obtained from the instrument, and respondents rate their answers on a 5-point rating scale (1=almost never, 5=almost always). The Turkish version of the scale adapted by Akin et al. (2007) was used in the present study. The item-factor loadings of the adapted scale were between 0.41 and 0.88, the corrected item-total correlations ranged between 0.48 and 0.71, and all differences between the mean scores of the 27% upper and lower groups were significant. In addition, Cronbach's alpha consistency coefficients ranged from 0.72 to 0.80, while test-retest reliability coefficients ranged from 0.56 to 0.69.

Procedure

A survey set was formed through Google Forms after obtaining the necessary permission from the Ethics Committee of the Faculty of Literature of Dokuz Eylül University. Participants were mostly recruited through social media and official university community pages. Prior to the survey set, an Informed Consent Form including necessary details of the research was presented to the participants and their approvals were obtained. The questionnaires took approximately 30 minutes to complete. Instruments were presented to all participants in the same order.

Statistical Analyses

Before the basic analyses, it was determined that the data transferred to the SPSS 23.0 program met the normality and linearity assumptions. In line with the purposes of the study, the mean and standard deviation values of the basic variables were calculated. In addition, since the distribution of men and women in the sample was not equal, independent samples t-test and multivariate analysis of variance (MANOVA) were used to determine if the mean scores of the variables differed according to gender. While MANOVA was performed for schema domains consisting of five dimensions, independent samples t-tests were conducted

to see the differences for gender in terms of the total scores of social anxiety, mindfulness, and self-compassion levels. Regarding exploratory purposes, correlations among variables were examined not only for schema domains but also for all individual schemata. In order to determine the schema domains that significantly predict the social anxiety symptoms, a hierarchical regression analysis in which the schema domains having significant correlations with social anxiety were entered as a block after controlling for gender was performed before the mediation analyses. Only schema domains were used in this regression analysis since examination of all individual schemas together in this model was not possible due to the sample size. Finally, parallel multiple mediation analyses were performed using Hayes' (2013) PROCESS Macro 3.4 version to examine the role of mindfulness and self-compassion for each schema domain that were found as significant predictors of social anxiety. To test the significance of the indirect effects, the bias-corrected (BC) bootstrap method with a sample size of 5000 and a confidence interval of 95% was employed. According to the BC bootstrap analysis condition in the simulation created by Fritz and MacKinnon (2007), the sample size of the study has sufficient power for the mediation analysis, since the required sample size to detect even small mediating effects with an acceptable statistical power (0.8) should be between 368-462.

RESULTS

Descriptive Statistics, Independent Samples t-test, MANOVA, and Correlation Analysis

Table 2 shows the mean, standard deviation, and Cronbach's alpha values of all variables that constitute the mediation

models to be examined, as well as the independent samples t-test and MANOVA findings to inspect the differences for gender. First, it was observed in the t-tests that homogeneity of variance was met according to Levene's test for social anxiety, mindfulness, and self-compassion ($p > 0.05$). The results of these t-tests indicated that the social anxiety ($p = 0.55$), mindfulness ($p = 0.08$), and self-compassion ($p = 0.21$) levels of women and men were not significantly different. Before examining the differences in terms of schema domains, the equality of variances was tested with the Box M test and it was seen that the assumption was met ($M = 15.63$, $p = 0.42$). In addition, Levene's test results revealed that homogeneity of variance was present for all dimensions ($p > 0.05$). According to the MANOVA results, the model was significant (Pillai's Trace = 0.062, $F_{(5,438)} = 5.70$, $p < 0.001$, $\eta^2_{\text{partial}} = 0.062$, power = 0.99), indicating that the scores of men and women differed significantly in terms of schema domains. In order to avoid the Type 1 error in the interpretation of the follow-up ANOVAs to determine which schema domains are different between genders, the critical p-value of the significance level was calculated as 0.01 (0.05/5) using the Bonferroni correction. When the impaired autonomy scores were examined, it was determined that women ($M = 2.33$, $SD = 0.94$) scored lower than men ($M = 2.77$, $SD = 1.00$) ($p < 0.001$). It was also observed that the disconnection levels of women ($M = 2.41$, $SD = 1.01$) were lower than men ($M = 3.02$, $SD = 1.13$) ($p < 0.001$). Finally, it was determined that the other-directedness score of women ($M = 3.39$, $SD = 0.93$) was lower than that of men ($M = 3.68$, $SD = 0.89$) ($p = 0.004$). However, no significant differences were found in schema domains of unrelenting standards ($p = 0.02$) and impaired limits ($p = 0.04$). Due to the significant differences in the schema domains, the effect of gender was controlled for in all analyses.

Table 2. Means, Standard Deviations (SD) and Cronbach's Alpha Values of Variables and Independent Samples t-test, MANOVA Results (N = 440)

Variables	Whole Sample			Gender						
				Women (n = 325)		Men (n = 115)				
Schema Domains	α	M	SD	M	SD	M	SD	F	p	η^2
Disconnection	0.94	2.57	1.07	2.42	1.01	3.02	1.13	28.31	0.000	0.061
Impaired Autonomy	0.95	2.45	0.97	2.33	0.93	2.77	1.00	17.53	0.000	0.038
Impaired Limits	0.74	3.71	1.02	3.65	1.04	3.88	0.98	4.30	0.039	0.010
Other-Directedness	0.80	3.46	0.92	3.39	0.93	3.68	0.89	8.18	0.004	0.018
Unrelenting Standards	0.77	3.43	0.97	3.36	0.98	3.61	0.92	5.50	0.019	0.012
Other Scales								t	p	
Mindfulness	0.83	3.20	0.44	3.22	0.44	3.14	0.42	1.76	0.08	
Self-Compassion	0.93	2.99	0.72	3.02	0.75	2.92	0.66	1.25	0.21	
Social Anxiety	0.96	2.10	0.58	2.11	0.57	2.07	0.60	0.59	0.55	

Table 3. Correlations among Variables

Early Maladaptive Schemas	Mindfulness	Self-Compassion	Social Anxiety
Disconnection	-0.44	-0.56	0.40
Emotional Deprivation	-0.37	-0.44	0.32
Emotional Inhibition	-0.29	-0.38	0.29
Social Isolation/Mistrust	-0.35	-0.55	0.40
Defectiveness	-0.50	-0.53	0.35
Impaired Autonomy	-0.47	-0.54	0.43
Enmeshment/Dependence	-0.43	-0.39	0.38
Abandonment	-0.37	-0.43	0.30
Failure	-0.51	-0.52	0.39
Pessimism	-0.34	-0.55	0.34
Vulnerability to Harm	-0.27	-0.41	0.38
Impaired Limits	-0.02	-0.14	0.23
Entitlement /Insufficient Self-Control	-0.02	-0.14	0.23
Other-Directedness	-0.15	-0.29	0.29
Self-Sacrifice	-0.11	-0.18	0.25
Punitiveness	-0.14	-0.31	0.25
Unrelenting Standards	-0.15	-0.30	-0.31
Unrelenting Standards	-0.07	-0.24	0.21
Approval-Seeking	-0.22	-0.31	0.33
Social Anxiety	-0.35	-0.37	

Note. Values of 0.14 and above are significant at the $p < 0.01$ level, the value of 0.11 is significant at the $p < 0.05$ level, values of 0.07 and below are not significant ($p > 0.05$).

The relationship patterns among variables obtained from the correlation analysis are shown in Table 3. When these were examined, it is seen that all early maladaptive schemas and schema domains were significantly and positively correlated with social anxiety. In addition, the relationship patterns of early maladaptive schemas and schema domains with other variables were similar. It is observed that all early maladaptive schemas and schema domains, other than the impaired limits and unrelenting standards domains, were significantly and negatively correlated with mindfulness; and all early maladaptive schemas and schema domains showed significant and negative correlations with self-compassion. Similarly, it was determined that social anxiety was significantly and negatively correlated with mindfulness and self-compassion.

Hierarchical Regression Analysis

The effect of gender was controlled for in the first step of the hierarchical regression analysis, and the five schema domains having a significant correlation with social anxiety were included in the second step. These variables together explained 20% of the variance ($R^2 = 0.20$, $F_{(6,433)} = 19.74$, $p < 0.001$). When

the first step of the model was examined, it was determined that gender (1=women, 2=men) was a significant predictor of social anxiety ($\beta = -0.11$, $t_{(433)} = -2.49$, $p < 0.05$, $pr^2 = 0.01$). After controlling for the effect of gender, it was observed that disconnection ($\beta = 0.16$, $t_{(433)} = 2.04$, $p < 0.05$, $pr^2 = 0.01$), impaired autonomy ($\beta = 0.24$, $t_{(433)} = 2.88$, $p < 0.01$, $pr^2 = 0.02$) and unrelenting standards ($\beta = 0.12$, $t_{(433)} = 2.13$, $p < 0.05$, $pr^2 = 0.01$) significantly and positively predicted social anxiety. For this reason, mediation analyses were performed using these three schema domains that were significant predictors of social anxiety.

Mediation Analyses

Three parallel multiple mediations analyses were conducted to examine the mediating role of both mindfulness and self-compassion in the same analysis, after controlling for the effect of gender. These parallel multiple mediation models are given in Figure 1. It was determined that the first multiple mediation model, which focuses on the mediating role of mindfulness and self-compassion between the relationship of the disconnection schema domain with social anxiety was

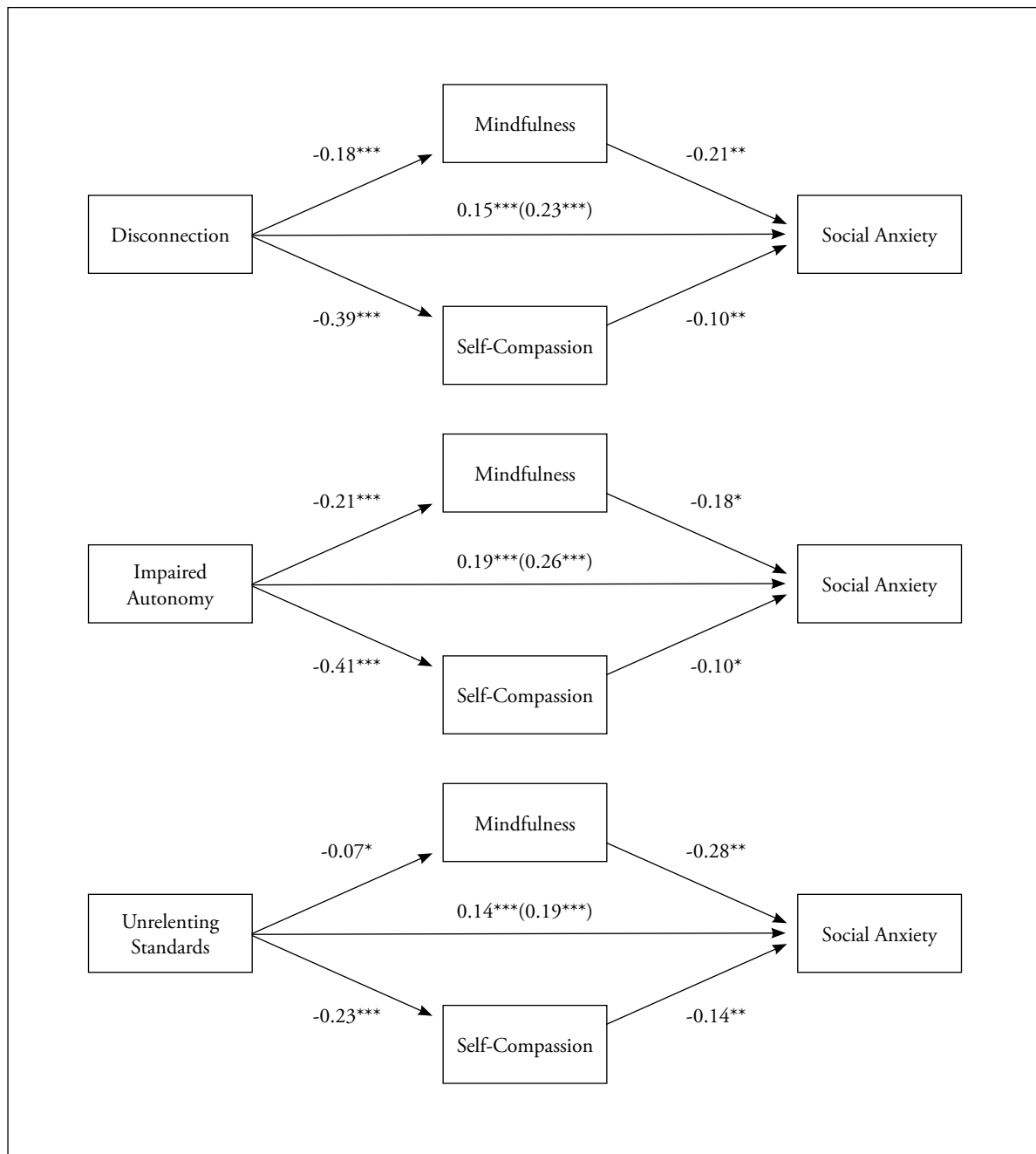


Figure 1. Mediation Models

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

significant ($R^2=0.21$, $F_{(4,435)}=29.53$, $p<0.001$), and that the full model explained 21% of the variance in social anxiety. Accordingly, the total effect of the disconnection schema domain on social anxiety was significant ($B=0.23$, $SE=0.02$, $t=9.46$, $p<0.001$). When the mediator variables are not in the model, the disconnection schema domain explains 17% of the variance in social anxiety ($R^2=0.17$, $F_{(2,437)}=44.75$, $p<0.001$). When the effects of mindfulness and self-compassion were examined, it was determined that the direct effect of the disconnection schema domain on social anxiety was significant ($B=0.15$, $SE=0.03$, $t=5.30$, $p<0.001$). When

the direct connections in the model are examined, it is seen that the direct effects of the disconnection schema domain on mindfulness ($B=-0.18$, $SE=0.02$, $t=-9.95$, $p<0.001$) and self-compassion ($B=-0.39$, $SE=0.03$, $t=-14.22$, $p<0.001$) were negative and significant. In addition, after controlling for the effect of other variables in the model, it was determined that the direct effect of mindfulness ($B=-0.21$, $SE=0.07$, $t=-3.03$, $p<0.01$) and self-compassion ($B=-0.10$, $SE=0.05$, $t=-2.09$, $p<0.01$) on social anxiety was negative and significant. Examinations of bootstrapping analysis, intended to determine the significance of the indirect effects arising

from the disconnection schema domain on social anxiety, through the mindfulness and self-compassion variable set were significant ($B=0.08$, $SE=0.02$, 95% CI 0.04 to 0.11). When the specific indirect effects of the variables were examined, it was determined that the specific indirect effect of the disconnection schema domain on social anxiety was significant through mindfulness ($B=0.04$, $SE=0.01$, 95% CI 0.01 to 0.07); and the specific indirect effect on social anxiety through self-compassion ($B=0.04$, $SE=0.02$, 95% CI -0.0002 to 0.08) was not significant.

In the second parallel multiple mediation model, the mediating role of mindfulness and self-compassion in the relationship of the impaired autonomy schema domain with social anxiety was examined. The results indicated that the model was significant ($R^2=0.23$, $F_{(4,435)}=31.73$, $p<0.001$), the variables in the model together explained 23% of the variance in social anxiety, the impaired autonomy schema domain alone explained 19% of the variance ($R^2=0.19$, $F_{(2,437)}=51.12$, $p<0.001$), and the direct effect of the impaired autonomy schema domain on social anxiety was significant ($B=0.19$, $SE=0.03$, $t=5.96$, $p<0.001$) after the effect of the mediating variables was controlled for. In addition, it was observed that the direct effects of the impaired autonomy schema domain on mindfulness ($B=-0.21$, $SE=0.02$, $t=-10.86$, $p<0.001$) and self-compassion ($B=-0.41$, $SE=0.03$, $t=-13.35$, $p<0.001$) were negative and significant, and the direct effects of mindfulness ($B=-0.18$, $SE=0.07$, $t=-2.55$, $p<0.05$) and self-compassion ($B=-0.10$, $SE=0.04$, $t=-2.23$, $p<0.05$) on social anxiety were negative and significant, after controlling for the effect of other variables in the model. Bootstrapping analysis indicated that the total indirect effect of the impaired autonomy schema domain on social anxiety through mindfulness and self-compassion was significant ($B=0.08$, $SE=0.02$, 95% CI 0.04 to 0.12). The specific indirect effects of the variables were also examined, and the impaired autonomy schema domain's specific indirect effect on social anxiety was found to be significant through mindfulness ($B=0.04$, $SE=0.02$, 95% CI 0.01 to 0.07) and self-compassion ($B=0.04$, $SE=0.02$, 95% CI 0.002 to 0.08). The results of the pairwise comparisons indicated that the specific indirect effects of mindfulness and self-compassion were not statistically different from each other ($B=0.003$, $SE=0.03$, 95% CI -0.06 to 0.07).

In the third parallel multiple mediation model, the mediating roles of mindfulness and self-compassion on the effect of the unrelenting standards schema domain on social anxiety was examined. It was determined that the proposed model was significant ($R^2=0.21$, $F_{(4,435)}=29.25$, $p<0.001$), the full model explained 21% of the variance in social anxiety, the unrelenting standards schema domain alone explained 10% of the change in social anxiety ($R^2=0.10$, $F_{(2,437)}=24.26$, $p<0.001$), and when the effects of mediating variables

were controlled, direct effect of the unrelenting standards on social anxiety continued to be significant ($B=0.14$, $SE=0.03$, $t=5.21$, $p<0.001$). In addition, the direct effects of the unrelenting standards schema domain on mindfulness ($B=-0.07$, $SE=0.02$, $t=-3.07$, $p<0.05$) and self-compassion ($B=-0.23$, $SE=0.03$, $t=-6.58$, $p<0.001$) were negative and significant, and after the effects of other variables in the model were controlled, the direct effects of mindfulness ($B=-0.28$, $SE=0.07$, $t=-4.08$, $p<0.01$) and self-compassion ($B=-0.14$, $SE=0.04$, $t=-3.23$, $p<0.01$) on social anxiety were negative and significant. As a result of the bootstrapping analysis, it was seen that the total indirect effect of the unrelenting standards schema domain on social anxiety through mindfulness and self-compassion variables was significant ($B=0.05$, $SE=0.01$, 95% CI 0.02 to 0.08). When the specific indirect effects of the variables were examined, it was seen that the specific indirect effect of the unrelenting standards schema domain on social anxiety was significant through mindfulness ($B=0.02$, $SE=0.01$, 95% CI 0.004 to 0.04) and self-compassion ($B=0.03$, $SE=0.01$, 95% CI 0.01 to 0.06). A pairwise comparison was made to determine whether there was a significant statistical difference between the specific indirect effects of mindfulness ($B=0.02$) and self-compassion ($B=0.03$) as significant mediators, and it was observed that the specific indirect effects did not differ statistically ($B=0.01$, $SE=0.02$, 95% CI -0.02 to 0.04).

DISCUSSION

The current study, conducted with university students, began by determining which schema domains predict social anxiety symptoms, and then moved on to investigate the mediating roles of mindfulness and self-compassion in the association between schema domains that had a significant predictive effect and social anxiety symptoms. The findings of the study demonstrated that disconnection, impaired autonomy, and unrelenting standards schema domains positively predicted social anxiety. This result is in line with research findings in the literature (Calvete et al. 2018, Diez et al. 2012, Drummond and Gatt 2018, Orue et al. 2014, Parsons et al. 2017, Pinto-Gouveia et al. 2006). However, the clustering of the schema domains differently in national and international literature makes the results difficult to compare. When the studies conducted in Turkey were examined, it was found that one study had concluded that disconnection, impaired autonomy, and impaired limits schema domains positively predict social anxiety (Eldoğan and Barışkın 2014). Another study in which the depressive symptom levels of the participants were controlled determined that disconnection, impaired autonomy, other-directedness, and unrelenting standards schema domains positively predicted social anxiety (Bintaş-Zörer 2015). As can be seen, the association of disconnection and impaired autonomy schema domains with social anxiety

is consistent between the present study and the other two studies conducted in Turkey. In addition, the unrelenting standards schema domain is a common schema domain that predicts social anxiety symptoms between this study and Bintaş-Zörer's study (2015). Although they exhibited significant positive correlations with social anxiety, the impaired limits and other-directedness schema domains that are significant in the other two studies were not significant predictors in the present study. This controversy might be explained by the differences in the sample characteristics, in the models tested, and in the statistical analysis among these three studies.

The schemas in the disconnection schema domain are characterized by not expressing any emotion, feeling insecure, and thinking that they are unlovable and defective (Young et al. 2003). It is seen that people with this schema domain have cold, indifferent, or refusing parents; their basic needs, such as protection, being loved, and unconditional acceptance, are not met. This situation may lead to the view of social environments as unsafe and open to negative evaluation by others (Clark and Beck 2010). Since the need to gain competence and differentiation from others is not met in people with schemas of impaired autonomy domain, intense feelings of inadequacy, low self-confidence, and a tendency to view themselves as unsuccessful can be seen (Young et al. 2003). These people may interpret the outside world as threatening, have achievement-oriented dysfunctional thoughts, and create catastrophic scenarios related to social mishaps (Hofmann 2007). Finally, people with high social anxiety may have high expectations and perfectionistic tendencies toward their performances in social environments (Levinson et al. 2015). These people can determine criteria that are difficult to meet, have low error tolerances, and interpret ordinary life situations, such as errors, defects, and deficiencies as disastrous (Hofmann 2007). In addition, it is known that people with social anxiety have the desire to be approved, accepted, and avoidance from being rejected by others more than other people (Leary and Kowalski 1997). This information in the literature explains why these three schema domains predict social anxiety.

In the present study, it was determined that women scored lower than men in disconnection, impaired autonomy, and other-directedness schema domains. Since our sample is predominantly women, this may have biased the results. In a systematic review study conducted by Nicol et al. (2020), the correlations between youths' (between the ages of 12-25) psychological status and early maladaptive schemas were examined. It is noteworthy that only three of the 58 studies included in this systematic review focused on early maladaptive schemas on a gender basis. It was determined in two of these three studies (Calvete et al. 2013, Orue et al. 2014) that early maladaptive schemas and schema domain

scores of women were higher than those of men, and in one study (Cámara and Calvete 2012) that men had higher emotional deprivation and abandonment schema scores than women. In this systematic review study, although it was concluded that there was a gender difference between the scores, it was also stated that the relationship patterns with psychopathologies were similar for both genders. When studies focusing on early maladaptive schemas conducted in Turkey are examined, it is seen that early maladaptive schemas were not examined in terms of gender differences (Eldoğan and Barışkın 2014, Soygüt et al. 2009). The neglect of the gender effect in studies conducted within the scope of schema theory might be a result of the assumption that early maladaptive schemas originated from parental attitudes rather than gender (Young et al. 2003). However, it is also known that in some cultures parents may exhibit different attitudes towards boys and girls (e.g., giving more autonomy to the son), or similar parental attitudes may lead people to develop different psychopathologies. Therefore, it is thought that addressing psychopathologies based on the concept of gender is a broad field of research that should include many possible variables such as cultural codes, number/order of siblings, gender roles, or gender-oriented attitudes.

When the findings obtained from the proposed mediation models are evaluated, it is seen that all three schema domains the effects of which on social anxiety are examined predicted mindfulness significantly and negatively. Negative correlations between these schema domains and mindfulness are in line with the findings of the literature (Janovsky et al. 2019, Shorey et al. 2015, Thimm 2017). This implies that mindfulness features of people with higher scores of relevant schema domains have decreased mindfulness features. The schema domains that people have may in turn lead them to the tendency to be less aware and be able to stay in the moment. When it comes to the correlations between mindfulness and social anxiety in the tested models, it is seen that mindfulness significantly and negatively predicted social anxiety symptoms. This finding is consistent with the results of other studies in the literature (Norton et al. 2015, Parsons et al. 2017). The low levels of mindfulness may contribute to the triggering of social anxiety by leading to biased evaluation of the internal and external cues, resulting in failing to notice the environmental cues, which is a common phenomenon that occurs in social anxiety.

In the proposed mediation models, it is seen that all three schema domains predicted self-compassion negatively. Similarly, in the study conducted by Thimm (2017), it was determined that there was a negative relationship between all schema domains and self-compassion levels. The cognitive structures of the individual may bring along a negative self-image, being critical of oneself, not being able to tolerate

imperfections, mistakes, deficiencies, and inadequacies, or not seeing negative experiences as human experiences (Clark and Beck 2010). The examination regarding the correlations between self-compassion and social anxiety in our models, identified that self-compassion also predicted social anxiety symptoms negatively. In the study conducted by Werner et al. (2012), it was concluded that the fear of positive and negative evaluation was higher in individuals with low self-compassion. In another study, the relationship between self-compassion and post-event processing, which means ruminative thinking about the experience after exposing anxiety-provoking social environments, was examined. The results demonstrated that people with low self-compassion engaged in more post-event processing upon being exposed to social environments (Blackie and Kocovski 2018). In a longitudinal study with adolescents, it was shown that training individuals for the skills of accepting their defects and on being compassionate and kind to themselves, which are among the main components of self-compassion, brought about a decrease in adolescents' social anxiety symptoms during their transition to adulthood period (Ştefan 2019). In addition, several research indicate that self-compassion has an adaptive value by acting as an effective emotion regulation strategy in the face of stressful life events or situations (Diedrich et al. 2014, Leary et al. 2007). As it is known, people with high social anxiety interpret social environments as stressful and threatening and are unable to use effective emotion regulation strategies after going through negative experiences (Eldoğan and Barışkin 2014). The above-mentioned studies conducted on different indicators of social anxiety reveal that low self-compassion might be a risk factor for social anxiety.

In our parallel multiple mediation models, it was determined that mindfulness had a mediating role in the correlations between all three schema domains tested and social anxiety symptoms and that self-compassion had a mediating role in the correlations between the two schema domains and social anxiety symptoms, except for the disconnection schema domain. Accordingly, the expectation that mindfulness and self-compassion will have mediating roles in the correlations between schema domains and social anxiety is confirmed, except for the disconnection schema domain for self-compassion. These findings indicated that mindfulness and self-compassion are important mechanisms mediating the effect of various schema domains on social anxiety symptoms. That is, early maladaptive schemas positively predict social anxiety, and the likelihood of experiencing social anxiety is enhanced by the mediating effects of low levels of mindfulness and self-compassion. The decrease in mindfulness may be a cognitive way of avoiding negative emotions and experiences evoked by the active maladaptive schemas, and a way of coping with such experiences using an

ineffective “detached protector” mode. Similarly, low level of self-compassion causes the person to not be able to support himself/herself in the face of negativities, encountered by every person in social environments, as if serving to maintain internalized demanding/accusatory parental voice. The results obtained from the current study suggest that the decrease in mindfulness and self-compassion may create a predisposition to social anxiety as maladaptive coping or emotion regulation strategies employed to deal with the effects of schemas and that the increase in mindfulness and self-compassion may play a protective role against social anxiety. In situations where schemas are triggered by any stimulus or experience, the main objectives of schema therapy include increasing one's insight to recognize and define what is happening at that moment and preparing the basis for self-protection by showing understanding towards oneself, experiences, and mistakes (Young et al. 2003). From this point of view, it is possible to claim that mindfulness and self-compassion are concepts related to schema theory.

When the literature is reviewed, it is evident that the mediating roles of mindfulness and self-compassion are examined in different samples and in terms of different psychological structures. Examples include studies examining the mediating roles of mindfulness and self-compassion in the correlations between anxiety and impulsivity (Mantzios 2014), between early maladaptive schemas and psychological distress (Thimm 2017), and between early maladaptive schemas and psychological needs (Faustino et al. 2020). In addition, it is possible to observe that mindfulness interventions are integrated into schema therapy in clinical practice (Bricker and Labin 2012, van Vreeswijk et al. 2014) or meditative practices aiming to increase self-compassion are included in the therapeutic processes and theoretical approaches (Bricker and Labin 2012). According to the recent recommendations, in this direction, incorporating the short or long-term mindfulness and self-compassion techniques into psychotherapy processes and teaching clients under what conditions, when and how to use these techniques would be valuable (Bricker and Labin 2012, Thimm 2017). Supportingly, the findings of our research point to the inclusion of mindfulness and self-compassion contents in the psychotherapy process, and to the use of intervention techniques aimed at developing mindfulness and self-compassion. In addition, it is seen in the literature that connections similar to the findings of our study have been obtained in different clinical groups, too. For example, a negative correlation was found between post-traumatic stress disorder (PTSD) symptoms and self-compassion in a sample diagnosed with PTSD (Karatzias et al. 2019); men with a diagnosis of a substance use disorder reported lower levels of mindfulness if they have stronger early maladaptive schemas (Shorey et al. 2015); and individuals with a diagnosis

of borderline personality disorder have lower levels of mindfulness and self-compassion compared to those without any diagnosis (Salgó et al. 2021). The findings of the relevant literature indicate that self-compassion and mindfulness are important concepts in understanding both different psychological structures and psychopathologies.

Schema therapy protocols in clinical practice are extensively used for various personality disorders, in particular for borderline personality disorder (Hilden et al. 2020, Khasho et al. 2019). Although the main target of schema therapy was personality disorders in its earlier development phase, the effectiveness of this approach in different psychopathologies has been proven over time (Calvert et al. 2018, Kopf-Beck et al. 2020). However, it is worth noting that the number of studies and psychotherapy protocols on the correlations between early maladaptive schemas and social anxiety disorder is very few. Determining which schema domains or individual schemas explain social anxiety is also of great importance in terms of psychotherapy studies to be carried out for the treatment of social anxiety disorder. Therefore, it is thought that the present study which is conducted on a Turkey sample contributes significantly to the literature. The strong and unique aspect of the current study is that it is the first to examine the mediating role of mindfulness and self-compassion in the possible correlations between schema domains and social anxiety symptoms. It is thought that the findings obtained from this research may be beneficial for clinicians and researchers working with individuals who experience social anxiety symptoms. It seems important to address the early maladaptive schemas of individuals with social anxiety problems and to plan intervention programs for improving mindfulness and self-compassion.

This research has some limitations as well as the above-mentioned strengths and clinical implications. The present cross-sectional study was conducted using self-report scales on university students who had access to the internet and were not clinically diagnosed with social anxiety disorder. Since the experimental design was not used, a cause-effect relationship cannot be established between the variables, and the findings of the research cannot shed light on the temporal and developmental processes between the relevant variables. Since the current findings were obtained from a nonclinical sample, it is also a matter of curiosity whether these relational patterns will apply to people with social anxiety disorders. For these reasons, the findings should be interpreted cautiously, and the results should be replicated on clinical samples using longitudinal or experimental designs in future studies. In addition, the schema domains that predict social anxiety were determined first and the basic analyzes were carried out using these schema domains in this study. The intercorrelations among the variables have shown that all individual schemas have relationship patterns

with research variables similar to that of schema domains, however, the effect of schemas on mediation analysis has not been examined individually. In future studies, examination of the associations of each individual maladaptive schema with social anxiety and proposing mediation models depending on these correlations will ensure more interpretable and useful conclusions.

Finally, schema theory states that early maladaptive schemas are implicit structures and the data collected by self-report tools are not the only accurate way of detecting of schemas (Young et al. 2003). For this reason, a multi-facet evaluation approach is preferred in clinical practice where information obtained from the clinical interview, experiential techniques, and therapeutic relationship-specific observations are used together as well as self-report scales (Young et al. 2003). In future research, the inclusion of multi-faceted clinical evaluation procedures that include such qualitative methods is important for the detection of schemas accurately and for a more holistic understanding of their correlation with psychopathologies.

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Validity and Reliability of the Turkish Version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale (BPSD-T): A Psychometric Evaluation Among Caregivers



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ABSTRACT

Objective: This study aimed to validate the Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale (BPSD-T) among caregivers. The goal was to assess the scale's psychometric properties, ensuring it accurately measures caregivers' knowledge of dementia-related behavioral and psychological symptoms in a Turkish context.

Methods: In this cross-sectional study, the data were collected from 212 caregivers providing home-based care to dementia patients across Turkey. Participants completed a 12-item Behavioral and Psychological Symptoms of Dementia (BPSD) knowledge questionnaire along with a sociodemographic form. To examine the factor structure of the scale, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted. Sample adequacy for EFA was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. For CFA, model fit was evaluated using fit indices such as χ^2/df , Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), and Root Mean Square Error of Approximation (RMSEA). The internal consistency of the scale was assessed with Cronbach's alpha coefficient.

Results: The findings showed that the BPSD-T has strong internal consistency (Cronbach's alpha=0.85) and a robust factor structure. Factor loadings ranged from 0.396 to 0.744, supporting the construct validity of the scale. Item-total correlations ranged from 0.437 to 0.711, with the item "BPSD are the major source of caregiving burden" having the highest correlation ($r=0.711$). The results indicate that the BPSD-T is a reliable instrument for assessing caregivers' knowledge of behavioral and psychological symptoms associated with dementia.

Conclusion: The BPSD-T provides an effective means of identifying knowledge gaps among caregivers in Turkey and serves as a valuable tool for developing training programs aimed at improving the management of BPSD. This study contributes to the literature by validating the scale in a non-Western context, suggesting that enhancing caregivers' knowledge of BPSD can have positive impacts on clinical management and patient care. In this regard, the implementation of the BPSD-T may support the more effective management of behavioral and psychological symptoms in dementia patients.

Keywords: Behavioral Symptoms, Dementia, Caregivers, Psychometrics, Behavioral and Psychological Symptoms of Dementia, Neuropsychiatric symptoms, Alzheimer's Disease

INTRODUCTION

Dementia is a growing public health problem globally, affecting more than 50 million people. This number is projected to triple by 2050 due to the aging population (World Health Organization 2017). Although dementia is considered a form of cognitive decline, the behavioral and psychological symptoms of dementia (BDPS) are equally important and are often underrecognized in care settings. BDPS encompasses a

wide range of noncognitive symptoms, including agitation, aggression, depression, anxiety, hallucinations, and apathy, and approximately 90% of people with dementia are affected by these symptoms at some point in the course of the disease (Lyketsos et al. 2011). These symptoms are distressing not only for patients but also for their caregivers, and can seriously impact both quality of life and health status (Kales et al. 2015).

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Effective management of BPSD is critical in dementia care, yet there remains a significant gap in understanding and knowledge about these symptoms among caregivers. Studies have shown that caregivers, including health professionals, often lack adequate knowledge regarding the identification and management of BPSD (Ornstein and Gaugler 2012, Cations et al. 2018). Nonpharmacological approaches, considered first-line interventions for BPSD, are underutilized due to this lack of knowledge (Livingston et al. 2014). In recent years, various dementia knowledge assessment tools have been developed to assess caregivers' understanding of dementia-related symptoms. However, most of these tools, such as the Dementia Knowledge Assessment Scale (DKAS), focus primarily on cognitive symptoms and do not adequately assess knowledge about BPSD (Annear et al. 2015, Annear et al. 2017). Tools specifically designed to measure BPSD knowledge are scarce, limiting the ability to tailor educational interventions to address these critical aspects of dementia care. Moreover, the lack of culturally adapted and validated tools in non-English-speaking countries further exacerbates this gap, particularly in countries like Turkey, where dementia care is still evolving (Akyol et al. 2021).

This study aims to provide a tool that can assess caregivers' knowledge about BPSD and identify gaps in knowledge and areas for improvement. Our research aims to shed light on the negative effects of caregivers' lack of knowledge about BPSD management in Turkey on patient prognosis and psychological burden on caregivers. Our hypothesis is that increasing BPSD knowledge will improve the quality of care and reduce the burden on both patients and caregivers. Accordingly, we aim to obtain findings that will guide the development of targeted educational interventions on BPSD management.

METHOD

Study Design

This study employed a cross-sectional design to evaluate the validity and reliability of a 12-item questionnaire designed to assess knowledge about BPSD. The tool was specifically developed to measure caregivers' knowledge about BPSD, who provide care for dementia patients.

Sample and Participants

Data were collected between May 2024 and October 2024. The sample consisted of caregivers of patients with dementia. Data were collected from family members and home caregivers providing home care services throughout Turkey. Convenience sampling was used. In order to determine the sample size for validity and reliability studies, it is generally recommended to have 5-10 participants for each item of

the survey (Sousa and Rojjanasrirat 2011). Based on this guideline, a total of 212 participants were included in the study. Participants were individuals aged 18 and over who provided care to patients with dementia, spoke Turkish, and agreed to fill out the survey voluntarily. Individuals with visual and/or hearing impairments were not included in the study.

Data Collection

Data were collected using a sociodemographic form and a 12-item BPSD information questionnaire. All participants were interviewed face-to-face by the researchers. Participants were informed about the purpose of the study and written informed consent was obtained from participants before completing the questionnaire.

BPSD Knowledge Survey

The 12-item BPSD knowledge survey used in this study was developed to assess caregivers' knowledge levels about BPSD. The survey uses a 5-point Likert scale. Response options are '1 = False', '2 = Probably false', '3 = Probably true', '4 = True' and additionally '5 = Don't know'. Responses are scored between 0 and 2 points. For a correct statement, selecting 'true' earns 2 points, and selecting 'probably true' earns 1 point. Similarly, for a false statement, selecting 'false' earns 2 points, and selecting 'probably false' earns 1 point. 'Don't know' or incorrect answers receive 0 points. The minimum score for each item is 0, and the maximum score is 2. The total score of the survey ranges from 0 to 24; higher scores indicate greater knowledge about BPSD.

Validity

Permission for translation and psychometric assessment of the questionnaire was obtained via e-mail from the original author, Dr. Qian Tao. The questionnaire was translated from English to Turkish by the researchers. Each item was examined for linguistic accuracy, meaning, and conceptual equivalence. To ensure the accuracy of the translation, the scale was back-translated into Turkish by a professional bilingual translator. The researchers ensured the consistency of the scale by comparing the back-translated version to the original version. The final Turkish version of the Behavioral and Psychological Dementia Symptoms Knowledge Scale (BPDS-T) was approved by one of the original authors of the scale. Revisions were made to items 2, 4, and 11 based on the authors' suggestions.

Since both the BPSD-T and the Turkish versions of the Dementia Knowledge Assessment Scale (DKAS-T) measure related constructs of dementia knowledge, convergent validity was assessed by analyzing the relationship between the two (Akyol et al. 2021). For this analysis, items addressing similar concepts from both scales were paired and the Pearson

correlation coefficient was calculated to determine the degree of correlation between the scores.

Statistical Analyses

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 25.0 and AMOS (Analysis of Moment Structures) version 25.0. The analysis included descriptive statistics, factor analyses and reliability tests.

- Descriptive Statistics: Demographic characteristics of the participants were analyzed using frequencies, percentages, means and standard deviations.
- Exploratory Factor Analysis (EFA): Exploratory factor analysis was conducted to examine the factor structure of the data. Kaiser-Meyer-Olkin (KMO) sample fit criterion and Bartlett's sphericity test were used to assess suitability for factor analysis (Kaiser 1974). Principal component analysis and varimax rotation were used to determine the factor structure.
- Confirmatory Factor Analysis (CFA): Confirmatory factor analysis was conducted to verify the factor structure of the scale. Model fit was assessed using various indices such as $\chi^2/\text{degrees of freedom}$ (χ^2/df), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Normed Fit Index (NFI) and Root Mean Square Error of Approximation (RMSEA) (Hu and Bentler 1999).
- Internal Consistency: The internal consistency of the scale was assessed using Cronbach's alpha coefficient (Cronbach 1951). A Cronbach's alpha value above 0.70 was considered acceptable reliability.
- Test-Retest Reliability: The stability of the scale over time was assessed using test-retest reliability analysis. Pearson correlation coefficients and paired sample t-test were used to compare the initial and follow-up test results. The absence of a statistically significant difference between the two tests indicated that the scale was stable over time (Nunnally and Benstein 1994).
- Item-Total Correlation: Item-total correlations were calculated to examine the contribution of each item to the overall score of the scale. Item-total correlation values above 0.20 indicated that the items made sufficient contributions to the scale (DeVellis 2016).
- Ceiling and Floor Effects: Ceiling and floor effects were examined to assess the homogeneity and reliability of the scale. Ceiling and floor effects below 20% indicated that the scale was reliable (Streiner 2003).

Ethical Principles

Ethical approval for this study was obtained from the Izmir Bakırçay University Non-Interventional Clinical Research

Ethics Committee with the decision numbered 1619 and dated 30.05.2024. Participants were informed about the purpose, content and method of the study and written consent was obtained from all participants. Participation in the study was voluntary and participants had the right to withdraw from the study at any time.

RESULTS

Demographic Information

A total of 212 participants were included in the study. Of these participants, 163 (76.9%) were family caregivers and 49 (23.1%) were non-family caregivers. The majority of participants were female ($n=186$, 87.7%), with 22 (10.5%) males in the family caregivers group and 4 (1.8%) males in the non-family caregivers group. The mean age of family caregivers was 47.1 ± 12.4 years, ranging from 19 to 68 years, while the mean age of non-family caregivers was 45.5 ± 12.0 years, ranging from 34 to 60 years.

In terms of marital status, more than half of the family caregivers were married ($n=110$, 51.9%), with 23 (10.8%) non-family caregivers. While a significant portion of family caregivers were university graduates ($n=74$, 35.4%), primary or high school education was more common among non-family caregivers ($n=25$, 11.8% and $n=23$, 11.7%, respectively). In addition, only 6.6% ($n=14$) of family caregivers reported attending dementia-related education programs, compared to 5.2% ($n=11$) for non-family caregivers (see Table 1).

The study found that the total score differed significantly according to some demographic characteristics. In particular, it was found that the total scores of individuals with a postgraduate education, those who had been providing dementia care for 3-10 years, and those who had attended dementia-related training programs were significantly higher than the other groups ($p<0.05$). However, no significant difference was observed between other variables such as gender, marital status, and experience. These results support the potential of the scale to assess awareness levels in certain subgroups (see Table 2).

BPSD Knowledge Scores and Factor Loadings

As shown in Table 2, the mean scores of the BPSD-T items ranged from 0.62 to 1.94. The item "Behavioral and psychological symptoms have a significant impact on patients' physical and mental health." had the highest mean score (Mean=1.94, SD=0.65), indicating that caregivers had the most knowledge about the effects of BPSD on patients' general health. In contrast, the item "Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs." had the lowest mean score (Mean=0.62, SD=0.99),

Table 1. Sociodemographic Profile of BPSD Knowledge Survey Respondents (n=212)

Variables	Family Caregivers n (%)	Non-Family Caregivers n (%)
Gender		
Males	22 (13.5%)	4 (8.2%)
Females	141 (86.5%)	45 (91.8%)
Age		
18-31	30 (18.4%)	0 (0%)
32-44	35 (21.5%)	20 (40.8%)
45-57	60 (36.8%)	25 (51.0%)
58-70	38 (23.3%)	4 (8.2%)
Marital Status		
Married	110 (67.5%)	23 (46.9%)
Unmarried	32 (19.6%)	12 (24.5%)
Divorced	21 (12.9%)	14 (28.6%)
Education		
Elementary school	29 (17.8%)	25 (51.0%)
High school graduate	47 (28.8%)	23 (47%)
University graduate	74 (45.4%)	1 (2.0%)
Higher university degree	13 (8.0%)	0 (0%)
How long you have been caring for people with dementia?		
1-6 months	15 (9.2%)	5 (10.2%)
6-12 months	25 (15.3%)	6 (12.2%)
1-3 years	63 (38.7%)	19 (38.8%)
3-10 years	46 (28.2%)	14 (28.6%)
Over 10 years	14 (8.6%)	5 (10.2%)
Previous experience with dementia care		
Yes	25 (15.3%)	40 (81.6%)
No	138 (84.7%)	9 (18.4%)
Whether you have participated in education programs related to dementia		
Yes	14 (8.6%)	11 (22.4%)
No	149 (91.4%)	38 (77.6%)
Mean age and SD	47.1 ± 12.4	45.5 ± 12.0
Age range of respondents, years	19–68	34–60

BPSD: Behavioral and Psychological Symptoms of Dementia, SD: Standard Deviation

indicating that caregivers were less aware of the holistic care needs of patients with dementia, especially their psychological needs.

According to the factor analysis results of the scale, the KMO value indicating sample adequacy was found to be 0.78, and a significant correlation structure was determined by $p < 0.001$ as a result of the Bartlett Sphericity Test. The total variance explanation percentages of the factors were determined

as 28% for the Care and Risks factor, 22% for the Disease Characteristics factor, and 35% for the Treatment Needs factor, respectively. These results show that the three-factor structure of the scale has a sufficient explanatory level and that different dimensions are significantly differentiated throughout the scale. In confirmatory and exploratory factor analyses, three main dimensions were defined for BPSD knowledge: Care and Risks, Disease Characteristics, and Treatment Needs. The

Table 2. Distribution of Total Score According to Demographic Characteristics and Significance Analysis

Demographic Variable	n (%)	Mean Score $\pm$ SD	p-Value
Gender: Female	186 (87.7%)	20.8 $\pm$ 1.6	0.065
Gender: Male	26 (12.3%)	18.2 $\pm$ 1.8	0.072
Marital Status: Married	133 (62.7%)	20.0 $\pm$ 1.4	0.062
Marital Status: Single	44 (20.8%)	20.6 $\pm$ 1.7	0.068
Marital Status: Divorced	35 (16.5%)	20.5 $\pm$ 1.5	0.074
Education Level: Primary School	54 (25.5%)	19.5 $\pm$ 1.9	0.078
Education Level: High School	70 (33.0%)	20.2 $\pm$ 1.6	0.071
Education Level: University	75 (35.4%)	20.3 $\pm$ 1.5	0.062
Education Level: Postgraduate	13 (6.1%)	21.7 $\pm$ 1.4	0.015
Duration of Care: 1-6 months	24 (11.3%)	18.7 $\pm$ 3.2	0.063
Duration of Care: 6-12 months	35 (16.5%)	19.8 $\pm$ 3.5	0.074
Duration of Care: 1-3 years	89 (42.0%)	20.2 $\pm$ 2.1	0.071
Duration of Care: 3-10 years	64 (30.2%)	21.1 $\pm$ 2.3	0.020
Experience with Dementia: Yes	65 (30.7%)	19.8 $\pm$ 1.4	0.069
Experience with Dementia: No	147 (69.3%)	20.5 $\pm$ 1.6	0.073
Participation in Education Program: Participated	25 (11.8%)	21.7 $\pm$ 1.3	0.013
Participation in Education Program: Did Not Participate	187 (88.2%)	17.4 $\pm$ 1.5	0.072

SD: Standard Deviation

Table 3. Mean Scores and Factor Loading of BPSD-T

BPSD Items	Mean	SD	Factor 1 (Care and Risks)	Factor 2 (Disease Characteristics)	Factor 3 (Treatment Needs)
BPSD occur frequently in patients with dementia.	1.45	0.72	0.567	0.468	0.396
Psychological symptoms are common in BPSD.	1.33	0.73	0.526	0.498	0.615
BPSD have different manifestations in different dementia stages.	1.62	0.57	0.540	0.688	0.428
BPSD can result from biopsychosocial factors.	1.22	0.85	0.576	0.654	0.431
Most BPSD are related to emotions.	0.98	0.92	0.645	0.468	0.536
Early intervention does not help manage BPSD.	0.75	0.98	0.468	0.520	0.712
Poor interactions exacerbate BPSD.	1.50	0.72	0.615	0.475	0.412
BPSD are the major source of caregiving burden.	1.88	0.63	0.697	0.578	0.572
Supporting programs help manage BPSD effectively.	1.77	0.65	0.587	0.424	0.658
Daily care should only focus on practical needs, not psychological needs.	0.62	0.99	0.445	0.557	0.744
Treatment on BPSD reduces caregiving burden.	1.81	0.66	0.623	0.667	0.582
BPSD significantly impact patients' physical and mental health.	1.94	0.65	0.576	0.449	0.714

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia, SD: Standard Deviation

factor loadings for the Exploratory Factor Analysis ranged from 0.396 to 0.744, supporting the multidimensional structure of BPSD-T. “Behavioral and psychological symptoms show different clinical manifestations in different stages of dementia.” The item “Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs” had the highest loading on the Illness Characteristics factor (0.688), while the item “Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs” had the highest loading on the Treatment Needs factor (0.744). These factor loadings strongly support the validity of the BPSD-T

in capturing different but related aspects of BPSD knowledge among caregivers (see Table 3).

In the confirmatory factor analysis, the correlation values between the factors were found to be 0.65, 0.68 and 0.70, respectively, which revealed that the factors were related to each other but independent dimensions. The factor loadings on the items ranged between 0.60 and 0.77, which supports that the scale has good construct validity. (See Figure 1) The obtained fit indices reveal that the model generally has a reasonable fit with the data. The CFI value was calculated as 0.92 and the TLI value as 0.90. Although these values are below the ideal cut-off value of 0.95 suggested by Hu and Bentler (1999), many studies in the literature have evaluated CFI and TLI values in the range of 0.90-0.95 as borderline

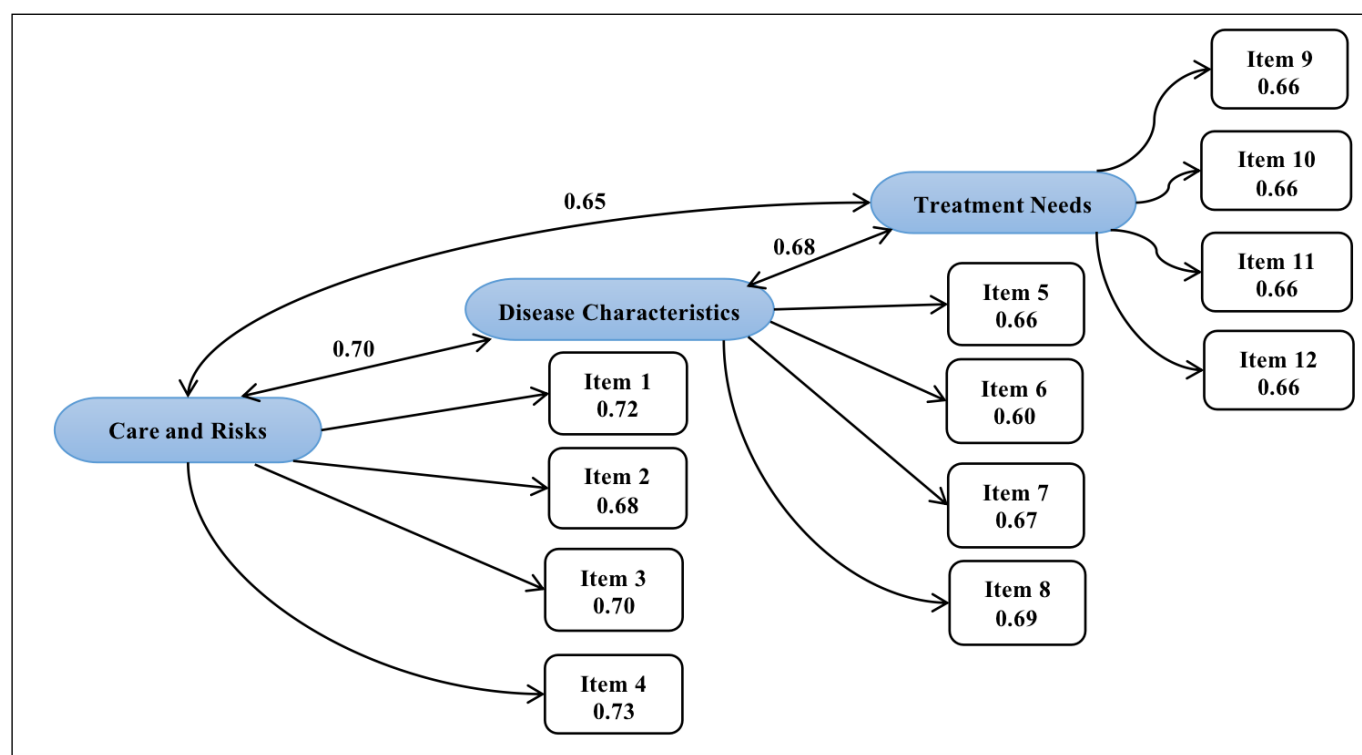


Figure 1. Confirmatory Factor Analysis path diagram.

Table 4. Confirmatory Factor Analysis (CFA) Fit Indices and Cut-off Values

Fit Index	The Values in the Study	Hu & Bentler (1999) Cut-off Value	Comment
χ^2	120.5	-	Acceptable fit
DF	55	-	-
χ^2/df	2.19	< 3.00	Good fit
CFI	0.92	≥ 0.95	Borderline acceptable fit
TLI	0.9	≥ 0.95	Moderate fit
RMSEA	0.06	≤ 0.06	Good fit
SRMR	0.05	≤ 0.08	Good fit

χ^2 : Chi-square, DF: Degrees of Freedom, CFI: Comparative Fit Index, TLI: Tucker-Lewis Index, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual

Table 5. Item-Total Score Correlation of BPSD-T

BPSD Items	Item-Total Correlation (r)	Cronbach's Alpha Value
BPSD occur frequently in patients with dementia	0.582	0.83
Psychological symptoms are common in BPSD	0.524	0.83
BPSD have different manifestations in different dementia stages	0.673	0.82
BPSD can result from biopsychosocial factors	0.628	0.82
Most BPSD are related to emotions	0.556	0.83
Early intervention does not help manage BPSD	0.484	0.84
Poor interactions exacerbate BPSD	0.612	0.82
BPSD are the major source of caregiving burden	0.711	0.81
Supporting programs help manage BPSD effectively	0.589	0.83
Daily care should only focus on practical needs, not psychological needs	0.437	0.84
Treatment on BPSD reduces caregiving burden	0.663	0.82
BPSD significantly impact patients' physical and mental health	0.681	0.82

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia

Table 6. Cronbach's Alpha and Test-Retest Reliability Values (p-values are given only for Test-Retest Reliability)

Score Type	Cronbach's Alpha Value	Test-Retest Reliability (Pearson r)	Significance of Test-Retest Reliability (p-value)
Total Score	0.85	0.8	0.45
Subscale: Care and Risks	0.83	0.79	0.4
Subscale: Disease Characteristics	0.82	0.81	0.42
Subscale: Treatment Needs	0.84	0.78	0.48

acceptable fit or moderate fit (Hu & Bentler 1999, Schreiber et al. 2006, Kline 2015). In addition, other fit indices such as RMSEA (0.06) and SRMR (0.05) support that the model fits well (see Table 4).

Item-Total Score Correlations

The Item-Total Correlation analysis showed strong internal consistency across the scale, with correlation values ranging from $r=0.437$ to $r=0.711$ (see Table 5). The item "Behavioral and psychological symptoms are the main source of caregiver burden." had the highest correlation ($r=0.711$), indicating that caregivers who were aware of their BPSD burden generally scored higher on the BPSD-T. This suggests that understanding the caregiver burden is one of the main components of caregivers' general knowledge of BPSD. On the other hand, the item "Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs." had the lowest correlation ($r=0.437$), highlighting the lack of knowledge in holistic care of dementia patients with BPSD.

Reliability and Validity of the DPB-T

The internal consistency of the scale is strong, with a Cronbach's alpha coefficient of 0.85, indicating good overall reliability. Test-retest reliability was assessed using the Pearson correlation coefficient, yielding a value of 0.80, indicating that the BPSD-T is a stable and consistent measurement tool over time. In addition, the absence of a significant difference between the responses between the initial and retest tests further supports the reliability of the scale (Table 6). The BPSD-T results obtained in this study show significant similarities and some differences when compared to scales such as the DKAS, which are widely used in the assessment of dementia knowledge. Although both the DKAS and the BPSD-T aim to measure the level of knowledge related to dementia, the BPSD-T's specific focus on behavioral and psychological symptoms allows it to capture a different knowledge structure. Similarly, studies with the DKAS have shown that lack of knowledge and false beliefs among caregivers lead to negative outcomes in dementia management. Therefore, the role of the BPSD-T in measuring the specific knowledge levels of caregivers about

Table 7. Convergent Validity Analysis Between BPSD-T and DKAS Scales

BPSD-T Item	Similar DKAS Item	Pearson Correlation Coefficient (r)
BPSD occur frequently in patients with dementia	Dementia is a progressive disease that cannot be prevented	0.58
Psychological symptoms are common in BPSD	Symptoms of depression can be mistaken for dementia	0.52
BPSD have different manifestations in different dementia stages	The characteristics of dementia vary by stage	0.61
BPSD can result from biopsychosocial factors	Dementia symptoms are caused by multiple factors including psychological and social aspects	0.64
Most BPSD are related to emotions	People with dementia often experience mood changes	0.56
Early intervention does not help manage BPSD	Early diagnosis of dementia is crucial for effective management	0.55
Poor interactions exacerbate BPSD	Communication difficulties can worsen behavioral symptoms in dementia	0.63
BPSD are the major source of caregiving burden	Dementia caregiving often leads to significant emotional strain	0.67
Supporting programs help manage BPSD effectively	Support groups and education programs can improve caregiving for dementia	0.59
Daily care should only focus on practical needs, not psychological needs	Dementia care requires attention to emotional and psychological needs, not just practical tasks	0.48
Treatment on BPSD reduces caregiving burden	Appropriate treatment for dementia's behavioral symptoms can reduce the caregiving burden	0.66
BPSD significantly impact patients' physical and mental health	Dementia has a profound impact on both physical and mental health of patients	0.68

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia, DKAS: Dementia Knowledge Assessment Scale

Table 8. Ceiling and Floor Effects for the BPSD-T Scale Items

BPSD Items	Mean	SD	Ceiling Effect (%)	Floor Effect (%)
BPSD occur frequently in patients with dementia.	1.45	0.72	12%	5%
Psychological symptoms are common in BPSD.	1.33	0.73	9%	6%
BPSD have different manifestations in dementia.	1.62	0.57	15%	3%
BPSD can result from biopsychosocial factors.	1.22	0.85	11%	4%
Most BPSD are related to emotions.	0.98	0.92	8%	7%
Early intervention does not help manage BPSD.	0.75	0.98	5%	9%
Poor interactions exacerbate BPSD.	1.5	0.72	10%	5%
BPSD are the major source of caregiving burden.	1.88	0.63	16%	2%
Supporting programs help manage BPSD effectively.	1.77	0.65	14%	3%
Daily care should only focus on practical needs.	0.62	0.99	4%	10%
Treatment on BPSD reduces caregiving burden.	1.81	0.66	13%	3%
BPSD significantly impact patients' physical health.	1.94	0.65	18%	1%

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia

the BPSD offers a valuable contribution in an international context.

Based on convergent validity analysis, significant positive correlations were found between BPSD-T and DKAS scales. DKAS is a tool developed to measure the level of knowledge about dementia. The scale has a multidimensional structure covering basic issues such as the characteristics of dementia, treatment processes, care needs and psychosocial effects. DKAS is a measurement tool with high internal consistency and validity coefficients that can be applied to healthcare professionals and caregivers. Pearson correlation coefficients showed significant relationships between 12 items of BPSD-T and the corresponding items in DKAS, and the correlation values ranged between $r=0.521$ and $r=0.718$. The highest correlation was observed between the item “Behavioral and psychological symptoms have a significant effect on patients’ physical and mental health” and the corresponding item in DKAS ($r=0.718$). These findings demonstrate the construct validity of the BPSD-T in a manner consistent with the DKAS, suggesting that both scales consistently measure knowledge of behavioral and psychological symptoms of dementia. The results provide strong evidence for the convergent validity of the BPSD-T and confirm that it is a valid tool for assessing dementia care knowledge (Table 7). Ceiling and floor effects were examined to assess the distribution of scores across the BPSD-T items. A ceiling effect was observed in 18% of the participants, while a floor effect was detected in 10%; both rates are below the acceptable 20% threshold. This indicates that the BPSD-T scale prevents scores from converging at extremes such as very high or very low, and thus the difficulty level and reliability of the items are within an appropriate range. These findings indicate that the scale can effectively distinguish between different knowledge levels among caregivers and contribute to its overall validity and reliability (Table 8).

DISCUSSION

This study aims to evaluate the validity and reliability of the Turkish version of the Knowledge Scale for Behavioral and Psychological Symptoms of Dementia (BPSD-T) among caregivers. The importance of education programs in the management of BPSD is increasingly recognized. Targeted education programs developed for caregivers can help address knowledge gaps in BPSD management and have positive effects on patient outcomes. In the literature, such education programs have been shown to be effective in reducing patient prognosis and psychological burden of caregivers (Gitlin et al. 2015, Brodaty and Arasaratnam 2019). In this context, scales such as the BPSD-T can serve as a valuable tool in evaluating the effectiveness of education programs by objectively measuring changes in the knowledge level of caregivers. Since

the results show that the BPSD-T is both a valid and reliable tool in assessing the knowledge of BPSD among caregivers in Turkey, the use of this scale may contribute to optimizing interventions for caregiver education, resulting in better outcomes for both the patient and the caregiver.

The findings highlight the capacity of the BPSD-T scale to measure knowledge levels according to different demographic characteristics and the importance of targeted training programs in this context. The high level of knowledge, especially in participants with postgraduate education and many years of experience in dementia care, confirms the effect of education and experience in increasing knowledge. However, the fact that variables such as gender or marital status did not create a significant difference indicates that the general lack of knowledge about dementia care requires more extensive training.

The psychometric properties of the BPSD-T are strong, and internal consistency was measured with a Cronbach’s alpha coefficient of 0.85. This value exceeds the generally accepted threshold of 0.70, indicating good internal reliability. Item-total correlations ranged from $r=0.437$ to $r=0.711$, with the highest correlation found for the item on caregiver burden (“Behavioral and psychological symptoms are the main source of caregiver burden”). This is consistent with the literature that draws attention to the caregiver burden due to the emotional and psychological difficulties BPSD creates on caregivers (Hu et al. 2022). Exploratory (CFA) and confirmatory factor analyses (CFA) revealed three main factors: Care and Risks, Disease Features, and Treatment Needs. The factor loadings ranged from 0.396 to 0.744, confirming that each item contributes significantly to the overall structure of BPSD knowledge. The identification of these dimensions is consistent with the multidimensional nature of the caregiving process, indicating that caregivers need to be knowledgeable about behavioral, emotional, and social aspects of dementia beyond clinical symptoms (Finkel et al. 1996). Test-retest reliability further supported the robustness of the scale with a Pearson correlation coefficient of 0.80, demonstrating its stability over time. The absence of significant differences between the initial and follow-up tests demonstrates that caregivers’ knowledge measured with the BPSD-T is consistent over time, reinforcing the usability of the scale in both cross-sectional and longitudinal studies (Chen et al. 2021).

In terms of practical implications, this study shows that caregivers in Turkey, especially family caregivers, have different levels of knowledge about BPSD. Notably, the statement “Daily care of patients with behavioral and psychological symptoms should focus solely on meeting their practical needs rather than psychological needs.” had the lowest mean score. This indicates a lack of understanding of the importance of

meeting the psychological needs of patients with dementia in addition to their physical care. This finding emphasizes the need for educational programs that teach caregivers how to provide holistic care for patients with dementia based on the biopsychosocial model (Brodaty and Arasaratnam 2012). Despite the positive findings, only 8.6% of family caregivers and 22.4% of non-family caregivers have attended dementia-related educational programs. This clearly shows that access to educational programs needs to be increased. These programs should focus specifically on addressing the lack of knowledge on meeting psychological needs and BPSD management. Given that BPSD is one of the major sources of caregiver burden, effective management can improve both patient outcomes and the overall health status of caregivers (Gitlin et al. 2015).

The determination of a three-factor structure is consistent with other studies validating knowledge scales for caregivers. The Care and Risks dimension reflects caregivers' awareness of immediate risks such as agitation and aggression, while the Illness Characteristics dimension focuses on the progression and stages of dementia. The Treatment Needs factor, which includes interventions to reduce burden, emphasizes the importance of appropriate education in symptom management (Green and Parker 2018). Ceiling and floor effects were observed at 18% and 10%, respectively, and were found to be within acceptable limits. These results confirm the ability of the BPSD-T to discriminate between caregivers' knowledge levels by preventing scores from converging at extreme points and contribute to the reliability of the scale (Pallant 2013). In addition, convergent validity analysis showed a significant positive correlation between the BPSD-T and DKAS scores, strengthening the construct validity of the scale (Hinkin 1998). This finding supports the use of the BPSD-T to assess caregivers' understanding of BPSD in both research and clinical practice, demonstrating concordance with similar measures of dementia knowledge.

Despite the strengths of this study, there are several limitations that should be considered. First, the use of a convenience sampling method may limit the generalizability of the findings to all caregivers in Turkey. Although the sample size of 212 participants is sufficient for factor analysis and reliability tests, testing the validity and reliability of the scale across different demographic groups and cultural contexts would increase the applicability of the results to a larger population (Martin 2021). Second, the reliance on self-report data in the study may lead to biases such as social bias or recall bias. Caregivers may have provided responses that they thought were socially acceptable or may not have correctly recalled certain details about their caregiving experiences. Future studies, such as observational studies, may reduce these biases by using more objective measures of caregiving practices.

CONCLUSION

In conclusion, BPSD-T is a valid and reliable tool for assessing BPSD knowledge of caregivers in Turkey. The findings reveal areas that need to be improved in the knowledge levels of caregivers, especially regarding the psychological aspects of care. These results emphasize the importance of targeted educational interventions that focus on the holistic needs of patients with dementia. The successful validation of BPSD-T in a non-Western context suggests that this scale can be adapted and used in other regions with similar care settings. In the future, integrating this tool into routine caregiver education programs may improve the quality of dementia care and alleviate the burden on caregivers, resulting in better outcomes for both patients and caregivers. It is thought that the use of BPSD-T in clinical education programs will make a valuable contribution in terms of leading to permanent improvements in the knowledge and skills of caregivers.

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Validity and Reliability of the Turkish version of the Affiliated Stigma Scale for Caregivers of Dementia



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ABSTRACT

Objective: The aim of this study was to adapt the “Affiliated Stigma Scale” to Turkish for caregivers of people with dementia and determine its psychometric properties. The scale measures the affiliated stigma experienced by caregivers of people with dementia.

Method: We assessed the psychometric properties of Affiliated Stigma Scale in 218 adults who were primary caregivers for their relatives with dementia. Sociodemographic data was collected and the Affiliated Stigma Scale, the Caregiver Burden Inventory, and the Beck Depression Inventory were administered.

Results: The Confirmatory Factor Analysis results did not support the three-factor structure of the original scale, Exploratory Factor Analysis (EFA) was performed. EFA, revealed that the Turkish form of the Affiliated Stigma Scale has a four-factor structure as “other related/cognition”, “emotion”, “self-related”, and “behavior” with a total of 20 items. The variance explained by four factors constitutes 65.34% of the total variance. It was positively correlated with depression and caregiver burden scores. The internal consistency coefficients of the scale range was between 0.82 and 0.86 and was 0.91 for the total scale.

Conclusion: The Affiliated Stigma Scale is a valid and reliable measurement tool in Turkey for the caregivers of people with dementia in assessing affiliated stigma.

Keywords: Affiliated Stigma, Caregiver, Dementia, Reliability, Validity

INTRODUCTION

Dementia is a condition of disability that is continuous and often progressive in areas of the mind such as memory, language, visual spatial skills (Karakaş 2017), attention, motor movements, acquiring new knowledge and skills, judgment, abstract thinking, problem solving (Öztürk and Uluşahin 2015). From the early stages of the disease, cognitive impairment is accompanied by psychological and behavioral problems (Cankurtaran and Kulaksızoğlu 2020). Although the biggest risk factor for dementia is age, the World Health Organization states that there are around 55 million people with dementia worldwide and this number is expected to triple by 2050 (WHO 2021; 2023). From the perspective of Türkiye, in studies conducted in different regions, the prevalence of dementia was found to be 8.4% in Central Anatolia (Arslantaş

et al. 2009) and 22.9% in Izmir (Keskinoglu et al. 2006). Dementia is a health problem that negatively affects not only the patient but also the caregiver in various ways. It is known that caring for an individual with dementia negatively affects the lives of caregivers in many areas such as psychological, financial, physical, and social areas (Eğilli and Sunal 2017). Caregivers may quit their jobs and social lives, experience fatigue due to the demands of 24-hour care, and develop symptoms of depression, anxiety, burnout, stress, and prolonged grief disorder as a result of caregiving (Alfakhri et al. 2018, Bertrand et al. 2006, Liu et al. 2016, Önal et al. 2023).

The concept of stigmatization, which is widely used in the psychology literature, was first defined by Goffmann (1963) as attributing less value to the other person and/or devaluing that person due to any characteristic. It can be considered as the person being labeled as flawed, worthless, and undesirable

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by others in society due to deviating from the standards accepted as 'normal' by the society they live in (Karagöl et al. 2013). When examining the characteristics for which individuals are subjected to stigma, it is stated that situations such as chronic physical diseases (Aktan Bektaş et al. 2023), mental illnesses (Danacı et al. 2016), cognitive disabilities (Ağaç and Turan 2022), belonging to a different group (race (Deniz et al 2016), age (Yaşar and Avcı 2020), gender identity, sexual orientation (Başar and Öz 2016, Ünal and Yılmaz 2020, etc.) are seen as risk factors for stigmatization (Goffmann 1963). In some cases, not only the person with stigmatizable characteristics, but also their relatives such as friends, family members and even health professionals who provide care for them are known to be stigmatized and to experience the negative effects of stigma. This situation, which occurs in the relatives of the actual person being stigmatized, is defined as affiliate stigma (Mak and Cheung 2008).

In the literature on affiliate stigma, it has been noted that due to the relatively limited studies on caregivers of individuals with dementia, results related to affiliate stigma often rely on findings concerning the relatives of individuals with psychiatric illnesses (Werner and AboJabel 2020). When examining the existing literature on the relationship between dementia and affiliate stigma, Su and Chang's (2020) study on 270 caregivers found that caregivers of individuals with dementia with high levels of affiliated stigma experienced higher levels of anxiety, depression, and burnout. This study also revealed that variables affecting the level of affiliate stigma included the younger age of the patient and their lower dependency on daily living activities, both of which were associated with higher levels of affiliate stigma. Additionally, a high level of burnout within the family was also found to be related to affiliate stigma. Some other studies in the literature found that low educational level and social support were the main predictors of affiliated stigma (Werner and AboJabel 2020); severity of the disease (Livingston and Boyd 2010), low self-esteem and self-efficacy in caregivers, and inadequate coping skills (Gerlinger et al. 2013, Krejevski et al. 2013; Livingston and Boyd 2010) were found to be associated with higher affiliated stigma. Another study examining the impact of affiliate stigma on psychological well-being (such as depressive symptoms, sleep problems, and fatigue) found that female relatives of patients were more affected by the negative impacts of affiliate stigma compared to male relatives, those with higher education levels compared to those with lower education levels, and partners of patients compared to non-partner relatives. This study also revealed that the longer the duration of dementia, the greater the affiliate stigma (Van den Bossche and Schoenmakers 2022).

There is a need for an objective measurement of affiliated stigma to evaluate how it affects caregivers' caregiving functions, their own mental and physical health, and patients.

One of the scales developed to evaluate affiliate stigma is the Affiliate Stigma Scale (ASS) by Mak and Cheung (2008), which measures affiliate stigma among relatives of individuals with any psychiatric disorder or cognitive impairment and has been frequently used in recent studies. In the literature, it has been observed that ASS has been adapted into various languages such as Persian, Greek, Hindi, Malay (Kumari et al. 2022, Papadopoulos et al. 2022, Saffari et al. 2019, Yun et al. 2018), and it is known that in other languages, this scale can be used not only for caregivers of individuals diagnosed with dementia but also for caregivers of individuals with different diagnoses (Parkinson's disease, cancer, autism spectrum disorder, etc.). When considering the study results using the ASS especially in caregivers of individuals with dementia, it is noted that male gender, high anxiety level, and high caregiver burden are significant risk factors for affiliated stigma in terms of variables related to caregivers (Su and Chang 2020).

It has been seen that adaptation studies of the ASS have been conducted in Türkiye for caregivers of children with mental disabilities (Kasımoğlu and Arıkan 2020) and individuals with spinal cord injury/disorder (Kuzu et al. 2023). However, despite its presence in international literature (Saffari et al. 2019), it is highlighted that there has been no Turkish adaptation specifically for caregivers of individuals with dementia, which constitutes a different disease category. Considering the increasing prevalence of dementia (Alzheimer Disease International 2013) and the negative effects it has on both patients and caregivers (Bass et al. 2012, Fonareva and Oken 2014, Soner and Aykut 2017, Cankurtaran and Kulaksızoğlu 2020), it is thought important to validate and establish the reliability of the scale within the Turkish cultural context to examine the situation of affiliate stigma among caregivers of individuals with dementia and determine its relationships with other variables. In addition, it is thought that developing an easily understandable affiliated stigma scale with relatively few questions into our language will fill an important gap in the literature to evaluate the effectiveness of intervention programs to be developed to prevent the stigma that relatives who care for individuals with dementia may experience. Therefore, this study was aimed at adapting the ASS developed by Mak and Cheung (2008) for an adult sample of caregivers of individuals with dementia in our country (Türkiye) and to determine its psychometric properties.

METHOD

Participants

Within the scope of the study, a total of 218 participants aged between 19 and 88 years ($Mean=49.55$, $SD=13.22$) who were caregivers for family members diagnosed with dementia were reached. In the study, caregivers of individuals already known to have a diagnosis of dementia were reached through convenient sampling methods (through the Turkish

Alzheimer's Association) and snowball sampling techniques. The majority of participants resided in Ankara and Istanbul provinces. Of the participants, 78.4% were female and 20.2% were male. Most participants (81.2%) perceived themselves to be at a middle-income level. Data collection was conducted face-to-face with 28.4% of participants (N=62) and online with 71.6% (N=156). The mean age of the Patients with Dementia that participants being cared for was 77.71 years (SD=8.99), with approximately half of the patients (47.7%) diagnosed in the middle-stage of dementia. Descriptive information about the participants and the individuals with dementia they care for can be found in Table 1.

Measures

Within the scope of the current study, in addition to the Socio-Demographic Information Form, the Affiliated Stigma Scale, the Caregiver Burden Inventory and the Beck Depression Inventory were administered to the participants.

Socio-Demographic Information Form: This form was created by the researchers to gather various demographic characteristics from caregivers of individuals with dementia and information about the individuals with dementia as listed in Table 1.

The Affiliated Stigma Scale (ASS): The leading data collection tool is the ASS, which was developed by Mak and Cheung (2008) and whose Turkish adaptation, validity and reliability studies were conducted within the scope of the current study. This scale aims to measure affiliate stigma experienced by relatives of individuals with any psychiatric or cognitive impairment and consists of 22 items organized into three factors: Affective, behavioral, and cognitive. Questions 1, 4, 7, 10, 13, 16, 19 in the scale assess affective factors; questions 2, 5, 8, 11, 14, 17, 20, 22 assess behavior factors; and questions 3, 6, 9, 12, 15, 18, 21 assess cognition factors. Responses are measured on a 4-point Likert scale (1: Strongly disagree; 2: Disagree; 3: Agree; 4: Strongly agree). Higher scores on the scale indicate higher levels of affiliate stigma experienced by the respondent. In its original form, the scale demonstrated good internal consistency with Cronbach's alpha coefficients ranging from 0.85 to 0.94 for the subscales, and split-half reliability coefficients ranging from 0.88 to 0.99 (Mak and Cheung 2008). The scale was adapted for use with the adult sample of caregivers of individuals with dementia in this research.

The Caregiver Burden Inventory (CBI): The CBI, developed by Novak and Guest (1989) and adapted into Turkish by Küçükgüçlü et al. (2009), aims to measure the burden experienced by caregivers of individuals with dementia. The scale consists of 24 items with five sub-dimensions: Time-dependence burden, developmental burden, physical burden, social burden, and emotional burden. The CBI is evaluated using a 5-point Likert-type scale (0:Not all descriptive - 4:Very

descriptive). Higher scores on the scale indicate a higher level of caregiver burden. The internal consistency coefficients of the adapted scale's subdimensions ranged from 0.82 to 0.94. In the current study, this value was determined to be 0.93 for the total scale.

The Beck Depression Inventory (BDI): The scale developed by Beck (1961) and adapted into Turkish by Hisli (1989) aims to measure the degree of emotional, motivational, somatic, cognitive, and interpersonal disturbances associated with depression through a self-report method. The scale is scored from 0 to 3 for each item, with a total possible score ranging from 0 to 63. Higher scores indicate a higher level of severity of depression. In the adaptation study, the Cronbach's alpha internal consistency coefficient of the scale was found to be 0.80, and the split-half reliability was found to be 0.74 (Hisli Şahin 1989). For the current study, the Cronbach's alpha value was calculated to be 0.91.

Procedure

First, permission was obtained from the authors who developed the ASS (Mak and Cheung 2008) to adapt it to Turkish and to determine its psychometric properties in caregivers of individuals with dementia. Subsequently, the scale items were blindly translated from English to Turkish by a clinical psychology PhD student, a psychiatric nursing PhD student, and a clinical psychologist who were fluent in English and Turkish. The Turkish items were examined by three experts (clinical psychologists) who are proficient in both languages, and the text regarding the translation of the scale items was finalized. A clinical psychologist and an English instructor, who were not involved in the initial translation process, performed a back-translation of the scale items from Turkish to English, and this was compared with the original items by the research team. No changes were made to the scale items during the adaptation process (only a note was added to item B11: "Please answer without considering Covid-19 precautions"). Finally, approval for the final version of the items was obtained from the original developers, and the Turkish version of the scale was finalized. A pilot study with five caregivers of individuals with dementia was conducted to evaluate the clarity of the scale items.

The current research was conducted with the approval of the Ethics Committee of Hacettepe University, dated December 13, 2021, with the reference number E-35853172-900-00001914070. After obtaining the necessary permissions, contact was made with neurologists specializing in dementia and the "Turkish Alzheimer Association", which operates in the field of dementia in Türkiye, and required permissions from the administrators were obtained. In the study, we reached out to caregivers of individuals already diagnosed with dementia. Before administering the scale, participants were confirmed to have a relative with a dementia diagnosis,

Table 1. Information for Caregivers and the Patients with Dementia They Care for

Variables Related to Caregivers		N (%)
Age (Mean $\pm$ Standard Deviation)		49.55 $\pm$ 13.22 Min-Max: 19-88
Caregiving time (Mean $\pm$ Standard Deviation)		46.25 $\pm$ 46.22 (month) Min-Max: 1-288
Gender	Female	171 (78.4)
	Male	44 (20.2)
	I don't want to specify	3 (1.4)
Marital Status	Single	51 (23.4)
	Divorced	16 (7.3)
	Married	147 (67.4)
	Widowed	4 (1.8)
Educational Background	Primary school	17 (7.8)
	Middle school	15 (6.9)
	High school	40 (18.3)
	University	122 (56)
	Graduate	24 (11)
Working status	Working	76(34.9)
	Not working	74 (33.9)
	Retired	68 (31.2)
Perceived income level	Low	23 (10.6)
	Middle	177 (81.2)
	High	18 (8.3)
Status of receiving help for care	I don't get help	57 (26.1)
	Help from another family member	111 (50.9)
	Help from a professional caregiver	30 (13.8)
	Help from someone beyond my family	20 (9.2)
Physical illness	Yes	33 (15.1)
	No	185 (84.9)
Psychiatric diagnosis	Yes	27 (12.4)
	No	191 (87.6)
Variables Related to Patients with Dementia		
Age (Mean $\pm$ Standard Deviation)		77.71 $\pm$ 8.99 Min-Max: 54-96
Gender	Female	151 (69.3)
	Male	66 (30.3)
	I don't want to specify	1 (0.5)
Dementia level	Mild	31 (14.2)
	Moderate	104 (47.7)
	Advanced	68 (31.2)
	I don't know	15 (6.9)
Degree of kinship between the patient and the caregiver	Mother	114 (52.3)
	Father	39 (17.9)
	Sibling	3 (1.5)
	Spouse	22 (10.1)
	Grandmother	15 (6.9)
	Grandfather	5 (2.3)
	Mother-in-law	13 (6)
	Father-in-law	1 (0.5)
	Relative (sister-in-law, aunt etc.)	5 (2.3)

and informed consent was obtained after providing information about the study. Data collection was carried out between January 2022 and February 2023, either face-to-face or online, with caregivers of individuals with dementia. Care was taken to ensure that participants did not fill out the form multiple times in the online environment. Completing the scales took an average of 30-35 minutes for the participants.

Statistical Analysis

Before the analysis, the data entries were checked to determine if any of the 220 participants did not meet the inclusion criteria (providing care to a family member with dementia) or left more than 10% of the scale items unanswered. No data was excluded at this step. Following this, a univariate outlier analysis was performed, and two participants who did not meet the criterion ($-3.29 < Z < +3.29$; Field 2009) were excluded from the analyses. All analyses were then conducted with the remaining 218 participants. Lastly, the normality of the data distribution was assessed, and it was found that the skewness and kurtosis values of all scale scores were within the normal range ($-1.96 < \text{skewness and kurtosis} < +1.96$; Field 2009).

The factor structure of the Turkish version of the scale was first evaluated using confirmatory factor analysis (CFA), with the following fit and error statistics considered: $\chi^2/\text{df} < 3.0$, NFI, CFI, GFI, or IFI ≥ 0.95 , and RMSEA < 0.08 (Hu and Bentler 1999, Kline 2016). Construct validity was also examined using exploratory factor analysis (EFA). Pearson Product-Moment Correlation analyses were conducted to assess the relationships between the scale and other measurement tools used in the study. Correlation coefficients were interpreted as follows: 0.10-0.29 as low, 0.30-0.49 as moderate, and 0.50 and above as high (Cohen 1988). In reliability analyses, both the Cronbach's Alpha coefficient and reliability coefficients calculated using the split-half method were reported. The SPSS 26.0 software was used for analyses, and LISREL 8.8 (Jöreskog and Sörbom 2006) was used for confirmatory factor analysis.

RESULTS

Results Regarding the Validity of the Affiliated Stigma Scale

Construct Validity: To evaluate whether the factor structure of the Turkish version of the ASS is similar to the factor structure of the original scale, a first-order CFA was conducted.

Results of Confirmatory Factor Analysis (CFA): A measurement model was created for the original scale, which consists of a total of 22 items, with the latent variable "emotion" composed of 7 observed variables, the latent variable "behavior" composed of 8 observed variables, and the latent

variable "cognition" composed of 7 observed variables. The CFA results showed that the t-values of the factor loadings for all items, except item 13 in the "emotion" latent variable, were statistically significant. However, it was determined that the first measurement model did not provide an acceptable fit to the data: $\chi^2(206)=1299.41$, $p=0.00$, $\chi^2/\text{df}=6.31$, CFI=0.69, NFI=0.64, GFI=0.65, IFI=0.69, RMSEA=0.156. Even after removing item A13, whose factor loading was not significant, and reanalyzing the measurement model, the model still did not fit the data: $\chi^2(186)=1080.53$, $p=0.00$, $\chi^2/\text{df}=5.81$, CFI=0.71, NFI=0.68, GFI=0.68, IFI=0.72, RMSEA=0.149. To improve the fit and error statistics, five error variances (A4-A10; C15-C18; B11-B22; A10-A19; B2-B17) were related as suggested by the modification indices, and the measurement model was retested. However, in the final measurement model, the fit and error indices were still not within acceptable limits: $\chi^2(181)=763.97$, $p=0.00$, $\chi^2/\text{df}=4.22$, CFI=0.79, NFI=0.74, GFI=0.75, IFI=0.79, RMSEA=0.122. As a result of the analysis, it was observed that the model did not fit the data because the ratio of the χ^2 value to the degrees of freedom was greater than 3, the RMSEA value was greater than 0.05 (Kline 2011, Schermelleh-Engel ve ark. 2003), the CFI, NFI, and IFI values were below 0.90 (Jöreskog ve Sörbom 1993), and the GFI value was below 0.85 (Anderson ve Gerbing 1988). In conclusion, it can be said that the factor structure of the scale adapted for dementia caregivers did not resemble the factor structure of the original scale.

Despite the consensus on the face and content validity of the scale in the literature, researchers from other countries have also encountered similar psychometric issues with these items and identified a factor structure different from the initially proposed one (e.g., Yun et al. 2018). This suggests that some items may have been understood differently or corresponded to different concepts due to cultural characteristics. Additionally, considering that the original scale was intended by the researchers to be adapted for caregivers of individuals with dementia, it was decided to conduct an EFA to redefine the dimensions and items of the scale in Türkiye. Such a step is considered an initial part of the internal validation process in factor analysis (Kline 1994).

Results of Exploratory Factor Analysis (EFA): First, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity were applied to determine the suitability of the data for principal components factor analysis. The KMO index was found to be above 0.50 (0.90), indicating that the sample was adequate for factor analysis, and Bartlett's Test of Sphericity was statistically significant ($p=0.00$), indicating that the variables were sufficiently correlated with each other (Kaiser 1974; as cited in Field 2009). When the distribution of items to factors was left free and the analysis was conducted, it was found that the eigenvalues of four factors were greater than 1 (8.78, 2.74, 1.10, 1.03). Considering that

the scree plot (Figure 1) also pointed to a four-factor solution and the item contents formed a more meaningful common structure in four factors, it was decided to proceed with a four-factor solution in the analysis. Additionally, since the subdimensions of the scale were assumed to be correlated with each other, it was deemed appropriate to use the Direct Oblimin rotation method (Seçer 2013).

Based on the analysis, items B14 and A1, which had a variance explanation rate of less than 0.50 in a common factor (Costello and Osborne 2005), were sequentially removed and the analyses were repeated. No cross-loading items were found among the remaining 20 items, and the factor loadings of all items ranged from 0.32 to 0.81. Since the factor loadings were above 0.30, it can be said that the items are related to their respective dimensions (Field 2009). Reviewing the content of the items in the four factors, it was deemed appropriate to name the factors as “other related/cognition”, “emotion”, “self-related”, and “behavior”. As a result, it was found that the ASS has a four-factor structure with eigenvalues above 1 and each factor explaining more than 5% of the variance in the scale (Seçer 2018). The factor of “other related/cognition” with an eigenvalue of 8.25 explained 41.27% of the variance, the factor of “emotion” with an eigenvalue of 2.71 explained 13.57% of the variance, the factor of “self-related” with an eigenvalue of 1.07 explained 5.35% of the variance, and the factor of “behavior” with an eigenvalue of 1.03 explained 5.16% of the variance. The four factors together accounted for 65.34% of the total variance, which is considered to be at an acceptable level (Büyüköztürk 2009). The final details regarding the factors, factor loadings, eigenvalues, and

explained variances of the scale items are presented in Table 2 under the title “AFA Results”.

Criterion (Relationship) Validity: To assess the criterion validity of the adapted scale in this study, the relationships between the ASS and the Caregiver Burden Inventory and the Beck Depression Inventory were evaluated using Pearson Product-Moment Correlation analysis. The results of the correlation analysis show that the sub-dimensions of the ASS—related to other related/cognition, emotion, self-related, and behavior—and the total score have significant positive correlations with depression and caregiving burden. The results of the correlation analysis are presented in Table 3.

Results Regarding the Reliability of ASS

Cronbach's Alpha internal consistency coefficient:

The Cronbach's Alpha values calculated to determine the internal consistency of the ASS were 0.86 for Factor 1 (the “other related/cognition” dimension), 0.82 for Factor 2 (the “emotion” dimension), 0.84 for Factor 3 (the “self-related” dimension), 0.82 for Factor 4 (the “behavior” dimension) and 0.91 for the total scale.

Item-Total Correlations: Item-total correlations assess whether an individual item measures the attribute that the whole scale is intended to measure and its discriminative ability. Therefore, this study aimed to determine the reliability of the scale through this method as well. In the current adaptation study, the corrected item-total correlations of the scale items ranged from 0.53 to 0.71 (Table 2), indicating that the items were functioning very well.

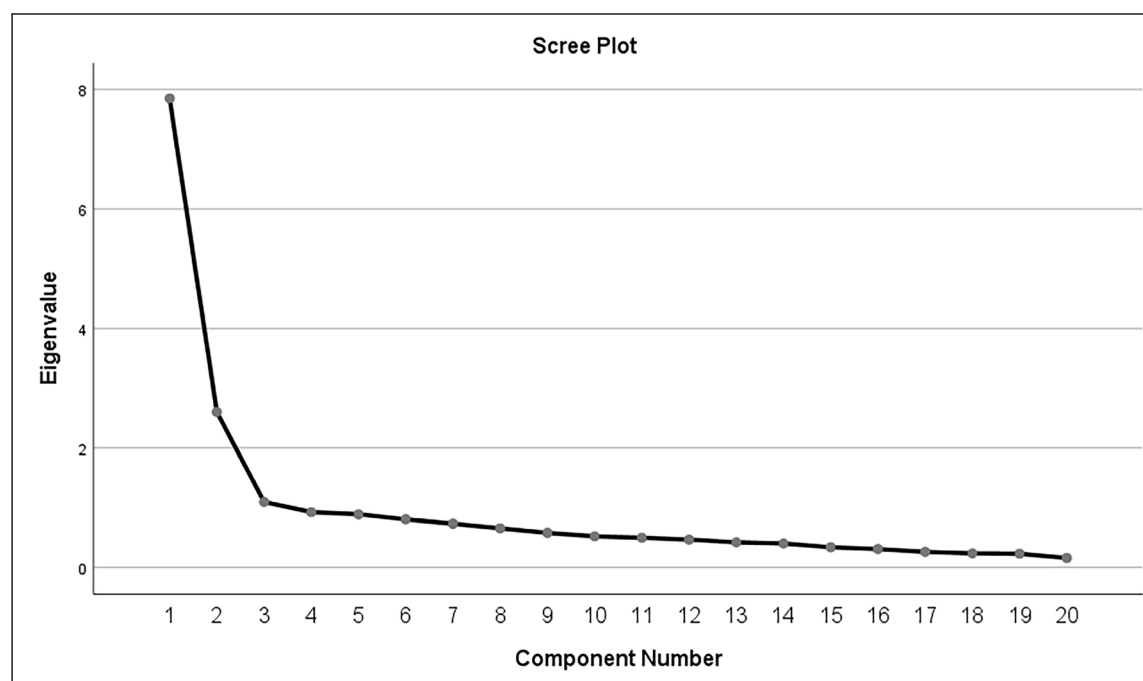


Figure 1. Scree Plot of the Affiliate Stigma Scale.

Table 2. Results of the Exploratory Factor Analysis

		Factor Loading				Item-Total Correlation
		1	2	3	4	
Factor 1: Other Related/Cognition/Variance=%41.27; Cronbach α =0.86						
Item No	Item					
21	Having a family member with dementia makes me lose face.	0.79				0.70
20	I do not dare to participate in activities related to dementia lest other people suspect I have a family member with dementia.	0.78				0.70
16	I worry that other people will find out I have a family member with dementia.	0.75				0.67
18	Having a family member with dementia makes me think that I am less than others.	0.70				0.71
15	Having a family member with dementia makes me think that I am incompetent compared to other people.	0.70				0.65
Factor 2: Emotion/Variance=%13.57; Cronbach α =0.82						
Item No	Item					
10	I feel helpless about having a family member with dementia.		0.80			0.71
13	I feel sad because I have a family member with dementia.		0.79			0.53
12	Having a family member with dementia has a negative impact on me.		0.74			0.66
4	I feel emotionally disturbed because I have a family member with dementia.		0.71			0.56
19	I feel that I am under great pressure because I have a family member with dementia.		0.63			0.62
Factor 3: Self Related/Variance=%5.35; Cronbach α =0.84						
Item No	Item					
3	Other people would discriminate against me if I was with a family member who has dementia.			0.81		0.60
6	My reputation is damaged because I have a family member with dementia.			0.72		0.69
5	I do not dare to tell others that I have a family member with dementia.			0.63		0.68
7	The behavior of my family member with dementia is embarrassing.			0.49		0.62
9	People's attitudes towards me are negative when I am with my family member who has dementia.			0.32		0.59
Factor 4: Behavior/Variance=%5.16; Cronbach α =0.82						
Item No	Item					
2	I avoid communicating with my family member who has dementia.				0.38	0.60
11	I reduce contact with my friends and relatives because I have a family member with dementia. * Please answer without considering COVID precautions.				0.80	0.61
22	I reduce contact with my neighbors because I have a family member with dementia.				0.73	0.68
8	I avoid going out with my family member who has dementia.				0.47	0.61
17	I reduce interacting with my family member who has dementia.				0.34	0.63

The Cronbach's alpha for the total scale was calculated to be 0.91; there are no reverse-coded items in the scale.

Table 3. Results of Correlation Analysis

Variables	1	2	3	4	5	6	7
1. The ASS-Other-Related/Cognition Dimension	1						
2. The ASS-Emotion Dimension	0.34***	1					
3. The ASS-Self-Related Dimension	0.70***	0.30***	1				
4. The ASS-Behavior Dimension	0.71***	0.45***	0.70***	1			
5. The ASS-Total	0.83***	0.71***	0.80***	0.87***	1		
6. The Caregiver Burden Inventory	0.25***	0.43***	0.22**	0.43***	0.43***	1	
7. The Beck Depression Inventory	0.19**	0.42***	0.15*	0.31***	0.36***	0.67***	1

ASS: Affiliate Stigma Scale, *p<0.05, **p<0.01, ***p<0.001

Split-half reliability: To assess whether there were any random errors in the responses to the scale, the split-half method was also used for reliability analysis. The split-half procedure typically involves dividing the items into odd and even and calculating the correlation coefficients obtained from half-tests (Erkuş 2003). Accordingly, the Cronbach Alpha value for the first half was 0.84, for the second half it was 0.84, the inter-form correlation was 0.81, the Spearman-Brown coefficient for equal length was 0.89, and the Guttman split-half value was 0.89. Based on this, it can be said that the adapted scale is a reliable measurement tool.

DISCUSSION

In this study, the aim was to adapt the ASS developed by Mak and Cheung (2008) into Turkish and to determine the psychometric properties of the scale in caregivers of individuals with dementia. Since there was no Turkish scale available to assess affiliate stigma among caregivers of individuals with dementia in our country, the validity and reliability analyses of the ASS were addressed within the scope of the research. The scale's validity was evaluated in terms of Confirmatory Factor Analysis (CFA), Exploratory Factor Analysis (EFA), and criterion validity, while its reliability was assessed through Cronbach's Alpha internal consistency, item-total correlations, and split-half reliability. The adaptation study conducted with a sample of 218 adults caring for individuals with dementia revealed that the 20-item, four-dimensional scale is valid and reliable in our country.

In the current study, a first-order Confirmatory Factor Analysis (CFA) was conducted to evaluate whether the factor structure of the ASS is similar to the original scale's factor structure (Young and Bullock 2003). It was found that the fit and error indices of the tested measurement model were not within acceptable limits. Some modifications (such as removing non-significant factor loadings and correlating the error variances of observed variables) were performed to improve the fit and error statistics, but the CFA results indicated that the original scale's three sub-dimensions were not validated. In other words, the factor structure of the adapted scale did not resemble that of the original scale. This discrepancy may be attributed to some items in different dimensions of the original scale being understood differently or corresponding to different conceptual meanings due to cultural characteristics. Although some studies in the literature have shown that scales adapted to different languages have similar structures to the original scale (Cheng-Chang et al. 2016, Saffari et al. 2019), other studies (e.g., Kasımoğlu and Arıkan 2020, Yun et al. 2018) such as this one, have reported that the scale has a different structure from the original and that items forming a dimension have loaded onto different factors. Furthermore, since the scale in this study was adapted

to assess affiliate stigma in caregivers of individuals with dementia, rather than caregivers of individuals with mental or cognitive impairments as in the original study, the differences in the target sample may have contributed to the lack of validation of the original scale's items and dimensions.

EFA was conducted to evaluate the structure of the ASS for caregivers of individuals with dementia in our country. As a result of the EFA, items B14 and A1, which had low common variance ratios (Costello and Osborne 2005), were removed from the analysis. Therefore, unlike the original scale, the adapted scale consisted of 20 items and four dimensions. The fact that the lowest factor loading for items in each dimension was above 0.30 (Field 2009) and that the variance explained by each factor alone was above 5% (Seçer 2018) indicates that the adapted scale has a valid structure. The total variance explained by these four factors being 65.34% of the total variance is another indicator suggesting that these variance amounts are at an acceptable level (Büyüköztürk 2009). When examining the content of the items, it was deemed appropriate to name the factors as "other-related/cognition", "emotion", "self-related", and "behavior" due to the common structure they form based on their meanings. The other-related/cognition dimension includes items related to negative thoughts arising from comparing oneself to others (e.g., "Having a family member with dementia makes me think that I am incompetent compared to other people."); the emotion dimension includes items related to negative emotions associated with affiliate stigma, similar to the original (e.g., "I feel sad because I have a family member with dementia."); the self-related dimension includes items related to the self and self-esteem of a stigmatized person (e.g., "Other people would discriminate against me if I was with a family member who has dementia."); and the behavior dimension includes items related to actions associated with affiliate stigma, as in the original (e.g., "I avoid communicating with my family member who has dementia."). In particular, most of the items in the "self-related" dimension, which emerged as a different factor in this study, were also part of the "self-esteem" dimension in Yun et al.'s (2018) study, hence it was defined similarly in the current study. Consequently, although the factor names and the dimensions to which some items loaded differ from the original, various differences in the number of factors and items have also been observed in versions adapted to other languages. For instance, the scale adapted to Malay for caregivers of individuals with mental illness consists of four sub-dimensions and 21 items (Yun et al. 2018), whereas the adaptation for parents of children with intellectual disabilities into Turkish resulted in a single-factor structure (Kasımoğlu and Arıkan 2020).

To examine criterion validity, correlation analysis between the ASS and the Caregiver Burden Inventory and the Beck Depression Inventory revealed that the scale's other-related/

cognition dimension and self-related dimension were found to have low-level correlations with both caregiver burden and depression levels, while the emotion and behavior dimensions had moderate-level significant correlations with these variables. Additionally, the total score of the adapted scale showed a moderate-level significant correlation with caregiver burden and depression. Positive and significant relationships between affiliate stigma in caregivers of individuals with dementia and caregiver burden and depression were expected. Caregivers experience increased burden due to providing care for family members with dementia and coping with dementia symptoms (Watson et al. 2019). Moreover, the negative attitudes, emotions, and avoidant behaviors of other individuals in society towards those providing care to their patients pose a risk of negative experiences for caregivers due to affiliate stigma that caregivers experience (Park and Park 2014). Consequently, an increase in the caregivers' burden and a subsequent decline in their psychological health can be anticipated (Kolanowski et al. 2017). Indeed, numerous studies have shown that caregivers with high levels of affiliate stigma experience burnout (Su and Chang 2020), increased caregiver burden, and elevated levels of depression (Chen et al. 2023, Hu et al. 2023).

The reliability of the ASS was evaluated in terms of Cronbach's Alpha internal consistency, item-total correlations, and split-half reliability. The internal consistency coefficients being above 0.80 for both sub-dimensions and the total scale (Nunnally et al. 1994) indicate that it is a reliable measurement tool. Additionally, in psychological research, coefficients of 0.70 and above are generally considered satisfactory (Field 2009). Furthermore, the fact that both in the development of the original scale and in other studies adapted into different languages (e.g., Kumari et al. 2022, Yun et al. 2018) these coefficients for sub-dimensions were reported above 0.80 and for the total scale above 0.90 supports the findings of this study. Another method used to evaluate the scale's reliability was examining the item-total correlations. If the item-total correlation value is above 0.20 (Aiken 2020, Ebel 1965) or 0.30 (Nunnally and Bernstein 1994), it indicates that the item makes a significant contribution to the total score and has high discriminative power, while a value above 0.40 corresponds to a good item (Büyüköztürk 2009). In this study, the appropriateness of the corrected item-total correlations indicated that the items worked very well. Additionally, since the lowest correlation coefficient among the total scores of the sub-dimensions of the adapted scale was 0.30 (Nunnally and Bernstein 1994), it was considered that the ASS was reliable. The final method used for reliability is split-half reliability (Erkuş 2003). Accordingly, the Cronbach Alpha values and Guttman split-half reliability coefficients for both halves were found to be above 0.80, providing further information about the scale's reliability.

Limitations

The current study's findings are likely to be more generalizable due to its inclusion of caregivers across a wide age range. However, there are some limitations to this research. First, most participants were caregivers who visited neurologists with their patients or were affiliated with branches of the Turkish Alzheimer Association. In this context, it is likely that the caregivers are relatively more informed about the disease and their patients. The fact that a large proportion of participants were female could also be a limitation. Additionally, many demographic variables were unevenly distributed across groups, which prevented any analysis of the scale's discriminative validity. Second, the data collection method used was self-report, which may introduce a bias of socially desirable responses. Moreover, responses related to the level of dementia (mild, moderate, severe, etc.) in the descriptive statistics were reported by caregivers based on information provided by physicians to the patients' relatives. However, since this information was not directly obtained from a physician and there may be instances of incorrect knowledge or recall by caregivers, this can be considered another limitation. The lack of detailed information on types of dementia constitutes a third limitation of the study. Fourth, since some of the data were collected online, the sample may not be fully representative of the population. Finally, the model predetermined for the original scale structure was rejected in this study through CFA, and changes were only identified using EFA. Moreover, since data were collected from a single sample for the adaptation study and it was noted that both EFA and CFA could not be conducted within the same sample (Lorenzo-Seva 2022), CFA could not be conducted again to validate the structure determined in this study. Therefore, future research should focus on validating this scale in our country or discussing possible changes in the scale's dimensions and items.

The Contribution of the Study to Clinical Practice

As previously mentioned, assessing the level of affiliate stigma among caregivers of individuals with dementia is particularly important for psychological health. Given that dementia is increasingly prevalent and has adverse effects on both patients and caregivers, there is a need for a scale in our country that can evaluate affiliate stigma from various perspectives. The current study was aimed to address this gap by providing a valid and reliable scale for measuring affiliate stigma, which is easy to understand, has a relatively small number of items, facilitates scoring and interpretation, and consists of four dimensions. This adaptation of the scale is expected to contribute to the existing body of scales in our country and shed light on both theoretical and practical studies in psychology and geriatrics to prevent affiliate stigma among caregivers of individuals with dementia. Moreover, the

availability of this scale in our language will enable support for psychological health and planning of rehabilitation services for those affected by stigma. It can be said that the ASS is a valid and reliable measurement tool for assessing affiliate stigma among adults caring for individuals with dementia in scientific research in our country.

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Improving Psychiatry Services with Artificial Intelligence: Opportunities and Challenges



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ABSTRACT

Mental disorders are a critical global public health problem due to their increasing prevalence, rising costs, and significant economic burden. Despite efforts to increase the mental health workforce in Türkiye, there is a significant shortage of psychiatrists, limiting the quality and accessibility of mental health services. This review examines the potential of artificial intelligence (AI), especially large language models, to transform psychiatric care in the world and in Türkiye. AI technologies, including machine learning and deep learning, offer innovative solutions for the diagnosis, personalization of treatment, and monitoring of mental disorders using a variety of data sources, such as speech patterns, neuroimaging, and behavioral measures. Although AI has shown promising capabilities in improving diagnostic accuracy and access to mental health services, challenges such as algorithmic biases, data privacy concerns, ethical implications, and the confabulation phenomenon of large language models prevent the full implementation of AI in practice. The review highlights the need for interdisciplinary collaboration to develop culturally and linguistically adapted AI tools, particularly in the Turkish context, and suggests strategies such as fine-tuning, retrieval-augmented generation, and reinforcement learning from human feedback to increase AI reliability. Advances suggest that AI can improve mental health care by increasing diagnostic accuracy and accessibility while preserving the essential human elements of medical care. Current limitations need to be addressed through rigorous research and ethical frameworks for effective and equitable integration of AI into mental health care.

Keywords: Artificial Intelligence, Health, Large Language Model, Machine Learning, Psychiatry

Economic Burden and Workforce Limitations in Psychiatry: Insights from Global and Turkish Perspectives

Mental health disorders represent a critical global public health burden due to their prevalence and economic costs. A study published in 2022, analysing data from 204 countries on 12 mental disorders between 1990 and 2019, found that global disability-adjusted life years (DALYs) due to mental disorders increased from 80.8 million to 125.3 million, with the share of DALYs attributed to mental disorders increasing from 3.1% to 4.9% (GBD 2019 Mental Disorders Collaborators 2022). This finding shows that the burden of mental disorders is increasing on a global scale. The economic disadvantages associated with mental disorders, an increase in risk factors such as social exclusion, and limited access to protective factors like education contribute to the further

increase in the prevalence of mental disorders (Niemeyer et al. 2019, Heinz et al. 2020). According to a 2021 study on the economic burden of major depressive disorder (MDD) in the United States, the cost associated with MDD increased by 37.9% from 2010 to 2018, from \$236.6 billion to \$326.2 billion. During this period, the number of adults diagnosed with MDD increased from 15.5 million to 17.5 million; however, the proportion of patients receiving treatment decreased in 2018 compared to 2010 (Greenberg et al. 2021). This shows that although the frequency of diagnoses such as MDD has increased, access to effective treatment has not increased at the same rate. As mental health disorders are associated with serious outcomes such as disability and death, preventive measures and accessible services are crucial (Martin-Carrasco et al. 2016).

According to the National Mental Health Action Plan published in 2021, while there were 2.2 psychiatry

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specialists per 100,000 people in Türkiye in 2011, this number increased to 3.43 in 2020; the number of child and adolescent mental health and diseases specialists was 1.63 per 100,000 people (Ulusal Ruh Sağlığı Eylem Planı 2021). Despite efforts to increase the number of mental health professionals, the insufficient number of mental health professionals continues and this situation negatively affects the quality and accessibility of mental health services. According to the 2016 report of the Psychiatric Association of Türkiye, mental health centres lack up-to-date technological facilities and psychiatry specialists in public hospitals examine up to 80 patients a day. Appointment durations are limited to 1-2 minutes, which falls significantly below the World Health Organization's recommended minimum of 20 minutes. Consequently, it is not always possible to prioritize acute and high-risk patients (Türkiye Psikiyatri Derneği 2016). In addition, increasing stigmatisation at the societal and individual level is a significant barrier to seeking mental health support (Zweifel 2021) and, according to the same report of the Psychiatric Association of Türkiye, it pushes patients to seek help from non-specialists in the field of psychiatry, causing their current health conditions to worsen and thus further aggravating the burden on the mental health system (Türkiye Psikiyatri Derneği 2016). Patients' access to psychiatry services is already limited due to the limited number of specialists and time constraints in public hospitals. Additionally, the exclusion of psychiatric services from many private insurance plans further restricts access to care. Although efforts are being made to increase the number of mental health professionals, the training and supervision of a psychiatrist usually takes 4 to 5 years. This process involves the transfer of knowledge and skills from supervisors/lecturers to trainees and involves direct observation, assessment and follow-up of patient interviews and case files. Currently this training is highly dependent on human input, making it both time consuming and difficult to standardise training across institutions. In addition to clinical practice and training, there is also a need for more precise standardisation, classification and documentation of psychopathological symptoms and findings in order to create larger datasets for research. For these standardised assessments, common consultants and evaluators across centres are needed. Conducting and standardising all these assessments requires time and effort.

Evolution of Artificial Intelligence and Integration with Mental Health Services

Artificial intelligence (AI) is a multidisciplinary field of computer science that focuses on performing tasks where human intelligence is required. Endowing machines with the ability to perform tasks such as perception, reasoning,

learning, and decision-making—tasks that humans can easily accomplish—falls within the scope of AI and its sub-disciplines. The beginning of AI studies in the modern sense dates back to 1950, when Alan Turing published his article *Computing Machinery and Intelligence* (Turing 2009). The term AI was coined in 1956 at the Dartmouth conference, which brought together researchers working in this field. Despite the optimistic atmosphere at the beginning, AI did not reach the expected development in the 1970s and 1980s due to the lack of sufficient computing power of computers (Delipetrev 2020). Exponentially increasing data and processing resources, together with machine learning techniques such as artificial neural networks and deep learning, revitalised the field of AI in the late 1990s (Pastur-Romay et al. 2016). IBM-developed Deep Blue's defeat of chess master Garry Kasparov in 1996 is one of the symbolic moments of this re-emergence (Delipetrev 2020). In the years after 2020, the exponential growth of AI has led to increased debate on AI safety and usefulness. It has been suggested that AI systems using machine learning algorithms and artificial neural networks can detect diseases such as cancer, heart disease and neurological disorders with high sensitivity by analysing complex data such as medical imaging and genetic information (Jiang et al. 2017). It has also been suggested that AI can accelerate drug discovery by predicting molecular interactions and identifying potential drug candidates (Gupta et al. 2021). AI can assist in adjusting treatment plans in real-time on an individual basis by using algorithms developed from information about treatment responses throughout the course of the disease. This dynamic method aims to increase the likelihood of a more effective treatment compared to conventional treatment approaches that still involve trial and error (Espejo et al. 2023).

The application of AI in mental health services started in the mid-20th century with preliminary studies on robots designed to mimic human thought processes (Olawade et al. 2024). The potential of this technology in mental health was first demonstrated by Joseph Weizenbaum in the 1960s when he developed a chatbot that mimics therapeutic conversations (Basset 2019). As stated in Ayhan's (2023) article, despite concerns about ethical use and reliability, AI in mental health is expected to integrate large amounts of data such as genetic data, magnetic resonance imaging results, daily experiences, data from wearable devices that track physical changes, and behavioural phenotypes in order to provide better diagnosis, follow-up, risk assessment and prevention. (Ayhan 2023). These AI-enabled tools can provide stigma-free, accessible and measurable mental health services and provide a solution that allows patients to receive support outside of traditional therapy and psychiatric examination sessions. This change may not only increase the effectiveness of interviews, but also enable mental health resources to reach

those in need more widely (Omarov et al. 2023). The impact of AI can also extend to the post-treatment phase, where continuous monitoring of fluctuations in mental health dimensions, whether they improve, worsen or remain stable, can play a critical role in monitoring patient behaviour and outcomes. Regular monitoring and processing of mental health dimensions (functioning, sleep, appetite, psychomotor movement, etc.) can enable early detection of relapses and allow for timely interventions that can significantly improve treatment effectiveness and outcomes through comprehensive assessment of patients' mental health status (Zlatintsi et al. 2022, Hickey et al. 2021, Krysta et al. 2024).

Understanding AI Processes: Data Management, Machine Learning and Deep Learning

AI works through a series of processes that enable machines to perform tasks. This process starts with 'data collection', where a large amount of information is gathered from various sources such as images, texts or sensor inputs. This data is then cleaned and organised so that the AI system can effectively extract meaningful patterns and relationships (Roh et al. 2019). AI then uses algorithms, a set of mathematical instructions, to analyse the data and identify patterns or relationships (Basu et al. 2010). For example, in image recognition, an AI model can gain the ability to distinguish cats from dogs by examining thousands of labelled images (Elgendy 2020). This learning phase, often referred to as training, involves adjusting the algorithm's variables to improve accuracy. Once trained, the AI system can make predictions or decisions about new data that it has not encountered before, based on the model it has built from previous data (Baduge et al. 2022).

At this point, it would be useful to explain the concepts of Machine Learning (ML) and Deep Learning (DL), which are branches of AI. ML focuses on the development of algorithms and statistical models that enable computer systems to improve their performance on a given task through experience, without explicit programming. It is necessary to use large amounts of data to train models that can make predictions, recognise patterns or make decisions with minimal human intervention (Jordan and Mitchell 2015). An example of such decision-making is when autonomous driving vehicles stop at a red light. A common approach to prediction in ML is to use linear regression, which attempts to model the relationship between input features (such as house size, number of bedrooms, location) and the target variable (house price). The algorithm learns by minimising the difference between its predictions and actual house prices in a training dataset. It adjusts the weights assigned to each attribute to find the line of best fit. Once trained, it can predict the model price considering the features of a new house (Ghosalkar et al. 2018). In the field of machine learning, both linear and non-linear algorithms play

crucial roles in addressing various prediction tasks. While linear regression offers a simple approach for problems with linear relationships, many real-world scenarios require more complex, non-linear models. Random forests and neural networks are nonlinear ML algorithms that can capture complex relationships in data. Apart from these, another commonly used nonlinear technique is support vector machines (SVM). SVM can find discriminative hyperplanes by moving the data to a higher dimensional space for classification or regression (Greener et al. 2022). The choice between linear and non-linear algorithms usually depends on the data structure and the problem to be solved (Suthaharan et al. 2016). DL (DL) is a sub-branch of ML that utilises multilayer artificial neural networks. While traditional ML algorithms usually require manually determined features, DL models can automatically extract these representations from data. This feature enables DL to work with unstructured data such as images, audio and text. The most important difference of DL is that it can process raw input data through a multi-layered structure. These layers extract increasingly more abstract features at each step. For example, in an image recognition system, while the first layers detect edges, deeper layers can recognise objects and more complex shapes (LeCun et al. 2015).

This hierarchical learning enables the DL to handle more complex patterns and achieve superior performance in tasks such as speech recognition and computer vision (Mikolov et al. 2011, Krizhevsky et al. 2012). However, compared to simpler ML algorithms, it usually requires larger datasets and more computational resources, and its decision-making process is less interpretable due to its complex network structure (Hestness et al. 2019, Lipton 2018). Despite these challenges, the capacity of DL to learn complex patterns has led to advances in AI applications in various fields. The features related to ML and DL are summarised in Figure 1.

Machine Learning in Psychiatry: Diagnostic Potential, Limitations and Transdiagnostic Frameworks

Psychiatry, which focuses on understanding the natural processes of emotion, behaviour and thought in humans and their disorders, can benefit from AI's ability to analyse large and multifaceted data sets such as speech content (Joshi et al. 2022), scales, brain imaging, blood and digital biomarkers, audio data (Huang et al. 2021), mood (Barzilay et al. 2019), social media data, oculo-metric system dynamics, eye movements for attention assessment and peripheral physiological signals (Saxena et al. 2021, Morar et al. 2020, Kalmady 2019, Giorgi 2021) to reveal complex patterns. Collectively, these methods contribute to the assessment and understanding of both brain and body activities and their interactions. For example, AI-enabled tools can assess speech

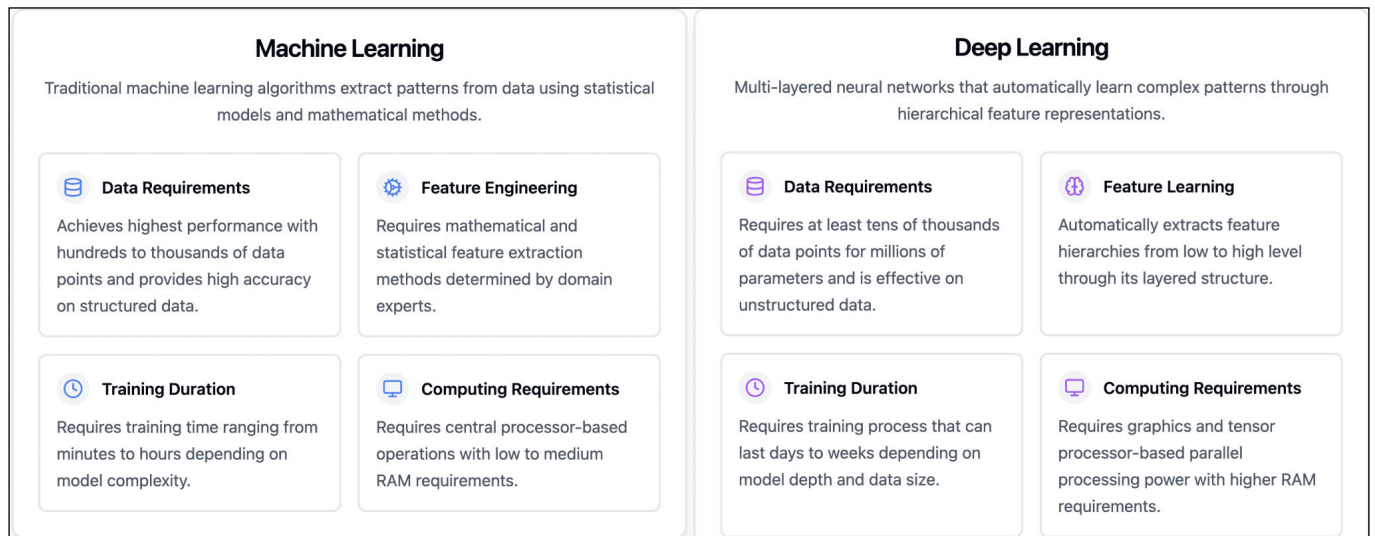


Figure 1. Comparison of machine learning and deep learning.

Note: RAM (Random Access Memory) is a type of fast-access memory that a computer uses to store temporary data. In data-intensive operations such as machine learning and deep learning, RAM plays a critical role, especially during training and data processing procedures. CPU (Central Processing Unit) refers to the processor unit designed for general-purpose computing operations; GPU (Graphics Processing Unit) refers to the processor unit capable of parallel processing, optimized especially for deep learning operations such as matrix multiplications; TPU (Tensor Processing Unit) refers to the processor unit specifically developed by Google for deep learning applications, providing high performance in matrix operations.

patterns, facial expressions and social media activity to detect early signs of mental disorders such as depression, anxiety and bipolar disorder (Srnke et al. 2021, Su et al. 2020). A systematic review compiling ML models used to predict psychiatric disorder diagnoses from genetic data revealed that model performances varied across disorders. Schizophrenia (SchZ) models showed the widest range of Area Under Curve (AUC) accuracy (0.541-0.95), bipolar disorder predictions were less accurate (0.482-0.65), and anorexia nervosa models showed moderate accuracy (0.623-0.693). The diagnostic predictive accuracy of ML for Autism Spectrum Disorder (ASD) was found to vary (0.516-0.806). The algorithms used included SVMs, neural networks and random forests. The authors warn that the results carry a high risk of bias and potential overfit due to sample overlap and population structure issues (Bracher-Smith et al. 2021).

The review by Zhang et al. in 2020 examined DL applications for four brain disorders: Alzheimer's Disease (AD), Parkinson's Disease (PD), Autism Spectrum Disorder (ASD) and Schizophrenia (SchZ). The study reported impressive results. DL models were able to predict diseases with accuracy ranging from 90-99.3% for AD, 85-98.8% for PD, 70-91% for ASD and 70-98.09% for Schizophrenia compared to healthy controls. These diagnostic algorithms were developed using various DL architectures such as 3D-Convolutional Neural Networks (CNNs) and stacked autoencoders applied to neuroimaging data, including magnetic resonance imaging and functional magnetic resonance imaging (Zhange et al. 2020).

According to Squarcina et al. (2021), DL methods show promise in predicting response to depression treatment. A

review of eight studies revealed that when DL models analysed various types of data (clinical, genetic, neuroimaging and electroencephalography), the power to predict treatment response with DL was better than traditional methods. The AUC values above 0.80 found in some studies indicate the promising performance of the models in integrating various data and identifying complex patterns that predict treatment outcomes.

There are also studies on suicide risk assessment with machine learning. However, according to a recent systematic review, its effectiveness in this area currently remains around 80% accuracy on average with survey-based data (Some et al. 2024). Most existing studies have achieved similar levels of accuracy for different psychiatric disorders using different measurement and diagnostic tools. Our research group's work in the peer-review phase with a sample of undergraduate and graduate students at Koç University did not exceed 80% accuracy in detecting suicidal/self-harm ideation using various ML algorithms with routine psychometric scales and inventories answered by people applying to the university's psychological counselling and therapy centre (Ballı et al. 2024, work in progress).

As mentioned above, research currently indicates that the capacity of AI technologies to reliably diagnose mental disorders and predict complex behaviours such as suicide remains limited. This shortcoming can be attributed to the combined effect of several factors, including the inherent complexity of human cognition and behaviour, and potential human-induced biases that may arise during the design and editing of training data sets. The ML models used may

have some methodological limitations. These include low sample size, lack of leave-one-out or nested cross-validation, problems in the design of training, testing and validation data sets, inappropriateness in the selection of the ML method and the variables used, etc. (Cearns et al. 2019). Future studies should improve their methods accordingly to achieve higher accuracy rates.

On the other hand, psychiatric diagnoses are currently classified according to diagnostic criteria determined in terms of symptom clusters, functionality and duration, as specified in systems such as the International Classification of Diseases-11 (ICD-11) or the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) (World Health Organization 2018, American Psychiatric Association 2013, Di Vincenzo 2023). However, these diagnoses are actually structures developed by humans and psychiatric disorders are highly co-occurring (Yapici Eser et al. 2018). This co-occurrence poses difficulties for ML methods and makes it difficult to create pure diagnostic groups and to distinguish between them. Furthermore, there are many common environmental, genetic, cellular and neuroanatomical pathways between psychiatric disorders (Scangos et al. 2023). Moreover, an individual may be diagnosed with more than one psychiatric diagnosis during his/her lifetime, which may impose limitations on ML approaches. The transdiagnostic approach in psychiatry focuses on the common processes underlying different mental disorders, rather than addressing each diagnosis separately. This approach recognises common mechanisms, views symptoms as a continuum, and allows for flexible interventions targeting core psychological processes (Fusar-Poli et al. 2019). The Research Domain Criteria (RDoC) introduced by the National Institute of Mental Health (NIMH) focuses on this transdiagnostic approach. The RDoC aims to establish a new framework for investigating mental disorders based on dimensions of observable behaviour and neurobiological measures (Cuthbert 2014). The ability of AI to combine different types of data, such as imaging, biochemistry, self-report and behavioural measures provided by clinician observation, and to capture non-linear relationships between these data, may make a cross-diagnostic approach possible and feasible and thus enable more accurate classification of psychiatric disorders. According to the review study by Bzdok et al. in 2018, ML has significant potential in advancing personalised medicine and high-precision psychiatry, particularly in treatment optimisation and dimensional approaches to psychopathology, rather than traditional classification systems. The authors suggest that predictive models can be used for individualised drug regulation, going beyond traditional trial-and-error methods. Representation learning algorithms are ML methods that automatically learn meaningful and useful representations (features) from raw data. Multimodal data analysis refers to the

simultaneous processing of multiple data types, for example, text, image, audio, genetic or neuroimaging. Representation learning-based ML algorithms adapt to the RDoC framework by working with multimodal data. For example, by evaluating an individual's genetic data, brain images and behavioural measures together, it can discover hidden dimensions of psychopathology. This approach can help us understand biologically-based and clinically predictable disease processes, going beyond traditional diagnostic boundaries. At the same time, it may make it possible to reach a more biologically accurate and holistic psychiatric classification system (nosology), taking into account the heterogeneity in existing diagnostic categories and common features among disorders.

Leveraging Natural Language Processing and Large Language Models to Improve Psychiatry Services

Natural Language Processing (NLP) is a branch of AI that processes and analyses human language. In the medical field, it is used for many critical applications such as diagnosing, supporting clinical research, detecting drug interactions and making sense of patient data (Juhn and Liu 2020, Savova et al. 2019, Luo et al. 2017, Bhatnagar et al. 2022). NLP can extract rich information, including semantic and emotional content, from speech and texts, overcome the limitations of standard scales used in psychiatry, and make a more in-depth and personalised assessment by analysing patterns in individuals' language use (Kjell et al. 2023), and thus can make significant contributions to the development of medical decision support systems (Yang et al. 2022).

Large language models (LLMs), which are advanced NLP based AI systems designed to understand, produce and interact with a language in a human-like manner, entered the lives of the masses in November 2022, when OpenAI released ChatGPT. LLMs developed with DL techniques, especially transformer architectures, are trained on large and diverse textual datasets and can recognise complex linguistic patterns and contextual relationships. The transformer architecture is a DL architecture that effectively models contexts and complex relationships in long texts using the self-attention mechanism and is fundamental to the success of LLMs, with features that allow parallel processing (Vaswani et al. 2017). The process of developing LLMs involves training the model with large amounts of text data to predict the next word in a sequence, allowing the model to learn grammar, general information and various writing styles. This training allows LLMs to perform a wide range of tasks such as text completion, translation, summarisation, and speech interactions (Radford et al. 2019). Multimodal LLMs extend the capabilities of traditional LLMs by integrating and processing multiple data types such as text, images, and audio within a single framework (Wu et al.

2023). This development enables these models to understand and generate content that combines different modalities, increasing their ability to perform tasks such as image captioning, video analysis, and interactive conversations involving visual information. For example, a multimodal LLM can analyse a photo, generate a descriptive paragraph or respond to questions about the image, thus providing a more comprehensive and intuitive user experience.

Large Language Models (LLMs) can be used in psychiatry and can enrich the descriptive nature of the field by providing advanced tools for analysing complex human emotions, thoughts and behaviours expressed through language. LLMs can help clinicians to recognise clues to mental disorders such as depression, anxiety or schizophrenia in patients' speech or writing. These models can provide information about an individual's mental health by analysing salient language patterns such as frequently repeated phrases, emotional tones or particular themes in texts (Kjell et al. 2023). For example, by analysing therapy session transcripts, an LLM can detect linguistic cues and thematic content that may be missed during traditional assessments (Volkmer et al. 2024). Multimodal LLMs can also perform analyses based on image data of psychiatric patients for whom mood assessment is critical (AlSaad et al. 2024). In addition, these models can synthesise the extensive psychiatry literature, helping researchers and practitioners to stay abreast of the latest developments.

Another advantage of language models is that, due to their training methods and design features, they can produce correct responses despite spelling or grammatical errors in user commands. Training on large and diverse text corpora, including examples of incorrect and informal language use, enables models to develop a nuanced and context-sensitive understanding of language that goes beyond strict grammatical rules (Gao et al. 2020). These models prioritise semantic integrity over superficial features and assess the importance of different input elements using attention mechanisms, so that they can often correctly infer intended meanings even when errors are found (Zhao et al. 2023). Furthermore, some models are specifically trained with 'noisy' inputs to increase fault tolerance (Karpukhin et al. 2019). This multifaceted approach can also be useful in understanding the reports of people who present to psychiatry and have some difficulties in expressing their problems. However, this may have some negative consequences, especially for people who are in the process of language learning; getting correct answers despite their mistakes may make the learning process difficult for people, and the understanding shown by the language models may cause distortion of everyday language because it is not the kind that can be found in daily life (Adeshola et al. 2023). The limitations of these models are that although the input is the same, they can produce different responses each

time and these responses can be contradictory in some cases (de Leon 2023).

Limitations of Artificial Intelligence in Psychiatry: Bias, Accuracy and Ethical Challenges

Despite their impressive capabilities, LLMs have a number of limitations. First, building a LLM requires access to big data and the resources to analyse it (Hoffman et al. 2022). Second, various biases may be present in the training data and these biases may be 'inherited' and magnified during LLM training, potentially leading to inequitable outputs (Acerbi et al. 2023). Furthermore, LLMs have a fixed information cut-off date, so they do not have access to information or events that occur after their training period, which may result in outdated or inaccurate responses (Wang et al. 2023). Humans rely on sensory information derived from the physical environment to understand and navigate the world. In addition, they use 'embodied cognition', which enhances cognitive processes by integrating mind-body interactions, leading to a more comprehensive understanding of their environment (Dove 2023). LLM models are also being worked on to be embodied agents for better goal-oriented decision making. However, at the current level of progress, as discussed in detail by Özer (2024), a critical problem for LLMs is the output of LLMs, also called hallucinations, which appear coherent and plausible but are in reality false, misleading or completely fabricated (Banerjee et al. 2024, Maynez et al. 2020). This is because LLMs are trained to predict possible word sequences based on patterns in the training data, rather than having the ability to understand or reason about the real world in the sense that the human mind works. While this can yield creative results in some contexts, it can pose significant challenges in applications that require 'accuracy' in the sense of matching reality (Woodland 2023). In fact, this fabricated output is incompatible with the clinical use of hallucination as a term, as hallucinations are perceptual disturbances related to the senses of hearing, sight, touch and smell (Sterzer et al. 2018, Russo et al. 2019). Although the term hallucination evokes the process of making up (creating) something that does not exist in many people's minds, confabulation may be a more appropriate term in this context. Because confabulation is a type of memory error characterised by the unconscious production of fabricated, distorted or misinterpreted memories. As Özer (2024) argues, a number of recent scientific papers prefer the term confabulation to hallucination (Smith et al. 2023). Contrary to assumptions, confabulations are not perceived experiences, but inaccurate reconstructions of information due to the influence of past experiences, expectations and context. When answering questions, LLMs produce responses based on patterns learnt from very large data sets. The phenomenon of confabulation in both humans and LLMs involves internal

processes that produce outputs that are not fully grounded in external reality, emphasising a parallel between the brain's predictive processing and statistical prediction mechanisms in LLMs (Wang et al. 2023).

Bias is another critical issue in AI models; for example, if certain demographic groups are underrepresented in training data, the results produced by AI may not be fair to the community to which it will be applied and may increase health inequalities (Rajkomar et al. 2018). Moreover, the complexity and subjectivity of mental health pathologies pose a challenge for AI systems, which struggle to interpret nuanced human emotions, cultural contexts and individual experiences that are crucial for accurate assessments. Cultural representations of phenomena must be adequately captured in the context of language-based differences between countries and cultures in the datasets. Furthermore, the lack of transparency and explainability in some AI algorithms may make it difficult for clinicians to understand the rationale behind AI-generated recommendations, hinder their ability to make informed decisions, and undermine trust in the technology (Antoniadi et al. 2021).

The entrusting of the job of psychiatrists to AI raises ethical concerns; AI may not provide empathy and therapeutic alliance, which are essential elements in the patient-physician relationship, as expected (Morrow et al. 2023). Furthermore, as AI is increasingly relied upon in fields ranging from education to healthcare, the risk of widespread use of any misinformation that may be associated with AI will become a serious threat. Developing systems that alert users to the accuracy of these models in real time, for example by integrating feedback loops into use where user interactions help to improve model responses, can reduce the risks associated with confabulations (Nahar et al. 2024). Furthermore, when using LLMs in sensitive areas, transparency about how the content of these models is generated will enable users to critically evaluate the information presented to them (Reddy et al. 2024).

Addressing the shortcomings of LLMs in psychiatric applications requires a versatile approach. For example, fine-tuning is a process whereby a pre-trained language model is further trained on a smaller, customised dataset to adapt its knowledge and performance to a specific domain or task. This technique allows the model to learn domain-specific vocabulary, contexts and nuances, potentially leading to more accurate and reliable outputs (Gu et al. 2021). Fine-tuning models on high-quality, domain-specific psychiatric data can significantly improve accuracy and reduce confabulations. Another approach, Retrieval-Augmented Generation (RAG), increases factual accuracy by grounding LLM outputs with validated psychiatric information. This method combines the generative capabilities of LLMs with information retrieval from a regulated knowledge base (Lewis et al. 2020). When generating responses, the model

first retrieves relevant information from a trusted psychiatric database, then uses this information to validate and constrain its output. This approach not only increases factual accuracy, but also increases transparency as the information sources are traceable and citable. Furthermore, Reinforcement Learning from Human Feedback (RLHF), proposed by Bai et al. in 2022, is a method that can be used to align AI models with best clinical practice in mental health. Mental health professionals evaluate the model's responses, rating them for accuracy, empathy and ethics. The model then fine-tunes using these expert ratings as rewards. This iterative approach involving human feedback increases the reliability of AI outputs, ensuring that responses are clinically appropriate and consistent with ethical principles. By incorporating expert knowledge, RLHF creates more reliable AI assistants for mental health practice. Through this secure and controlled structure, clinical standards can be improved by utilising the extraordinary capabilities of AI in pattern recognition. The continuous learning method allows new knowledge to be gradually incorporated into the model, overcoming the knowledge cut-off date problem and keeping AI models up-to-date with the latest psychiatric findings, treatment approaches, and ethical guidelines (Parisi et al. 2019).

Ensuring Confidentiality and Ethical Integrity in AI-Supported Psychiatry Services

Ensuring patient privacy during the training and use of LLMs poses a significant challenge and is a topic of ongoing debate. The performance of LLMs is often measured using metrics on reasoning, benchmarking, accuracy in data sets, and efficiency in specific tasks such as coding or language comprehension. LLMs owned by private companies require data to be temporarily stored on company servers in order to function, which can lead to breaches of patient privacy due to the risk of unauthorised access to data and problems with company compliance with data protection regulations (Nazi et al. 2024). Applications intended for use in the United States must comply with regulations specified by the Health Insurance Portability and Accountability Act (HIPAA) (U.S. Department of Health & Human Services 2023). According to the recommendations of AI language model server companies that are actively used today, a Business Partner Agreement with the AI company is required to ensure compliance with data protection and security standards (OpenAI 2023). Furthermore, according to the recommendations of experts working in the field of ethics, product design should take into account UNESCO's ethical guidelines on neurotechnology and the recommendations of the Personal Data Protection Authority for Türkiye regarding AI (International Bioethics Committee 2022, Kişisel Verileri Koruma Kurumu 2023). This approach can ensure that personal data privacy is in line with both national and

international regulations. A precautionary stance focussing on risk prevention and mitigation should be adopted to protect fundamental rights and freedoms. At all stages of data collection and processing, necessary measures should be taken to prevent discrimination and avoid adverse consequences for individuals, and the protection of fundamental rights should be consistently prioritised. The data used should be evaluated according to its quality, source and category, and only the minimum necessary data should be collected. In psychiatry, it is not always clear what the minimum data required should be and there is limited guidance on this. Determining what information is necessary is an important area of ongoing research.

Some open-access LLMs offer the possibility to run on local servers without the need to send data to their own servers, giving organisations the ability to integrate and manage AI systems independently (Jiyang et al. 2023, Touvron et al. 2023). This approach provides greater control over data privacy and security, complies with stringent healthcare requirements and allows for transparency and customisation. Healthcare providers can audit the code, implement additional security measures and fine-tune the models to meet specific needs in psychiatric care, thereby reducing bias, increasing accuracy and maintaining the high ethical standards required in mental health care. Models operating in speech-to-text localised environments are another important component of data and patient privacy. By processing and analysing spoken language in real-time, these applications can facilitate tasks such as transcription or the detection of speech patterns associated with specific mental health conditions. This approach, exemplified by the systems proposed by Collobert and colleagues, complies with strict regulations on healthcare confidentiality and can ensure that confidential information remains in a controlled environment (Collobert et al. 2016). These practices can improve the effectiveness of psychiatric care by allowing clinicians to gain valuable insights during therapy sessions without compromising patient confidentiality.

Another challenge to the widespread application of AI in psychiatry is its low acceptability (McCradden 2023). Patients and mental health professionals may be concerned about relying on AI for mental health assessments and interventions, fearing that it may undermine the therapeutic relationship or lack the empathy necessary in psychiatric care. To overcome this barrier, it is important to present AI as a tool that helps human professionals, not replaces them. Acceptance of AI tools with clinicians can be achieved by emphasising the support they provide, such as providing them with valuable insights about their patients, improving diagnostic accuracy and allowing them more time for patient interaction. This approach ensures that the human connection remains at the forefront of mental health care while utilising AI to improve outcomes and efficiency.

In addition to the limitations listed above, it should be emphasised that evidence-based data on psychiatric practices involving AI are still insufficient. Suggestions for solutions are listed in the following sections.

The Need for Turkish LLMs and Psychiatric Corpus to Improve AI Services in Türkiye

The use of AI in psychiatry in Türkiye is still in its infancy. As in other branches, apart from the use of large data sets such as genetics, biochemistry and imaging, studies on the detection of psychiatric disorders by speech analysis have started to be carried out. For example, a research group at Bilkent University is working on an AI-based software that detects depression using speech content, tone of voice, facial expression and posture data, and the first data of the study have been published (Kaynak and Dibeklioglu 2024). In addition, the study conducted by Çabuk et al. (2024) on NLP in schizophrenia patients and the study conducted by Arslan et al. (2024) in patients diagnosed with bipolar disorder and psychosis make important contributions in this field. However, both studies have low sample sizes and their methods have not yet been replicated on different samples. Although research is conducted within various universities and health institutions, the integration and widespread use of these studies in clinical practice is still limited. Particularly in the field of digital health, steps need to be taken to establish public and private sector collaborations, and to establish technological infrastructure for collecting and analyzing clinical data. In Türkiye, collaboration between the Ministry of Health, the Psychiatric Association of Türkiye, universities, and other private institutions is crucial in developing applications that could be reflected in clinical use.

The development of Turkish-specific Large Language Models (LLMs) and psychiatric corpora is crucial for the advancement of AI services in Türkiye. Although global LLMs have made significant progress, they often lack the nuanced understanding of other languages and cultures necessary for optimal performance in local contexts (Tenzer et al. 2024). In particular, a large language model trained in a single language is likely to better understand that language's idioms, nuances, proverbs, and other cultural and local contexts compared to a model created by fine-tuning an existing multilingual model (Pires et al. 2023). In support of this, when various languages, including Turkish, were used with ChatGPT for different tasks, English consistently outperformed other languages in all tasks (Lai et al. 2023). This is particularly important in psychiatric applications where cultural sensitivity and semantic accuracy of language are crucial (Ratana et al. 2019).

However, developing LLMs for agglutinative languages like Turkish comes with its own challenges. Agglutinative languages form words by adding suffixes to a root, creating complex, informationally dense words (Chimalamarri et al. 2021). This morphological richness creates challenges for traditional tokenization methods used in LLMs (Petrov et al. 2024). Tokenization is a preprocessing method that divides text into smaller units such as words, roots, or affixes, enabling language models to process and make sense of these units. The multiplicity of possible word forms exponentially increases vocabulary size, making it difficult for models to learn and generalize effectively (Li et al. 2020). Additionally, the context-sensitive nature of affixes in these languages requires models to understand distantly related expressions and nuanced interactions between morphemes. To overcome these challenges and effectively capture the linguistic subtleties of Turkish in LLMs, specialized approaches in data preprocessing, model architecture, and training strategies are needed.

Today, the number of open-source language models that understand Turkish and respond to questions is increasing day by day. These models are typically developed by fine-tuning multilingual original versions with Turkish corpora. An alternative to this method is creating a new language model from scratch using only Turkish corpora.

Future Trends for Artificial Intelligence in Psychiatric Services

Artificial intelligence, beyond virtual therapists and psychiatrists, can assist mental health professionals in diagnosis, treatment, and follow-up stages, improve the quality and accessibility of mental health services, focus on individual needs, and can also be used as part of the psychoeducation process. Systems such as having a personal virtual psychotherapist available 24/7 for each individual with real therapists only providing supervision to virtual therapists, or assessing the need for psychiatric examination and even referral to a specific psychiatrist based on a person's daily conversations and communications, may not be too far away. Advanced AI systems can analyze an individual's conversations and all communications, provide instant feedback, and help provide customized effective therapy sessions according to their emotional and mental needs (Olawade et al. 2024). Smart systems that continuously collect data through wearable technologies and mobile applications can help better understand the connections between mental and physical health and create integrated treatment plans by analyzing physical health data. AI, combined with virtual reality and augmented reality technologies, can offer innovative and effective therapy methods in areas such as mindfulness applications, trauma therapy, and treatment of phobias.

In current conditions, making AI applications directly available to non-professional individuals would pose risks and might also hinder individuals' autonomy. For more reliable and effective use of AI in clinical settings, it might initially be appropriate to design these applications to assist experienced professionals in the field and offer them to patients under the guidance of experienced healthcare professionals within clinical processes. Considering the possibility that AI-based tests and applications may contain margins of error, it should be understood that the decision-making mechanism should ultimately belong to the clinician. Additionally, platforms reaching large audiences, such as social media, have the potential to contain biased or incomplete information-based content. Therefore, for the development and reliability of AI, more controlled progress should be ensured primarily using evidence-based clinical data and highly valid measurement tools. For now, awareness should be raised that the data provided by AI algorithms should not be considered directly as "reality" but rather as clinical "indicators" (for example, elevated troponin is an indicator of heart attack but not the heart attack itself) and consists of strong statistical predictions. Therefore, it will still be important today that AI is supported by clinical experience in every case where it is used in clinical processes.

Conclusion

Artificial intelligence applications integrated with mental health services offer significant potential to address psychiatry's global economic burden and workforce loss. AI techniques such as machine learning and natural language processing can enhance diagnosis, treatment, and patient follow-up. However, there are challenges such as diagnostic accuracy, ethical concerns, data privacy issues, and maintaining therapeutic collaboration. For countries like Türkiye, developing AI models that reflect linguistic and cultural nuances is crucial. Overcoming these barriers requires transparency, ethical strategies, and collaboration with mental health professionals. AI's potential to support professionals rather than replace them can improve the accessibility and outcomes of mental health services.

Turkish LLMs are still in the development phase, and an AI tool that can be used by psychiatrists in Türkiye would be very beneficial for psychiatry. There is a need for collaboration between patient representatives, psychiatrists, linguists, AI developers and researchers, ethics and legal experts in the development phase of AI tools to be used in psychiatry. This interdisciplinary collaboration can ensure that AI systems are culturally and linguistically appropriate and ultimately improve psychiatric care in our society. The pioneering role of experts in the field of psychiatry in the development of AI tools will play a role in increasing the confidence of both the mental health community and patient groups in this technology.

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Lithium in the Treatment of Premenstrual Dysphoric Disorder: A Case Report



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ABSTRACT

Premenstrual dysphoric disorder (PDD) is characterized by mental, physical and cognitive symptoms that occurs in the late luteal phase of the menstrual cycle and regresses in the week following menstruation. In PDD, serotonin reuptake inhibitors and combined contraceptives are the primary pharmacologic treatments. In cases where there is a personal or family history of bipolar disorder (BD), the use of antidepressants may pose a risk of inducing manic episodes. The frequent coexistence of BD and PDD, the fact that both diseases are cyclic in nature and that common mechanisms such as hormonal changes play a role in their aetiologies, suggest that lithium might be efficacious in the treatment of PDD. Here, we present a case who didn't have a BD but a family history of BD and was treated with lithium monotherapy for PDD with a successful outcome. In cases where first- and second-line therapies cannot be used or no response is obtained in PDD patients, pharmacological agents that have demonstrated efficacy in preventing mood episodes among first-degree relatives, may present a viable solution.

Keywords: Antidepressive Agents, Drug Therapy, Lithium, Premenstrual Dysphoric Disorder, Premenstrual Syndrome

INTRODUCTION

Premenstrual Dysphoric Disorder (PDD), the severe form of Premenstrual Syndrome (PMS) causing significant impairment in functionality, was first defined in the DSM-IV and classified under the category of mood disorders in the DSM-V. PDD presents during the late luteal phase of the menstrual cycle, regressing in severity in the week following menstruation, with a clinical profile comprising at least one affective (depressive mood/hopelessness, tension, anxiety, emotional lability, irritability/anger) and at least one somatic (decreased interest, difficulty in concentrating, decreased energy, appetite changes, insomnia or excessive sleep, feeling overwhelmed, joint/muscle pain, bloating, sensation of weight gain, breast tenderness) symptom among 11 specified symptoms, with at least 5 being present. Diagnosis of PDD should be confirmed through prospective daily evaluations over a minimum of 2 symptomatic menstrual cycles. Symptoms of PDD are of such intensity as to cause impairment in social relationships and in functionality in occupational/school or family life (American Psychiatric Association 2013).

The prevalence of PDD varies between 3% and 8% (de Carvalho et al. 2018). Although PDD can be seen in women without other psychiatric disorders, 30% to 70% of cases are accompanied by anxiety disorders, major depression and bipolar disorder (BD) (Sepede et al. 2016). Research indicates that women diagnosed with PMS or PDD are more likely to receive a diagnosis of BD-I or BD-II, and women with BD-II are at a higher risk of having PMS or PDD (Cirillo et al. 2012, Slyepchenko et al. 2021).

In patients with PDD without psychiatric comorbidity, selective serotonin reuptake inhibitors (SSRIs) and combined contraceptives are considered primary pharmacological treatments (Carlini and Deligiannidis 2020, Sepede et al. 2016). However, the use of SSRIs in the presence of comorbid BD poses a risk of antidepressant-induced manic shift (Nevatte et al. 2013). In cases of comorbid BD and PDD, the use of mood stabilizers is the initial step to stabilize BD and differentiate whether symptoms are attributable to PDD or to premenstrual exacerbation of BD (Sepede et al. 2020). Karadağ et al. (2004) examined menstrual symptom changes in 34

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patients diagnosed with BD who responded to lithium and/or valproate treatment and were in euthymic state, compared to 35 healthy controls, using the Daily Record of Severity of Problems-Short Form and Premenstrual Assessment Form (Karadag et al. 2004). Both retrospective and prospective evaluations indicated that euthymic BD patients experienced fewer mood and behavioral changes during the premenstrual period compared to the control group, suggesting that mood-stabilizing treatment may have a prophylactic effect against premenstrual symptoms (Karadag et al. 2004). D'Mello et al. (1993) reported two cases of premenstrual mania responding to lithium, emphasizing the importance of investigating the link between BD and PDD as it may provide clues to the etiology of both conditions (D'Mello et al. 1993). Studies by Singer et al. (1974) and Steiner et al. (1980) reported that lithium at doses ranging from 600 to 1000 mg per day was ineffective in treating behavioral premenstrual symptoms in the majority of women (Singer et al. 1974, Steiner et al. 1980). However, Sletten and Gershon (1966) reported 8 cases where lithium reduced premenstrual symptoms (Sletten and Gershon 1966). They suggested that some PMS patients benefiting from lithium have first-degree relatives with affective disorders, potentially classifying these patients as "subsyndromal affective disorders" and thus benefiting from lithium (Sletten and Gershon 1966). However, these studies were conducted before the 1980s, when there was no systematic classification for PDD as there is today.

CASE

In this report, a case of PDD who had no accompanying physical or mental illness and who had a family history of BD and was successfully treated with lithium is presented. The patient is a 43-year-old married woman, a university graduate, and a mother of one child. She reported experiencing breast tenderness and irritability during the premenstrual period since her early twenties, with these symptoms subsiding shortly after menstruation. Approximately 15 years ago, during a period of intense life stress, she began experiencing symptoms such as depressed mood, tension, irritability, mood swings, loss of interest, apathy, fatigue, excessive sleepiness, and loss of appetite about one week before menstruation, leading to impairment in performing household chores and caring for her child. She found it increasingly difficult to get out of bed in the morning and eventually became unable to go to work, resulting in obtaining numerous sick leave reports. She reported that her symptoms began to alleviate shortly after menstrual bleeding commenced and disappeared within a week. Subsequently, similar complaints recurred almost every menstrual cycle. After one year, the patient presented to our psychiatric outpatient clinic and was prospectively monitored daily for two consecutive symptomatic cycles, confirming the diagnosis of PDD. In her family history, her father had been

diagnosed with BD at the age of 23, with one mixed and one manic episode requiring hospitalization, unresponsive to valproate treatment. For approximately seven years, her father had been regularly using lithium monotherapy at a dose of 1200 mg/day and had been in remission. The patient was initiated on fluoxetine 20 mg/day, which was used for seven weeks with no response observed during two premenstrual cycles. Subsequently, sertraline was started at 50 mg/day, increased to 100 mg/day after four weeks, and the patient was followed for three menstrual cycles without any change in symptoms. Duloxetine was then initiated at 30 mg/day, increased to 60 mg/day during the next menstrual period, and monitored for premenstrual symptoms for eight weeks over two menstrual cycles, but no significant response was obtained. No manic or hypomanic shift was observed in the patient during or after antidepressant treatment. The patient, whose symptoms persisted, was referred to the gynecology and obstetrics outpatient clinic. Combined oral contraceptive therapy was recommended to the patient, but she refused this treatment due to the history of stomach cancer in her mother and colon cancer in her grandfather, considering the possibility of cancer development in herself in the future. The patient, who continued to attend psychiatric outpatient follow-ups and had a positive response history to lithium in her father, was started on lithium treatment. As premenstrual symptoms persisted, a dose increase of 300 mg/day was made during each of the two menstrual cycles, gradually increased to 1200 mg/day, and lithium blood level was measured as 0.8 mEq/L. The patient benefited significantly from lithium treatment at a dose of 1200 mg/day, with premenstrual symptoms decreasing from the first menstrual cycle after reaching this dose and completely disappearing from the third menstrual cycle onwards. One year later, an attempt was made to reduce the lithium dose, however, when the dose was reduced to 600 mg/day and the lithium blood level was measured as 0.4 mEq/L, the patient's symptoms recurred. Premenstrual symptoms receded again from the third menstrual cycle after increasing the dose to 1200 mg/day and restoring the lithium blood level to 0.8 mEq/L. In the following years, lithium dose was attempted to be reduced twice more, however, due to the recurrence of symptoms, the patient insisted on using lithium at a dose of 1200 mg/day. The patient has been using lithium at the same dose for 4 years, and lithium blood level is measured every three months, ranging from 0.7 to 0.9 mEq/L, and the patient is in remission with this treatment. The patient, who had difficulty fulfilling her professional, social, and family responsibilities and was negatively affected in terms of functionality before starting lithium treatment, began to fulfill her responsibilities without difficulty after lithium treatment. No mood attacks or adverse effects related to lithium use developed in the patient during the follow-up period.

DISCUSSION

BD typically manifests in women during adolescence and early adulthood, generally between 15 to 23 years, when hormonal changes mark the onset of reproductive age (Slyepchenko et al. 2021). Rapid cycling, mixed features, and a higher prevalence of BD-II are more commonly observed in women compared to men (Slyepchenko et al. 2021). A significant proportion of women diagnosed with BD experience mood symptoms to varying degrees during the premenstrual period, similar to other periods characterized by hormonal fluctuations such as pregnancy, postpartum, and menopause (Slyepchenko et al. 2021). The symptom cluster resembling mixed features and the rapid cycling nature of PDD share descriptive characteristics with BD, suggesting clinical similarities between the two conditions. The frequent co-occurrence of BD and PDD, the similarity in clinical presentations, and the exacerbation of symptoms during the premenstrual period in some patients with BD raise the possibility of shared etiological factors in these disorders (Sepede et al. 2020).

Although the etiology of PDD has not been fully elucidated, it is thought that the underlying mechanism involves cyclic changes in sex steroids triggering dysregulation of the serotonergic system (Freeman and Sondheim 2003). It is known that mood disorders such as BD can also be influenced by changes in steroid sex hormones (Teatero et al. 2014). Sensitivity to changes in sex hormones in some women may underlie the mood changes observed in both PDD and BD (Teatero et al. 2014). Additionally, BD, seasonal affective disorder, and PDD have been associated with increased sensitivity to suppression of melatonin induced by light, suggesting the involvement of a common chronobiological mechanism in these disorders (Parry et al. 2010).

It is crucial to differentiate between premenstrual exacerbation of BD and PDD for the management of treatment. The fact that our case's symptoms began only a week before menstruation and subsided in the week following menstruation, the absence of mental symptoms outside these periods, the absence of a history of manic or hypomanic episodes, the absence of manic shift with antidepressant treatment, all distance us from the possibility of premenstrual exacerbation of BD.

Treatment of PDD is challenging and controversial, especially in the presence of a family history of BD, as in our case. While SSRIs are considered first-line agents for PDD treatment, the use of antidepressants in such cases is risky in terms of manic shift and should be used with caution. There is a lack of large, controlled studies for other recommended treatments for PDD when hormonal therapy is contraindicated or refused by the patient. Data on the use of mood stabilizers in PDD treatment is limited, mainly based on case reports (Singer et al. 1974, Sletten

and Gershon 1966, Steiner et al. 1980). The frequent co-occurrence of BD and PDD, the cyclical nature of both disorders, and the presence of common mechanisms such as hormonal changes have encouraged us to use lithium in PDD treatment. The primary use of lithium is in recurrent mood disorders, especially bipolar disorder (Pisanu et al. 2022). It is debated whether the efficacy of lithium is specific to the disorder or to the symptoms. Lithium has been suggested to be effective not only in bipolar disorder but also in other episodic conditions (Tupin 1972). Thirty percent of BD patients respond excellently to lithium (Duffy et al. 2007). It has been shown that this subset of patients who benefit from lithium have some phenotypic features such as a family history of BD and a positive response to lithium in the family (Duffy et al. 2007). The clustering of both BD and lithium responses in families indicates the importance of genetics in the onset and treatment response of the disease. Monozygotic and dizygotic twin studies have reported similar responses to lithium in both types of twins (Tomar Bozkurt et al. 2018). Given the inherited aspect of lithium response, increasing number of genetic studies are being conducted in this area (Pisanu et al. 2022). Literature review revealed that pharmacogenetic studies evaluating response to lithium share common gene polymorphisms thought to be involved in the mechanism of action of lithium or the etiopathogenesis of bipolar disorder. These genes include the serotonin transporter gene promoter region (5-HTTLPR), brain-derived neurotrophic factor (BDNF), inositol polyphosphate 1-phosphatase (IPase), inositol monophosphatase (IMPase), bisphosphate nucleotidase (BPNase), fructose 1,6-bisphosphatase (FBPase), phosphoglucotransferase (PGM), GSK3 β , mitochondrial DNA, serotonin receptors (5HT2A and 5HT2C), X-box binding protein 1 (XBP1) (Altınbaş et al. 2018, Seretti et al. 2009, Smith et al. 2010). Our case demonstrated successful treatment of PDD with lithium therapy in the presence of a family history of BD. To our knowledge, this is the first case who had a family history of BD but did not have a mental illness other than PD, and who used lithium monotherapy for the treatment of PD and achieved successful results. Considering a pharmacological agent with a positive response in the family when first and second-line treatments are unavailable or ineffective may be an appropriate solution in patients with PDD. There is limited information in the literature on the effects of lithium use on premenstrual symptoms in patients with a family history of BD or PDD. It is thought that studies comparing the frequency and severity of premenstrual symptoms during periods of mood stabilizer use and non-use in patients with both BD and PDD could contribute to the literature. The need for randomized controlled trials in this regard could contribute to the elucidation of the etiopathogenesis of BD and PDD.

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↻ Türk Psikiyatri Dergisi ↻

Turkish Journal of Psychiatry

Letter to the Editor

Is Artificial Intelligence Hallucinating?

Dear Editor,

Artificial intelligence (AI) is rapidly advancing to become an indispensable part of our daily lives. Particularly, the development and accessibility of generative AI systems using large language models (LLMs) such as ChatGPT have accelerated transformations in every field. Generative AI concerns all professions and eliminates age range distinctions. Consequently, a comprehensive AI ecosystem is currently forming. However, awareness of the issues it causes or may cause in the long run is not developing at the same pace as its benefits. Therefore, being aware of the risks as well as the benefits will provide insight into what kind of ecosystem will be formed (Ayhan, 2023; Perc et al. 2019).

There are roughly three main risks associated with generative AI. The most well-known of these is data privacy. AI systems, which are fed with data, can violate data protection and privacy if precautions are not taken, leaving individuals vulnerable to various manipulations. Secondly, these systems have a high risk of producing biased results (Ozer et al. 2024a). There are two sources of biased results: biases in the training data set and biased assumptions in the algorithms. Since these systems learn based on big data, they maintain biases related to different contexts such as religion, culture, race, gender, or socioeconomic status present in big data, and can thus reproduce these biases in their outputs. The second source of bias is the assumptions made in the algorithms of these systems. The bias in algorithmic assumptions naturally

ensures that the results are also biased. In both cases, AI has the potential to deepen existing inequalities by spreading inequalities more quickly. Finally, not all information produced by these systems is accurate; AI systems often exhibit hallucinations, producing incorrect content. This article will briefly evaluate the hallucinations observed in the behavior of AI systems.

AI hallucination is a phenomenon where AI generates a convincing, contextually coherent but entirely fabricated response that is independent of the user's input or previous context. Therefore, although the responses generated by generative AI may seem plausible, they can be meaningless or incorrect. For example, in a study aiming to evaluate the frequency of AI hallucinations in research proposals entirely prepared by ChatGPT, it was shown that out of 178 references generated by ChatGPT, 69 were not Digital Object Identifiers (DOIs) and 28 references did not appear in Google searches or have an existing DOI (Athaluri et al. 2023). Generally, while generating content based on the training data set, generative AI can produce content during the hallucination process by disconnecting from the source of the training data set (source amnesia) (Berberette et al. 2024). Furthermore, to maintain consistency with the incorrect results it generates, generative AI can continue to produce incorrect content sequentially once it has produced incorrect content, a behavior known as the snowball effect of hallucination (Zhang and Press et al. 2023).

Hallucinations are classified into intrinsic and extrinsic categories (Ji et al. 2023). According to this classification, intrinsic hallucinations result in outputs that contradict the source content and the conversation history, while extrinsic hallucinations correspond to outputs whose accuracy cannot be verified based on the source content or conversation history. Therefore, outputs based on intrinsic hallucinations are directly related to the misinterpretation of information and are directly incorrect, while extrinsic hallucinations are

fictional content added to the generated text. On the other hand, Zhang et al. (2023) evaluate hallucinations in three different categories: input-conflicting (content deviating from the source input provided by the user), context-conflicting (content conflicting with the previously generated content by the generative AI), and reality-conflicting hallucinations. If both classifications are combined, hallucinations conflicting with the input and context correspond to intrinsic hallucinations, while hallucinations conflicting with reality correspond to extrinsic hallucinations.

Hallucinations observed in generative AI are more related to the probabilistic nature of the model and its direct relationship with the training data set than to any real cognitive process. Patterns, expressions, or concepts that are more frequently included in the training data set can trigger hallucinations during the response generation process of generative AI due to their easy and quick accessibility, regardless of the context's accuracy. Additionally, conflicting information within the large training data set can cause intrinsic tensions in the generative AI's response generation process, thereby triggering hallucinations (Berberette et al. 2024). Similarly, outdated, incomplete, or false information in the data sets can also lead to hallucinations (Zhang et al. 2023). Therefore, there is a strong relationship between generative AI hallucinations and the distribution of the training data (McKenna et al. 2023). On the other hand, hallucinations can also arise due to the weaknesses of various language models used in generative AI (Athaluri et al. 2023). In summary, the large, unstructured text corpus used to train generative AIs, the stochastic behavior caused by the probabilistic nature of the model, and the weaknesses of language models can lead to hallucinations.

On the other hand, considering that this behavior of generative AI is mostly related to incomplete, inconsistent, or incorrect information in the data sets used for AI system learning, it also shows how susceptible real-life data is to hallucinations. In fact, it is suggested that everyday memory reconstruction often involves a degree of confabulation (French et al. 2009), and that it is common for healthy individuals to unintentionally make details of stories fictional (Riesthuis et al. 2023). In other words, people often resort to fictional but unreal information to fill gaps in their narratives without malicious intent. Similarly, it is observed that the fabricated content produced by generative AI appears more frequently in texts that exhibit narrativity (Sui et al. 2024).

Additionally, the difficulty in distinguishing between inspiration and imitation during the content generation process based on large training sets by generative AI (GAI) also stands out as a separate issue (Carobene et al. 2024). The demonstration of a closer relationship among articles with LLM modifications indicates that GAI reduces text diversity (Liang et al. 2024). In this context, recent studies highlight the need to evaluate the problems caused by hallucinations according to different fields, suggesting that hallucinations

may be beneficial in some areas. For example, it has been empirically shown that hallucinations exhibit significantly higher narrativity than fact-based outputs (Sui et al. 2024). Areas where hallucinations can be particularly valuable include providing inspiration for creative writing (Mukherjee and Chang, 2023), architectural design (Hegazy and Saleh, 2023), discovering new proteins (Anishchenko et al. 2021), and formulating innovative legal analogies (Dahl et al. 2024) (Sui et al. 2024). Therefore, beyond strengthening the language models used in this context, while efforts are made to reduce the frequency or scale of hallucinations by filtering out incorrect information from the learning data, it is important to consider what constitutes incomplete or inconsistent information and whether reducing hallucinations might negatively impact the diversity of the generated information.

On the other hand, clinically, hallucinations—defined as sensory experiences not associated with an external stimulus—are often linked to conditions such as schizophrenia, bipolar disorder, and Parkinson's disease (Tamminga, 2009). Using the term “hallucination” to describe the fictitious outputs produced by LLMs similarly implies that LLMs are consciously engaging in a sensory input perception process (Smith et al. 2023). However, generative AI lacks consciousness, and thus is devoid of subjective experience or awareness (Berberette et al. 2024). On the other hand, unlike human hallucinations that are not associated with an external stimulus, in AI systems the data on which LLMs are trained and the prompts that lead to this behavior are considered external stimuli (Østergaard and Nielbo, 2023). Therefore, since generative AI models do not see something that isn't there but rather fabricate it, the term “hallucination” may not be appropriate to describe this situation. Instead, the term “confabulation”—a psychiatric concept referring to the creation of narrative details that are believed to be true despite being false—is suggested (Smith et al. 2023). Recent studies indicate that much of the information produced by generative AI can be considered within the context of confabulation (Berberette et al. 2024; Sui et al. 2024).

Finally, understanding this behavior as confabulation also carries within it the solution to mitigating the problem. Clinically, confabulation is associated with right hemisphere deficiency in the brain, where the left hemisphere creates fabricated or distorted memories influenced by existing knowledge, experience, or contextual cues (Smith et al. 2023). Therefore, since the situation in generative AI corresponds to the incorrect reconstruction of information influenced by existing knowledge and context, the concept of confabulation better defines the current situation from a technological background perspective. This concept actually provides significant evidence that choosing a path that complements humans rather than automation will create a more humane ecosystem in the AI landscape. As previously stated, the human-complementing path is a new approach that focuses on complementing human deficiencies while considering

the impacts of automation on efficiency, but also protecting employment (Capraro et al. 2023; Ilikhan et al. 2024; Ozer et al. 2024b; Ozer and Perc, 2024). Thus, confabulation, which occurs when the right hemisphere of the brain is damaged and cannot perform its real function, corresponds to the working method of AI that lacks the contributions of the right hemisphere of the brain. In other words, the production of incorrect or nonexistent information by generative AI overlaps with the similar behavior of the left hemisphere when the right hemisphere is damaged. Therefore, metaphorically, having humans step in to correct these deficiencies and complete the text could be likened to donating the human right hemisphere to AI, supporting the correction of such errors and complementing generative AI.

In conclusion, generative AI systems can produce incorrect information due to various reasons. Therefore, it is evident that not all information generated by generative AI will be accurate, and incorrect information produced without malicious intent can always exist alongside correct information. Whether this behavior is labeled as hallucination or confabulation, the severity of complications it causes varies depending on the field of application. For instance, in the healthcare sector, the hallucination or confabulation experienced by generative AI could lead to critically dangerous outcomes in diagnosis and treatment processes (Ilikhan et al. 2024). Similarly, in the education system, such behavior could have profound negative effects on learning processes (Ozer, 2024). However, as noted in the literature, in creative and innovative fields, this behavior may prove beneficial. Therefore, contextual awareness of this behavior is crucial in mitigating its potential negative impacts while harnessing its potential benefits in appropriate contexts.

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Letter to the Editor

The Use of Artificial Intelligence in Psychotherapy: Practical and Ethical Aspects

Dear Editor,

Artificial intelligence (AI) has the potential to create radical changes in the field of psychiatry. Examples of the positive effects of AI on psychiatry include innovations in the diagnostic process, development of new treatment methods, personalized treatment approaches, and demonstration of treatment effectiveness with objective data (Ayhan 2023). However, in addition to all these advantages, there are also concerns about the use of AI in psychiatry. Ethical and confidentiality concerns regarding the use of AI, uncertainties regarding the transparency of decision processes, misleading results, and the risk of shaping treatment according to these results are the main concerns expressed (Ayhan 2023, Gürcan et al. 2024).

AI has the potential to influence and change psychotherapy as well. Chatbots/conversational agents have been developed with AI technology. These programs have the ability to maintain a dialogue similar to human-human interaction. In other words, a non-human entity exhibits language processing abilities similar to and sometimes even exceeding those of humans (Haber et al. 2024). In current versions of AI systems that use large language models (LLM) (e.g. ChatGPT 4.0), it has become possible to conduct a dialog with the AI (OpenAI 2023). It is stated that chatbots, like human therapists, can communicate with users to help them recognize their emotions and thought patterns and offer coping methods (Mead et al. 2024). Companies developing AI-supported therapeutic

applications aim to make these applications similar to face-to-face therapies with tools such as chatbots and virtual reality therapies (Holohan and Fiske 2021).

With these developments, AI applications are becoming more and more common in psychotherapy. It is claimed that AI can ensure the active participation of patients in the recovery process thanks to the personalized psychotherapy that it will conduct by considering the clinical, cultural, and personal characteristics of the patient with the information obtained from large data sets (Haber et al. 2024). The ability to apply evidence-based therapies such as cognitive behavioral therapy (CBT), and to create a pluralistic environment that integrates approaches such as CBT and psychoanalytic therapy with new and developing therapy modalities are presented as other advantages that AI provides to psychotherapy (Haber et al. 2024). In addition, augmented reality and virtual reality technologies offer opportunities for exposure therapy by creating controlled and safe scenarios (Ayhan 2023). The groups that are thought to benefit the most from AI-assisted psychotherapy are people who have problems in accessing treatment due to fear of stigmatization, economic difficulties, lack of therapists, and vulnerable groups (Fiske et al. 2020).

AI also has challenges, such as deficits that may be encountered in clinical practice and a lack of standardized practice. This raises ethical concerns, too. The first question that comes to mind data security. Especially in the psychotherapy process, when a lot of sensitive and private information about individuals is stored in the AI database, patients' personal data may become available for unauthorized data use or detailed analysis of the data without explicit consent. How to protect this data is a serious concern. On the other hand, it is another concern if the data is collected under the control of companies involved in AI development. This could lead to prioritizing commercial interests and jeopardize service quality (Zajko

2023). These issues point to the risk of violating ethical principles such as security and privacy.

There is a risk that AI may produce biased or erroneous results (Panch et al. 2019). It is also known that AI can generate fabricated responses that appear to be persuasive and consistent within the text, but are completely independent of user input or previous context. This is referred to as AI hallucination or confabulation (Özer 2024). In other words, the responses produced by the AI may be meaningless or inaccurate, even if they seem plausible. As a result, the patient can be formulated according to the wrong results and psychotherapy can be conducted with erroneous or fabricated responses.

Although LLMs appear neutral and objective, they learn a set of value systems shaped by culture, gender, race, ethnicity, socio-economic factors, and so on. The transparency of this learning and the exact formation of the value system remain unclear (Hadar-Shoval et al. 2024). Consequently, AI-supported therapies may lack homogeneity, and non-transparent processes could result in varied applications. Additionally, the mechanism by which these differences and the therapy process are monitored is not well-defined. Concerns may escalate further if therapists are employed by AI companies, as conflicts of interest could complicate the evaluation of AI-based psychotherapy, the open sharing of test outcomes, and addressing potential drawbacks in favor of the patient. The absence of legal regulations and ethical guidelines governing AI development and use in psychotherapy further exacerbates these concerns, potentially violating the ethical principles of nonmaleficence and beneficence.

Another issue is that evidence regarding the effectiveness and reliability of using AI in psychotherapy is still insufficient. Widely used chatbots are often introduced without being based on empirical evidence. Due to the lack of sufficient research in this area, caution is necessary when making general conclusions.

It does not yet seem plausible for AI to function as a stand-alone therapist, especially when it comes to psychoanalytic psychotherapies. Sedlakova and Trachsel (2022) argue that AI's role in psychotherapy is limited to conveying information based on the data it gathers and that it would fall short in more advanced functions. According to the authors, if users' expectations of AI include establishing an authentic dialogue, gaining new self-understanding, insights, or feeling human closeness, AI may not be sufficient for these purposes, and users may be misled. This misconception could lead to patients being unable to independently develop new attitudes and behavior patterns about themselves, thereby reducing their autonomy (Sedlakova and Trachsel 2022).

The introduction of AI into psychotherapy poses several issues related to the basic elements of psychotherapy. Chatbots do not

have emotions; hence, they lack the ability to display genuine empathy. Although some chatbot responses are interpreted as empathic by users (Inkster et al. 2018), AI responses are learned and chatbots cannot show genuine empathy. Due to the lack of empathy, one of the most essential qualities in a therapist, chatbots are thought to have a higher potential to harm patients and a lower ability to benefit patients compared to human therapists (Meady et al. 2024). Human-human interaction in psychotherapy, i.e. the human touch, strengthens the therapeutic relationship. The therapeutic relationship, whose healing power in psychotherapy is undeniable, will not be established sufficiently with chatbots due to the problem of empathy.

The significance of establishing the therapeutic relationship with software instead of a human is an important topic that needs to be discussed. The concept of transference, which is central to therapy, may also change with the introduction of AI into psychotherapy. Transference has a place and value in all forms of psychotherapy collaboration, including cognitive-behavioral therapy (CBT) (Prasko et al. 2022). Transference should be a consideration in every psychotherapy involving AI.

In a study (2021), Holohan and Fiske raised many important questions about this issue: "Does transference occur with the introduction of AI into psychotherapy? If so, how does it happen and how is the subsequent therapeutic relationship and practice affected? How might the patient relate to the chatbot? Through which words, behaviors, attitudes can the development of transference be monitored? How can transference be understood, explained and addressed in AI-assisted therapy? How can developers and engineers enable the use of transference in the design of AI-assisted therapeutic applications? Is this transference as we are familiar with it? Or is there some other kind of relationship that looks like transference but is somehow different?" There is no doubt that it is necessary to reflect on these questions and gather evidence-based data to answer them. However, there are no publications that study transference in AI-assisted psychotherapy. Nevertheless, there is evidence in some studies that there is a relationship between a human and a chatbot similar to a human-human relationship (Fulmer et al. 2018). This indicates that transference can develop. The development of transference in psychotherapy is inevitable. The use and handling of transference is essential, especially for psychoanalytic psychotherapy. However, it is not easy to predict how the AI can realize the developing transference. Since it has no emotions and cannot recognize emotions, the chatbot can only analyze the transference according to the patient's utterances and conclude about the transference. However, this is not a genuine understanding and interpretation of the transference. On the other hand, it is unclear what the patient's understanding of the developing transference towards the relationship with AI signifies in

their daily life and whether it will benefit the patient. As a matter of fact, it is not known how close these feelings are to transference in the classical sense.

Although the companies market the 24/7 availability of chatbots as a positive feature, it can lead to serious issues in psychotherapy. Patients who can access the chatbot at any moment may find it difficult to adhere to the therapy framework and respect boundaries. Those seeking help from AI for every issue may struggle to develop their coping skills. The constant presence of a “therapist” may fuel the patient’s savior fantasies. Due to the impact of the transference they develop, patients may establish a dependent relationship with AI and may trust the chatbot unconditionally, without any questioning (Sedlakova and Trachsel 2022).

In psychotherapy, where there is transference, there is also countertransference. Considering that AI lacks the ability to generate and recognize emotions but can only imitate them (Weber-Guskar 2021), problems with understanding countertransference can be expected in psychotherapies using AI. The inability to use countertransference by AI makes it difficult to understand the patient and to identify the relationship he/she establishes with others in his/her daily life and the way he/she makes others feel. This means a setback in the therapy process.

Being a therapist is not the only role AI can take in psychotherapy. AI applications can also appear as an auxiliary element in psychotherapy. Sedlakova and Trachsel (2022). Tried to define AI in psychotherapy in two poles. The first one is to define AI as a therapeutic tool that does not deal with the state of mind and intention of the patient, does not connect, and plays an auxiliary role in therapist-patient communication. The second one defines AI as an active agent that thinks about situations, builds relationships, and learns (or imitates) empathy and emotions. According to the authors, the place of AI in psychotherapy is neither of these. It is not possible to reduce AI to a tool because AI can communicate and relate to patients. Moreover, using AI only as a tool may mean ignoring its possible wide use and potential benefits in psychotherapy. On the other hand, it is not possible to define AI as an effective actor because it lacks human abilities such as empathy, understanding and conceptualizing the other’s state of mind, purposeful application, and bonding. Additionally, using AI as an effective actor means placing the responsibilities assigned to human therapists onto AI, with its current level of advancement. However, AI does not have the competence to assume this responsibility yet, and doing so could lead to many ethical issues. Instead of this distinction, the authors propose a hybrid use of AI as both a tool and an actor in therapy (Sedlakova and Trachsel 2022). Although these views of the authors are plausible, new studies as well as ethical and legal regulations are needed to find the balance of using AI as a tool and as an effective actor.

Despite all these problems and possible negativities, it is clear that AI has a potential to make psychotherapy more accessible. Therefore, another question comes to mind: “Should AI-assisted psychotherapies be made available to patients who cannot access psychotherapy or should such services be avoided until the data are sufficient?” This early question will inevitably come up as AI develops and its application areas increase.

In conclusion, it is clear that AI has the potential to bring about significant changes and advancements in the practice of psychotherapy in the future, as well as to make psychotherapy more accessible. In addition to the many positive effects that may result from the incorporation of AI into psychotherapy, there may also be uncertainties and problems, as outlined in the paper, which may result in patient harm. All these issues are still at the level of speculation. As reflections on the subject deepen, many other issues may come to the minds of mental health professionals. It can be predicted that many dilemmas will arise with the inclusion of AI not only in psychotherapy practice but also in training and supervision processes. In this article, we have mainly tried to address the practical and ethical aspects of using AI in individual psychotherapy. It can be easily assumed that the addition of AI to various practices such as couple therapy, sexual therapy, group therapy, and counseling interviews will pave the way for the development of other negativities and ethical problems specific to these practices.

There is a need for empirical studies and the reporting of patients’ positive and negative experiences regarding the validity of all the speculations and how they can be addressed. On the other hand, to achieve the most positive outcomes, software developers, mental health professionals, and experts in ethics and law need to work collaboratively to improve existing AI tools. Legal regulations should be developed to ensure the well-being of patients by establishing laws and guidelines that respect patient rights and ethical principles. Given that the practice of psychotherapy and interaction with patients may vary according to cultural differences, it will not be enough to follow international literature and regulations and shape our practices accordingly. Teams should also be formed in Turkey, and studies should be conducted regarding the use of AI in psychotherapy, which is inevitable to enter clinical practice in the future.

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Letter to the Editor

On the ‘Hallucinations’ of Artificial Intelligence and the Hallucination Experience in Human

Dear Editor,

We have read Mahmut Özer’s editorial letter titled “Does Artificial Intelligence Have Hallucinations?” published in your journal. It is well-known that large language models based on artificial intelligence (AI), such as ChatGPT, recently made widely available, are not immune to errors and can generate incorrect information (Ayhan, 2023). As Mr. Özer explains clearly in his article, the term “AI hallucinations” is often used to define these different types of “false” or “fabricated” responses (Özer, 2024). Given that the concept of “intelligence,” which pertains to the human mind, serves as an analogy in the development of this technology, it is understandable that attempts are made to explain its malfunction (pathology) using a term related to the human mind. However, as Mr. Özer also pointed out in his article, the production of false or fabricated information by AI does not fully overlap with the concept of hallucinations, a neuropsychiatric phenomenon. Nevertheless, we believe that addressing the hallucinatory experience within a neuropsychiatric context in parallel with this article would offer a more comprehensive understanding to readers of the journal.

The term “hallucination” entered the psychiatric literature towards the end of the 18th century, and the briefest definition of the term was made as “perception without an object” (Esquirol, 1822; Telles-Correia et al., 2015). In its widely accepted form today, hallucinations are defined as “sensory experiences that occur in the absence of an external stimulus from the relevant sensory organ, have a sufficient sense of reality to resemble actual perception, occur in a waking state, and are experienced without the individual having direct or voluntary

control over them” (David, 2004). In the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), which helps establish a common language among psychiatrists, hallucinations are similarly described as perception-like experiences that occur without an external stimulus, with the following characteristics: “They are vivid and clear, have the full force and impact of normal perceptions, and are not under voluntary control” (American Psychiatric Association, 2013).

An important feature indicated by these definitions is that hallucinations occur spontaneously, even intrusively, and are not under the individual’s voluntary control. Although there may be triggering conditions, they do not emerge directly in response to any preceding input. Another key characteristic of hallucinations, which differs significantly from what is defined in AI, is that they are subjective experiences. For example, when considering auditory verbal hallucinations (AVH), the content of the heard voice, its physical characteristics, the attributed source’s characteristics (gender, age, status, etc.), the duration, frequency, and intensity of the hallucinations, and the emotions experienced by the person in response to these experiences all vary from individual to individual. Furthermore, all of these are features experienced only by the individual, and they can only be expressed to the outside world as an output through communication with others (Parnas et al., 2024).

Hallucinations can occur in all sensory modalities, including hearing, sight, touch, smell, taste, and even proprioceptive senses, and sometimes in multiple modalities simultaneously (Montagnese et al., 2021). The hallucinatory experience has been associated with numerous clinical conditions, and it has also been reported that 10-15% of the population may experience hallucinatory-like phenomena (Sommer et al., 2008a). Major clinical conditions associated with hallucinations include psychiatric disorders such as schizophrenia spectrum disorders and bipolar disorder, neurodegenerative diseases like Lewy Body Dementia (LBD),

the effects of drugs and substances, epilepsy, brain tumors, and other neurological and medical conditions, as well as sensory disorders such as hearing or vision impairments. While some phenomenological features are statistically more prominent in different diagnoses (e.g., visual hallucinations being much more common in LBD), none of them is considered pathognomonic for any particular diagnosis (Waters & Fernyhough, 2017).

Many hypotheses have been proposed regarding the causes and processes of hallucinations from past to present, but a definitive and universally accepted mechanism has yet to be clarified. With the introduction of hallucinations into psychiatric literature, a debate emerged about whether their origin is perceptual or cognitive in nature (Telles-Correia et al., 2015). Considering the heterogeneous nature of the hallucinatory experience, it is believed that multiple processes with overlapping features may play a role. For instance, the cognitive mechanisms underlying musical auditory hallucinations resulting from medication side effects, where the individual retains full insight, are likely to differ from those of auditory verbal hallucinations that are threatening in nature and interpreted through delusional explanations. Among the various types of hallucinations, auditory verbal hallucinations (AVH) are the most extensively studied in terms of their formation processes, and several hypotheses have been proposed regarding their development (Barber et al., 2021).

The first hypothesis regarding the cognitive model of auditory verbal hallucinations (AVH) is based on a reduction in top-down inhibition. It is proposed that dysfunction of the prefrontal cortex, which is responsible for inhibition, leads to hyperactivation in functional networks, including the auditory cortex, resulting in abnormal auditory signals (Waters et al., 2012). When these abnormal neural activations produce auditory signals that exceed the perception threshold, they may generate unexpectedly intense (hyper-salient) sensory information.

Additionally, deficits in source monitoring led to these stimuli being perceived as foreign and distinct from the individual's internal mental processes, concluding that their source is external. According to this hypothesis, the content of AVHs is shaped by factors such as perceptual expectations, mental imagery, and prior experiences or knowledge (e.g., memories), which contribute to the formation of a unique and highly personalized sense of reality.

Another relatively consistent hypothesis in the explanation of auditory verbal hallucinations (AVH) is the "memory intrusion" hypothesis (Waters et al., 2006). According to this hypothesis, with a reduction in cognitive inhibitory control, material related to long-term memory (memory fragments) is activated in a repetitive, unexpected, and intrusive manner, disconnected from its context, and becomes involved in

language processing, thus experienced as AVH (Ćurčić-Blake et al., 2017). There is clear evidence that in patients with AVH, memory networks abnormally interact with language areas (Ćurčić-Blake et al., 2017). It has been suggested that this explains the intrusive and repetitive nature of hallucinations. In support of this, in individuals diagnosed with schizophrenia, hippocampal deactivation was observed just before the onset of AVH, which points to a memory discharge (Hoffman et al., 2008). Additionally, source-monitoring deficits accompanying memory intrusions lead to these intrusions being perceived as external stimuli rather than internal processes.

Finally, the most prominent hypothesis in explaining auditory verbal hallucinations (AVH) today is the attribution of inner speech to an external source (Langland-Hassan, 2016). Inner speech is the process of talking to oneself in order to perform functions such as planning and verbal rehearsal. In this case, a self-monitoring error occurs, and the individual mistakenly attributes their own inner voice to an external source. As a result, the common points where all the hypotheses intersect are that mental contents (such as thoughts, memories, plans, etc.) are transformed into auditory verbal forms, and this auditory representation becomes dissociated from subjective ownership.

Hallucinations can also be addressed through the predictive processing theory, which is a Bayesian approach and shares similarities with AI working principles (Fletcher & Frith, 2009; Cho & Wu, 2013; Horga et al., 2014a). According to this theory, the human brain is not a passive receiver of sensory information but an inferential process that actively generates predictions about sensations. The individual has a top-down "prediction" about sensory information, and after the sensation, this prediction is updated with the sensory data. The difference between the prediction and the actual sensory information is referred to as "prediction error." Actions initiated by the individual are more predictable, resulting in a much smaller prediction error, and as a result, the salience of that sensation is more limited. In contrast, external stimuli tend to cause a higher prediction error, and these stimuli are harder to ignore. In schizophrenia, many experimental and electrophysiological studies have demonstrated a disruption in the prediction error processes, and it is believed that this disruption, especially in the context of AVH, leads to inner speech being perceived as an external voice (Randeniya et al., 2018). It has been suggested that the marked activity observed in the left inferior and superior temporal gyri during AVH may be associated with a prediction error leading to inner speech misattribution. Current meta-analyses, highlighting the existence of conflicting results, also emphasize the importance of the insula (Barber et al., 2021).

The formation of the verbal content of AVH has been associated with language processing mechanisms. It has been shown that during normal speech, the lateralization of Broca's

area occurs in the left hemisphere, whereas during AVH, the right Broca's area is activated (Sommer et al., 2008b). In aphasia cases where the left hemisphere is damaged, individuals often speak with shorter, less complex sentences, especially those with negative content, and this has been compared to the AVHs of psychotic individuals. It is also suggested that the amygdala plays a role in forming negative verbal content (Horga et al., 2014b).

From this brief discussion on auditory verbal hallucinations, it can be concluded that viewing hallucinations solely as a perceptual pathology provides limited information. On the contrary, hallucinations can be understood as phenomena that arise from errors in self-perception and the internal-external distinction (Parnas et al., 2024), and they may be considered as the result of alterations in multiple complex mental processes, such as memory, attention, time perception, interpersonal relationships, and bodily experiences (Pienkos et al., 2019).

If the effort to understand the human mind is viewed as a form of reverse engineering, then discovering “pathological” phenomena that emerge while building AI, a “model” of the human mind, (which is forward engineering) can also be valuable in understanding the human mind itself. Rather than using analogies such as hallucinations or confabulations, which are still subject to conceptual debates and whose formation processes have not been fully explained, it may be more beneficial to seek alternative technical terms that more clearly define these situations in the long term.

If the sense of self is fundamental to the experience of hallucinations, another question that arises is whether it would be possible for artificial intelligence to experience hallucinations in the same way humans do, once it attains a sense of self. Perhaps such a development could illuminate our understanding and conceptualization of human hallucinations, helping us gain deeper insights into the phenomenon. This idea raises intriguing questions about the relationship between consciousness, self-awareness, and perceptual experiences, which may provide valuable perspectives on both human and artificial cognition.

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