Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi
Journal of Cognitive-Behavioral Psychotherapy and Research
DOI: 10.14744/JCBPR.2026.84492
J Cogn Behav Psychother Res 2026;15(1):1–13

Original Article / Özgün Makale

Epileptic Versus Psychogenic Nonepileptic Seizures: The Different Roles of Experiential Avoidance, Cognitive Fusion, and Mindfulness

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ABSTRACT

The etiology of psychogenic nonepileptic seizure (PNES) has not been completely understood. This study aimed to investigate the role of experiential avoidance (EA), cognitive fusion (CF), and mindfulness in PNES etiology. The study included 45 patients with epilepsy, 45 patients with PNES, and a control group comprising 60 healthy participants. Independent samples' t-test, chi-squared test, bivariate Pearson correlation analyses, and hierarchical linear regression analyses were performed. Results revealed that EA levels were higher in the PNES group than in the epilepsy group, whereas the mindfulness level was lower. Although the CF scores were higher in the PNES group, no statistically significant difference was observed compared with the epilepsy group. Thus, PNES diagnosis can predict the levels of EA and mindfulness. The findings of this study indicated that high EA and low mindfulness levels play a prominent role in the psychopathological appearance of patients with PNES, suggesting that psychotherapy methods aimed at these parameters will be beneficial.

Keywords: Cognitive fusion, epilepsy, experiential avoidance, mindfulness, psychogenic nonepileptic seizure.

ÖZ

Epileptik ve Psikojenik Non-Epileptik Nöbetler: Yaşantısal Kaçınma, Bilişsel Birleşme ve Bilinçli Farkındalığın Ayrımsal Rolleri

Psikojenik non-epileptik nöbetin (psychogenic non-epileptic seizures [PNES]) etiyolojisi tam olarak aydınlatılamadı. Bu çalışmada, PNES etiyolojisinde yaşantısal kaçınma (experiential avoidance [EA]), bilişsel birleşme (cognitive fusion [CF]) ve bilinçli farkındalığın rolünün araştırılması amaçlandı. Araştırmaya 45 epilepsi, 45 PNES tanılı hasta ve 60 sağlıklı kontrol dahil edildi. Araştırmada bağımsız örneklem t testi, ki-kare testi, iki değişkenli Pearson korelasyon analizleri ve hiyerarşik doğrusal regresyon analizleri kullanıldı. Araştırma sonuçlarına göre EA düzeylerinin PNES grubunda epilepsi grubundan daha yüksek, bilinçli farkındalık düzeyinin ise daha düşük olduğu gözlendi. Çalışmamızda PNES'te CF skorları daha yüksek bulunmakla birlikte, epilepsi grubuyla karşılaştırıldığında istatistiksel olarak anlamlı farklılık saptanmadı. PNES tanısının EA ve bilinçli farkındalık düzeylerini yordayabildiği gösterildi. Çalışmanın sonuçları, yüksek EA düzeylerinin ve düşük bilinçli farkındalık düzeylerinin PNES'li hastaların psikopatolojik görünümünde önemli bir yer aldığını ve bu parametrelere yönelik psikoterapi yöntemlerinin faydalı olabileceğini öne sürmektedir.

Anahtar Kelimeler: Bilinçli farkındalık, bilişsel birleşme, epilepsi, yaşantısal kaçınma, psikojenik nonepileptik nöbet.

Cite this article as:
Çelikbaş Z, Batmaz S, Sümbül O. Epileptic Versus Psychogenic Nonepileptic Seizures: The Different Roles of Experiential Avoidance, Cognitive Fusion, and Mindfulness. J Cogn Behav Psychother Res 2026;15(1):1–13.

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Submitted: 25.08.2025
Revised: 30.12.2025
Accepted: 18.01.2026
Available Online: 27.02.2026

JCBPR, Available online at
http://www.jcbpr.org/

INTRODUCTION

Psychogenic nonepileptic seizures (PNES) are attacks similar to epileptic seizures, but without epileptiform discharge and electroencephalography (EEG) changes (Cope et al., 2017). In the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5), PNES is classified as a form of conversion disorder or functional neurological symptom disorder. Although it is a common issue encountered in clinical services in Türkiye, there is no established rate regarding the prevalence of conversion disorder. The reported conversion disorder rates were 4.5%–32% in studies conducted with patients admitted to healthcare services (Özen et al., 2000).

Functional neurological symptom disorder (FND), including PNES, represents a clinically significant yet under-investigated issue in Türkiye. (Yildiz et al., 2025). Although epidemiological data specific to PNES remain limited, available evidence suggests that conversion disorder and related functional neurological symptoms constitute a substantial public mental health burden in Türkiye (Akyüz et al., 2017; Deveci et al., 2007). Moreover, delayed or inaccurate PNES diagnosis remains common, partly because differential diagnosis from epileptic seizures often requires prolonged video-EEG monitoring, which may not be readily accessible (Gedzelman & LaRoche, 2014; Memmedov et al., 2023). These contextual factors highlight the importance of examining psychological mechanisms underlying PNES within the Turkish healthcare setting and underscore the need for empirical studies addressing this population.

The etiology of PNES is not completely understood; however, factors such as trauma, dissociative tendencies, difficulties in emotion regulation, somatization, depression, anxiety disorders, stressful life events, epileptic attack, or having a family member with epilepsy have been associated with the development of nonepileptic attacks (Baslet, 2011; Bodde et al., 2009; Brown & Reuber, 2016).

The model proposed by Brown and Reuber (2016) presents an important theory about the development of PNES. This model suggests that internal or external triggers, such as traumatic memories and daily stressors activate the "seizure scaffold" and develop the cognitive appearance of nonepileptic attacks. Following the activation of the "seizure scaffold," the deficiency in the inhibitory process causes a nonepileptic attack. Psychological flexibility is one of the psychological concepts of potential relevance in this model. Psychological flexibility refers to an individual's ability to stay in the present moment rather than remain stuck in their past and future and to perform behaviors in line with their determined values (Luoma et al., 2010). Psychological inflexibility means the opposite. Psychological flexibility has the following six dimensions: acceptance, defusion, awareness of the present moment, self as context, values, and committed action (Luoma et al., 2010). All components of psychological flexibility are inter-related and contribute to psychological stress (Hayes et al., 2013). Among these dimensions, cognitive fusion (CF), experiential avoidance (EA), and mindfulness levels occupy an important place in Brown and Reuber's model (Brown & Reuber, 2016). CF is the predominance of thought over behavior. It can be defined as a situation in which a person's behavior is heavily influenced and controlled by cognitions (Hayes et al., 2006a). Individuals do not consider these thoughts to be just a thought or a part of their inner experiences but instead equate them with reality without questioning their functioning. They become less sensitive to the context in which certain behaviors occur, i.e., to environmental factors and the consequences of the behavior (Luoma et al., 2010). Based on the concept that equates the thoughts with the events themselves, cognitive fusion with the thoughts of nonepileptic seizures in individuals with PNES may trigger nonepileptic seizures. These individuals are likely to engage in experiential avoidance because of the anxiety of seizures (Cope et al., 2017).

EA—another component of psychological inflexibility—can be defined as staying with negative inner experiences, being reluctant to contact them, and trying to change the frequency and form of these inner experiences and the events that trigger them (Hayes et al., 2013). Nine of the ten studies comparing patients with PNES with the healthy control group showed that it was higher in the PNES group than in the healthy control group (Bagherzade & Kataki, 2015; Bakvis et al., 2011; Cronje & Pretorius, 2013; Dimaro et al., 2014; Frances et al., 1999; Goldstein et al., 2000; Gul & Ahmad, 2014; Novakova et al., 2015; Urbanek et al., 2014). Dimaro et al. (2014) also found that EA correlated with the frequency of seizures. However, Novako et al. (2015) did not find a significant relationship between EA and frequency of seizures. EA can paradoxically reinforce unwanted thoughts. Thus, a nonepileptic seizure can be triggered by suppressing thoughts about seizures or unwanted emotions; therefore, it is likely to perpetuate CF. It may be important to make contact at this moment. Losing contact with the present moment is defined as a phenomenon in which the stories of one's past and future occupy one's attention, the person misses what is happening around them at that particular moment, and is unable to react actively when necessary (Luoma et al., 2010). Improving the ability of individuals to choose how they will respond to cognition may prevent nonepileptic episodes. Cope et al. (2017) observed that acceptance and commitment therapy (ACT) may help support PNES patients. They also suggested that the mindfulness component of ACT could improve mind-body awareness and help individuals recognize the early stages

of NE seizures (Cope et al., 2017). Evidence that mindfulness contributes to the cognitive skills involved in the ability to choose how to respond to thoughts is the result of research on mindfulness and inhibition's executive function. Inhibition refers to the ability to inhibit or prevent previously learned rules or sets. Robust inhibition allows a person to choose how to respond rather than responding in a way that has already been learned. Mindfulness has been shown to improve inhibition (Gallant, 2016). A case series found that mindfulness-based interventions reduced the frequency of nonepileptic attacks (Baslet et al., 2015). Additionally, a study investigating the psychological inflexibility of individuals with PNES demonstrated that EA and CF predict mindfulness, and both are highly correlated with somatization (Cullingham et al., 2020).

Although psychological constructs such as experiential avoidance, CF, and mindfulness have been extensively studied as transdiagnostic processes across a wide range of mental health conditions, including anxiety, depression, and trauma-related disorders (Hayes et al., 2006b; Gillanders et al., 2014; Gu et al., 2015), their role in PNES remains insufficiently explored (Brown & Reuber, 2016; Pick et al., 2017).

Notably, existing studies in the PNES literature are often limited by small sample sizes, heterogeneous diagnostic procedures, and insufficient control of psychiatric comorbidity, which restricts the generalizability of findings (Dimaro et al., 2014; Reuber & Brown, 2017). Moreover, few studies have simultaneously examined these transdiagnostic psychological processes while directly comparing individuals with PNES, epilepsy, and healthy control groups within a unified methodological framework (Brown & Reuber, 2016; Reuber & Brown, 2017). Thus, addressing these knowledge gaps may contribute to a more nuanced understanding of PNES and inform psychologically informed assessment and intervention strategies.

The present study aimed to compare the EA, CF, and mindfulness of individuals with PNES, epilepsy, and healthy controls.

Based on literature, the following hypotheses were proposed:

H1: Individuals with PNES would report higher levels of EA compared with both patients with epilepsy and healthy controls.

H2: Individuals with PNES demonstrated higher CF levels than the other groups.

H3: Individuals with PNES reported lower levels of mindfulness compared with patients with epilepsy and healthy controls.

H4: PNES diagnosis significantly predicts EA, CF, and mindfulness scores even after controlling for psychiatric symptom severity and functional impairment.

METHODS

Participants

Participants aged 18–65 years who were admitted to the Tokat Gaziosmanpaşa University Faculty of Medicine, Department of Mental Health and Diseases outpatient clinic between December 2019 and November 2020 were included in the study. Inclusion criteria for the PNES group (n=45) were as follows: no epileptic activity detected in the EEG test, no abnormality detected in the cranial imaging examination, epileptic seizure diagnosis ruled out by a neurologist, and PNES diagnosis made by a psychiatrist after a clinical interview structured in accordance with the DSM-5. Inclusion criteria for the epilepsy group (n=45) were as follows: epileptic activity in the EEG test, no structural abnormality in cranial imaging, no psychiatric treatment, diagnosis of epilepsy by a neurologist according to the International League Against Epilepsy classification, and having generalized seizures. The control group comprised 60 healthy individuals without any physical or mental illness. Participants with concomitant mental disability, a history of head trauma, organic brain syndrome, another psychiatric diagnosis, epilepsy, and PNES comorbidity were excluded from the study. Participants were excluded if diagnostic uncertainty persisted after comprehensive neurological and psychiatric evaluation. Specifically, cases were excluded when seizure semiology, clinical history, and available EEG findings did not allow a clear classification as PNES or epilepsy or when mixed or indeterminate seizure etiology was documented in the medical records.

PNES diagnoses were established through a comprehensive clinical evaluation conducted jointly by psychiatry and neurology specialists, including neurological examination and routine EEG findings, in accordance with the DSM-5 criteria (American Psychiatric Association, 2013). Although video-EEG monitoring was not available for all patients, we excluded those with ambiguous diagnostic profiles. Healthy controls were screened via self-reporting and brief clinical interviews to confirm the absence of current or past psychiatric or neurological disorders.

Ethical Approval

The study was approved by the Tokat Gaziosmanpaşa University Ethics Committee (letter no: 19-KAEK-220) and conducted in accordance with the ethical principles of the Declaration of Helsinki.

Procedure

Participants in the PNES and epilepsy groups were recruited from neurology and psychiatry outpatient clinics. Patients were not restricted to first-time admissions; however, information regarding previous psychiatric treatment, psychotherapy

history, and antiepileptic medication use was systematically collected using the sociodemographic and clinical information forms. Individuals with PNES often reported prior medical consultations for seizure-related symptoms, whereas patients with epilepsy were required to have no history of psychiatric treatment to minimize diagnostic overlap.

Furthermore, face-to-face diagnostic interviews were conducted with the participants in the outpatient clinics of psychiatry and neurology to which they were admitted. After being informed about the study, the patients who agreed to participate in the research on the day they were admitted received the scales in the study. The scales were ensured to be filled out in a quiet room. The interviewer reviewed the unanswered questions, and the participant was asked to answer them. An informed consent form was obtained from all participants. The participants did not receive any fee for contributing to the study.

Materials

Sociodemographic and Clinical Data Collection Form

The interviewer used this form to evaluate the sociodemographic characteristics of the patients, the past and current status of their diseases, the diagnosis and treatment they received, and their family history.

Patient Health Questionnaire-Somatic, Anxiety, and Depressive Symptoms Questionnaire

This questionnaire was developed by Kroenke et al. (2010) and is used to detect somatic, anxiety, and depressive symptoms in patients admitted to health units or in a clinical setting. This questionnaire, which was developed to meet the needs of primary healthcare services, was designed as a module for somatization, anxiety, depression, and panic. The Cronbach's alpha coefficient of this questionnaire was 0.82, and the validity and reliability study of its Turkish version was performed by Güleç et al. (2012).

AAQ-II: Acceptance and Action Questionnaire-II

Created by Bond et al. (2011), AAQ-II is a Likert-type self-report scale comprising seven questions, with each question scoring between 1 and 7. An increase in the scale score indicates an increase in EA. The validity and reliability study of the Turkish version of the scale was conducted by Yavuz et al. (2016), and Cronbach's alpha value was 0.84.

Five-Factor Mindfulness Questionnaire-Short Form (FFMQ-SF)

It comprises 20 questions and five subscales. The subitems include the following: acting with awareness, nonjudgmental inner experience, nonreactivity to inner experiences, observation, and description. It is a Likert-type self-report scale where each question is scored between 1 and 5. Results of the analysis showed that the five-factor structure in the original form was maintained, and other psychometric properties, such as validity and reliability, were suitable in the Turkish version of the scale's short form (Ayalp & Hisli Şahin, 2018; Tran et al., 2013).

Cognitive Fusion Questionnaire

It is a seven-point Likert-type self-report scale comprising seven items. It measures the level of CF, which is one of the main components of psychological inflexibility (Gillanders et al., 2014). High scores on the scale indicate a prominent CF level. It is a Likert-type self-report scale consisting of seven questions, where each question is scored between 1 and 7. High scores obtained from the scale indicate a higher CF level. The internal consistency coefficient (Cronbach's alpha) of the Turkish version was calculated as 0.89 (Kervancıoğlu et al., 2023).

Global Assessment of Functioning Scale (GAF)

This numeric scale evaluates the social, occupational, and mental functioning of adult patients. The development of the scale started with the Health-Sickness Rating Scale (HSRS) developed by Luborsky (1962). Endicott et al. (1976) developed the Global Assessment Scale based on this. This scale was modified in the DSM-III-R and started to be used with the name The Global Assessment of Functioning at Axis V to evaluate the mental, social, and occupational functioning of patients over 90 points. However, the numeric rates were changed from 0–90 to 0–100 to differentiate high-functioning individuals in the DSM-IV. The present study used the most recent form included and defined in the DSM-IV-TR (Köroğlu, 2001).

Statistical Analysis

Power analyses (G*Power v3.1.9.2; Heinrich-Heine-Universität Düsseldorf) indicated that at least 159 participants were required to detect mean group differences in three groups with a medium effect size allowing for 5% type I error. Therefore, we aimed to include at least 60 participants in each group. Unfortunately, participant recruitment had to be stopped at 150 due to the SARS-CoV-2 pandemic. The mean (standard deviation) or frequency (percentage) of the demographic and clinical variables were identified using descriptive statistics. For group comparisons, we used one-way analysis of variance with post hoc Scheffe correction, independent samples' t-test, or chi-square test. Bivariate Pearson correlation analyses were used to investigate the relationship between the study variables. The association between diagnostic group membership and EA, CF, and mindfulness levels was predicted using a hierarchical linear regression model. Dummy variables for the diagnostic categories (PNES and epilepsy) were formed, and the healthy control group was selected as the reference category. In the first step of the regression analysis, the psychological symptom severity

Table 1. Demographic and clinical characteristics of the participants and comparisons between groups

	Total sample (n=150)	Healthy control group (n=60)	PNES roup (n=45)	Epilepsy group (n=45)	Statistics (F/t/χ^2)	*Post hoc* comparisons
Age (years)	33.99 (11.73)	32.75 (9.75)	39.58 (12.24)	30.07 (11.78)	8.79***	CG=EG<PG
Sex, female	100 (66.7)	38 (63.3)	37 (82.2)	25 (55.6)	7.70*	EG<PG
Marital status, married	86 (57.3)	33 (55.0)	34 (75.6)	19 (42.2)	10.44**	EG<PG
Education (years)	11.65 (3.95)	14.47 (2.21)	9.20 (3.67)	10.33 (3.77)	40.27***	CG>EG=PG
Employment status, regular income job	71 (47.3)	52 (86.7)	9 (20.0)	10 (22.2)	62.11***	CG>EG=PG
Socioeconomic status, middle	95 (63.3)	32 (53.3)	35 (77.8)	28 (62.2)	6.65*	CG<PG
Family history of a psychiatric disorder	21 (14.0)	6 (10.0)	12 (26.7)	3 (6.7)	8.80*	EG<PG
Previous and present suicide attempts	5 (3.3)	0 (0.0)	4 (8.9)	1 (2.2)	6.55	CG=EG=PG
Previous psychiatric hospitalization and present	11 (7.3)	0 (0.0)	11 (24.4)	0 (0.0)	27.70***	CG=EG<PG
Smoking	23 (15.3)	12(20.0)	4 (8.9)	7 (15.6)	2.45	CG=EG=PG
Duration of illness/disorder (months)	67.55 (88.80)	N/A	68.67 (95.06)	65.87 (80.04)	0.13	EG=PG

*p<0.05, **p<0.01, ***p<0.001. Results are presented as mean (standard deviation) or frequency (percentage). CG: Control group; EG: Epilepsy group; N/A: Not applicable; PG: Psychogenic nonepileptic seizure group; PNES: psychogenic nonepileptic seizure.

and general functioning levels were entered. In the second analysis step, diagnostic categories were entered as predictors. The statistical significance level was set at p value of <0.05. All analyses (except for sample size calculation) were performed using MedCalc v20 (MedCalc Software Ltd, Ostend, Belgium).

RESULTS

Demographic and Clinical Characteristics of the Participants and Comparisons Between Groups

A total of 150 participants, including 60 in the control (CG), 45 in the epilepsy (EG), and 45 in the PNES groups (PG), were included in the study. The mean age of the participants was 32.75±9.75 years in the CG, 39.58±12.24 years in the PG, and 30.07±11.78 years in the EG. The proportion of women was 63.3% (n=38) in the CG, 82.2% (n=37) in the PG, and 55.6% (n=25) in the EG. Table 1 presents the sociodemographic characteristics of all participants.

Scores and Group Comparisons According to the Assessment Instruments Used

When the scores taken by the participants in the PHQ-SADS subscales were examined, no difference was observed between EG and PG with regards to depression (CG=4.40±4.35, EG=11.51±5.93, PG=9.47±6.48, p<0.001), anxiety (CG=3.48±3.84, EG=8.56±5.40, PG=6.67±5.50, p<0.001), panic (CG=0.80±1.31, EG=2.78±1.83, PG=2.36±1.68, p<0.001), and somatization (CG=5.13±4.27, EG=12.98±6.72, PG=8.38±5.45, p<0.001) scores, whereas the average scores of both groups were higher than the CG.

One-way analyses of variance (ANOVA) was conducted to compare the EA, CF, and mindfulness of the PG, CG, and EG. The omnibus ANOVA yielded statistically significant group differences for all three variables (all ps<0.001). Bonferroni-adjusted post hoc comparisons were performed to identify specific between-group differences.

Post hoc analyses indicated that the PNES group reported significantly higher EA and lower mindfulness compared with the epilepsy and healthy control groups (all adjusted ps<0.001). Conversely, CF scores did not differ significantly between the PNES and epilepsy groups after correction for multiple comparisons (adjusted p>0.05), although both clinical groups differed from healthy controls.

Mean AAQ-II scores of the participants in PG (26.53±10.53), EG (19.51±9.76), and CG (14.38±8.03) were significantly higher (p<0.001). While there was no difference between the EG (24.09±1.47) and PG (27.84±9.57) groups with regards to CFQ scores, the mean scores of both groups were significantly (p<0.001) higher in the CG (15.25±7.20).

When the FFMQ-SF subscales and total scale scores were examined, no significant difference in the observation subscore was found between the groups. Acting with awareness score was significantly (p<0.001) higher in the CG (15.48±3.76) than epilepsy (13.27±4.40) and PNES group (11.42±3.47). The nonjudgmental inner experience score (p<0.001), nonreactivity to inner experiences score (p<0.01), and mindfulness level (p<0.001) were significantly lower in the PG group (Table 2).

Table 2. Scores of and group comparisons according to the assessment instruments used

	Total sample (n=150)	Healthy control group (n=60)	PNES group (n=45)	Epilepsy group (n=45)	Statistics (F)	*Post hoc* comparisons
Depression level	8.05 (6.31)	4.40 (4.35)	11.51 (5.93)	9.47 (6.48)	23.28**	CG<EG=PG
Anxiety level	5.96 (5.30)	3.48 (3.84)	8.56 (5.40)	6.67 (5.50)	14.63**	CG<EG=PG
Panic level	1.86 (1.81)	0.80 (1.31)	2.78 (1.83)	2.36 (1.68)	22.89**	CG<EG=PG
Somatization level	8.46 (6.32)	5.13 (4.27)	12.98 (6.72)	8.38 (5.45)	26.61**	CG<EG=PG
Difficulty level	1.39 (0.65)	1.12 (0.32)	1.71 (0.76)	1.42 (0.72)	12.39**	CG<EG=PG
PHQ-SADS score	25.72 (17.68)	14.93 (11.21)	37.53 (18.08)	28.29 (16.01)	30.14**	CG<EG<PG
AAQ-II score	19.57 (10.59)	14.38 (8.03)	26.53 (10.58)	19.51 (9.76)	21.59**	CG<EG<PG
CFQ score	21.68 (10.78)	15.25 (7.20)	27.84 (9.57)	24.09 (11.47)	25.42**	CG<EG=PG
FFMQ observation score	13.41 (3.57)	13.85 (3.33)	13.02 (3.44)	13.20 (3.99)	0.80	CG=EG=PG
FFMQ description score	13.23 (3.15)	14.27 (2.67)	11.80 (2.68)	13.27 (3.65)	8.71**	CG>PG
FFMQ with awareness score	13.60 (4.21)	15.48 (3.76)	11.42 (3.47)	13.27 (4.40)	14.31**	CG>EG=PG
The FFMQ nonjudgmental inner experience score	13.73 (4.03)	15.25 (3.66)	11.82 (3.42)	13.62 (4.29)	10.52**	CG>PG
FFMQ score for nonreactivity to inner experiences	12.39 (4.08)	12.98 (4.40)	10.76 (3.37)	13.24 (3.89)	5.55*	CG=EG>PG
Mindfulness level	66.36 (11.52)	71.83 (10.48)	58.82 (8.46)	66.60 (11.46)	20.79**	CG>EG>PG
Level of global functioning	92.43 (8.38)	98.58 (3.69)	85.56 (9.37)	91.04 (5.30)	55.59***	CG>EG>PG

*p<0.01, **p<0.001. Results are presented as the mean (standard deviation). AAQ-II: Acceptance and Action Questionnaire-II; CFQ: Cognitive Fusion Questionnaire; CG: healthy control group; EG: epilepsy group; FFMQ: Five Facet Mindfulness Questionnaire; PG: psychogenic nonepileptic seizure group; PHQ-SADS: Patient Health Questionnaire - Somatic, Anxiety, and Depressive Symptoms; PNES: psychogenic nonepileptic seizure.

Table 3. Bivariate intercorrelations of the study variables

		1	2	3	4	5	6	7	8	9	10
1.	PHQ-SADS score	1	0.58**	0.76**	0.04	-0.36**	-0.57**	-0.49**	-0.19*	-0.54**	-0.48**
2.	AAQ-II score		1	0.73**	-0.07	-0.43**	-0.52**	-0.50**	-0.27**	-0.60**	-0.36**
3.	CFQ score			1	-0.03	-0.41**	-0.53**	-0.58**	-0.23**	-0.60**	-0.47**
4.	FFMQ observation score				1	0.15	0.03	-0.09	0.28**	0.43**	0.19*
5.	FFMQ description score					1	0.30**	0.30**	0.30**	0.64**	0.21*
6.	FFMQ with awareness score						1	0.54**	0.18*	0.71**	0.26**
7.	The FFMQ nonjudgmental inner experience score							1	0.05	0.62**	0.22**
8.	FFMQ score for nonreactivity to inner experiences								1	0.61**	0.21*
9.	FFMQ score									1	0.36**
10.	GAFS score										1

*p<0.05, **p<0.01. AAQ-II: Acceptance and Action Questionnaire-II; CFQ: Cognitive Fusion Questionnaire; FFMQ: Five Facet Mindfulness Questionnaire; GAFS: Global Assessment of Functioning Scale; PHQ-SADS: Patient Health Questionnaire - Somatic, Anxiety, and Depressive Symptoms.

Bivariate Intercorrelations of the Study Variables

Correlation analysis demonstrated negative and significant correlations between PHQ-SADS, AAQ-II, and CFQ scores and description, acting with awareness, nonjudgmental inner experience, and nonreactivity to inner experiences scores among the FFMQ-S subscales, FFMQ-S total score, and GAFS score. Significant correlations were found between the PHQ-SADS, AAQ-II, and CFQ scores (Table 3).

Table 4. Final step of the hierarchical linear regression analyses with diagnostic group membership (PNES and epilepsy) as predictors for psychological flexibility, cognitive fusion, and mindfulness levels

	AAQ-II score						CFQ score						FFMQ score					
	R^2=0.39	AdjR²=0.37	ΔR²=0.03	F=22.48***	ΔF=3.79*	R^2=0.60	AdjR²=0.59	ΔR²=0.01	F=54.40***	ΔF=1.97	R^2=0.32	AdjR²=0.30	ΔR²=0.03	F=16.76***	ΔF=2.79			
	B	SE	β	95% CI	t	B	SE	β	95% CI	t	B	SE	β	95% CI	t			
Constant	6.17	11.42		-16.40, 28.74	0.54	16.73	9.38		-1.81, 35.27	1.78	12.78	11.92		-10.77, 36.34	1.07			
PHQ-SADS score	0.32	0.05	0.46	0.22, 0.43	5.95***	0.47	0.04	0.67	0.38, 0.56	10.64***	0.37	0.06	0.53	0.26, 0.48	6.52***			
GAFS score	0.01	0.11	0.01	-0.22, 0.23	0.06	-0.13	0.09	-0.10	-0.31, 0.06	-1.36	0.32	0.12	0.25	0.08, 0.55	2.70**			
PNES diagnosis	6.25	2.32	0.27	1.66, 10.83	2.69**	2.14	1.91	0.09	-1.63, 5.90	1.12	5.01	2.42	0.22	0.22, 9.79	2.07*			
Epilepsy diagnosis	2.24	1.92	0.10	-1.56, 6.04	1.16	3.13	1.58	0.13	0.01, 6.25	1.98	4.32	2.01	0.19	0.36, 8.29	2.15*			

*p<0.05, **p<0.01, ***p<0.001. AAQ-II, Acceptance and Action Questionnaire-II; CFQ, Cognitive Fusion Questionnaire; CI, confidence interval; FFMQ, Five Facet Mindfulness Questionnaire; GAFS, Global Assessment of Functioning Scale; PHQ-SADS, Patient Health Questionnaire - Somatic, Anxiety, and Depressive Symptoms.

Final Step of the Hierarchical Linear Regression Analyses with Diagnostic Group Membership (PNES and Epilepsy) as Predictors of EA, CF, and Mindfulness Levels

Regression analysis for AAQ-II levels revealed that the severity of psychological symptoms and PNES diagnosis were significant predictors. EA diagnosis or general functioning levels were not significantly associated with EA. CF levels were not predicted by either the diagnostic category or the general functioning levels. Thus, H4 was not supported for cognitive fusion, and after controlling for psychiatric symptom severity (PHQ-SADS) and global functioning (GAFS), diagnostic group membership did not significantly predict CFQ scores (Table 4). However, PHQ-SADS scores were positively associated with CFQ scores, and PNES and epilepsy diagnoses were significant predictors of mindfulness levels. Levels of mindfulness were also associated with psychological symptom severity and general functioning levels (Table 4). Although PNES diagnosis emerged as a significant predictor of EA and mindfulness, its association with CF was weaker and did not reach robust statistical significance after controlling for psychiatric symptom severity. The final models explained a substantial proportion of variance in EA and mindfulness, whereas the variance explained in CF was largely attributable to psychiatric symptom severity rather than diagnostic group membership.

DISCUSSION

This study examined EA, CF, and mindfulness in individuals with PNES compared to patients with epilepsy and healthy controls. Overall, the findings indicate that PNES is characterized by elevated EA and reduced mindfulness, whereas after accounting for psychiatric symptom severity, CF did not consistently differentiate diagnostic groups. These results support the relevance of transdiagnostic psychological processes in PNES and provide clinically meaningful insights into potential therapeutic targets.

When the PHQ-SADS subscale and total scores were examined, the PNES group had higher scores regarding depression, anxiety, somatization, and panic levels; however, there was no statistically significant difference from the epilepsy group. Both groups had a higher psychopathological level than the CG. Many studies have shown that depression accompanies PNES by 8.9%–85% (Bora et al., 2011; Bowman, 1993; Turner et al., 2011). Studies have shown that depression rates are higher in the PNES (Arnold & Privitera, 1996; Binzer et al., 2004; Dikel et al., 2003; Turner et al., 2011), whereas some other studies present no statistically significant difference (Direk, et al., 2012; Salinsky et al., 2012; Scévola et al., 2013). Furthermore, anxiety disorder rates in PNES range from 4.5% to 70% (Snyder et al., 1994; Turner et al., 2011). A meta-analysis including 32 articles found that the PNES group was more prone to anxiety disorders than patients

with epilepsy (Diprose et al., 2016). Hendrickson et al. (2014) examined panic symptoms in 224 patients with PNES and 130 patients with epilepsy and demonstrated that panic symptoms were more frequent in the PNES group. Goldstein and Mellers (2006) demonstrated that patients with PNES report similar levels of mental and cognitive symptoms of ictal panic compared to patients with epilepsy; however, patients with PNES are more likely to report symptoms of somatic and autonomic arousal associated with a panic attack. Patients with PNES also have higher somatization tendencies than those with epilepsy (Baslet, 2011; Owczarek, 2003; Reuber et al., 2003). PNES is associated with higher scores on the Minnesota Multidimensional Personality Questionnaire-2 somatization-related scales (Cragar et al., 2003). Moreover, some studies have shown that patients with PNES exhibit more intense somatic complaints, higher somatization tendency, and higher physiological characteristics as well as a tendency to experience negative emotions, as measured by the NEO Personality Inventory-Revised (Galimberti et al., 2003; Testa et al., 2007). Difficulties in recognizing, expressing, and regulating emotion in patients with PNES may cause symptoms of somatization that substantially reduce the quality of life of those with PNES compared with those with epilepsy (Wolf et al., 2015). The absence of a significant difference between the PHQ-SADS subscale scores between patients with PNES and epilepsy is not consistent with our hypothesis and may be related to the small sample size. However, considering that different types of convulsive seizures are evaluated together in the literature, the psychiatric symptom profiles of patients with epilepsy with generalized seizures may differ. Therefore, there may have been no differentiation from the severity scores reported in the literature compared to patients with PNES (Turner et al., 2011). Additionally, the severity of psychiatric symptoms in patients with epilepsy is not lower than that in patients with PNES, which is a remarkable finding and contributes to the literature indicating that the need for psychological support may be overlooked when evaluating patients with epilepsy. The absence of significant differences in depressive and anxiety symptoms between the PNES and epilepsy groups may reflect the high psychiatric burden commonly observed in both conditions. Chronic illness, functional impairment, stigma, and medication-related effects contribute to elevated psychological distress in patients with epilepsy, potentially narrowing symptom differences between the groups. Additionally, the clinical nature of the sample and the use of a general symptom screening measure may have limited the sensitivity to detect DSEPs.

Results of the research indicated that the EA levels were higher in PG compared to EG. EA refers to an active attempt to eliminate or escape thoughts, feelings, physical sensations, memories, and experiences (Luoma et al., 2010). In studies comparing patients with epilepsy and PNES, the PNES group had higher EA levels (Dimaro et al., 2014; Frances et al., 1999; Goldstein & Mellers, 2006). PNES is a psychological dissociation response to threatening situations, sensations, feelings, thoughts, or memories (Reuber et al., 2003). Psychodynamic, cognitive, behavioral, and systemic psychological theories recognize the patient's response to anxiety as a key factor in the development of the disease and suggest that EA may reflect the inability, failure, or unwillingness of individuals with PNES to actively engage with anxiety. This phenomenon is supported by evidence showing that patients with PNES generally prefer avoidant coping strategies and are more likely to somaticize their distress than those with epilepsy (Bakvis et al., 2011; Cragar et al., 2005; Stone et al., 2004). Furthermore, the EA level can predict the diagnosis of PNES based on the hierarchical regression analysis results in our study, which is consistent with the literature. EA and other accompanying dysfunctional coping methods may be one of the underlying reasons for the continuation of NE seizures in patients with PNES. Therefore, the present results suggest that an EA-focused approach may be appropriate in psychotherapeutic interventions for patients with PNES. Different initiatives, such as acceptance, re-evaluation, habituation, and developing a nonjudgmental awareness, may be possible in reducing seizures where avoidance of negative inner experiences and ultimately dissociation play a role. Furthermore, the difference in EA levels can be considered a clue that can present physicians with an idea about the distinction between PNES and epileptic seizures.

Although the CF scores were higher in the PNES in our study, no statistically significant difference was found compared with the epilepsy. This result contradicts our hypothesis. No study has been found in the literature that compares both groups about CF levels. A study that included only 285 patients with PNES found that an increase in EA and CF levels was associated with a decrease in mindfulness (Cullingham et al., 2020). Similarly, in our study, CF and EA levels were negatively correlated with mindfulness levels. Epilepsy is associated with an increased risk of cognitive deficits, mood disorders, and anxiety disorders, which are two to three times higher than those in the general population (Tellez-Zenteno et al., 2007). Epilepsy may cause specific concerns about seizures that can cause significant limitations in patients' independence and social functioning (Fisher et al., 2000). PNES and epilepsy are associated with perceived stigma and low self-esteem (Baker et al., 2000; Dimaro et al., 2015; Mayor et al., 2022). Individuals may experience a more intense CF with negative beliefs about the disease compared to the healthy CG. Both groups had similar durations of disease regarding chronicity, and no significant difference was found between the two groups in terms of psychopathology, which may explain the similarity of CF levels and the inability of CF to predict the diagnosis

of PNES or epilepsy based on the regression analysis results. However, studies with larger samples should investigate whether CF, as is the case with EA, may be related to a helpful finding that can be used to differentiate patients with PNES from those with epilepsy. This is because CF levels are likely to facilitate dissociation, increase EA, decrease mindfulness levels, and prolong the duration of psychopathology and may be more common in patients with PNES. Even if the CF levels did not reach a statistically significant level, they were higher in the PNES group than in the epilepsy group, which suggests this phenomenon.

CF was expected to differentiate PNES from epilepsy and HCs and be predicted by PNES diagnosis even after accounting for psychiatric symptom burden and global functioning (H4). However, this hypothesis was not supported for CF. In the hierarchical regression model, diagnostic group membership did not significantly predict CFQ scores once PHQ-SADS and GAFS were entered, whereas PHQ-SADS was a strong positive predictor of CF (Table 4). A plausible explanation is that CF in this sample may primarily reflect transdiagnostic distress severity rather than diagnosis-specific mechanisms, which is consistent with the lack of robust between-group differences between PNES and epilepsy on CFQ scores despite both groups differing from healthy controls. Additionally, the Turkish CFQ psychometrics are relatively less established than the other measures used in this study, which may have contributed to the reduced diagnostic sensitivity. Collectively, the present findings suggest that CF may be clinically relevant in PNES (given its associations with symptom severity and mindfulness) but does not appear to provide incremental diagnostic differentiation beyond psychiatric symptom severity in this dataset. Thus, future studies with larger samples and fully established local validation of the CFQ should re-test whether CF shows a diagnosis-specific signal when comorbidity and distress are more comprehensively modeled.

In the present study, the mindfulness level was significantly lower in the PNES group than in the epilepsy group. Difficulty in recognizing and accepting emotions is associated with a psychological predisposition to PNES and mindfulness (Williams et al., 2018, Pick et al. 2019). Furthermore, many functional neurological disorders, such as increased attention to body symptoms and misinterpretation of symptoms, are associated with cognitive processes (Nielsen et al., 2015). Cognitive defusion, which can be used in mindfulness-based interventions, may improve these cognitive processes (Larsson et al., 2016). Only one study in the literature evaluated the level of mindfulness in patients with PNES, and it demonstrated that a low level of mindfulness was associated with increased somatization. Additionally, the mindfulness level negatively correlated with EA and CF levels, which is similar to our study results. The results of the linear regression analysis showed that the PHQ-SADS, GAFS scores, and the diagnosis of PNES and epilepsy could predict the level of mindfulness. Some studies have shown that mindfulness-based therapies have a positive effect on depression, anxiety, and quality of life in patients with epilepsy (Tang et al., 2015; Thompson et al., 2010; Thompson et al., 2015). Similarly, mindfulness-based therapy improves the frequency, intensity, and quality of life of nonepileptic seizures in individuals with PNES (Baslet et al., 2020). Psychotherapeutic interventions that directly target mindfulness levels can reduce the frequency of seizures in patients with PNES. Additionally, patients with PNES have significantly lower levels of mindfulness, which may be a guiding element in distinguishing them from patients with epilepsy. Patients with PNES are affected by their psychological symptoms and findings to a greater extent, both due to EA and CF, which may have a role in this low level. Thus, the value of applying ACT approaches to patients with PNES, which allows intervention in all three areas with a holistic approach in psychotherapy interventions, is understood more profoundly.

Limitations

The cross-sectional nature of the study, the inability to use the video-EEG method for PNES diagnosis, and the small sample size are a few of the limitations of the present study. The absence of video-EEG confirmation for all PNES cases and the inclusion of patients with varying treatment histories may have influenced diagnostic precision and generalizability. Furthermore, the use of self-report scales in addition to the GAFS in the study may also be considered a limitation. Individuals with PNES are likely to have alexithymia (Myers et al., 2013). Alexithymic individuals may have trouble describing their inner experiences, which may lead them to have difficulty accurately completing self-report measures. This factor should also be considered when interpreting the results. Despite its limitations, the current study revealed some crucial findings, including the fact that the diagnosis of PNES predicts EA and mindfulness levels, and that EA and CF levels are positively correlated with psychopathology and negatively correlated with mindfulness levels.

CONCLUSION

The present findings have important implications for the psychological treatment of PNES. Elevated EA and reduced mindfulness observed in individuals with PNES suggest that avoidance-based coping strategies and disengagement from present-moment experience may play a central role in symptom maintenance. These processes are directly targeted within ACT, a transdiagnostic intervention model that aims to reduce EA, promote psychological flexibility, and facilitate values-based action (Hayes et al., 2006; Hayes et al., 2012).

Emerging evidence suggests that ACT-based and mindfulness-oriented interventions may be well suited for individuals with functional neurological disorders, including PNES, by fostering acceptance of internal experiences and reducing maladaptive attentional focus on bodily sensations and seizure-related fear (Graham et al., 2018;Barrett-Naylor et al. 2018). Similarly, mindfulness-based approaches have been shown to improve emotional regulation, attentional control, and symptom-related distress in populations with functional neurological disorders (Carlson & Perry, 2017; O'Neal & Baslet, 2018).

Routine assessment of EA and mindfulness may enhance case conceptualization and support individualized treatment planning for PNES from a clinical perspective. Importantly, these interventions are most effective when delivered within an integrated care framework, involving close collaboration between neurology and mental health professionals to provide clear diagnostic communication, psychoeducation, and timely referral to psychological treatment (LaFrance et al., 2014; Reuber & Rawlings, 2016).

Future research should examine other clinical populations experiencing a type of emotional stress other than epilepsy to understand the role of psychological flexibility and related factors in PNES. Comparison of groups comprising people with anxiety, depression, or personality disorders may help in understanding this relationship more profoundly. There is only one study in the literature showing that people with PNES exhibit enhanced avoidance behavior compared with the healthy CG, even when their anxiety levels are controlled. In other words, avoidance is an important component of PNES, regardless of additional psychological distress factors, such as anxiety (Bakvis et al., 2011). Results of the study showed that high EA levels and low mindfulness levels have a major place in the psychopathological appearance of patients with PNES, suggesting that treatment methods aimed at these parameters will be beneficial.

Future Research

Future research should focus on investigating the effectiveness of ACT-based interventions in individuals with PNES to increase the amount of evidence necessary for a more profound understanding of the relationship between the psychological resilience model and PNES.

Ethics Committee Approval: The Tokat Gaziosmanpaşa University Ethics Committee granted approval for this study (date: 21.11.2019, number: 19-KAEK-220).

Informed Consent: Informed consent forms were obtained from all participants.

Conflict of Interest: The authors declare that there is no conflict of interest.

Financial Disclosure: The authors received no financial support for the research, authorship, and/or publication of this article.

Use of AI for Writing Assistance: Not declared.

Author Contributions: Concept – ZÇ; Design – SB, OS; Supervision – SB; Fundins – SB; Materials – OS, ZÇ; Data Collection and/or Processing – OS, ZÇ; Analysis and/or Interpretation – SB; Literature Review – ZÇ; Writing – ZÇ; Critical Review – SB.

Peer-review: Externally peer-reviewed.

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