P-ISSN: 2146-9490 | E-ISSN: 2636-8765

Journal of Cognitive-Behavioral Psychotherapy and Research

Volume 15 Issue 1 Year 2026

jcbpr.org

Volume: 15 Issue: 1 Year: 2026

Journal of Cognitive-Behavioral Psychotherapy and Research

Editorial Board

Volume: 15 Issue: 1 Year: 2026

Journal of Cognitive-Behavioral Psychotherapy and Research

Editorial Board

Contact
Address: *İran Caddesi Karum İş Merkezi B Blok 4. Kat, No: 422 Kavaklıdere/Çankaya/Ankara, Türkiye*
E-mail: *bdpdernek@yandex.com* ***Web address:*** *www.jcbpr.org*

Yayın frekansı / Publication frequency: Üç ayda bir / Quarterly journal • Basım yeri / Printed at: Filmevi, Yüzyıl Matbaacılar Sitesi, No: 22, Bağcılar, İstanbul, Türkiye (+90 212 429 29 03) • Basım tarihi / Printing Date: Şubat 2026 / February 2026

Volume: 15 Issue: 1 Year: 2026

Journal of Cognitive-Behavioral Psychotherapy and Research

Editorial Board

Abstracting & Indexing
TUBITAK TR Index, PsycInfo, ScopeMed, Türk Psikiyatri Dizini, Türkiye Atif Dizini, Türk Medline, DOAJ, Embase, J-Gate, UlrichsWeb, Asos, CiteFactor, Journal TOCs, BASE, ASCI and Gale Cengage.

Publisher: *KARE Publishing;* ***Project Assistant:*** *Zehra Suğra TÜRKSAVAŞ;* ***Graphics, Design:*** *Neslihan ÇAKIR*
Address: *Göztepe Mahallesi, Fahrettin Kerim Gökay Caddesi, No: 200, Daire: 2, Göztepe, Kadıköy, İstanbul, Türkiye;* ***Phone:*** *+90 216 550 61 11;* ***Fax:*** *+90 216 550 61 12;* ***E-mail:*** *kare@karepb.com*

BDPD
BİLİŞSEL DAVRANIŞÇI PSİKOTERAPİLER DERNEĞİ

Volume: 15 Issue: 1 Year: 2026

Journal of Cognitive-Behavioral Psychotherapy and Research

Contents

Original Articles

Systematic Reviews

Reviews

Volume: 15 Issue: 1 Year: 2026

Journal of Cognitive-Behavioral Psychotherapy and Research

Dear Mental Health Professionals, Researchers, and Trainees,

The Cognitive Behavioral Psychotherapies Association of Türkiye was founded in 2010 with the aim of promoting the learning, scientific development, and competent dissemination of cognitive behavioral psychotherapies (CBT) across our country. Since then, the Association has organized numerous training programs, scientific meetings, and professional activities dedicated to strengthening evidence-based psychotherapy practices and fostering collaboration among clinicians and researchers.

In line with this mission, the Journal of Cognitive Behavioral Psychotherapy and Research (JCBPR) was established as the first and currently the only peer-reviewed international scientific journal in Türkiye focusing specifically on cognitive behavioral psychotherapy. With this issue, the journal proudly enters its 13th year of publication, continuing to serve as an academic platform supporting scientific dialogue between research and clinical practice.

Over the years, our Association has aimed to cultivate a professional community grounded in scientific rigor, collaboration, and shared learning. Becoming a full member of the European Association for Behavioural and Cognitive Therapies (EABCT) in 2013 and receiving EABCT accreditation for our CBT training program in 2016 represented important milestones in aligning our national efforts with international standards. Our biennial Cognitive Behavioral Psychotherapies Congresses, held in 2018, 2020, 2022, and 2024, have further strengthened this exchange of knowledge. Moreover, hosting the 53rd EABCT Congress in 2023 under the theme "CBT: Migration and Cultural Diversity" marked a significant contribution from Türkiye to the global CBT community.

The February 2026 issue of JCBPR reflects the growing diversity and methodological richness of contemporary CBT research and clinical applications. The articles included in this issue collectively address assessment, clinical interventions, emerging therapeutic processes, and culturally informed psychotherapy practices, illustrating how CBT continues to evolve while maintaining its empirical foundations.

Several contributions in this issue focus on clinical applications of CBT across different psychological conditions, highlighting both traditional disorder-specific approaches and newer transdiagnostic perspectives. These studies examine therapeutic processes that contribute to symptom reduction as well as broader improvements in functioning and psychological well-being.

Another group of articles explores cognitive, emotional, and metacognitive mechanisms underlying psychopathology, emphasizing how advances in theory continue to inform therapeutic innovation. By examining mediating and moderating variables within treatment processes, these studies contribute to a deeper understanding of how and for whom CBT interventions are most effective.

This issue also includes research addressing measurement, adaptation, and psychometric evaluation of assessment tools, an area that remains essential for strengthening evidence-based clinical practice. The development and validation of reliable instruments allow clinicians and researchers to better evaluate treatment outcomes and psychological constructs within culturally relevant contexts.

In addition, readers will find papers discussing clinical case formulations, applied therapeutic techniques, and therapist competencies, bridging the gap between empirical findings and everyday psychotherapy practice. Such contributions highlight the importance of integrating scientific knowledge with clinical expertise, which is one of the defining principles of CBT.

Taken together, the articles presented in this issue demonstrate the continued expansion of CBT beyond symptom-focused interventions toward more integrative, process-oriented, and context-sensitive approaches. They also reflect the increasing contributions of researchers and clinicians from diverse settings who are enriching the international CBT literature.

In alignment with these scientific developments, we are delighted to announce the upcoming 5th Cognitive Behavioral Psychotherapies Congress, which will be held in Ankara between April 30 and May 3, 2026, under the theme: "Cognitive Behavioral Therapy as an Umbrella Concept in Psychotherapy."

The congress aims to bring together leading national and international scholars, trainers, therapists, and researchers who have significantly contributed to the development of CBT. The scientific program will cover a wide range of contemporary topics, reflecting both established CBT models and emerging integrative perspectives.

BDPD
BİLİŞSEL DAVRANIŞÇI PSİKOTERAPİLER DERNEĞİ

Volume: ***15*** *Issue:* ***1*** *Year:* ***2026***

Journal of Cognitive-Behavioral Psychotherapy and Research

Pre-congress and congress workshops, working groups, and skills-based training sessions will provide participants with opportunities not only to follow current scientific developments but also to enhance their clinical competencies. We warmly encourage our readers to contribute to the congress through panel proposals, symposia, courses, poster presentations, and oral submissions and to participate actively in this important scientific gathering.

The continued growth of CBT depends on the integration of research, clinical experience, and professional collaboration. Journals and scientific congresses play a crucial role in sustaining this dialogue and supporting the next generation of clinicians and researchers.

We extend our sincere gratitude to the authors, reviewers, editorial board members, and readers whose contributions make JCBPR possible. We hope that the studies presented in this issue will inspire new research questions, enrich clinical practice, and promote further collaboration within the CBT community.

We look forward to meeting many of you in Ankara and continuing to advance cognitive behavioral psychotherapy together.

With our warm regards,

M. Hakan Türkçapar, MD, PhD
Editor-in-Chief

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

Zekiye Çelikbaş,[1] Sedat Batmaz,[2] Orhan Sümbül[3]

[1]Department of Psychiatry, Gölhisar State Hospital, Burdur, Türkiye
[2]Department of Psychology, Social Sciences University of Ankara, Faculty of Social Sciences and Humanities, Ankara, Türkiye
[3]Department of Neurology, School of Medicine, Tokat Gaziosmanpasa University, Tokat, Türkiye

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.

Address for correspondence:
Zekiye Çelikbaş.
Gölhisar Devlet Hastanesi, Psikiyatri Kliniği, Burdur, Türkiye
Phone: +90 554 837 26 87
E-mail:
zekiyecelikbas@gmail.com

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.

REFERENCES

Akyüz, F., Gökalp, P. G., Erdiman, S., & Karşıdağ, Ç. (2017). Conversion disorder comorbidity and childhood trauma. *Nöro Psikiyatri Arşivi, 54*(1), 15–20.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. American Psychiatric Publishing.

Arnold, L. M., & Privitera, M. D. (1996). Psychopathology and trauma in epileptic and psychogenic seizure patients. *Psychosomatics, 37*(5), 438–443.

Ayalp, H. D., & Hisli Şahin, N. (2018). Beş faktörlü bilgece farkındalık ölçeği-kısa formu'nun (BFBFÖ-K) Türkçe uyarlaması. *Klinik Psikoloji Dergisi, 2*(3), 117–127. [Article in Turkish]

Bagherzade, A., & Kataki, S. S. H. (2015). Positive and negative affects and coping strategies in patients with psychogenic non-epileptic seizure, temporal lobe epilepsy and control groups. *Biomedical and Pharmacology Journal, 8*(1), 133–139.

Baker, G. A., Brooks, J., Buck, D., & Jacoby, A. (2000). The stigma of epilepsy: A European perspective. *Epilepsia, 41*(1), 98–104.

Bakvis, P., Spinhoven, P., Zitman, F. G., & Roelofs, K. (2011). Automatic avoidance tendencies in patients with psychogenic non-epileptic seizures. *Seizure, 20*(8), 628–634.

Barrett-Naylor, R., Gresswell, D. M., & Dawson, D. L. (2018). The effectiveness and acceptability of a guided self-help Acceptance and Commitment Therapy (ACT) intervention for psychogenic nonepileptic seizures. *Epilepsy & Behavior, 88*, 332–340.

Baslet, G. (2011). Psychogenic non-epileptic seizures: A model of their pathogenic mechanism. *Seizure, 20*(1), 1–13.

Baslet, G., Dworetzky, B., Perez, D. L., & Oser, M. (2015). Treatment of psychogenic nonepileptic seizures: Updated review and findings from a mindfulness-based intervention case series. *Clinical EEG and Neuroscience, 46*(1), 54–64.

Baslet, G., Ehlert, A., Oser, M., & Dworetzky, B. A. (2020). Mindfulness-based therapy for psychogenic nonepileptic seizures. *Epilepsy & Behavior, 103*(Pt A), 106534.

Binzer, M., Stone, J., & Sharpe, M. (2004). Recent onset pseudoseizures—Clues to aetiology. *Seizure, 13*(3), 146–155.

Bodde, N. M., Brooks, J. L., Baker, G. A., Boon, P. A., Hendriksen, J. G., Mulder, O. G., & Aldenkamp, A. P. (2009). Psychogenic non-epileptic seizures—Definition, etiology, treatment and prognostic issues: A critical review. *Seizure, 18*(8), 543–553.

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy, 42*(4), 676–688.

Bora, I. H., Taşkapilioğlu, O., Seferoğlu, M., Kotan, O. V., Bican, A., Özkaya, G., & Akkaya, C. (2011). Sociodemographics, clinical features, and psychiatric comorbidities of patients with psychogenic nonepileptic seizures: Experience at a specialized epilepsy center in Turkey. *Seizure, 20*(6), 458–461.

Bowman, E. S. (1993). Etiology and clinical course of pseudoseizures: Relationship to trauma, depression, and dissociation. *Psychosomatics, 34*(4), 333–342.

Brown, R. J., & Reuber, M. (2016). Towards an integrative theory of psychogenic non-epileptic seizures (PNES). *Clinical Psychology Review, 47*, 55–70.

Brown, R. J., & Reuber, M. (2016). Psychological and psychiatric aspects of psychogenic non-epileptic seizures (PNES): A systematic review. *Clinical Psychology Review, 45*, 157–182.

Carlson, P., & Perry, K. N. (2017). Psychological interventions for psychogenic non-epileptic seizures: A meta-analysis. *Seizure, 45*, 142–150.

Cope, S. R., Poole, N., & Agrawal, N. (2017). Treating functional non-epileptic attacks—Should we consider acceptance and commitment therapy? *Epilepsy & Behavior, 73*, 197–203.

Cragar, D. E., Berry, D. T., Schmitt, F. A., & Fakhoury, T. A. (2005). Cluster analysis of normal personality traits in patients with psychogenic nonepileptic seizures. *Epilepsy & Behavior, 6*(4), 593–600.

Cragar, D. E., Schmitt, F. A., Berry, D. T., Cibula, J. E., Dearth, C. M., & Fakhoury, T. A. (2003). A comparison of MMPI-2 decision rules in the diagnosis of nonepileptic seizures. *Journal of Clinical and Experimental Neuropsychology, 25*(6), 793–804.

Cronje, G., & Pretorius, C. (2013). The coping styles and health-related quality of life of South African patients with psychogenic nonepileptic seizures. *Epilepsy & Behavior, 29*(3), 581–584.

Cullingham, T., Kirkby, A., Eccles, F. J. R., & Sellwood, W. (2020). Psychological inflexibility and somatization in nonepileptic attack disorder. *Epilepsy & Behavior, 111*, 107155.

Deveci, A., Taskin, O., Dinc, G., Yilmaz, H., Demet, M. M., Erbay-Dundar, P., Kaya, E., & Ozmen, E. (2007). Prevalence of pseudoneurologic conversion disorder in an urban community in Manisa, Turkey. *Social Psychiatry and Psychiatric Epidemiology, 42*(11), 857–864.

Dikel, T. N., Fennell, E. B., & Gilmore, R. L. (2003). Posttraumatic stress disorder, dissociation, and sexual abuse history in epileptic and nonepileptic seizure patients. *Epilepsy & Behavior, 4*(6), 644–650.

Dimaro, L. V., Dawson, D. L., Roberts, N. A., Brown, I., Moghaddam, N. G., & Reuber, M. (2014). Anxiety and avoidance in psychogenic nonepileptic seizures: The role of implicit and explicit anxiety. *Epilepsy & Behavior, 33*, 77–86.

Dimaro, L. V., Roberts, N. A., Moghaddam, N. G., Dawson, D. L., Brown, I., & Reuber, M. (2015). Implicit and explicit self-esteem discrepancies in people with psychogenic nonepileptic seizures. *Epilepsy & Behavior, 46*, 109–117.

Diprose, W., Sundram, F., & Menkes, D. B. (2016). Psychiatric comorbidity in psychogenic nonepileptic seizures compared with epilepsy. *Epilepsy & Behavior, 56*, 123–130.

Direk, N., Kulaksızoğlu, I. B., Alpay, K., & Gürses, C. (2012). Using personality disorders to distinguish between patients with psychogenic nonepileptic seizures and those with epileptic seizures. *Epilepsy & Behavior, 23*(2), 138–141.

Endicott, J., Spitzer, R. L., Fleiss, J. L., & Cohen, J. (1976). The Global Assessment Scale: A procedure for measuring overall severity of psychiatric disturbance. *Archives of General Psychiatry, 33*(6), 766–771.

Fisher, R. S., Vickrey, B. G., Gibson, P., Hermann, B., Penovich, P., Scherer, A., & Walker, S. (2000). The impact of epilepsy from the patient's perspective I: Descriptions and subjective perceptions. *Epilepsy Research, 41*(1), 39–51.

Frances, P. L., Baker, G. A., & Appleton, P. L. (1999). Stress and avoidance in pseudoseizures: Testing the assumptions. *Epilepsy Research, 34*(2–3), 241–249.

Galimberti, C. A., Ratti, M. T., Murelli, R., Marchioni, E., Manni, R., & Tartara, A. (2003). Patients with psychogenic nonepileptic seizures, alone or epilepsy-associated, share a psychological profile distinct from that of epilepsy patients. *Journal of Neurology, 250*(3), 338–346.

Gallant, S. N. (2016). Mindfulness meditation practice and executive functioning: Breaking down the benefit. *Consciousness and Cognition, 40*, 116–130.

Gedzelman, E. R., & LaRoche, S. M. (2014). Long-term video EEG monitoring for diagnosis of psychogenic nonepileptic seizures. *Neuropsychiatric Disease and Treatment, 10*, 1979–1986.

Gillanders, D. T., Bolderston, H., Bond, F. W., Dempster, M., Flaxman, P. E., Campbell, L., Kerr, S., Tansey, L., Noel, P., Ferenbach, C., Masley, S., Roach, L., Lloyd, J., May, L., Clarke, S., & Remington, B. (2014). The development and initial validation of the Cognitive Fusion Questionnaire. *Behavior Therapy, 45*(1), 83–101.

Goldstein, L. H., Drew, C., Mellers, J., Mitchell-O'Malley, S., & Oakley, D. A. (2000). Dissociation, hypnotizability, coping styles and health locus of control: Characteristics of pseudoseizure patients. *Seizure, 9*(5), 314–322.

Goldstein, L. H., & Mellers, J. D. (2006). Ictal symptoms of anxiety, avoidance behaviour, and dissociation in patients with dissociative seizures. *Journal of Neurology, Neurosurgery & Psychiatry, 77*(5), 616–621.

Graham, C. D., O'Hara, D. J., & Kemp, S. (2018). A case series of Acceptance and Commitment Therapy (ACT) for reducing symptom interference in functional neurological disorders. *Clinical Psychology Psychotherapy, 25*(3), 489–496.

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis. *Clinical Psychology Review, 37*, 1–12.

Gul, A., & Ahmad, H. (2014). Cognitive deficits and emotion regulation strategies in patients with psychogenic nonepileptic seizures: A task-switching study. *Epilepsy & Behavior, 32*, 108–113.

Güleç, M. Y., Güleç, H., Şimşek, G., Turhan, M., & Sünbül, E. A. (2012). Psychometric properties of the Turkish version of the Patient Health Questionnaire–Somatic, Anxiety, and Depressive Symptoms. *Comprehensive Psychiatry, 53*(5), 623–629.

Hayes, S. C., Pistorello, J., & Levin, M. E. (2012). Acceptance and commitment therapy as a unified model of behavior change. *The Counseling Psychologist, 40*(7), 976–1002.

Hayes, S. C., Levin, M. E., Plumb-Vilardaga, J., Villatte, J. L., & Pistorello, J. (2013). Acceptance and Commitment Therapy and contextual behavioral science: Examining the progress of a distinctive model of behavioral and cognitive therapy. *Behavior Therapy, 44*(2), 180–198.

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006a). Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy, 44*(1), 1–25.

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (2006b). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*(6), 1152–1168.

Hendrickson, R., Popescu, A., Dixit, R., Ghearing, G., & Bagic, A. (2014). Panic attack symptoms differentiate patients with epilepsy from those with psychogenic nonepileptic spells (PNES). *Epilepsy & Behavior, 37*, 210–214.

Kervancıoğlu, A., Aydın, Y., Sakarya, D., Duymaz, G., & Özdel, K. (2023). Adaptation of Cognitive Fusion Questionnaire to Turkish: A validity and reliability study. *Journal of Cognitive Behavioral Psychotherapies and Research, 12*(1), 50–56.

Köroğlu, E. (Trans.). (2001). *Amerikan Psikiyatri Birliği: Psikiyatride hastalıkların tanımlanması ve sınıflandırılması el kitabı, yeniden gözden geçirilmiş 4. baskı (DSM–IV–TR)*. Hekimler Yayın Birliği. [In Turkish]

Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2010). The Patient Health Questionnaire Somatic, Anxiety, and Depressive Symptom Scales: A systematic review. *General Hospital Psychiatry, 32*(4), 345–359.

LaFrance, W. C., Jr., Baird, G. L., Barry, J. J., Blum, A. S., Frank Webb, A., Keitner, G. I., Machan, J. T., Miller, I. W., & Consortium Nonepileptic Seizures Treatment Trial (NEST-T). (2014). Multicenter pilot treatment trial for psychogenic nonepileptic seizures. *JAMA Psychiatry, 71*(9), 997–1005.

Larsson, A., Hooper, N., Osborne, L. A., Bennett, P., & McHugh, L. (2016). Using brief cognitive restructuring and cognitive defusion techniques to cope with negative thoughts. *Behavior Modification, 40*(3), 452–482.

Luborsky, L. (1962). Clinician's judgments of mental health. *Archives of General Psychiatry, 7*, 407–417.

Luoma, J. B., Hayes, S. C., & Walser, R. D. (2010). *Learning ACT: An Acceptance & Commitment Therapy skills-training manual for therapists*. New Harbinger Publications.

Mayor, R., Gunn, S., Reuber, M., & Simpson, J. (2022). Experiences of stigma in people with epilepsy: A meta-synthesis of qualitative evidence. *Seizure, 94*, 142–160.

Memmedov, A., Aliş, C., Delil, Ş., Tanrıverdi, T., & Yeni, S. N. (2023). Retrospective analysis of patients undergoing video-EEG monitoring. *Archives of Epilepsy, 29*(2), 56–61.

Myers, L., Matzner, B., Lancman, M., Perrine, K., & Lancman, M. (2013). Prevalence of alexithymia in patients with psychogenic non-epileptic seizures and epileptic seizures and predictors in psychogenic non-epileptic seizures. *Epilepsy & Behavior, 26*(2), 153–157.

Nielsen, G., Ricciardi, L., Demartini, B., Hunter, R., Joyce, E., & Edwards, M. J. (2015). Outcomes of a 5-day physiotherapy programme for functional (psychogenic) motor disorders. *Journal of Neurology, 262*(3), 674–681.

Novakova, B., Howlett, S., Baker, R., & Reuber, M. (2015). Emotion processing and psychogenic non-epileptic seizures: A cross-

sectional comparison of patients and healthy controls. *Seizure, 29*, 4–10.

O'Neal, M. A., & Baslet, G. (2018). Treatment for patients with a functional neurological disorder (conversion disorder): an integrated approach. *American Journal of Psychiatry, 175*(4), 307-314.

Owczarek, K. (2003). Somatisation indexes as differential factors in psychogenic pseudoepileptic and epileptic seizures. *Seizure, 12*(3), 178–181.

Özen, Ş., Özbulut, Ö., Altındağ, A., & Arıcıoğulları, Z. (2000). Acil serviste konversiyon bozukluğu tanısı konan hastaların sosyodemografik özellikleri ve stres faktörleri. *Türkiye'de Psikiyatri, 2*(1), 87–96. [Article in Turkish]

Pick, S., Goldstein, L. H., Perez, D. L., & Nicholson, T. R. (2017). Emotional processing in functional neurological disorder: A review, biopsychosocial model and research agenda. *Journal of Neurology, Neurosurgery & Psychiatry, 88*(6), 544–553.

Pick, S., Goldstein, L. H., Perez, D. L., & Nicholson, T. R. (2019). Emotional processing in functional neurological disorder: a review, biopsychosocial model and research agenda. *Journal of Neurology, Neurosurgery & Psychiatry, 90*(6), 704–711.

Reuber, M., House, A. O., Pukrop, R., Bauer, J., & Elger, C. E. (2003). Somatization, dissociation and general psychopathology in patients with psychogenic non-epileptic seizures. *Epilepsy Research, 57*(2-3), 159–167.

Reuber, M., & Brown, R. J. (2017). Understanding psychogenic nonepileptic seizures—Phenomenology, semiology and the Integrative Cognitive Model. *Seizure, 44*, 199–205.

Reuber, M., & Rawlings, G. H. (2016). Nonepileptic seizures: Rational treatment approaches. *Epilepsy & Behavior, 56*, 33–41.

Salinsky, M., Evrard, C., Storzbach, D., & Pugh, M. J. (2012). Psychiatric comorbidity in veterans with psychogenic seizures. *Epilepsy & Behavior, 25*(3), 345–349.

Scévola, L., Teitelbaum, J., Oddo, S., Centurión, E., Loidl, C. F., & Kochen, S. (2013). Psychiatric disorders in patients with psychogenic nonepileptic seizures and drug-resistant epilepsy: a study of an Argentine population. *Epilepsy & Behavior, 29*(1), 155–160.

Snyder, S. L., Rosenbaum, D. H., Rowan, A. J., & Strain, J. J. (1994). SCID diagnosis of panic disorder in psychogenic seizure patients. *The Journal of Neuropsychiatry and Clinical Neurosciences, 6*(3), 261–266.

Stone, J., Binzer, M., & Sharpe, M. (2004). Illness beliefs and locus of control: A comparison of patients with pseudoseizures and epilepsy. *Journal of Psychosomatic Research, 57*(6), 541–547.

Tang, V., Poon, W. S., & Kwan, P. (2015). Mindfulness-based therapy for drug-resistant epilepsy: An assessor-blinded randomized trial. *Neurology, 85*(13), 1100–1107.

Tellez-Zenteno, J. F., Patten, S. B., Jette, N., Williams, J., & Wiebe, S. (2007). Psychiatric comorbidity in epilepsy: A population-based analysis. *Epilepsia, 48*(12), 2336–2344.

Testa, S. M., Schefft, B. K., Szaflarski, J. P., Yeh, H. S., & Privitera, M. D. (2007). Mood, personality, and health-related quality of life in epileptic and psychogenic seizure disorders. *Epilepsia, 48*(5), 973–982.

Thompson, N. J., Patel, A. H., Selwa, L. M., Stoll, S. C., Begley, C. E., Johnson, E. K., & Fraser, R. T. (2015). Expanding the efficacy of Project UPLIFT: Distance delivery of mindfulness-based depression prevention to people with epilepsy. *Journal of Consulting and Clinical Psychology, 83*(2), 304–313.

Thompson, N. J., Walker, E. R., Obolensky, N., Winning, A., Barmon, C., Dilorio, C., & Compton, M. T. (2010). Distance delivery of mindfulness-based cognitive therapy for depression: Project UPLIFT. *Epilepsy & Behavior, 19*(3), 247–254.

Tran, U. S., Gluck, T. M., & Nader, I. W. (2013). Investigating the Five Facet Mindfulness Questionnaire (FFMQ): Construction of a short form and evidence of a two-factor higher order structure of mindfulness. *Journal of Clinical Psychology, 69*(9), 951–965.

Turner, K., Piazzini, A., Chiesa, V., Barbieri, V., Vignoli, A., Gardella, E., & Gambini, O. (2011). Patients with epilepsy and patients with psychogenic non-epileptic seizures: Video-EEG, clinical and neuropsychological evaluation. *Seizure, 20*(9), 706–710.

Urbanek, M., Harvey, M., McGowan, J., & Agrawal, N. (2014). Regulation of emotions in psychogenic nonepileptic seizures. *Epilepsy & Behavior, 37*, 110–115.

Williams, I. A., Levita, L., & Reuber, M. (2018). Emotion dysregulation in patients with psychogenic nonepileptic seizures: A systematic review based on the extended process model. *Epilepsy & Behavior, 86*, 37–48.

Wolf, L. D., Hentz, J. G., Ziemba, K. S., Kirlin, K. A., Noe, K. H., Hoerth, M. T., & Locke, D. E. C. (2015). Quality of life in psychogenic nonepileptic seizures and epilepsy: The role of somatization and alexithymia. *Epilepsy & Behavior, 43*, 81–88.

Yavuz, F., Ulusoy, S., Işkın, M., Esen, F. B., Burhan, H. S., Karadere, M. E., & Yavuz, N. (2016). Turkish version of Acceptance and Action Questionnaire-II (AAQ-II): A reliability and validity analysis in clinical and non-clinical samples. *Klinik Psikofarmakoloji Bülteni–Bulletin of Clinical Psychopharmacology, 26*(4), 397–408.

Yildiz, I., Yalçın Çakmaklı, G., Fil Balkan, A., Demirsöz, T., Elibol, B., & Yazici, M. K. (2025). Management of functional neurological disorders: Türkiye experience. *European Psychiatry, 68*(S1), S618–S619.

Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi
Journal of Cognitive-Behavioral Psychotherapy and Research
DOI: 10.14744/JCBPR.2026.77388
J Cogn Behav Psychother Res 2026;15(1):14–22

Validation of the Body Image Acceptance and Action Questionnaire in Turkish: Role of Body Image Flexibility Between Obsessive-Compulsive Personality Beliefs and Disordered Eating

Emine Serra Nebati,[1] Hasan Turan Karatepe,[2] Mücahit Öztürk[1]

[1]Department of Psychology, School of Humanities and Social Sciences, Ibn Haldun University, İstanbul, Türkiye
[2]Department of Psychiatry, Medical Faculty, İstanbul Medeniyet University, İstanbul, Türkiye

This study is based on a part of the first author's doctoral dissertation and was previously presented as a poster at the Association for Contextual Behavioral Science (ACBS) UK & Republic of Ireland Chapter Annual Conference held in London, 2024.

Cite this article as:
Nebati ES, Karatepe HT, Öztürk M. Validation of the Body Image Acceptance and Action Questionnaire in Turkish: Role of Body Image Flexibility Between Obsessive-Compulsive Personality Beliefs and Disordered Eating. J Cogn Behav Psychother Res 2026;15(1):14–22.

Address for correspondence:
Hasan Turan Karatepe.
İstanbul Medeniyet Üniversitesi Tıp Fakültesi, Psikiyatri Anabilim Dalı, İstanbul, Türkiye
Phone: +90 216 606 52 00
E-mail:
htkaratepe@yahoo.com

Submitted: 16.09.2025
Revised: 17.12.2025
Accepted: 02.01.2026
Available Online: 27.02.2026

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

ABSTRACT

Body image flexibility (BIF), which refers to one's ability to respond adaptively to body experience-related perceptions, emotions, thoughts, beliefs, and sensations, may play a crucial role in the development, maintenance, and treatment of eating disorders. However, the potential mediating role of BIF in the relationship between personality beliefs and disordered eating has not yet been explored. The present study aimed to examine the psychometric properties of the Body-Image Acceptance and Action Questionnaire (BI-AAQ) and to investigate how BIF affects the association between obsessive-compulsive personality beliefs (OCPB) and disordered eating. This cross-sectional study was conducted using convenience sampling in a general adult population (n=388). All participants anonymously completed the BI-AAQ, Eating Disorder Examination Questionnaire (EDE-Q), Personality Beliefs Questionnaire—Short Form (PBQ-SF), Body Shape Questionnaire (BSQ-34), and Acceptance and Action Questionnaire—II (AAQ-II). The original one-factor structure was confirmed for the Turkish version of the BI-AAQ and showed good internal consistency and concurrent validity. Furthermore, this study revealed that BIF, as measured by the BI-AAQ, fully mediated the relationship between OCPB and disordered eating. Our findings suggest that the BI-AAQ is a valid and reliable measure for the Turkish population. Aligned with the psychological flexibility model, the results of this study enhance our understanding of the relationship between personality beliefs and eating pathology. Furthermore, interventions targeting BIF may serve as a effective preventive interventions to reduce the risk of eating disorder onset among individuals with obsessive-compulsive personality disorder.

Keywords: Body image flexibility, Body Image Acceptance and Action Questionnaire, BI-AAQ, disordered eating, eating pathology, obsessive-compulsive personality beliefs.

ÖZ

Beden İmajı Kabul ve Eylem Formunun Türkçe Validasyonu: Beden İmajı Esnekliğinin Obsesif Kompulsif Kişilik İnançları ile Bozulmuş Yeme Davranışı Arasındaki Rolü

Beden imajı esnekliği, kişinin bedeni ile ilişkili algı, duygu, düşünce, inanç ve hislerine uyumlu bir biçimde tepki verebilme kapasitesi olarak tanımlanır ve yeme bozukluklarının gelişimi, sürmesi ve tedavisinde önemli bir role sahip olabilmektedir. Bununla birlikte, beden imajı esnekliğinin kişilik inançları ile bozul-

muş yeme davranışı arasındaki olası aracı rolü henüz incelenmedi. Bu çalışma, Beden İmajı Kabul ve Eylem Formunun psikometrik özelliklerini değerlendirmeyi ve beden imajı esnekliğinin obsesif kompulsif kişilik inançları ile bozulmuş yeme davranışı arasındaki ilişkiyi nasıl etkilediğini incelemeyi amaçlamaktadır. Bu kesitsel çalışma, kolayda örnekleme yöntemiyle ulaşılan genel yetişkin popülasyon (n=388) ile yapıldı. Katılımcılar anonim olarak Beden İmajı Kabul ve Eylem Formu, Yeme Bozukluğu Değerlendirme Ölçeği, Kişilik İnanç Ölçeği Kısa Formu, Vücut Şekli Anketi, Kabul ve Eylem Formu-2 ölçek bataryalarını doldurdu. Beden İmajı Kabul ve Eylem Formunun Türkçe versiyonu için özgün tek faktörlü yapısı doğrulandı ve iyi düzeyde iç tutarlılık ve eş zamanlı geçerlilik gösterdi. Ayrıca, bu çalışma beden imajı esnekliğinin obsesif kompulsif kişilik inançları ile bozulmuş yeme davranışı arasındaki ilişkide tam aracı olduğunu gösterdi. Çalışmanın bulguları, Beden İmajı Kabul ve Eylem Formunun Türk örnekleminde geçerli ve güvenilir bir ölçüm aracı olduğunu göstermektedir. Psikolojik esneklik modeli ile uyumlu olarak kişilik inançları ile yeme patolojisi arasındaki ilişkiyi anlamamızı güçlendirmektedir. Buna ek olarak, beden imajı esnekliğini geliştirmeye yönelik müdahaleler obsesif kompulsif kişilik bozukluğu olan bireylerde yeme bozukluğu gelişimini önlemeye yönelik etkili koruyucu müdahale olarak hizmet edebilir.

Anahtar Kelimeler: Beden imajı esnekliği, Beden İmajı Kabul ve Eylem Formu, bozulmuş yeme davranışı, obsesif kompulsif kişilik inançları, yeme patolojisi.

INTRODUCTION

Body image flexibility (BIF) is a concept grounded on the psychological flexibility model, which identifies psychological health as being aware of one's internal experiences and openly engaging with them while acting in accordance with one's values (Bond et al., 2011). Similarly, BIF emphasizes the awareness and acceptance of body-related perceptions, emotions, thoughts, and beliefs while acting in accordance with one's values (Sandoz et al., 2019). Negative body evaluations encompass negative thoughts and emotions regarding body size, shape, weight, muscle structure, and specific body parts, such as the legs and hips (Stice & Shaw, 2002; Grogan, 2017). Negative evaluation of one's body, also known as body dissatisfaction, is one of the most common symptoms and underlying mechanisms of eating disorder (ED) (McLean & Paxton, 2019; Stice, 2002; Stice & Shaw, 2002).

BIF is an important factor in the development, maintenance, and treatment of EDs (Bluett et al., 2016; Merwin et al., 2023). BIF reduces the effect of risk factors such as body dissatisfaction, appearance comparisons, and disordered eating cognitions on disordered eating (Kelly et al., 2014; Lee et al., 2017; Perey & Koenigstorfer, 2020; Wendell et al., 2012). Individuals with greater BIF show lower levels of disordered eating, that is, lower eating pathology, both in clinical and non-clinical populations (Linardon et al., 2021; Mendes et al., 2022; Pellizzer et al., 2018; Sandoz et al., 2019). Moreover, BIF is positively related to psychological flexibility (Sandoz et al., 2013) and inversely correlated with body dissatisfaction (Kelly et al., 2014; Lee et al., 2017), disordered eating (Linardon et al., 2021), and perfectionism (Ferreira et al., 2016).

According to the underlying model, psychological flexibility is the primary target of the acceptance and commitment therapy (ACT). In the case of EDs, body image flexibility is an equally important target of the ACT to achieve the desired treatment outcomes (Linardon et al., 2021). Studies have shown that changes in BIF mediate symptom improvement for ED treatment, thereby enhancing treatment success. However, Butryn et al. (2013) identified that individuals with lower baseline BI-AAQ scores exhibited more severe symptoms, and increases in their scores closely linked to symptom reduction. Similarly, Pellizzer et al. (2018) found that BIF was the strongest predictor and moderator of treatment outcomes, surpassing other factors, such as body image avoidance and psychological distress.

More than half of individuals with EDs exhibit comorbid personality disorders (Juli et al., 2023; Marañón et al., 2004). This coexisting personality disorder shapes the type and form of ED symptoms (e.g., the frequent occurrence of anorexia restrictive subtype in Obsessive-compulsive personality disorder (OCPD) and anorexia binge-purging type in borderline) (Cassin & von Ranson, 2005). OCPD is one of the personality disorders most frequently linked to EDs (Sansone et al., 2004). A clear relationship exists between OCPD and ED symptoms, including restriction, concerns about eating, body shape, and weight.

According to the psychological flexibility model, one of the primary reasons for dysfunctional behavior is the attempt to control unwanted thoughts or the dominance of such thoughts over behavior. To date, no research has been conducted on the effect of BIF on the relationship between Obsessive-compulsive personality beliefs (OCPB) and disordered eating. Wendell et al. (2012) found that BIF

served as a mediator between the cognition and eating disorders. This finding supports the role of BIF as a potential preventive factor to reduce the incidence of eating disorders among people with OCPB.

BI-AAQ, developed by Sandoz et al. (2013), is a well-known instrument for measuring BIF. Recent research suggests that psychological flexibility measures are too broad to be utilized for EDs, and BI-AAQ is more effective than other psychological flexibility measures in predicting the severity of EDs (Sandoz et al., 2019; Lee et al., 2017). BI-AAQ is adapted from the Acceptance and Action Questionnaire (AAQ), the most used measure to assess psychological flexibility, and assesses flexible responses to thoughts and feelings about one's body. The psychometric properties of the BI-AAQ were sufficient in the original study (α=0.92; test-retest r=0.80). Additional research has also supported the validity and reliability of the scale (Lee et al., 2017; Timko et al., 2014). BI-AAQ has also been translated into Portuguese (Ferreira et al., 2011), Persian (Izaadi et al., 2013), Spanish (Lucena-Santos et al., 2017), and Chinese (He et al., 2021).

Overall, the current study aimed to translate BI-AAQ into Turkish and examine its psychometric properties and investigate the relationship between OCPB, BIF, and disordered eating, with a specific focus on the mediating role of BIF. The study hypotheses are as follows: 1) The Turkish form of the Body Image-Acceptance and Action Questionnaire (BI-AAQ) is a valid and reliable measurement instrument. 2) BIF (BI-AAQ) serves as a mediator in the relationship between OCPB (PBQ-SF) and disordered eating (EDE-Q).

METHODS

Participants

The study sample consisted of 388 participants aged 18–65 years residing in Türkiye. No exclusion criteria were applied to enhance the representativeness of the general adult population. The inclusion criteria required participants to be aged 18 or older and to voluntarily consent to participate in the study.

Materials

Consent and Demographic Information Forms

Participants were first given an informed consent form that detailed the study purpose and content. Demographic information was also collected.

Body Image Acceptance and Action Questionnaire

Sandoz et al. (2013) developed the BI-AAQ to measure BIF, which is defined as the capacity to experience body-related inner experiences (thoughts, feelings, sensations, and perceptions) while acting in alignment with one's values. The scale was adapted from the Acceptance and Action Questionnaire (AAQ), the most commonly used measure of psychological flexibility. The BI-AAQ consists of 12 items rated on a 7-point Likert scale, ranging from 1 ("Never True") to 7 ("Always True"). Higher scores indicate lower BIF and increased body image inflexibility.

Acceptance and Action Questionnaire II

The AAQ-II measures psychological flexibility with improved psychometric properties compared to the original AAQ (Hayes et al., 2004; Bond et al., 2011). The AAQ-II consists of 7 items rated on a 7-point Likert scale, from 1 ("Never True") to 7 ("Always True"). Higher scores indicate decreased psychological flexibility and increased experiential avoidance. Yavuz et al. (2016) validated the Turkish form of the scale with a Cronbach's alpha reliability coefficient of 0.84. The Turkish form of the scale was used to measure psychological flexibility, and the internal consistency coefficient was 0.93.

Eating Disorder Examination Questionnaire (EDE-Q)

The EDE-Q, developed by Fairburn and Cooper (1993), is a self-report measure used to assess eating disorder behaviors. The EDE-Q consists of 33 items rated on a 7-point Likert scale ranging from 0 to 6. Higher scores indicate greater impairment in eating behaviors, and no clinical cut-off score has been reported. The scale has five subscales: restraint, binge eating, shape, eating, and weight concerns. The total score is computed by summing the subscale scores, excluding the binge eating subscale. The Turkish form of the scale was validated by Yücel et al. (2011), with Cronbach's alpha reliability coefficients of 0.93 for the overall scale. The total score was used to measure disordered eating in this study. The internal consistency coefficient for the overall scale was 0.96.

Body Shape Questionnaire (BSQ-34)

Cooper et al. (1987) developed the BSQ-34, which assesses concerns about body shape and weight. The BSQ-34 consists of 34 items rated on a 6-point Likert scale from "Never" to "Always." Higher scores indicate increased body dissatisfaction." The Turkish form of the scale was validated by Akdemir et al. (2012), with Cronbach's alpha reliability coefficients of 0.96. The total score was used to assess body dissatisfaction, and the internal consistency coefficient was 0.97.

Personality Belief Questionnaire-Short Form

The PBQ-SF is a short form of the original PBQ, designed to assess dysfunctional personality beliefs. It consists of 65 items and 9 subscales for different personality types (Butler et al., 2007). Items were rated on a 4-point Likert scale, from 0 ("I don't

believe it at all") to 4 ("I completely believe it"). The Turkish form of the scale was validated by Türkçapar et al. (2007), with a Cronbach's alpha reliability coefficient of.92 (Taymur et al., 2011). In this study, the OCPB subscale, consisting of 7 items, was used to assess OCPB. The internal consistency coefficient for this subscale was 0.83 in the Turkish adaptation study and.88 in the current study.

Procedure

The study was approved by the Scientific Research and Publication Ethics Committee of the School of Humanities and Social Sciences at Ibn Haldun University on December 15, 2023 (Decision number 2023/08-04), and the research was conducted following the principles of the Declaration of Helsinki. Approval for the Turkish translation of the scale was obtained from the original scale developer. The scale was translated into Turkish and back-translated into English using standard procedures. Minor discrepancies in the back-translation were made for linguistic clarity and were approved by the scale developer.

The finalized Turkish version of the scale was then administered to 12 undergraduate students fluent in both Turkish and English. Participants were asked to complete both the original English and Turkish versions of the scale and provide feedback on the items' clarity and comprehensibility. The final Turkish form of the BI-AAQ was used in this study (Appendix 1).

Participants were recruited using snowball sampling, and announcements were made via social media and email lists. The participants who provided informed consent were directed to the test battery. Completing the battery took approximately 15 minutes. Data were collected between November 2023 and April 2024.

Data Analysis

Data were analyzed using the Jamovi 2.3 software. To test the assumption of normality, the skewness and kurtosis coefficients were examined. Following the guidelines of Tabachnick and Fidell (2013), a normal distribution was assumed if the skewness and kurtosis coefficients were within the range of -1.50 to +1.50.

Cronbach's alpha internal consistency coefficient was computed to assess the reliability of the Turkish version of the BI-AAQ, where a value of $\alpha>0.70$ indicates that the scale is reliable (Kline, 1999). Additionally, item-total correlation values were analyzed to assess discrimination among items. According to Büyüköztürk (2018), an item-total correlation of 30 indicates good item discrimination indices.

Confirmatory factor analysis (CFA) was conducted to verify the construct validity. The results were evaluated using a

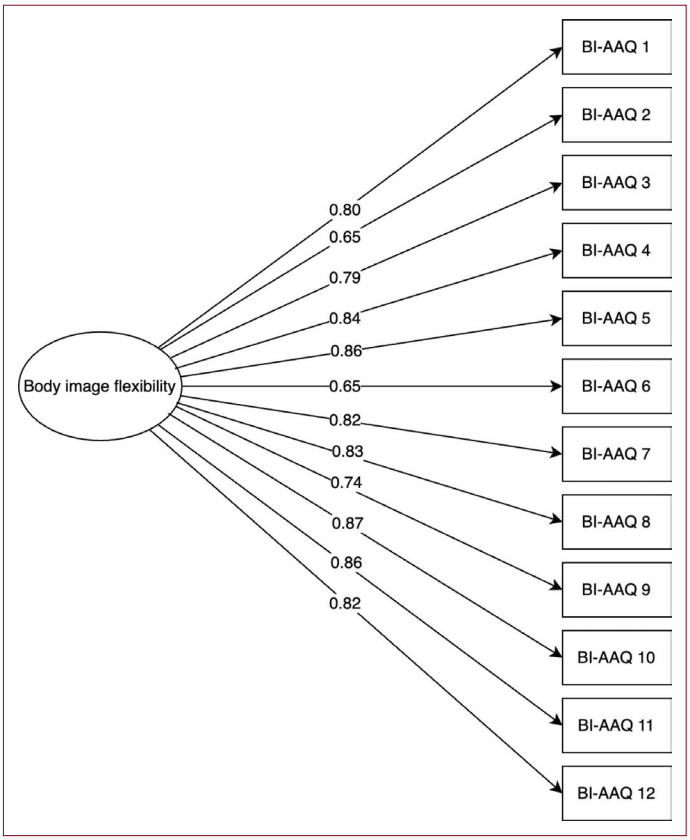

Figure 1. The one-factor model of the BI-AAQ.

95% confidence interval. The model fit indices, including CFI, TLI, SRMR, and RMSEA, were calculated. According to Kline (2011), a model is considered acceptable if the CFI and TLI values are greater than or equal to 0.90 and the RMSEA and SRMR values are less than 0.08. We used different indices because each performs better under varying conditions. In models based on Likert-type scales with five or more categories, RMSEA often tends to over-reject models, making SRMR a more reliable indicator of model fit (Shi et al., 2019). We reported RMSEA but primarily relied on CFI, TLI, and SRMR to interpret model fit.

For criterion-related validity, Pearson correlation analysis was used. When the normality assumption was violated, Spearman's rho analysis was used. The interpretation of Pearson's r value follows Field (2018), where $r>0.1$ indicates a small effect size, $r>0.3$ indicates a medium effect size, and $r>0.5$ indicates a large effect size.

The second research question was investigated using the Hayes process. The four conditions proposed by Baron and Kenny (1986) were examined prior to the analysis, and the findings were interpreted accordingly.

Table 1. Sociodemographic characteristics of the participants

Variables	Mean	SD	Min	Max
Age	33.13	12.08	18.00	65.00
BMI	25.35	5.51	16.33	52.74
	n	%		
Sex				
Female	352	90.7		
Male	336	9.3		
Educational level				
Primary school	18	4.6		
Middle school	13	3.4		
High school	90	23.2		
University	222	57.2		
Postgraduate	45	11.6		
Marital status				
Single	195	50.3		
Married	171	44.1		
Divorced	16	4.1		
Other	6	1.5		
Socioeconomic status				
Lower class	40	10.3		
Lower-middle class	69	17.8		
Middle class	178	45.9		
Upper-middle class	70	18.0		
Upper class	31	8.0		
BMI				
Underweight	18	4.7		
Normal weight	201	52.3		
Overweight	99	25.8		
Obese	66	17.2		
Physical illness				
Yes	107	27.6		
No	281	72.4		
Psychiatric diagnosis				
Yes	77	19.8		
No	311	80.2		
Eating disorder diagnosis				
Yes	16	4.1		
No	372	95.9		
Eating disorder treatment				
Yes	10	2.6		
No	378	97.4		

BMI: Body Mass Index; classified in accordance with World Health Organization (WHO) guidelines; SD: Standard deviation; Min: Minimum; Max: Maximum.

Table 2. Item total correlations of the Body Image Acceptance and Action Questionnaire

Item	If item deleted	
	Item total correlation	Cronbach's α
BI-AAQ1	0.79	0.95
BI-AAQ2	0.64	0.95
BI-AAQ3	0.76	0.95
BI-AAQ4	0.82	0.95
BI-AAQ5	0.83	0.95
BI-AAQ6	0.63	0.95
BI-AAQ7	0.80	0.95
BI-AAQ8	0.81	0.95
BI-AAQ9	0.72	0.95
BI-AAQ10	0.86	0.95
BI-AAQ11	0.83	0.95
BI-AAQ12	0.79	0.95

BI-AAQ: Body-Image Acceptance and Action Questionnaire.

RESULTS

Descriptives

Table 1 presents the detailed sociodemographic characteristics of the sample.

Normality

The total scores of the scales and subscales were normally distributed, except for BMI.

Confirmatory Factor Analysis (CFA)

The results of the CFA of the BI-AAQ indicated that the one-factor model fit the sample data adequately, with χ^2=305.04 (df=54, p<0.001), CFI=0.94, TLI=0.92, SRMR=0.03, and RMSEA=0.11 (90% CI: 0.09~0.12). Figure 1 shows the factor loadings of the BI-AAQ.

To improve the fit of the model, modification indices were examined, and theoretically error justifiable error were added accordingly. The modified model presented a better model fit χ^2=145.35 (df=46, p<0.001), CFI=0.97, TLI=0.96, SRMR=0.03, and RMSEA=0.07 (90% CI:0.06~0.09). Figure 2 displays the finalized BI-AAQ model.

Reliability

In this study, the Cronbach's alpha internal consistency coefficient of the single-factor BI-AAQ was 0.95, indicating that the scale is reliable (Kline, 1999). Table 2 displays the item-total correlations and Cronbach's alpha values if an item deleted. The item-total correlation value for each item

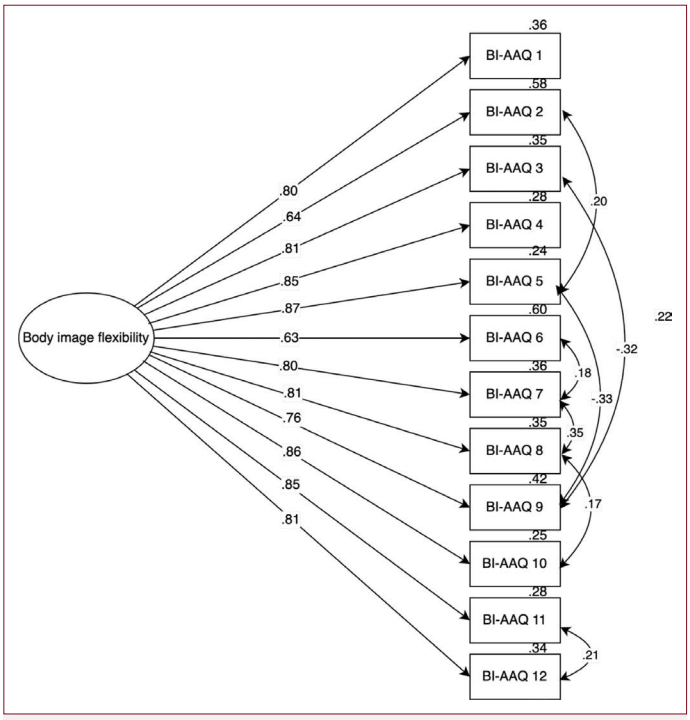

Figure 2. The modified model of the BI-AAQ.

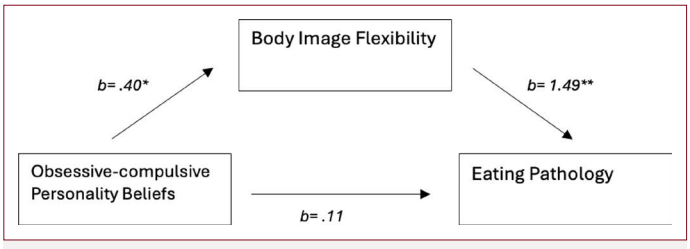

Figure 3. Results of the mediation analysis. Note: Standardized coefficients are presented and *p<0.05, **p<0.001.

was greater than 0.30, indicating good item discrimination indices. Furthermore, Cronbach's alpha remained stable when any item was deleted, suggesting that no item weakened the scale's reliability.

Criterion-related Validity

Table 3 presents the correlations between BIF and body dissatisfaction, general psychological flexibility, disordered eating, and BMI. As shown in the table, BI-AAQ scores were positively correlated with BSQ, AAQ, EDE-Q, and BMI.

Mediation Analysis

The findings revealed a significant relationship between BIF and OCPB (p<0.001; r=0.16), as well as between BIF and disordered eating (p<0.001; r=0.78). Mediation analysis

Table 3. Correlations between BI-AAQ and BSQ, AAQ, EDE-Q, BMI

	BI-AAQ
AAQ total	
Pearson's r	0.61
p-value	<0.001
BSQ total	
Pearson's r	0.79
p-value	<0.001
EDEQ total	
Pearson's r	0.78
p-value	<0.001
BMI	
Spearman's rho	0.21
p-value	<0.001

BI-AAQ: Body-Image Acceptance and Action Questionnaire; AAQ: Acceptance and Action Questionnaire; BSQ: Body Shape Questionnaire; EDEQ: Eating Disorder Examination Questionnaire; BMI: Body Mass Index.

conducted using the Baron Kenny method revealed that OCPB had a significant effect on disordered eating (b=0.71, t=2.95, p<0.05). After the mediator variable (BIF) was included in the model, the direct effect of OCPB on disordered eating changed to nonsignificant (b=0.11, t=0.78, p>0.05). As shown in Figure 3, OCPB had a significant indirect effect on disordered eating, and BIF fully mediated the relationship between OCPB and disordered eating (b=0.60, t=3.27, p<0.05).

DISCUSSION

This study aimed to validated the Turkish form of the BI-AAQ. The results indicate that the Turkish form of the BI-AAQ has acceptable psychometric properties and is suitable for use in the general adult population. BIF, assessed by the BI-AAQ, using a one-factor model, is conceptualized as a unidimensional construct. While the model fit indices CFI, TLI, and SRMR indicate good model fit, the RMSEA was found to be 0.11. As previously stated, we did not primarily interpret our results based on RMSEA values. Previous studies that validated BI-AAQ in different samples often reported that RMSEA was either not reported (e.g., Ferreira et al., 2016; Lucena-Santos et al., 2017) or reported but not relied upon in interpreting model fit (He et al., 2021). Although the initial model demonstrated an acceptable fit, supporting the scale's single-factor structure, the modified model showed a better fit with the data. The AAQ scales were originally developed as unidimensional measures assessing acceptance and action processes. Error covariances were added between item pairs, indicating overlap. 1 and 10 (weight-related internal experiences influencing behavior), 2 and 5 (excessive body-

related concern), 3 and 9 (avoidance of body-image-related internal experiences), 5 and 9 (impact of weight dissatisfaction on functioning), 6 and 7 (controlling or avoiding body-image-related internal experiences), 7 and 8 (need to stay in control), 8 and 10 (impact of body-image-related thoughts on one's life), and 11 and 12 (shape-related internal experiences influencing behavior). These modifications significantly improved the model fit. The results from the Turkish sample are consistent with previous findings, and these values can be interpreted as acceptable when evaluating the BI-AAQ structure across different cultural samples.

Furthermore, the Turkish form of the BI-AAQ has been identified as a reliable measurement instrument, with items strongly supporting the one-factor structure. The Turkish version of the BI-AAQ has excellent internal consistency (α=0.95) and good item discrimination indices for all items. Cronbach's alpha remained stable when any item was deleted, indicating that no item undermined the scale's internal consistency. This also indicates that even the items that performed poorly in different samples (e.g., Portuguese) provided high consistency in the Turkish sample.

Regarding criterion-related validity, the BI-AAQ was positively correlated with general psychological flexibility, EDs, body dissatisfaction, and BMI. Higher BI-AAQ and AAQ scores indicate lower flexibility. That is, BIF exhibits a positive correlation with general psychological flexibility and negatively correlated with body dissatisfaction, disordered eating, and BMI. These results are consistent with previous findings regarding BIF (Sandoz et al., 2013; Kelly et al., 2014; Lee et al., 2017; Timko et al., 2014; Ferreira et al., 2016).

This study enhances our understanding of the relationship between personality beliefs and disordered eating. Research consistently conceptualizes eating disorders as a well-established risk factor and indicator of ED. Sandoz and DuFrene (2014) explained BIF as the ability to accept the inner experiences of one's body without allowing them to dominate behavior. Consistent with the psychological flexibility model, acting in accordance with one's values while having unwanted internal experiences (e.g., thoughts) is a sign of psychological flexibility. Within the context of EDs, this might appear as a fusion of thoughts such as "If I eat, I will lose control" or "If I'm not thin, I'm disgusting," potentially leading to disordered eating. Similarly, OCPB statements such as "Imperfections cannot be tolerated" and "It is necessary to always strive to reach the highest standards" may influence the emergence of eating disorder symptoms. As OCPD is one of the most common personality disorders in EDs, OCPB may lead to symptoms of eating disorders in some scenarios.

This study has important implications for preventive interventions and treatments for patients with ED. Aligned with the psychological flexibility model, the findings of this study suggest that interventions targeting BIF (e.g., acceptance and commitment therapy) might help reduce the impact of OCPB in EDs and lower the risk of developing an eating disorder for individuals with OCPD. These findings require clinical validation.

This study also provides important implications within the Turkish context. Recent studies in Türkiye have highlighted the relationship between body image, eating behaviors, and obesity (Pehlivan et al., 2025). The prevalence of EDs in Türkiye is reported to be similar to global rates (Deveci, 2020). Considering the global increase in EDs, the importance of research on body image, one of the major risk factors, becomes more evident. The Turkish form of the BI-AAQ, as a problem-specific measure of psychological flexibility, can make a valuable contribution to future research on obesity and EDs in Türkiye.

The current study extends the literature on BIF while having some limitations. First, the study does not have a homogeneous sample (e.g., the majority of the sample is women), which could limit the findings. Second, the sampling technique used may can limit the findings. Although snowball sampling enhances participation through connections, its non-probability nature limits the findings' generalizability.

In addition, the potential influence of cultural differences and translation issues, a common limitation of adaptation studies, should be considered. Finally, while the findings regarding the mediating role of OCPB are consistent with the theoretical framework, their practical implications must be investigated.

CONCLUSION

Overall, this study confirms the factor structure and psychometric properties of the Turkish version of the BI-AAQ. Additionally, this study extends the literature on BIF by demonstrating the role of BIF in the relationship between OCPB and disordered eating.

Ethics Committee Approval: This study was approved by the School of Humanities and Social Sciences at Ibn Haldun University Ethic Committee (No: 2023/08-04; Date: 15.12.2023).

Informed Consent: Informed consent was obtained from 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 – HTK, MÖ, ESN; Design – HTK, ESN; Supervision – HTK, MÖ; Data Collection and/or Processing – ESN; Analysis and/or Interpretation – HTK, ESN; Literature Review – ESN; Writing – ESN; Critical Review – HTK, MÖ.

Peer-review: Externally peer-reviewed.

REFERENCES

Akdemir, A., İnandı, T., Akbaş, D., Karaoğlan Kahiloğulları, A., Eren, M., & Canpolat, B. I. (2012). Validity and reliability of the Turkish version of the Body Shape Questionnaire among female high school students: Preliminary examination. *European Eating Disorders Review, 20*(1), e114–e115.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.

Bluett, E. J., Lee, E. B., Simone, M., Lockhart, G., Twohig, M. P., Lensegrav-Benson, T., & Quakenbush-Roberts, B. (2016). The role of body image psychological flexibility on the treatment of eating disorders in a residential facility. *Eating Behaviors, 23*, 150–155.

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. C., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire—II: A revised measure of psychological flexibility and acceptance. *Behavior Therapy, 42*, 676–688.

Butler, A. C., Beck, A. T., & Cohen, L. H. (2007). The Personality Belief Questionnaire–Short Form: Development and preliminary findings. *Cognitive Therapy and Research, 31*, 357–370.

Butryn, M. L., Juarascio, A., Shaw, J., Kerrigan, S. G., Clark, V., O'Planick, A. O., & Forman, E. M. (2013). Mindfulness and its relationship with eating disorders symptomatology in women receiving residential treatment. *Eating Behaviors, 14*, 13–16.

Büyüköztürk, Ş. (2018). *Sosyal bilimler için veri analizi el kitabı: İstatistik, araştırma deseni, SPSS uygulamaları ve yorum* (24. baskı). Pegem Akademi.

Cassin, S. E., & Ranson, K. M. (2005). Personality and eating disorders: A decade in review. *Clinical Psychology Review, 25*, 895–916.

Cooper, P. J., Taylor, M. J., Cooper, Z., & Fairburn, C. G. (1987). The development and validation of the Body Shape Questionnaire. *International Journal of Eating Disorders, 6*, 485–494.

Deveci, E. (2020). *Üniversite öğrencilerinde yeme bozukluğunun görülme sıklığı ve psikososyokültürel yordayıcıları: İstanbul örneklemi* (Doctoral dissertation). İstanbul University.

Fairburn, C. G., & Cooper, Z. (1993). The eating disorder examination. In C. G. Fairburn & G. T. Wilson (Eds.), *Binge eating: Nature, assessment and treatment* (pp. 317–360). Guilford Press.

Ferreira, C., Pinto-Gouveia, J., & Duarte, C. (2011). The validation of the Body Image Acceptance and Action Questionnaire: Exploring the moderator effect of acceptance on disordered eating. *International Journal of Psychology and Psychological Therapy, 11*, 327–345.

Ferreira, C., Trindade, I. A., & Martinho, A. (2016). Explaining rigid dieting in normal-weight women: The key role of body image inflexibility. *Eating and Weight Disorders—Studies on Anorexia, Bulimia and Obesity, 21*(1), 49–56.

Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). SAGE Publications.

Grogan, S. (2017). *Body image: Understanding body dissatisfaction in men, women, and children* (3rd ed.). Routledge.

Hayes, S. C., Strosahl, K., Wilson, K. G., Bissett, R. T., Pistorello, J., Toarmino, D., Polusny, M. A., Dykstra, T. A., Batten, S. V., Bergan, J., Stewart, S. H., Zvolensky, M. J., Eifert, G. H., Bond, F. W., Forsyth, J. P., Karekla, M., & McCurry, S. M. (2004). Measuring Experiential Avoidance: A Preliminary Test of a Working Model. *The Psychological Record, 54*(4), 553–578.

He, J., Cai, Z., Chen, X., Lu, T., & Fan, X. (2021). Validation of the Chinese version of the Body Image Acceptance and Action Questionnaire and the mediating role of body image flexibility in the relationship between body dissatisfaction and psychological distress. *Behavior Therapy, 52*(3), 539–551.

Izaadi, A., Karimi, J., & Rahmani, M. (2013). Psychometric analysis of Persian version of Body Image Flexibility Questionnaire (BI-AAQ) among university students. *Journal of Hayat, 19*, 56–69.

Juli, R., Juli, M. R., Juli, G., & Juli, L. (2023). Eating disorders and psychiatric comorbidity. *Psychiatria Danubina, 35*(Suppl. 2), 217–220.

Kelly, A. C., Vimalakanthan, K., & Miller, K. E. (2014). Self-compassion moderates the relationship between body mass index and both eating disorder pathology and body image flexibility. *Body Image, 11*, 446–453.

Kline, P. (1999). *The handbook of psychological testing* (2nd ed.). Routledge.

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed). Guilford Press.

Lee, E. B., Smith, B. M., Twohig, M. P., Lensegrav-Benson, T., & Quakenbush-Roberts, B. (2017). Assessment of the Body

Image-Acceptance and Action Questionnaire in a female residential eating disorder treatment facility. *Journal of Contextual Behavioral Science, 6*, 21–28.

Linardon, J., Anderson, C., Messer, M., Rodgers, R. F., & Fuller-Tyszkiewicz, M. (2021). Body image flexibility and its correlates: A meta-analysis. *Body Image, 37*, 188–203.

Lucena-Santos, P., Carvalho, S. A., da Silva Oliveira, M., & Pinto-Gouveia, J. (2017). Body-image acceptance and action questionnaire: Its deleterious influence on binge eating and psychometric validation. *International Journal of Clinical and Health Psychology, 17*(2), 151–160.

Marañón, I., Echeburúa, E., & Grijalvo, J. (2004). Prevalence of personality disorders in patients with eating disorders: A pilot study using the IPDE. *European Eating Disorders Review, 12*, 217–222.

McLean, S. A., & Paxton, S. J. (2019). Body image in the context of eating disorders. *Psychiatric Clinics of North America, 42*(1), 145–156.

Mendes, A. L., Coimbra, M., Canavarro, M. C., & Ferreira, C. (2022). The powerful effect of body image inflexibility on the explanation of eating psychopathology severity. *Eating and Weight Disorders—Studies on Anorexia, Bulimia and Obesity, 27*(3), 961–968.

Merwin, R. M., Nikolaou, P., Moskovich, A. A., Babyak, M., Smith, P. J., & Karekla, M. (2023). Change in body image flexibility and correspondence with outcomes in a digital early intervention for eating disorders based on acceptance and commitment therapy. *Body Image, 44*, 131–135.

Pehlivan, M., Denkçi, N., Pehlivan, R., Çakır, M., & Mercan, Y. (2025). The relationship between body image and nutritional behaviors in adult individuals. *PLOS ONE, 20*.

Pellizzer, M. L., Waller, G., & Wade, T. D. (2018). Body image flexibility: A predictor and moderator of outcome in transdiagnostic outpatient eating disorder treatment. *International Journal of Eating Disorders, 51*(4), 368–372.

Perey, I., & Koenigstorfer, J. (2020). Appearance comparisons and eating pathology: A moderated serial mediation analysis exploring body image flexibility and body appreciation as mediators and self-compassion as moderator. *Body Image, 35*, 255–264.

Sandoz, E. K., & DuFrene, T. (2014). *Living with your body and other things you hate: How to let go of your struggle with body image using acceptance and commitment therapy*. New Harbinger Publications.

Sandoz, E. K., Webb, J. B., Rogers, C. B., & Squyres, E. (2019). Body image flexibility. In T. L. Tylka & N. Piran (Eds.), *Handbook of positive body image and embodiment* (pp. 42–51). Oxford University Press.

Sandoz, E. K., Wilson, K. G., Merwin, R. M., & Kellum, K. K. (2013). Assessment of body image flexibility: The Body Image-Acceptance and Action Questionnaire. *Journal of Contextual Behavioral Science, 2*(1–2), 39–48.

Sansone, R., Levitt, J., & Sansone, L. (2004). The prevalence of personality disorders among those with eating disorders. *Eating Disorders, 13*, 7–21.

Shi, D., Maydeu-Olivares, A., & Rosseel, Y. (2019). Assessing fit in ordinal factor analysis models: SRMR vs. RMSEA. *Structural Equation Modeling: A Multidisciplinary Journal, 27*(1), 1–15.

Stice, E. (2002). Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychological Bulletin, 128*(5), 825–848.

Stice, E., & Shaw, H. E. (2002). Role of body dissatisfaction in the onset and maintenance of eating pathology: A synthesis of research findings. *Journal of Psychosomatic Research, 53*(5), 985–993.

Taymur, İ., Türkçapar, M. H., Örsel, S., Sargın, E., & Akkoyunlu, S. (2011). Validity and reliability of the Turkish version of the personality belief questionnaire- short form (PBQ-STF) in the university students. *Klinik Psikiyatri, 14*, 199–209. [Article in Turkish]

Timko, C. A., Juarascio, A. S., Martin, L. M., Faherty, A., & Kalodner, C. (2014). Body image avoidance: An under-explored yet important factor in the relationship between body image dissatisfaction and disordered eating. *Journal of Contextual Behavioral Science, 3*(3), 203–211.

Türkçapar, M. H., Örsel, S., Uğurlu, M., Sargın, E., Turhan, M., Akkoyunlu, S., & Karakaş, G. (2007). Reliability and validity of the Turkish version of the Personality Beliefs Questionnaire (PBQ). *Klinik Psikiyatri, 10*, 177–191. [Article in Turkish]

Wendell, J. W., Masuda, A., & Le, J. K. (2012). The role of body image flexibility in the relationship between disordered eating cognitions and disordered eating symptoms among non-clinical college students. *Eating Behaviors, 13*(3), 240–245.

Yavuz, F., Ulusoy, S., Işkın, M., Esen, F. B., Burhan, H. S., Karadere, M. E., & Yavuz, N. (2016). Turkish version of Acceptance and Action Questionnaire-II (AAQ-II): A reliability and validity analysis in clinical and non-clinical samples. *Klinik Psikofarmakoloji Bülteni—Bulletin of Clinical Psychopharmacology, 26*(4), 397–408.

Yücel, B., Polat, A., İkiz, T., Düşgör, B. P., Yavuz, A. E., & Sertel Berk, Ö. (2011). The Turkish version of the Eating Disorder Examination Questionnaire: Reliability and validity in adolescents. *European Eating Disorders Review, 19*(6), 509–511.

Appendix 1. Beden İmajı- Kabul ve Eylem Formu (Bİ- KEF)

Yönerge: Aşağıda bir dizi ifade bulunmaktadır. Lütfen her bir ifadenin sizin için doğruluğunu derecelendiriniz. Seçimlerinizi yapmak için aşağıdaki derecelendirme ölçeğini kullanınız. Örneğin, bir ifadenin 'Her Zaman Doğru' olduğuna inanıyorsanız, o ifadenin yanına 7 yazınız.

Hiçbir zaman doğru değil	Çok nadiren doğru	Nadiren doğru	Bazen doğru	Sıklıkla doğru	Neredeyse her zaman doğru	Her zaman doğru

_____1. Kilom hakkında endişelenmek, istediğim bir hayat yaşamamı zorlaştırıyor.
_____2. Kilomu ve vücut şeklimi gereğinden fazla önemserim.
_____3. Vücut şeklim veya kilom hakkında kötü hissettiğimde kendimi kapatırım.
_____4. Hayatımda önemli adımlar atabilmem için vücut şeklim ve kilom hakkındaki düşünce ve duygularım değişmelidir
_____5. Vücudum hakkında endişelenmek çok fazla zamanımı alıyor.
_____6. Kendimi şişman hissetmeye başlarsam başka bir şey düşünmeye çalışırım.
_____7. Önemli bir plan yapabilmem için vücudum hakkında daha iyi hissetmem gerekir.
_____8. Vücudumla ilgili olumsuz düşüncelerimi kontrol edebilirsem, hayatımı da daha iyi kontrol edebilirim.
_____9. Hayatımı kontrol etmek için kilomu kontrolümde tutmam gerekir.
_____10. Şişman hissetmek hayatımda problemlere neden oluyor.
_____11. Bedenimin şekli ve boyutu hakkında düşünmeye başladığımda başka bir şey yapmak zor oluyor.
_____12. Kilom ve/veya vücut şeklim beni rahatsız etmeseydi ilişkilerim daha iyi olurdu.

Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi
Journal of Cognitive-Behavioral Psychotherapy and Research
DOI: 10.14744/JCBPR.2026.77629
J Cogn Behav Psychother Res 2026;15(1):23–33

Use of Metaphors in Cognitive Behavioral Therapy: A Systematic Review

İlayda Atıcı,[1] Merve Yeşiloğlu,[2] Bahar Mete Otlu[3]

[1]PhD Candidate, Department of Psychological Counseling and Guidance, Dokuz Eylül University, Buca Faculty of Education, İzmir, Türkiye
[2]MA Student, Department of Psychological Counseling and Guidance, Dokuz Eylül University Buca Faculty of Education, İzmir, Türkiye
[3]Assistant Professor, Department of Psychological Counseling and Guidance, Dokuz Eylül University, Buca Faculty of Education, İzmir, Türkiye

ABSTRACT

Cognitive behavioral therapy (CBT) is a well-established psychotherapeutic approach aimed at modifying maladaptive cognitive and behavioral patterns. In CBT, metaphors play a particularly important role in explaining core techniques, such as psychoeducation, cognitive restructuring, and exposure. Because psychotherapy is predominantly language-driven, examining the role and effectiveness of metaphors in CBT is essential for understanding therapeutic processes and their potential contribution to patient engagement and treatment outcomes. This study aimed to investigate the role of metaphors in the therapeutic process of CBT by focusing on studies published between 2000 and 2025. Nine studies (n=267; M=39.5 years; 69.3% female) that met the inclusion criteria were analyzed. Following the PRISMA guidelines, a comprehensive search was conducted in December 2025 across multiple databases, such as Web of Science and PubMed, with the keyword "metaphors in CBT" and related terms. The review included randomized and non-randomized studies employing CBT-based interventions incorporating metaphors, and reviews and studies with insufficient data were excluded. Methodological quality and risk of bias were assessed using design-appropriate criteria. The findings suggest that metaphors function as effective therapeutic tools by aiding patients in expressing complex emotions, understanding cognitive processes, facilitating cognitive restructuring, enhancing motivation, and fostering the therapeutic alliance across diverse clinical populations, including individuals with autism spectrum conditions, obsessive-compulsive disorder (OCD), and chronic pain, as well as those participating in group therapy settings. However, their effective use requires careful attention to timing, cultural context, and cognitive levels, and therapists need training to apply them intentionally and prevent misinterpretation. The limitations of this study include small sample sizes, heterogeneous participants, lack of control groups, short follow-up periods, and challenges in defining metaphors, which limit the generalizability and clinical applicability of the findings.

Keywords: CBT, cognitive behavioral therapy interventions, metaphors in psychotherapy.

ÖZ

Bilişsel Davranışçı Terapide Metaforların Kullanımı: Sistematik Bir İnceleme

Bilişsel davranışçı terapi (BDT), uyum bozucu bilişsel ve davranışsal örüntülerin değiştirilmesini amaçlayan, iyi yapılandırılmış ve yaygın olarak kullanılan bir psikoterapi yaklaşımıdır. Bu yaklaşımda metaforlar; psikoeğitim, bilişsel yeniden yapılandırma ve maruz bırakma gibi temel tekniklerin açıklanmasında özellikle önemli bir rol oynamaktadır. Psikoterapinin büyük ölçüde dile dayalı bir süreç olması nedeniyle BDT'de metaforların rolünün ve etkililiğinin incelenmesi; terapötik süreçlerin anlaşılması ve metaforların danışan

Cite this article as:
Atıcı İ, Yeşiloğlu M, Mete Otlu B. Use of Metaphors in Cognitive Behavioral Therapy: A Systematic Review. J Cogn Behav Psychother Res 2026;15(1):23–33.

Address for correspondence:
İlayda Atıcı.
Dokuz Eylül Üniversitesi, Buca Eğitim Fakültesi, Rehberlik ve Psikolojik Danışmanlık Anabilim Dalı, İzmir, Türkiye
Phone: +90 232 301 20 96
E-mail:
i.atici@ogr.deu.edu.tr

Submitted: 09.09.2025
Revised: 19.01.2026
Accepted: 12.02.2026
Available Online: 27.02.2026

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

katılımı ile tedavi çıktıları üzerindeki olası katkılarının değerlendirilmesi açısından önem taşımaktadır. Bu çalışmanın amacı, 2000-2025 yılları arasında yayımlanan ve dahil edilme ölçütlerini karşılayan 9 çalışmayı (n=267; yaş ortalaması=39,5; %69,3'ü kadın) inceleyerek, BDT'nin terapötik sürecinde metaforların rolünü araştırmaktır. PRISMA rehberi doğrultusunda, Aralık 2025'te Web of Science ve PubMed gibi birden fazla veri tabanında "BDT'de metaforlar" anahtar sözcüğü ve ilişkili terimler kullanılarak kapsamlı bir literatür taraması yapıldı. İncelemeye, metaforları içeren BDT temelli müdahaleleri kullanan randomize ve randomize olmayan çalışmalar dahil edildi; derleme makaleler ve yeterli veri içermeyen çalışmalar dışlandı. Metodolojik kalite ve yanlılık riski, araştırma desenine uygun ölçütler kullanılarak değerlendirildi. Bulgular, metaforların; danışanların karmaşık duyguları ifade etmelerine yardımcı olma, bilişsel süreçleri anlamayı kolaylaştırma, bilişsel yeniden yapılandırmayı destekleme, motivasyonu artırma ve terapötik ittifakı güçlendirme gibi işlevler aracılığıyla etkili terapötik araçlar olarak kullanıldığını göstermektedir. Bu etkiler; otizm spektrum özellikleri olan bireyler, obsesif kompulsif bozukluk ve kronik ağrı yaşayan bireyler ile grup terapisi uygulamaları dahil olmak üzere çeşitli klinik örneklemlerde gözlendi. Bununla birlikte, metaforların etkili biçimde kullanılabilmesi; zamanlama, kültürel bağlam ve danışanların bilişsel düzeyleri gibi unsurlara dikkat edilmesini gerektirmekte; terapistlerin metaforları bilinçli biçimde uygulayabilmeleri ve yanlış yorumlamaları önleyebilmeleri için özel bir eğitim almaları önem arz etmektedir. Çalışmaların sınırlılıkları arasında küçük örneklem büyüklükleri, heterojen katılımcı grupları, kontrol gruplarının bulunmaması, kısa izlem süreleri ve metafor kavramının tanımlanmasına ilişkin güçlükler yer almakta olup, bu durum bulguların genellenebilirliğini ve klinik uygulanabilirliğini sınırlamaktadır.

Anahtar Kelimeler: Bilişsel davranışçı terapi, bilişsel davranışçı terapi müdahaleleri, psikoterapide metafor.

INTRODUCTION

Cognitive behavioral therapy (CBT) is a widely used psychotherapeutic approach aimed at identifying and modifying maladaptive cognitions that contribute to emotional distress and dysfunctional behavior. In this regard, it addresses avoidance behaviors and enhances coping strategies to manage stress and improve emotional regulation (Nakao et al., 2021). Since psychotherapy approaches, including CBT, are largely language-based, the therapeutic relationship between the client and therapist, which relies on verbal communication, plays a critical role in the process. In fact, strengthening verbal communication has been shown to positively influence the therapeutic relationship (Bryant et al., 1998; Yu et al., 2022). In this context, metaphorical language has been increasingly recognized as an effective means of enhancing verbal communication and facilitating clients' understanding of the therapeutic process (Karaırmak & Güloğlu, 2012; Malkomsen et al., 2022). Additionally, metaphors have been found to support the development of the therapeutic relationship, symbolize experiences addressed in psychotherapy, facilitate emotional engagement, clarify ambiguous issues in therapy, enable confrontation and concrete action, identify areas of client resistance, and contribute to problem-solving and coping processes (Lyddon et al., 2001). However, despite their growing use, the systematic examination of metaphors in CBT, especially their link to clinical outcomes, such as symptom reduction and treatment adherence, remains underexplored. Existing studies are fragmented, and a comprehensive synthesis that evaluates their effectiveness across various clinical populations is lacking. This review aims to clarify the role of metaphors in CBT and provide guidance for therapists on how to use metaphors more intentionally and effectively in clinical practice by addressing these gaps.

Metaphors can serve as useful tools in CBT sessions for providing a therapeutic framework, introducing the cognitive model, explaining biased interpretations, and illustrating concepts such as automatic thoughts, intermediate beliefs, and core beliefs (Pištof & Şanlı, 2013). By concretizing abstract concepts, they help patients better understand their conditions and treatment strategies, particularly during psychoeducation (Malkomsen et al., 2021; Nagaoka et al., 2015). As a result, metaphors may increase CBT adherence, in which the restructuring of distorted cognition constitutes one of the primary aims (Dures et al., 2012). By offering new perspectives and reducing cognitive rigidity, metaphors can facilitate both cognitive restructuring and behavioral change. Metaphorical content integrated into CBT may provide an alternative or supplementary approach in conditions such as OCD (Madaan et al., 2023).

The early 2000s corresponded to a period during which CBT reached greater technical maturity, characterized by the widespread use of structured treatment protocols and the expansion of therapeutic techniques (Beck, 2011). During

this period, metaphors, imagery, and experiential techniques began to be addressed more systematically as therapeutic tools that facilitate clients' understanding and internalization of cognitive concepts. Accordingly, this review focuses on studies published between 2000 and 2025.

Given their potential to strengthen the therapeutic relationship, enhance treatment effectiveness, and support clients' understanding of complex psychological processes, examining the use of metaphors in CBT is of considerable importance. Despite the recognized clinical relevance of metaphors in CBT, no systematic review has comprehensively synthesized empirical studies on their use and effectiveness within CBT frameworks. Therefore, this study aims to investigate the role of metaphors in the therapeutic process of CBT, focusing on studies published between 2000 and 2025. Specifically, the review seeks to synthesize evidence on how metaphors contribute to clinical outcomes, such as symptom reduction, patient engagement, treatment adherence, and cognitive restructuring, and to clarify how these functions can enhance the effectiveness of CBT across various clinical populations.

METHODS

Research Design

This systematic review examines empirical research on the use of metaphors within the CBT process. The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, which provide a comprehensive and structured framework for conducting and reporting systematic reviews and meta-analyses (Page et al., 2021). Given the heterogeneity of study designs, outcome measures, and research aims across the included studies, a narrative synthesis approach was adopted to integrate and interpret the findings (Popay et al., 2006). The Web of Science, ScienceDirect, Scopus, PubMed, Cochrane Library, and TR Dizin databases were systematically searched for this review. A literature search was conducted in December 2025. Eligibility was determined based on the predefined inclusion and exclusion criteria described in the following section.

Inclusion and Exclusion Criteria

Studies that met the following criteria were included in the review:

(1) were conducted within clinical or health-related disciplines, including Psychology, Psychiatry, Clinical Medicine, or Social Work,

(2) were published between 2000 and 2025,

(3) were available as open-access with full-text accessibility,

(4) explicitly addressed the therapeutic use of metaphors within the CBT process,

(5) were empirical studies that employed quantitative, qualitative, or mixed-methods designs, and

(6) were published in either English or Turkish.

Studies were excluded from the review if they:

(1) were focused on disciplines unrelated to clinical, behavioral, or health sciences (e.g., purely technical or industrial fields),

(2) were published before 2000,

(3) were not available as open-access or did not provide full-text access,

(4) did not explicitly address the use of metaphors as a therapeutic technique within the CBT process.

(5) were non-empirical (e.g., review articles, theoretical papers, editorials, commentaries, or conference abstracts), or

(6) were published in languages other than English or Turkish.

Search Strategy

A literature search was conducted using Boolean operators (AND/OR). For English-language databases, the following key terms were employed: "cognitive behavioral therapy," "cognitive behavior therapy," and "CBT" in combination with "metaphor," "therapeutic metaphor," "figurative language," and "analogy." For Turkish-language publications indexed in the same databases, the corresponding Turkish equivalents were used: "bilişsel davranışçı terapi," "BDT" in combination with "metafor," "terapötik metafor," and "analoji."

Study Selection Criteria and Process

The study selection process for this systematic review focused on research addressing the use of metaphors within the CBT framework. Given the limited number of experimental studies employing random assignment and control groups in this field, the scope was broadened to include both randomized and non-randomized studies, regardless of the presence of a control group. Review articles and studies providing insufficient data or exhibiting methodological inadequacies were excluded to maintain analytical rigor.

Following initial database searches, 4.244 records were identified. The screening process was conducted in two distinct stages. In the first stage, two reviewers independently screened all retrieved records based on their titles and abstracts. Studies that were clearly unrelated to metaphor use within the CBT process were excluded at this juncture. In the second stage, the full texts of the remaining studies were retrieved and independently assessed for final eligibility by the same two reviewers. The assessment was strictly based on the predefined inclusion and exclusion criteria described in the previous section.

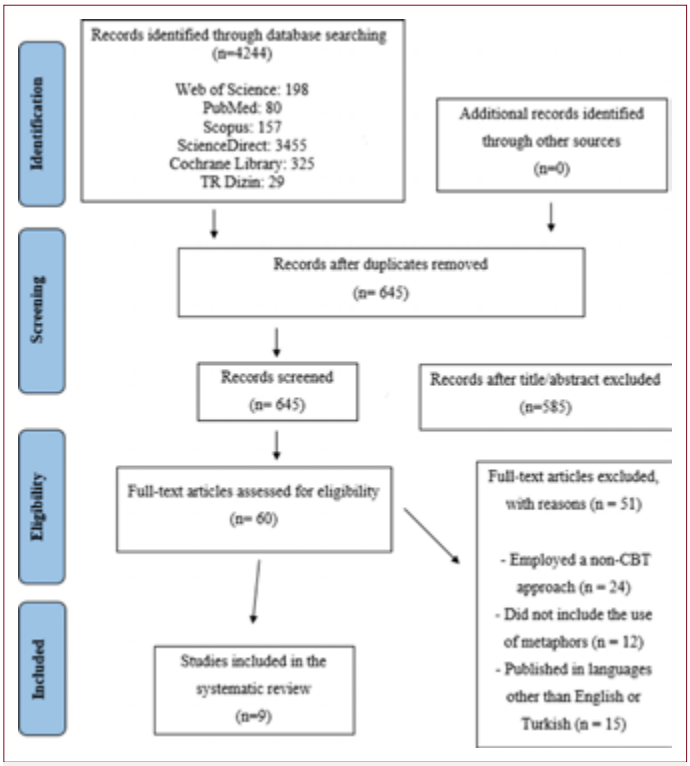

Figure 1. PRISMA flow diagram.

Disagreements at the title/abstract screening and full-text assessment stages were resolved through discussion and consensus. A third senior reviewer was consulted in cases where consensus could not be reached. Nine studies met all inclusion criteria and were incorporated into the final analysis. This selection process adhered strictly to the Preferred Reporting Items for Systematic Reviews (PRISMA) flow diagram (Fig. 1), ensuring methodological transparency and reproducibility.

Data Collection and Analysis Process

The keyword-based searches identified 198 studies in Web of Science, 3.455 in ScienceDirect, 157 in Scopus, 80 in PubMed, 325 in the Cochrane Library, and 29 in TR Dizin, totaling 4.244 studies. The remaining studies were assessed according to the inclusion criteria, and 9 studies meeting the criteria were analyzed for the final review. To maintain analytical rigor, review articles, dissertations, and conference proceedings were excluded. Data extraction was performed using a standardized form, including the following variables: author, year, country, sample characteristics, therapeutic aim, methodology, and key findings.

Risk of Bias and Quality Assessment

The methodological quality of the included studies was assessed using design-appropriate critical appraisal tools. The Cochrane Risk of Bias Tool 2 (RoB 2) was applied to the randomized controlled trial (Sterne et al., 2019). Quasi-experimental studies, including single-group pre–post intervention designs, were evaluated using the Joanna Briggs Institute Critical Appraisal Checklist for Quasi-Experimental Studies (Aromataris et al., 2024). The JBI Critical Appraisal Checklist for Qualitative Research was used to assess qualitative studies, and the JBI Critical Appraisal Checklist for Case Reports was used to evaluate the case report (Aromataris et al., 2024). Two reviewers independently assessed all included studies, and any disagreements were resolved through discussion to reach a consensus. The results of the quality assessment are presented in Table 1.

Ethical Considerations

This study is based solely on open-access and publicly available publications; therefore, ethics committee approval was not required. Ethical principles were rigorously observed throughout the research process.

RESULTS

Study Characteristics

Nine research articles meeting the inclusion criteria were selected and examined in detail. The included studies were summarized according to author, year, country, sample characteristics, research aim, methodological design, and main findings. An overview of the study characteristics is presented in Table 2.

The included studies employed qualitative, quantitative, and mixed-methods designs to examine the use and impact of metaphors in psychotherapy. Most studies adopted qualitative or mixed-methods approaches (De Nicola et al., 2024; Dures et al., 2012; Malkomsen et al., 2021; Mathieson et al., 2016; Mathieson et al., 2018; Rigby & Waite, 2006), primarily using semi-structured interviews and content or thematic analyses to explore therapists' and patients' experiences with metaphor use in depth.

The studies demonstrated substantial diversity in sample characteristics and clinical focus areas. Patients included individuals experiencing chronic pain (De Nicola et al., 2024), rheumatoid arthritis–related fatigue (Dures et al., 2012), OCD (Madaan et al., 2023; Samantaray et al., 2019), and depression (Malkomsen et al., 2021; Nagaoka et al., 2015). Metaphors were reported as central elements through which patients described their symptoms, therapeutic experiences, and perceived processes of change across these studies. For example, individuals with chronic pain frequently used metaphors to describe the nature and persistence of pain (De Nicola et al., 2024), whereas patients with depression used metaphors related to depth, clarity, and movement (e.g., "journeying from darkness to light") to articulate their therapeutic experiences (Malkomsen

Table 1. Studies on the use of CBT metaphors

Author and year	Country	Design type	Sample	Aim	Method	Results
Rigby & Waite (2006)	United Kingdom	Quasi-experimental (single-group pre-test/post-test)	n=72 (70% female)	To examine the effectiveness of metaphor-based and other creative techniques in cognitive behavioral therapy (CBT) group therapy for low self-esteem.	Quantitative self-esteem, anxiety, and depression assessments were conducted.	Metaphors and other creative approaches were used to support clients' understanding of cognitive processes.
Dures et al. (2012)	England	Qualitative study (FGD)	n=38 (30 females and 8 males)	To evaluate CBT group interventions incorporating metaphors for RA-associated fatigue.	Focus group interviews were conducted, and data were thematically analyzed.	The findings suggested that metaphors increased client awareness and supported behavior change during the CBT program.
Nagaoka et al. (2015)	Japan	Randomized controlled trial	n=146 (72% female; M age=19.45)	To evaluate metaphor use in cognitive behavioral therapy psychoeducation for depression in autistic traits.	Participants received psychoeducation programs, and their experiences were evaluated using standardized measures.	The use of metaphors was associated with increased client awareness, positive impressions, and support engagement with the therapeutic material.
Mathieson et al. (2018)	New Zealand	Quasi-experimental (single-group pre-test) (post-test)	n=12 (91% female; age range 36–40; M age=45)	To examine whether metaphor use training therapists influences their application in CBT case formulations.	The therapists completed self-report assessments before and after training.	After training, the therapists reported that they used metaphors more consciously in case conceptualization.
Samantaray et al. (2019)	India	Clinical case report (single case design)	n=1 (male, 25 years)	To describe the use of metaphors in CBT in a single case study.	A single case underwent a 4-week CBT intervention incorporating metaphors.	Symptoms of OCD decreased at post-treatment and follow-up, while quality-of-life scores increased.
Malkomsen et al. (2021)	Norway	Qualitative interview study using metaphor-led discourse analysis	n=22 (68% female; age range, 22–48 years)	To examine metaphor use in patients with major depressive disorder undergoing PDT or CBT.	Clients participated in the semi-structured interviews.	Metaphors allowed clients to convey nuances of therapeutic experiences that were difficult to express literally.
Malkomsen et al. (2022)	Norway	Qualitative thematic analysis (therapist perspectives)	n=10 (90% female; age range, 40–60 years)	To examine therapists' use of metaphors and their responses to patient metaphors in the treatment of MDD.	Semi-structured interviews were conducted with psychodynamic and CBT therapists.	PDT therapists focused more on client-generated metaphors, whereas CBT therapists emphasized therapist-generated metaphors.
Madaan et al. (2023)	India	Quasi-experimental (pilot single-group pre-test) (post-test)	n=10	To describe a treatment method integrating cognitive behavioral therapy, neuropsychoeducation, intrinsic motivation, and metaphoric content for patients with OCD.	Ten individuals with OCD participated in a 12-week metaphor-integrated treatment program.	The integrated treatment was found to be effective in treating OCD.
De Nicola et al. (2024)	England	Qualitative study (exploratory ınterviews)	n=10 (8 females, 2 males; age range, 25–71 years)	To examine how individuals with chronic pain describe their experiences using metaphors.	A qualitative study was conducted using semi-structured online interviews.	The participants used metaphorical imagery to describe their experiences of chronic pain.

Table 2. Risk of bias assessment of ıncluded studies

Author and year	Study design	Data collection/analysis	Critical appraisal tool	Overall quality
Rigby & Waite (2006)	Quasi-experimental (one-group pre-post)	RSE & HADS Scales (quantitative)	JBI quasi-experimental	Moderate
Dures et al. (2012)	Qualitative (nested in the RCT)	Focus groups and thematic analysis	JBI qualitative	Moderate
Nagaoka et al. (2015)	Randomized controlled trial (RCT)	Survey (quantitative) / factor analysis	Cochrane RoB 2	Some concerns
Mathieson et al. (2018)	Quasi-experimental Intervention	Self-Report Scales & reflection	JBI quasi-experimental	Low
Samantaray et al. (2019)	Case report	Clinical observation & Y-BOCS	JBI case report	Low
Malkomsen et al. (2021)	Qualitative study	Semi-structured ınterviews / discourse analysis	JBI qualitative	Moderate
Malkomsen et al. (2022)	Qualitative study	Semi-structured ınterviews and thematic analysis	JBI qualitative	Moderate
Madaan et al. (2023)	Quasi-experimental study (pilot study)	One-group pre-post (Y-BOCS)	JBI quasi-experimental	Moderate
De Nicola et al. (2024)	Qualitative study	Semi-structured ınterviews and thematic analysis	JBI qualitative	Moderate

et al., 2021). In addition, patients experiencing rheumatoid arthritis–related fatigue reported that metaphor use supported behavioral adaptation and coping (Dures et al., 2012).

In addition to patient-focused samples, several studies explored therapists' perspectives to provide a more comprehensive understanding of metaphor use within therapeutic contexts. For instance, Malkomsen et al. (2022) interviewed 10 therapists (9 females, 1 male; aged 40–60 years) regarding their experiences with metaphor use in therapy. Similarly, Mathieson et al. (2018) examined 12 clinical psychologists (11 females, 1 male; mean age=45 years; mean clinical experience=13.1 years) who received metaphor-focused CBT training.

Methodological Quality of Included Studies

The methodological quality of the included studies was assessed using design-appropriate appraisal tools, with detailed results presented in Table 1. Overall, variability in methodological quality was observed, reflecting differences in study designs and experimental control levels.

Quantitative Studies: The quantitative evidence was limited by the small number of randomized controlled trials. The single RCT included in this review (Nagaoka et al., 2015), assessed using the Cochrane RoB 2 tool, was judged to present some concerns regarding the risk of bias. Although random assignment was reported, information on allocation concealment was limited, and participant blinding was not feasible due to the nature of the psychoeducational intervention.

The three quasi-experimental studies (Rigby & Waite, 2006; Mathieson et al., 2018; Madaan et al., 2023), evaluated using the JBI Critical Appraisal Checklist, shared a common methodological limitation in the absence of a control group, as all employed single-group pre-test/post-test designs. Rigby and Waite (2006) and Madaan et al. (2023) used standardized outcome measures, including the Rosenberg Self-Esteem Scale (RSE), the Hospital Anxiety and Depression Scale (HADS), and the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS), whereas Mathieson et al. (2018) relied on study-specific self-report ratings developed for the training context, which resulted in a lower methodological quality rating.

Qualitative and Case Studies: Qualitative studies (Dures et al., 2012; Malkomsen et al., 2021; Malkomsen et al., 2022; De Nicola et al., 2024) assessed using the JBI Qualitative Checklist were generally rated as having moderate methodological quality. These studies reported their data collection and analysis procedures (e.g., thematic or discourse analysis) in a transparent manner and described the reflexivity of researchers. The single case report (Samantaray et al., 2019) provided a detailed description of the intervention but, by design, represents evidence with limited generalizability.

Main Findings on Metaphor Use in Therapy

The use of metaphors was reported in relation to several therapeutic processes across the included studies. Metaphor use was associated with the concretization of abstract concepts, increased emotional engagement, and support for patients' understanding of cognitive and behavioral processes. Metaphors also appeared within the therapeutic relationship, particularly in relation to communication and shared understanding between therapists and patients (Malkomsen et al., 2022).

Metaphors were most frequently reported in the context of psychoeducation and the explanation of therapeutic concepts within studies focusing on CBT. The findings indicated that metaphors were used to represent complex ideas in more concrete forms, which patients reported as helpful for understanding and remembering the therapeutic material. Several studies documented associations between metaphor use and patients' reports of applying therapeutic strategies outside therapy sessions. Some studies also reported links between metaphor use and outcomes such as self-efficacy, emotional regulation, and problem-solving abilities (Dures et al., 2012; Rigby & Waite, 2006).

In clinical populations with OCD, metaphor-based explanations were used to support engagement with treatment components. Metaphors were incorporated into psychoeducational explanations and treatment rationales and were reported alongside increased motivation and participation in therapy sessions (Madaan et al., 2023). Therapists described the use of metaphors as contributing to the development of a shared language within therapy, which was reported to facilitate communication and mutual understanding (Malkomsen et al., 2022; Mathieson et al., 2018).

At the same time, several studies reported challenges related to metaphor use in therapy. Therapists described differences in their level of awareness regarding metaphors and variability in whether metaphors were used intentionally or spontaneously (Malkomsen et al., 2022). In addition, some studies noted that patients sometimes interpret metaphors in different ways and that the therapist and patient do not always share the meanings attributed to metaphors. These findings highlight the variability in metaphor interpretation and use across therapeutic contexts (Malkomsen et al., 2021).

DISCUSSION

This systematic review, which synthesized nine empirical studies examining the use of metaphors in CBT, indicates that metaphor use constitutes a meaningful and multifaceted component of psychotherapeutic processes across diverse clinical populations and therapeutic contexts. Metaphors have consistently emerged as tools that facilitate the concretization of abstract psychological experiences, enhance emotional engagement, and support patients' understanding of cognitive and behavioral processes across qualitative, quantitative, and mixed-methods studies. Metaphors contributed to the development of a shared therapeutic language, strengthened the therapeutic alliance, and promoted treatment engagement in both patient- and therapist-focused studies. At the same time, the findings suggest that the effectiveness of metaphor use depends on therapists' awareness and collaborative exploration of metaphorical meanings, highlighting its potential benefits and challenges within clinical practice.

To better understand the mechanisms underlying these findings, selective attention and emotional bonds can be considered as factor that shape cognitive processes. Capturing clients' interests by using metaphors that are closely aligned with their personal experiences and current life contexts may enhance therapeutic effectiveness. However, while metaphors offer valuable insights into clients' perspectives, their interpretation may vary depending on the cultural context and cognitive processes (Karaırmak & Güloğlu, 2012). Thus, the effectiveness of metaphors is closely associated with clients' cognitive levels, which are influenced by factors such as educational background, living conditions, and pre-existing psychological conditions. Therefore, metaphors must be introduced safely and in a controlled manner to avoid increased threat perception or resistance, thereby supporting problem-solving and cognitive restructuring (Çam & Topçu, 2021; Lakoff & Johnson, 2015).

Given that the fundamental aim of CBT is to transform "meaning," metaphors have the potential to achieve this by providing a conceptual bridge from problematic interpretations to a new perspective on experiences (Stott et al., 2010). They stand out as powerful tools in the psychotherapeutic process because of their ability to concretize complex inner experiences and abstract concepts, enrich communication, and facilitate therapeutic change. The nine studies highlighted the multifaceted presence of metaphors across diverse clinical contexts and patient populations.

Metaphors Across Clinical Contexts

Perspectives of Therapists and Clinical Implications

It can be asserted that metaphors have a strong potential to help patients understand and express their own experiences. Metaphors can be seen as useful tools that enable individuals to articulate issues they cannot fully express in everyday language. This situation paves the way for therapists to access the inner worlds of their patients (Malkomsen et al., 2021). Using metaphors as mediating tools to describe difficult issues is a method used not only by patients but also by therapists. Thus, it has been observed that metaphors are employed by therapists at twice the rate of clients (Mathieson et al., 2016). In the context of therapeutic processes, the use of metaphors by therapists to explain difficult phenomena or establish and strengthen the therapeutic relationship seems plausible. Considering that most clients are unfamiliar with psychological terminology, therapists may occasionally rely on metaphors to verbalize clients' experiences and create resonance in their minds. Moreover, it has been affirmed that utilizing creative methods, such as metaphors, in therapy plays a significant role in helping clients make sense of cognitive processes and remember therapeutic material in ways that facilitate its application (Rigby & Waite, 2006). Although research has shown that metaphors are also effective in the process of cognitive restructuring (Hu et al., 2018; Rigby & Waite, 2006), it is vital to be attentive when generalizing these results, as many findings are limited to small samples and specific cultural contexts.

Paying closer attention to the experiences of therapists, metaphors emerge as powerful communication tools and complex elements that require careful management. The results reveal that therapists' awareness of metaphor use is generally

limited, and they rarely use metaphors intentionally. They also express this deficiency with self-criticism (Malkomsen et al., 2022). Another key finding is that the use of metaphors varies by therapeutic approach: CBT therapists generally emphasize therapist-generated metaphors, whereas psychodynamic therapy (PDT) therapists tend to focus on metaphors produced by patients (Malkomsen et al., 2022). This difference is consistent with the fundamental principles of these therapeutic approaches. CBT's emphasis on psychoeducation and skills training encourages therapists to explain concepts using their own metaphors, whereas PDT's focus on exploring the inner world and unconscious processes of patients leads to a greater emphasis on patient metaphors. Moreover, therapists use metaphors for various purposes. They create conceptual bridges in the psychoeducational process by making abstract psychological concepts concrete for patients. Furthermore, metaphors can strengthen the therapeutic alliance by creating a shared language and understanding between the therapist and patient. Using patients' own metaphors allows them to feel understood (Mathieson et al., 2018). Therefore, metaphors can help patients break free from rigid thought patterns and view their problems from different perspectives. In PDT, metaphors are sometimes used as a starting point for exploring patients' defense mechanisms. Since metaphors can evoke stronger emotional responses than literal language, therapists can also use them to enhance emotional interaction (Malkomsen et al., 2022). Nevertheless, the findings also reveal that therapists experience several difficulties and conflicting feelings regarding the use of metaphors. As previously noted, metaphors are prone to misinterpretation, and some patients may be resistant to them. Moreover, it is possible that therapists have varying approaches to addressing patients' "unhelpful" or "harmful" metaphors. Some attempt to change the metaphor, while others question or reframe it (Malkomsen et al., 2022). Lastly, therapists may lack training in the deliberate use of metaphors. Mathieson et al. (2018) demonstrated that metaphor-focused CBT training could increase the awareness and confidence of therapists.

Autism

The nine studies highlight diverse methodologies and sample profiles to explore the experiences of patients with a range of clinical conditions. Regarding the contribution of metaphors to individuals with autistic traits, the findings of Nagaoka et al. (2015) challenge the traditional perception that individuals with autism struggle with understanding figurative language. The study results demonstrate that using metaphors in psychoeducation for depression can help individuals with high autistic tendencies develop a more positive perception of depression. This finding suggests that metaphors may help autistic individuals better understand abstract concepts (such as depression) and develop feelings of hope and familiarity with the therapy process. This situation demonstrates the potential of metaphors to make psychoeducational materials more accessible and effective for individuals with autism.

Obsessive-Compulsive Disorder

The findings reveal that metaphors play a crucial role in helping patients understand their complex symptoms and treatment strategies. Given that up to 30% of patients reject exposure and response prevention therapy, Madaan et al. (2023) developed an effective integrated approach combining CBT with pharmacological therapy, neuropsychoeducation, intrinsic motivation, and metaphorical content, resulting in a significant reduction in obsession and compulsion scores. This strategy appears to be quite functional as the use of appropriately adapted metaphors can reduce anxiety and boost motivation for continuing therapy, especially when pharmacotherapy is integrated for a more comprehensive effect. Another study by Samantaray et al. (2019) highlights the importance of metaphor use in OCD treatment. In a context where OCD is typically treated with CBT, which usually requires 10 or more sessions, this case report presents the success of a CBT approach involving only 4 sessions. Through metaphors, the clinical translation of the patient's problems, a 25-year-old male who had been experiencing obsessive thoughts and images for 12 months, the role of feared objects and feared consequences, the role of neutralizing and safety behaviors in maintaining feared consequences, and the importance of "exposure" are discussed. The results highlight that the use of metaphors, a "clear narrative for easier understanding, is a component behind the success of this process." In other words, metaphors play a facilitative role during the sessions in case conceptualization and in enhancing compliance with exposure exercises (Samantaray et al., 2019). Therefore, this integrated approach in the therapy room can enhance patients' intrinsic motivation to resist their obsessive thoughts and limit their compulsive behaviors, with the aid of metaphorical language that facilitates the understanding of complex biological and psychological processes.

Group Therapy

Another area in which metaphors hold the potential to be powerful tools is group therapy processes. Because the group environment offers unique dynamics that can enhance interaction, the benefits of metaphors at both individual and collective levels could be observed explicitly. Members can use metaphors when they struggle to express their own internal experiences; in this way, abstract or embarrassing experiences become more concrete and shareable (De Nicola et al., 2024; Malkomsen et al., 2021). Furthermore, metaphors can

strengthen the sense of "we," reduce feelings of loneliness, and validate members' experiences by creating a shared language within the group (Dures et al., 2012; Rigby & Waite, 2006). Additionally, in a group environment, members can learn from each other's metaphors and strategies, supporting their own behavioral changes. On the other hand, the use of metaphors by therapists, combined with guided discovery and Socratic questioning, helps members analyze their thoughts, develop new perspectives, and strengthen group cohesion through increased support and creativity (Dures et al., 2012; Rigby & Waite, 2006). Therefore, therapist guidance is essential for the effective use of metaphors. Because metaphors are open to interpretation, therapists must ensure a shared understanding. In some cases, they may need to adapt their approach, as some members may respond better to metaphorical language, while others may require more concrete expressions.

Chronic Pain

In other respects, metaphors are vital tools for patients with chronic pain to communicate the subjective and often elusive nature of pain, both to themselves and others. De Nicola et al. (2024) noted that patients with chronic pain describe their pain in intense terms, such as "stabbing" or "knees on fire," and that these metaphors help them express the pain's intensity and emotional impact. Therefore, metaphors can allow patients to conceptualize and make sense of their pain experiences while also helping therapists understand the meanings attached to their pain and intervene accordingly. Metaphorical visualizations are widely used in approaches such as acceptance and commitment therapy to help patients cope with chronic pain.

CONCLUSION

In conclusion, metaphors are indispensable tools that offer the potential to deeply connect with patients, clarify complex concepts, and foster therapeutic change within psychotherapeutic processes. Research demonstrates that when metaphors are employed at the right time and place, appropriate to the client's cognitive level, they play an effective role in helping clients make sense of the therapeutic process. Metaphors provide therapists with a roadmap for conveying complex situations to clients. In some cases, describing events with metaphorical content allows clients to restructure their understanding, enabling them to perceive problems from a different perspective. Thus, metaphorical narratives can be used across a broad range of contexts: with clients diagnosed with specific psychological conditions (e.g., autism, OCD, and bipolar disorder), with children and adolescents, in group work, and during psychoeducation. Nevertheless, therapists' effective use of metaphors requires a high level of awareness, flexibility, and training. The misinterpretation or inappropriate use of metaphors can negatively impact the therapeutic process. Therefore, it is crucial for therapists to view metaphors not simply as a technique but as a door into the inner worlds of patients and to listen carefully to the messages coming from this door.

LIMITATIONS

Limitations of the Included Studies

The limitations of the included studies primarily stem from methodological issues, sample characteristics, and generalizability. Many studies, particularly qualitative ones, had small sample sizes (De Nicola et al., 2024; Madaan et al., 2023; Malkomsen et al., 2021; Mathieson et al., 2018), which restrict the ability to generalize the findings. The recruitment of participants from specific regions or clinics further restricts generalizability. Some studies also involved heterogeneous sample, such as varying pain types in De Nicola et al. (2024), which complicate cross-group comparisons. Moreover, variations in the experience of therapists (Mathieson et al., 2018) and the reliance on self-reports, which can be prone to bias, pose further challenges. Discrepancies between the reported metaphor use and the actual practice of therapists (Malkomsen et al., 2022) and the use of unvalidated Likert scales (Mathieson et al., 2018) are also concerning.

The absence of control groups in several studies (Madaan et al., 2023; Mathieson et al., 2018) makes it difficult to discern whether the observed improvements are due to the intervention or natural recovery. In addition, short or absent follow-up periods, as in Madaan et al. (2023) and De Nicola et al. (2024), limit insights into the long-term effectiveness of interventions. The lack of clear criteria for defining metaphors (Malkomsen et al., 2022) also hinders consistent analysis.

Finally, the pilot nature of some studies and their limited context (e.g., specific training programs) raise concerns about their applicability to general clinical practice. Mathieson et al. (2018) also highlighted the challenges faced by therapists in integrating new skills and managing workload.

These limitations caution against overgeneralizing the findings and suggest important directions for future research.

Limitations of the Review

Since a limited number of studies are available on the subject, more comprehensive research is needed to determine the generalizability of the findings and the effectiveness of therapeutic approaches. Furthermore, the significant heterogeneity among the included studies suggests that conducting a meta-analysis is challenging due to methodological differences and sample diversity in studies evaluating the impact of metaphor use. Therefore, future

research should strengthen knowledge in this area by using more homogeneous samples and standardized methods. Besides, because of other constraints, such as language restrictions (e.g., studies published only in certain languages), full-text access limitations (e.g., inability to access complete articles), and open-access barriers (e.g., some studies may be behind paywalls), as well as the related risks of publication bias, this study is limited by the databases accessible to the researchers and the articles for which full access was available.

Informed Consent: Not applicable.

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

Financial Disclosure: No funding was received for the preparation, writing, or publication of this study.

Use of AI for Writing Assistance: During the preparation of this study, artificial intelligence was used solely to generate visual content for the construction of the PRISMA flow diagram.

Author Contributions: Concept – BMO; Design – İA, MY, BMO; Supervision – BMO; Analysis and/or Interpretation – İA, MY; Literature Review – İA, MY; Writing – İA, MY; Critical Review – İA, MY, BMO.

Peer-review: Externally peer-reviewed.

REFERENCES

Aromataris, E., Lockwood, C., Porritt, K., Pilla, B., & Jordan, Z. (Eds.). (2024). *JBI manual for evidence synthesis*. JBI.

Beck, J. S. (2011). *Cognitive behavior therapy: Basics and beyond* (2nd ed.). Guilford Press.

Bryant, R. A., Harvey, A. G., Dang, S. T., Sackville, T., & Basten, C. (1998). Treatment of acute stress disorder: A comparison of cognitive-behavioral therapy and supportive counseling. *Journal of Consulting and Clinical Psychology, 66*(5), 862–867.

Çam, M. O., & Topçu, E. M. (2021). The use of metaphors in mental health and psychiatric nursing. *Hacettepe University Faculty of Nursing Journal, 8*(3), 335–340.

De Nicola, R., Blackwell, S. E., Hirata, E., & Daniels, J. (2024). "Knees being set on fire": A qualitative study exploring the impact of intrusive mental imagery on chronic pain patients. *The Cognitive Behaviour Therapist, 17*, 1–17.

Dures, E., Kitchen, K., Almeida, C., Ambler, N., Cliss, A., Hammond, A., Knops, B., Morris, M., Swinkels, A., & Hewlett, S. (2012). "They didn't tell us, they made us work it out ourselves": Patient perspectives of a cognitive-behavioral program for rheumatoid arthritis fatigue. *Arthritis Care & Research, 64*(4), 494–501.

Hu, J., Zhang, W., Zhang, J., Yu, F., & Zhang, X. (2018). The brief intervention effect of metaphorical cognitive restructuring on alleviating mental distress: A randomised controlled experiment. *Applied Psychology: Health and Well-Being, 10*(3), 414–433.

Karaırmak, Ö., & Güloğlu, B. (2012). Metaphor: A bridge between counselor and client. *Turkish Journal of Psychological Counseling and Guidance, 4*(37), 122–135.

Lakoff, G., & Johnson, M. (2015). Metaphors we live by. Ithaki Publishing.

Lyddon, W. J., Clay, A. L., & Sparks, C. L. (2001). Metaphor and change in counseling. *Journal of Counseling and Development, 79*(3), 269–274.

Madaan, A., Mishra, M., & Kochhar, S. (2023). Effectiveness of neuropsychoeducation, intrinsic motivation, and metaphoric content integrated with cognitive behavioral therapy in the treatment of obsessive-compulsive disorder: A pilot study. *Annals of Neurosciences, 30*(4), 230–235.

Malkomsen, A., Røssberg, J. I., Dammen, T., Wilberg, T., Løvgren, A., Ulberg, R., & Evensen, J. (2021). Digging down or scratching the surface: How patients use metaphors to describe their experiences of psychotherapy. *BMC Psychiatry, 21*, Article 533.

Malkomsen, A., Røssberg, J. I., Dammen, T., Wilberg, T., Løvgren, A., Ulberg, R., & Evensen, J. (2022). How therapists in cognitive behavioral and psychodynamic therapy reflect upon the use of metaphors in therapy: A qualitative study. *BMC Psychiatry, 22*(1), 433.

Mathieson, F., Jordan, J., Carter, J. D., & Stubbe, M. (2016). Nailing down metaphors in CBT: Definition, identification and frequency. *Behavioural and Cognitive Psychotherapy, 44*(2), 236–248.

Mathieson, F., Jordan, J., Bennett-Levy, J., & Stubbe, M. (2018). Keeping metaphor in mind: Training therapists in metaphor-enhanced cognitive behaviour therapy. *The Cognitive Behaviour Therapist, 11*.

Nagaoka, S., Asano, K., & Shimizu, E. (2015). Use of metaphors in psychoeducation for depression and its relationship with autistic traits. *Psychology, 5*(11), 624–633.

Nakao, M., Shirotsuki, K., & Sugaya, N. (2021). Cognitive–behavioral therapy for management of mental health and stress-related disorders: Recent advances in techniques and technologies. *BioPsychoSocial Medicine, 15*, 16.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, n71.

Pişтof, S., & Şanlı, E. (2013). The use of metaphors in cognitive behavioral therapy. *Journal of Cognitive Behavioral Psychotherapy and Research, 2*, 182–189.

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K., & Duffy, S. (2006). *Guidance on the conduct of narrative synthesis in systematic reviews: A product from the ESRC Methods Programme*. Lancaster University.

Rigby, L., & Waite, S. (2006). Group therapy for self-esteem, using creative approaches and metaphor as clinical tools. *Behavioural and Cognitive Psychotherapy, 35*(3), 361–364.

Samantaray, N. N., Kar, N., & Singh, P. (2019). Four-session cognitive behavioral therapy for the management of obsessive-compulsive disorder using a metaphor for conceptualization: A case report. *Indian Journal of Psychiatry, 61*(4), 424–426.

Sterne, J. A. C., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., Cates, C. J., Cheng, H. Y., Corbett, M. S., Eldridge, S. M., Emberson, J. R., Hernán, M. A., Hopewell, S., Hróbjartsson, A., Junqueira, D. R., Jüni, P., Kirkham, J. J., Lasserson, T., Li, T., McAleenan, A., … Higgins, J. P. T. (2019). RoB 2: A revised tool for assessing risk of bias in randomised trials. *BMJ, 366*, l4898.

Stott, R., Mansell, W., Salkovskis, P., Lavender, A., & Cartwright-Hatton, S. (Eds.). (2010). *Oxford guide to metaphors in CBT: Building cognitive bridges*. Oxford University Press.

Yu, G., Liu, R., & Zhang, W. (2022). Therapeutic metaphors: Theories, empirical efficacy and underlying mechanisms. *Advances in Psychological Science, 30*(7), 1546–1560.

Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi
Journal of Cognitive-Behavioral Psychotherapy and Research
DOI: 10.14744/JCBPR.2026.08937
J Cogn Behav Psychother Res 2026;15(1):34–42

Effectiveness of Cognitive Behavioral Therapy in Avoidant Personality Disorder: A Systematic Review

Dilara Nihal Çarıkçı Özgül,[1] Özden Yalçınkaya Alkar[2]

[1]Career Development, Application, and Research Center, Burdur Mehmet Akif Ersoy University, Burdur, Türkiye
[2]Department of Psychology, Ankara Yıldırım Beyazıt University, Ankara, Türkiye

ABSTRACT

Cognitive behavioral therapy (CBT) is a commonly applied therapy process for personality disorders; however, studies investigating its use in avoidant personality disorder (AvPD) are relatively limited. This systematic review aims to inquire about studies assessing the effectiveness of CBT in treating AvPD and examine its impact on functional improvement and overall well-being. A literature search was conducted using the databases Web of Science, PubMed, and Scopus, encompassing data available up to October 2025. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework guidelines were used. Ultimately, 9 studies applying CBT as the treatment for AvPD were reviewed. Among the analyzed studies, 1 was an open trial, 1 was a comparative longitudinal design, 4 were randomized control trials, and 3 were experimental studies. The findings showed that CBT interventions provide statistically significant reductions in AvPD symptoms, in some cases, even to the extent of failing to meet the diagnostic criteria. Effect sizes have generally been reported in the moderate-to-large range (d=0.50–0.80). CBT interventions that target avoidance behavior, social anxiety, and interpersonal difficulties have shown promising results even with a limited number of sessions. While some studies have shown complete recovery rates of 40%, others have reported this rate as high as 68%. Although CBT appears to work effectively, a CBT protocol specifically tailored for AvPD may produce more stable results.

Keywords: Avoidant personality disorder, cognitive behavioral therapy, effectiveness, symptom reduction.

ÖZ

Kaçıngan Kişilik Bozukluğunun Tedavisinde Bilişsel Davranışçı Terapinin Etkinliği: Sistematik Bir İnceleme

Bilişsel davranışçı terapi (BDT), kişilik bozuklukları için yaygın olarak uygulanan bir terapi yöntemidir, ancak kaçıngan kişilik bozukluğunda (KKB) kullanımını araştıran çalışmalar nispeten sınırlıdır. Bu sistematik derleme, KKB tedavisinde BDT'nin etkinliğini değerlendiren çalışmaları sentezlemeyi ve bu terapinin semptomlar ve genel iyi oluş üzerindeki etkisini ortaya koymayı amaçlamaktadır. Web of Science, PubMed ve Scopus veri tabanlarında Ekim 2025'e kadar olan çalışmaları kapsayan bir literatür taraması yapıldı. Sistematik derlemeler ve meta-analizler için tercih edilen raporlama ögeleri (PRISMA) çerçevesi kullanıldı. Sonuç olarak, KKB'nin tedavisi olarak BDT'yi uygulayan dokuz çalışma incelendi. Analiz edilen dokuz çalışmadan biri açık çalışma, biri karşılaştırmalı uzunlamasına tasarım, dördü randomize kontrollü çalışma ve üçü deneysel çalışmadır. Sonuçlar, KKB semptomlarında, bazı durumlarda tanı kriterlerini artık karşılamayacak düzeye kadar bir azalma olduğunu gösterdi. Etki büyüklükleri genellikle orta-büyük aralığında (d=0,50-0,80) bildirildi. Bazı çalışmalar %40 oranında tam iyileşme gösterirken, diğerleri bu oranı %68'e kadar çıkarmaktadır. Kaçınma davranışı, sosyal kaygı ve kişiler arası sorunları hedef alan BDT müdahaleleri, az sayıda seansla bile umut verici sonuçlar gösterebildi. BDT'nin KKB ile etkili bir şekilde çalışabildiği görülmektedir; ancak KKB için özel olarak hazırlanmış bir BDT protokolü daha stabilize sonuçlar üretebilecektir.

Anahtar Kelimeler: Bilişsel davranışçı terapi, etkinlik, kaçıngan kişilik bozukluğu, semptom azaltma.

Cite this article as:
Çarıkçı Özgül DN, Yalçınkaya Alkar Ö. Effectiveness of Cognitive Behavioral Therapy in Avoidant Personality Disorder: A Systematic Review. J Cogn Behav Psychother Res 2026;15(1):34–42.

Address for correspondence:
Dilara Nihal Çarıkçı Özgül. Burdur Mehmet Akif Ersoy Üniversitesi, Kariyer Geliştirme Uygulama ve Araştırma Merkezi, Burdur, Türkiye
Phone: +90 531 928 55 33
E-mail:
dncozgul@mehmetakif.edu.tr

Submitted: 17.11.2025
Revised: 30.12.2025
Accepted: 12.02.2026
Available Online: 27.02.2026

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

INTRODUCTION

Several personality disorders (PDs) are clustered with diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders (DSM), and one of them is avoidant personality disorder (AvPD) (APA, 2022). According to the literature, AvPD is one of the most prevalent PDs (Torgersen, 2009). AvPD can make individuals struggle in circumstances that require substantial interpersonal interaction because it is characterized by a specific fear of being negatively evaluated. It is characterized by the poorest social skills among the PD categories, consequently diminishing the quality of life, as humans are social creatures by nature (Cramer et al., 2007). The detriment includes overall functional impairment in occupational and social circumstances caused by social isolation. Hence, anxiety and avoidance of social situations are key manifestations of AvPD.

PDs show significant comorbidities not only with other diagnostic categories but also among one other (Stuart et al., 1998). The highest comorbidity of SAD is observed with AvPD because these two disorders are based on common diagnostic criteria, such as social isolation (Friborg et al., 2013; Reich, 2009). Distinguishing between SAD and AvPD can be difficult because both diagnoses share significant overlap in clinical features related to intense anxiety, discomfort, and accompanying avoidance behaviors in social situations. However, AvPD is defined not merely as an anxiety pattern specific to certain social situations but rather as a pervasive, persistent, and continuous personality pattern that encompasses an individual's self-perception, interpersonal relationships, and behavioral repertoire. In contrast, SAD is an anxiety disorder limited to specific social interactions or performance situations.

Individuals experiencing symptoms such as intense anxiety and a debilitating fear of interpersonal relationships often seek therapeutic interventions at some point in life (Sørensen et al., 2019). According to Alden (1989), AvPD treatment has shown positive outcomes, such as reduced symptoms and improved interpersonal functioning. Although this dated study suggests the effectiveness of treatment for AvPD, there is an ongoing controversy regarding the most effective therapeutic approach for treating AvPD. Understanding the most effective treatment is important for several reasons, such as cost-effectiveness for the individual undergoing treatment. Over the years, individual therapy, based on one-to-one sessions, has been the traditional approach for psychotherapy (Sanislow et al., 2012). However, no definite argument exists that a single therapy protocol would be equally beneficial for every individual with the same disorder. Owing to the nature of AvPD, exposure-based group therapy might also be effective because it requires social interaction during sessions. Wilberg et al. (2023) suggested that combined group and individual mentalization-based and metacognitive therapy methods are effective in reducing AvPD symptoms and improving overall well-being. However, no consensus has been reached on which therapy protocol is more effective than others (Weinbrecht et al., 2016).

Individual therapies for AvPD include behavioral interventions and social skills training. As outlined by Alden (1989), behavioral interventions assume that systematic exposure to feared situations can ultimately lead to symptom reduction. Therefore, behavioral interventions are designed to confront the client with feared and avoided situations. Social skills training assumes that individuals with AvPD may experience difficulties in relationships due to a lack of adaptive skills; therefore, it aims to improve these skills. These therapeutic approaches offer different strategies to address the specific challenges associated with AvPD and highlight the importance of CBT tailored to the specific needs of each PD.

Determining which approach is more effective for AvPD in the existing literature is difficult. Alden (1989) showed that therapeutic interventions are effective in addressing AvPD; however, the limited duration of short-term treatments may not be sufficient to fully return individuals to the normative range. Redesigning treatments to address factors such as content, duration, and whether they are individual- or group-based, with protocols specifically designed for each diagnosis, may be more effective in achieving full recovery. The need for further empirical research is undeniable.

Behavioral therapy, cognitive behavioral therapies (CBTs), and psychopharmacological treatments are commonly used for AvPD (Sanislow et al., 2012; Weinbrecht et al., 2016). The core focus of this review, CBT, is an effective approach for addressing various and enduring challenges faced by individuals with several PDs. CBT is used as an umbrella term for the family of cognitive and behavioral therapies, including Beckian CBT, cognitive therapy (CT), and third-wave CBTs (i.e., Schema therapy). The relationship between adverse childhood experiences and PDs aligns with the core CBT assumption that early childhood experiences shape core beliefs about people and the world (Davidson, 2008). Inflexible and relatively rigid thought patterns are core belief characteristics (Görmez, 2016). In turn, beliefs shape cognitive and behavioral responses to daily events. The core logic of CBT is based on the interrelatedness of these beliefs and thoughts and their ability to influence emotions and behaviors, because certain events or situations can trigger beliefs, potentially leading to the emergence of psychiatric disorders (James et al., 2009; Davidson, 2008). In short, thoughts influence behavior by

influencing emotions. In CBT, thought change is aimed at through various techniques, such as Socratic questioning (Scott & Beck, 2008). Along with addressing thoughts and schemas, synchronous or asynchronous techniques for behavioral change are also employed (Scott & Beck, 2008).

The sessions in CBT encompass elements such as psychoeducation, homework tasks, behavioral experiments (i.e., graduated exposure), and relaxation techniques (Beck et al., 2015; Matusiewicz et al., 2010). The characteristics of AvPD, anxiety, and avoidance can be targeted in CBT by working with cognitive structures, thoughts, beliefs, and behaviors (Zhou, 2024). The duration of therapy is typically up to 30 sessions (Balje et al., 2024) for both individual and group therapy methods. Therapy sessions in CBT are well-organized and have a fixed approximate duration, allowing for the focused exploration and modification of beliefs and maladaptive behavioral patterns (Davidson, 2008). These components are considered integral to an individual's mental health and, therefore, the treatment process. Specifically, cognitive restructuring involves exploring the thoughts underlying the individual's fears of being criticized or rejected and reconstructing them in a more adaptive manner (Sanislow et al., 2012), which is why it is effective in AvPD treatment.

Although AvPD is a common issue in practice and has been studied in the literature, the most appropriate treatment method remains a matter of debate (Lampe & Malhi, 2018). Conducting a review study 15 years after Matusiewicz's study (2010) is anticipated to contribute substantially to the literature. Matusiewicz reviewed CBT for PDs broadly and found that short-term group CBT (CBGT) is specifically effective, but multi-component ingredient therapies do not lead to better outcomes. According to Matusiewicz, while the compiled studies demonstrate effectiveness, complete recovery from symptoms has not been achieved for some patients in various studies. Therefore, further research is necessary to make informed decisions in determining effective treatment methods. Although Matusiewicz's study allows us to draw a general conclusion regarding PDs, the fact that it is a review conducted 15 years ago and that it did not examine CBTs specifically for AvPD highlights the importance of the present review for current literature. This systematic review aimed to evaluate the effectiveness of CBTs for treating AvPD by determining their effect on symptom reduction and general well-being. This will ensure a timely addition to the literature, incorporating current evidence reflecting the application of CBTs to AvPD. There are two hypotheses in the current review. First, classical CBTs are effective in treating AvPD. Effectiveness was measured by symptom reduction and functional improvement. Second, the effect sizes of classical CBTs in treating AvPD are medium to large.

LITERATURE STRATEGY

This systematic review follows the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework (Page et al., 2020). The Web of Science (WoS), Scopus, and PubMed databases were searched for the last time on October 25, 2025. The search was conducted with the following grouped terms: (CBT* OR CBT*) AND APD. The inclusion criteria were the use of at least one of the classical CBTs, studies conducted with people with AvPD, and reporting effective outcomes. The exclusion criteria were as follows: studies that were books, reviews, commentaries, or therapy protocols; studies published in languages other than English; those with an AvPD comorbid diagnosis rate of less than 50% in the sample; and CBT studies involving other psychopathologies. The literature search results were collected, and duplicates were removed using reference management software. The study selection was conducted in two stages by two independent reviewers (D.N.C.O. and O.Y.A.). Any inconsistencies or disagreements regarding compliance were resolved through discussion until a consensus was reached. All articles were evaluated by the authors using the appropriate risk-of-bias tools. The included non-randomized studies were subjected to a risk-of-bias assessment using The Risk-of-Bias in Non-randomized Studies – of Interventions, Version 2 (ROBINS-I V2) (Sterne et al., 2024). The Cochrane Risk of Bias Tool for Randomized Trials (RoB 2) was used to assess the risk of bias in the included randomized control trials (RTCs) (RoB 2, 2019). The overall risk of bias for the four included RCTs was moderate. Despite these bias findings, this review was conducted because there are very few studies in the literature, but it serves a much-needed purpose in both practical application and theoretical formation. The methodological quality and risk of bias of the three included case studies were assessed using the Joanna Briggs Institute Critical Assessment Checklists (Munn et al., 2015), which are appropriate for case studies. These studies are case reports or case series; thus, their internal validity is naturally limited. However, these studies provide valuable qualitative evidence regarding CBT's applicability and potential benefits in AvPD. Most studies were of moderate to high quality; however, case studies are naturally limited by sample size.

OVERVIEW OF THE INCLUDED STUDIES

Figure 1 depicts the search and selection processes. The initial search yielded 314 records. 156 were sourced from WoS, 140 from Scopus, and 18 from PubMed. Subsequently, duplicated studies were removed, resulting in the removal of 108 studies. A total of 206 studies remained for title and abstract screening. Afterward, 159 studies were excluded because they did not meet the predetermined inclusion criteria. The remaining 47 studies underwent a full-text scan. Of these, 38 were considered unsuitable for this review due to the exclusion criteria. Ultimately, 9 were synthesized.

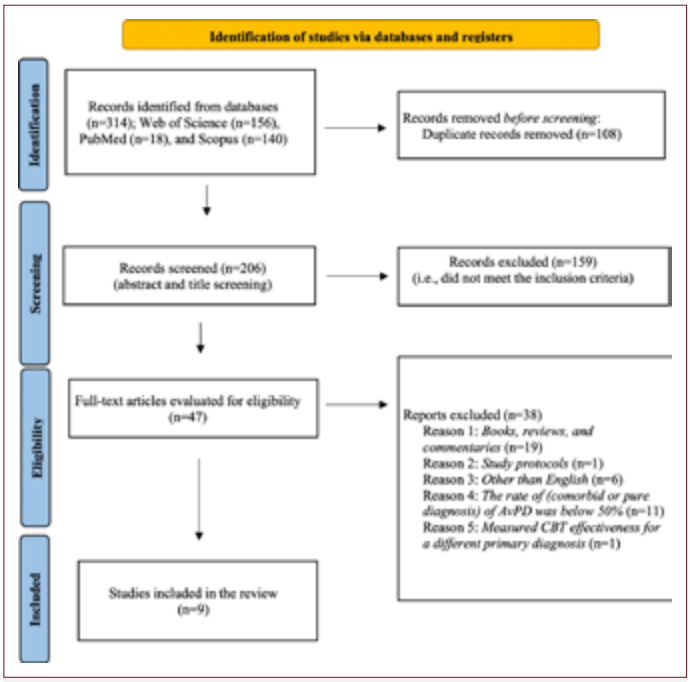

Figure 1. Flowchart of the article search and selection process (Source: PRISMA, Page et al., 2020).

Of the 9 studies covered, 1 was an open trial, 1 was a comparative longitudinal design, 4 were RCTs, and 3 were case studies (Appendix 1). The studies were conducted in 4 different countries: the United States, Australia, the Netherlands, and Norway. Although the sample sizes varied across the studies, the RCTs generally had larger sample sizes. The total sample size across all studies was 457 adults. Cognitive therapy (CT), brief dynamic therapy (BDT), CBT, CBGT, group schema therapy (GST), pharmacological interventions, and placebo were the treatment methods used in the studies. CT resembles the basis of traditional CBT techniques; therefore, in this review, CT studies cannot be distinguished from CBT studies that question the effectiveness of traditional CBT in PDs. Some studies incorporated control or comparison groups, resulting in the inclusion of multiple treatment methods. The findings indicate that the average number of sessions for CBT ranges from 12 to 43. Emmelkamp et al. (2006) reported that the average number of CBT sessions was approximately 18.5. The treatment duration was 12 weeks for CBT in the study by Nordahl et al. (2016). Another study also consisted of 12 sessions (Rees & Pritchard, 2013). In the study by Hofmann (2007), 27 CBT sessions were conducted. In Balje et al. (2024), 30 CBGT sessions were conducted. Strauss et al. (2006) found that the average session count for CBT was even higher at 43.28. Changes in CBT session counts across studies potentially imply differences in treatment duration. The treatment duration and number of sessions may depend on factors such as the therapeutic approach, condition severity, treatment goals, and individual client needs.

Cohen's d value was accepted as a small effect at 0.20, a medium effect at 0.50, and a large effect at 0.80 and above (Cohen, 1977). Emmelkamp et al. (2006) showed a large effect size for CBT, and the effect size of the comparison group was medium to large, whereas the effect size of the control group was small. In the study by Nordahl et al. (2016), both CT and SSRI interventions showed large effect sizes. However, CT exhibited a larger effect than SSRI. According to Balje et al.,(2024) CBGT had a large effect on AvPD symptoms at both 3- and 12-month follow-ups. The effect size was greater in patients who completed the treatment. Overall, CBT, GCBT, and CT showed significant therapeutic effects with large effect sizes. CBT approaches appear to have larger effect sizes than comparison treatment interventions. Balje et al. (2024) found that both GST and CBGT were effective for AvPD, yet no significant difference was found between them. Among those who completed the protocol, the recovery rate from AvPD at diagnosis at the 12-month follow-up was 22% for both GCBT and GST, again not statistically significant.

Emmelkamp et al. (2006) found that CBT showed notable improvements compared with the control group, which received no therapeutic intervention. The study showed that CBT has higher effectiveness rates than BDT on various measures at follow-up. Only 9% of the individuals in the CBT group still met the diagnostic criteria for AvPD. This suggests that CBT is promising in maintaining positive treatment outcomes. The findings suggest a potential ranking of effectiveness for symptom reduction and improvement between CBT, BDT, and no therapy, respectively.

The focus was on comparing the responses of individuals with AvPD and obsessive-compulsive personality disorder (OCPD) to CT in the study of Strauss et al. (2006). At the end of treatment, the diagnostic rates of AvPD and OCPD decreased from 100% to 7%. These findings demonstrate the success of CT in reducing AvPD symptoms. Hope et al. (1995) reported that 42% of participants with comorbid SAD and AvPD experienced complete recovery from social phobia. Similarly, Nordahl et al. (2016) showed that CBT demonstrated significantly higher rates of recovery than placebo. The post-test fear of negative evaluation (FNE) decreased significantly across all treatment methods. The order and significance of FNE reduction were as follows: CT>SSRI and CT>placebo. No significant difference was observed between the CT and combined treatment groups. No significant difference was observed between the combined treatment and SSRI alone. Based on the post-test results, the complete recovery rate

from SAD and comorbid AvPD was 68%, 23%, 45%, and 4% in the CT, SSRI, combined, and placebo groups, respectively. CT demonstrated significantly higher recovery rates than other treatments. Additionally, CT showed better results for social anxiety compared with SSRI treatment based on the post-test scores. Furthermore, CT demonstrated greater effectiveness for social anxiety than placebo. Even at the 12-month follow-up, CT maintained higher effectiveness than the combined treatment, SSRI, and placebo. Notably, the study revealed that the combination of CT and psychopharmaceuticals did not yield any additional advantages compared to using either alone (Nordahl et al., 2016) (Appendix 1 shows the significance values for all of the above-mentioned).

CBTs are effective in reducing various psychological symptoms and thus improving the overall well-being of individuals. According to the data from an open trial, significant changes were observed in SCID-II and in the scores of several other psychological disorders symptoms, indicating greater overall psychological well-being (Strauss et al., 2006). Hyman and Schneider (2004) reported significant improvements in depression, anxiety, social discomfort, and low self-esteem. Hope et al. (1995) demonstrated reductions in social anxiety scores. Emmelkamp et al. (2006) reported positive outcomes for CBT when considering social anxiety symptoms; hence, these findings collectively suggest that CBT approaches can address a range of symptoms associated with AvPD. Current evidence suggests that therapeutic effectiveness extends beyond cognitive-behavioral frameworks and includes other modalities, such as schema therapy (Balje et al., 2024). The existing literature does not support the clear superiority of any single approach. Rees and Pritchard (2013) found that therapy led to decreased anxiety and stress levels, contributing to an overall improvement in quality of life. Therefore, when describing the effectiveness of CBT, it is important to mention that receiving therapy, regardless of the specific approach, can yield positive outcomes for individuals with AvPD. In a study by Hyman and Schneider (2004), a patient received brief CBT for AvPD, and scores on various measures improved significantly from pretest to posttest. The improvements in the scores of depression, anxiety, adjustment, marital problems, obsession, low self-esteem, and social discomfort scales suggest that the participant would experience fewer daily difficulties after CBT. In Hofmann's study (2007), a patient underwent CBT for AvPD and also experienced symptom reduction. The case no longer met the diagnostic criteria in the follow-up assessments. Rees and Pritchard (2013) reported that FNE symptoms, a core feature of AvPD, decreased significantly after the treatment course. Hope et al. (1995) demonstrated that among participants diagnosed with both AvPD and SAD, 42% showed significant improvement, with 42% achieving full remission from their symptoms, highlighting the effectiveness of CBGT. However, a small percentage (16%) did not experience any improvement or showed only mild improvement. Notably, the presence of AvPD did not show a statistically significant relationship with treatment response compared with comorbid conditions. Overall, CBT has promising outcomes for treating AvPD.

DISCUSSION

Given the negative impact of PDs on various aspects of an individual's life, their extensiveness, and longevity, determining which treatment approach is more effective and has a higher cost-benefit ratio is crucial. This systematic review aimed to evaluate the results of studies on AvPD treatment using CBT. Nine studies were evaluated using a systematic review approach to estimate the impact of CBTs on AvPD. The results support the first hypothesis, confirming the efficacy of CBT in reducing AvPD symptoms. There is an ongoing controversy regarding which therapy method is more effective for AvPD in terms of symptom reduction or full recovery. Within the CBT approaches, CT was found to be more effective than medication treatments (Nordahl et al., 2016). The findings challenge the assumption that combining psychotherapy with pharmacological treatments in AvPD necessarily leads to superior clinical outcomes. Indeed, Nordahl et al. (2016) showed that SSRIs did not provide any additional contribution to the effectiveness of CT. The addition of psychopharmaceuticals to therapy does not seem to increase CBT effectiveness. The combination of CBT and SSRI does not appear to yield additional therapeutic benefits. Strauss et al. found similar outcomes to Nordahl et al. (2016); CT is effective for AvPD treatment. In another comparison of BDT and CBT, CBT had a greater effect size (Emmelkamp et al., 2006). No significant difference was found between the group schema and group CBT treatments, demonstrating that both treatments were effective (Balje et al., 2024). However, Balje et al.'s study also showed the effectiveness of GCBT for treating AvPD. It can be said that any treatment is more effective for AvPD than no treatment, and CBT often demonstrates robust effects compared with some alternative therapies. However, other structured approaches, such as GST, have also shown similar effects. Further research is still needed in this field. Definitive conclusions cannot be drawn, especially considering the varying number of sessions and effect sizes across all CBT protocols.

CBT is a promising treatment approach for PDs (Beck et al., 2015; Matusiewicz et al., 2010). Some reviewed studies provided results supporting the effectiveness of CBT compared with the control or placebo conditions. CBT seeks to facilitate positive changes in PDs by targeting maladaptive beliefs and skill deficiencies to improve overall outcomes. This is congruent with how the DSM approaches PDs, as it places particular emphasis on treating the cognitive and behavioral patterns associated with PDs and suggests that the ultimate aim may be to reduce

symptoms and improve psychological well-being (Davidson, 2008). The effectiveness of CBT in these conditions stems from its effective reduction of symptoms associated with FNE.

The number of therapy sessions varies according to the therapy goals and adopted approaches. Some researchers believe that AvPD requires a long therapy duration (Alden, 1989). Some studies empirically supported the necessity of a longer treatment duration for AvPD by implementing protocols of 30 or more sessions (Strauss et al., 2006; Balje et al., 2024). However, AvPD can be treated effectively in a shorter duration (Emmelkamp et al., 2006; Hofman, 2007; Nordahl et al., 2016; Rees & Pritchard, 2013). Extensive therapy may not even be necessary for PDs, yet this subject requires more studies. Among the studies reviewed, although some lasted for 43 sessions, others lasted for around 12 sessions (Strauss et al., 2006; Rees & Pritchard, 2013). Studies demonstrating symptom reductions in a shorter time emphasize the urgent need for a tailored CBT protocol for this disorder, highlighting the potential for a more efficient treatment process targeting specific challenges and symptoms of AvPD in a shorter duration. Further research is warranted, particularly through additional studies focusing on determining the relationship between CBT effectiveness and the number of sessions. However, regardless of the number of sessions, CBT is a useful therapy approach in reducing symptoms and improving general well-being in patients with AvPD.

The effect sizes provide significant information about the effectiveness of a therapy approach. The findings of this review support the second hypothesis, that is, CBT has medium-to-large effect sizes for treating AvPD. The effect sizes of CBT interventions in the treatment of AvPD have consistently been reported as medium-to-large, resulting in reduced symptoms and increased well-being (Emmelkamp et al., 2006; Nordahl et al., 2016; Balje et al., 2024). Furthermore, comparative studies have shown that CBT has larger effect sizes than alternative treatments (Emmelkamp et al., 2006; Nordahl et al., 2016). The greater efficacy of CBT compared with control conditions and its ability to maintain long-term positive outcomes support its effectiveness for AvPD treatment (Emmelkamp et al., 2006). Consequently, the effect sizes of CBT are considered optimal and, therefore, CBT is a suitable therapeutic approach for PDs.

Studies consistently demonstrate significant improvements in quality of life (i.e., marital distress), depression, anxiety, and social phobia symptomatology in individuals receiving CBT (Strauss et al., 2006; Emmelkamp et al., 2006; Rees and Pritchard, 2013). CBT also appears effective in alleviating social anxiety symptoms, regardless of the presence of AvPD (Hope et al., 1995). Reductions in social anxiety levels positively impact overall well-being by facilitating interactions, as humans are inherently social beings. This provides strong evidence for the effectiveness of CBT in reducing AvPD symptoms and improving the overall quality of life.

Hyman and Schneider (2004) and Hofmann (2007) also demonstrated the effectiveness of CBT for AvPD. Hyman and Schneider reported significant improvements in several measures of depression, anxiety, and social discomfort after a brief CBT session. In Hofmann's case, AvPD was severe enough that education was interrupted before beginning treatment. AvPD symptoms, such as extreme shyness and avoidance of social situations, prevented him from participating in academic activities or forming social networks. Individuals with AvPD can develop more adaptive mechanisms to continue their education with appropriate treatment (Skewes et al., 2015). Individuals with AvPD who recognize the potential for positive change in daily functioning and educational activities have a greater chance of developing adaptive mechanisms through personalized therapy, education, and appropriate interventions. A similar situation occurred in the case of Hofmann. In conclusion, CBT has a significant effect in reducing symptoms associated with AvPD and leads to improvements in overall well-being.

The main findings of this systematic review can be summarized as follows: CBT methods are effective in reducing AvPD symptoms and improving overall functionality. The effect sizes of CBT interventions for AvPD mostly range from moderate to high, indicating clinically significant change. Comparative studies have shown that CBT produces stronger symptom reduction than other treatments, such as SSRIs or BDT. While most studies have used existing CBT protocols, developing a standardized, disorder-specific CBT protocol that targets specific cognitive schemas (e.g., fear of rejection) and behavioral patterns (e.g., social avoidance) related to AvPD could make treatment outcomes more beneficial and sustainable.

This review contributes to the literature by synthesizing recent evidence on CBTs for AvPD, which have received limited synthesis despite growing clinical relevance. Unlike the review by Matusiewicz et al. (2010), the present study focuses solely on AvPD, allowing for a more nuanced understanding of how CBT interventions target the core features of this disorder. Furthermore, the inclusion of contemporary randomized controlled trials, comparative outcome studies, and longitudinal follow-up data provides up-to-date evidence that can better inform clinical practice and future research directions.

This review included studies with varying methodological rigor, ranging from RCTs to non-randomized open trials and case studies. While RCTs provide the highest level of evidence for efficacy, findings from other studies should be interpreted cautiously in terms of generalizability and causal inference strength. It is important to emphasize that this evidence hierarchy must be clearly acknowledged and the

results interpreted accordingly. This systematic review has several limitations. First, only three databases were searched. However, no date restrictions were imposed, and the most widely used databases in the healthcare field were searched. Second, studies may have been overlooked because of the similarity between the diagnostic criteria for SAD and AvPD. The inclusion and exclusion criteria were established a priori, and a careful, long-term review was conducted. A limitation was that studies were only searched in English. This was due to the language limitations of the authors.

A literature review was conducted using a predefined, focused, and repeatable search strategy related to CBT and AvPD. This approach ensured a systematic and manageable review process, while the search was conducted in the topic (title, abstract, and keywords) to capture relevant studies using different terminology or indexing. It also allowed the use of the asterisk plural suffix and different sentence-ending structures. However, future reviews may still consider additional search methods and strings, such as citation tracking, browsing specific journal archives, or searching separately for various therapies mentioned in this study, to reduce the possibility that the narrow string may have missed some studies. A limitation of this study is that some studies are case studies and do not provide data such as effect sizes. A similar limitation is the inability to conduct a meta-analysis due to the lack of sufficient numbers and quality of studies in the relevant field. However, future meta-analyses with new studies will provide a better understanding of the topic.

As mentioned earlier, a tailored protocol proposal can be developed based on this study's findings. While further studies are needed to detail and finalize the protocol and test its effectiveness, summarizing how the common findings of the included studies can be drawn upon to determine the cornerstones of the protocol is beneficial. The protocol should emphasize the therapeutic alliance's strength. Studies have shown the importance of a good alliance when in therapy with this disorder, which is characterized by problems in interpersonal relationships. Cognitive restructuring, beliefs, and behavioral experiments (exposure) should be worked on together. In the context of both a strong alliance and behavioral experiments, considering group therapies where exposure is necessary would be meaningful. Keeping the number of sessions as short as possible will increase individual cost-effectiveness and access to therapy. Studies have shown a success rate of as few as 12 sessions. Therefore, the protocol to be developed can be planned in the shortest possible time. Finally, AvPD screening should be mandatory at the beginning of therapy in patients with SAD. Undiscovered and untreated AvPD can increase recurrence in these two frequently comorbid conditions. Therefore, conducting PD screening is important.

CONCLUSION

In conclusion, the literature provides evidence supporting the effectiveness of CBT for AvPD treatment. CBT is a viable and promising intervention for improving the overall quality of life, reducing symptoms, and enhancing interpersonal functioning. The comorbidity of AvPD with other disorders, such as social anxiety disorder, highlights the importance of considering comorbidity and adopting a comprehensive approach to AvPD treatment. CBT is emerging as a viable therapeutic approach for AvPD, offering the potential for significant improvements in interpersonal relationships, career opportunities, and overall well-being. While CBT appears to be a feasible and plausible treatment, nearly every study has modified the guidelines. Therefore, a CBT guideline specifically tailored for AvPD is needed. Further studies are needed to contribute to the still limited literature.

Online Appendix File:
https://jcbpr.org/storage/upload/thumbnails/1772200918.jpeg

Informed Consent: This article is a systematic review; hence no human subjects were directly involved in this research Therefore, informed consent was not required.

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

Financial Disclosure: No funding was received for the preparation, writing, or publication of this study.

Use of AI for Writing Assistance: No generative artificial intelligence tools were used in any capacity in the preparation of this manuscript. All work is entirely the product of the human authors.

Authorship Contributions: Concept – DNÇÖ, ÖYA; Design – DNÇÖ, ÖYA; Supervision – ÖYA; Data Collection and/or Processing – DNÇÖ; Analysis and/or Interpretation – DNÇÖ; Writing – DNÇÖ; Critical Review – ÖYA.

Peer-review: Externally peer-reviewed.

REFERENCES

Alden, L. (1989). Short-term structured treatment for avoidant personality disorder. *Journal of Consulting and Clinical Psychology, 57*(6), 756–764.

American Psychiatric Association (APA). (2022). *Diagnostic and statistical manual of mental disorders* (DSM-5-TR). 5th ed. Available at: https://www.psychiatry.org/psychiatrists/practice/dsm. Accessed Feb 23, 2026.

Balje, A. E., Greeven, A., Deen, M., van Giezen, A. E., Arntz, A., & Spinhoven, P. (2024). Group schema therapy versus group cognitive behavioral therapy for patients with social anxiety disorder and comorbid avoidant personality disorder: A randomized controlled trial. *Journal of Anxiety Disorders, 104*, 102860.

Beck, A. T., Freeman, A., & Davis, D. D. (2015). *Cognitive therapy of personality disorders*. Guilford Press.

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences*. Academic Press.

Cramer, V., Torgersen, S., & Kringlen, E. (2007). Socio-demographic conditions, subjective somatic health, axis I disorders and personality disorders in the common population: The relationship to quality of life. *Journal of Personality Disorders, 21*(5), 552–567.

Davidson, K. M. (2008). Cognitive–behavioural therapy for personality disorders. *Psychiatry, 7*(3), 117–120.

Emmelkamp, P. M., Benner, A., Kuipers, A., Feiertag, G. A., Koster, H. C., & van Apeldoorn, F. J. (2006). Comparison of brief dynamic and cognitive–behavioural therapies in avoidant personality disorder. *The British Journal of Psychiatry, 189*(1), 60–64.

Friborg, O., Martinussen, M., Kaiser, S., Øvergård, K. T., & Rosenvinge, J. H. (2013). Comorbidity of personality disorders in anxiety disorders: A meta-analysis of 30 years of research. *Journal of Affective Disorders, 145*(2), 143–155.

Görmez, V. (2016). Bilişsel davranışçı terapide temel kavramlar: Bir teknisyen olarak terapistin malzeme çantasına genel bakış. *Çocuk ve Gençlik Ruh Sağlığı ve Hastalıkları Dergisi, 23*(2), 169–176. [Article in Turkish]

Hofmann, S. G. (2007). Treating avoidant personality disorder: The case of Paul. *Journal of Cognitive Psychotherapy, 21*(4), 346–352.

Hope, D. A., Heimberg, R. G., & Bruch, M. A. (1995). Dismantling cognitive-behavioral group therapy for social phobia. *Behaviour Research and Therapy, 33*(6), 637–650.

Hope, D. A., Herbert, J. D., & White, C. (1995). Diagnostic subtype, avoidant personality disorder, and efficacy of cognitive–behavioral group therapy for social phobia. *Cognitive Therapy and Research, 19*(4), 399–417.

Hyman, S. M., & Schneider, B. A. (2004). The short-term treatment of long-term interpersonal avoidance. *Clinical Case Studies, 3*(4), 313–332.

James, I., Todd, H., & Reichelt, F. K. (2009). Schemas defined. *The Cognitive Behaviour Therapist, 2*(1), 1–9.

Lampe, L., & Malhi, G. S. (2018). Avoidant personality disorder: Current insights. *Psychology Research and Behavior Management, 11*, 55–66.

Matusiewicz, A. K., Hopwood, C. J., Banducci, A. N., & Lejuez, C. W. (2010). The effectiveness of cognitive behavioral therapy for personality disorders. *Psychiatric Clinics of North America, 33*(3), 657–685.

Munn, Z., Moola, S., Lisy, K., Riitano, D., & Tufanaru, C. (2015). Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and incidence data. *International Journal of Evidence-Based Healthcare, 13*(3), 147–153.

Nordahl, H. M., Vogel, P. A., Morken, G., Stiles, T. C., Sandvik, P., & Wells, A. (2016). Paroxetine, cognitive therapy or their combination in the treatment of social anxiety disorder with and without avoidant personality disorder: A randomized clinical trial. *Psychotherapy and Psychosomatics, 85*(6), 346–356.

Oosterbaan, D. B., van Balkom, A. J., Spinhoven, P., de Meij, T. G., & van Dyck, R. (2002). The influence on treatment gain of comorbid avoidant personality disorder in patients with social phobia. The Journal of Nervous and Mental Disease, 190(1), 41–43.

Page, M. J., Moher, D., Bossuyt, P., Boutron, I., Hoffmann, T., Mulrow, C. D., Shamseer, L., Tetzlaff, J., Akl, E., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E., Mayo-Wilson, E., McDonald, S., … McKenzie, J. (2020). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews.

Rees, C. S., & Pritchard, R. (2013). Brief cognitive therapy for avoidant personality disorder. *Psychotherapy, 52*(1), 45–52.

Reich, J. (2009). Avoidant personality disorder and its relationship to social phobia. *Current Psychiatry Reports, 11*(1), 89–93.

RoB 2 Development Group. (2019). *Current version of RoB 2*. Available at: https://sites.google.com/site/riskofbiastool/welcome/rob-2-0-tool/current-version-of-rob-2. Accessed Jan 5, 2026.

Sanislow, C. A., Bartolini, E. E., & Zoloth, E. C. (2012). Avoidant personality disorder. In V. S. Ramachandran (Ed.), *Encyclopedia of human behavior* (pp. 257–266). Academic Press.

Scott, J., & Beck, A. T. (2008). Cognitive behavioural therapy. *Oxford Textbook of Psychotherapy*, 636–643.

Skewes, S. A., Samson, R. A., Simpson, S. G., & van Vreeswijk, M. (2015). Short-term group schema therapy for mixed personality disorders: A pilot study. *Frontiers in Psychology, 5*, 1592.

Sørensen, K. D., Råbu, M., Wilberg, T., & Berthelsen, E. (2019). Struggling to be a person: Lived experience of avoidant personality disorder. *Journal of Clinical Psychology, 75*(4), 664–680.

Sterne, J. A. C., Higgins, J. P. T., Elbers, R. G., Reeves, B. C., & ROBINS-I Development Group. (2024). *Risk of bias in non-randomized studies of interventions (ROBINS-I), Version 2*. Available at: https://sites.google.com/site/riskofbiastool/welcome/robins-i-v2. Accessed Feb 16, 2026.

Strauss, J. L., Hayes, A. M., Johnson, S. L., Newman, C. F., Brown, G. K., Barber, J. P., Laurenceau, J.-P., & Beck, A. T. (2006). Early alliance, alliance ruptures, and symptom change in a nonrandomized trial of cognitive therapy for avoidant and obsessive-compulsive personality disorders. *Journal of Consulting and Clinical Psychology, 74*(2), 337–345.

Stuart, S., Pfohl, B., Battaglia, M., Bellodi, L., Grove, W., & Cadoret, R. (1998). The cooccurrence of DSM-III-R personality disorders. *Journal of Personality Disorders, 12*(4), 302–315.

Torgersen, S. (2009). The nature (and nurture) of personality disorders. *Scandinavian Journal of Psychology, 50*(6), 624–632.

Weinbrecht, A., Schulze, L., Boettcher, J., & Renneberg, B. (2016). Avoidant personality disorder: A current review. *Current Psychiatry Reports, 18*, 1–8.

Wilberg, T., Pedersen, G., Bremer, K., Johansen, M. S., & Kvarstein, E. H. (2023). Combined group and individual therapy for patients with avoidant personality disorder—A pilot study. *Frontiers in Psychiatry, 14*, 1181686.

Zhou, N. (2024). Avoidant personality disorder: A review of features, performances, and treatments. *SHS Web of Conferences, 193*, 03001.

Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi
Journal of Cognitive-Behavioral Psychotherapy and Research
DOI: 10.14744/JCBPR.2026.59921
J Cogn Behav Psychother Res 2026;15(1):43–54

Effects of Circadian Rhythm and Melatonin on Epilepsy Research

Cumaali Demirtaş

Department of Physiology, University of Health Sciences, Hamidiye Institute of Health Sciences, İstanbul, Türkiye

ABSTRACT

A significant amount of clinical and experimental research has been conducted on the treatment of epilepsy, a condition that negatively impacts human health and quality of life. Circadian rhythm refers to vital physiological changes occurring over an approximately 24-hour period, primarily influenced by daylight. Melatonin levels play a crucial role in this mechanism, with its secretion varying throughout the day. This review aims to assess the potential impact of circadian rhythm-related changes in melatonin levels on epilepsy research findings. The PubMed, Google Scholar, and Web of Science databases were used to search for relevant publications. Articles published up to 2025 were included in the review. Melatonin modulates neuronal electrical activity by reducing glutamatergic transmission and increasing GABAergic neurotransmission. In humans, melatonin has been shown to alleviate seizures and to exert positive effects in the treatment of childhood refractory epilepsy. In addition, it has been found to improve physical, emotional, cognitive, and social functions. A significant portion of experimental studies has confirmed the anticonvulsant properties of melatonin. However, several studies have shown that melatonin exerts direct or indirect proconvulsant effects. This review revealed that epilepsy research data sometimes show contradictory results. The seizure parameters tested in these studies, as well as cognitive and behavioral characteristics, may be influenced by daily variations in circadian rhythms. It was concluded that considering circadian rhythms-related variables during the conduct of these studies and basing all modeling and planning on them is essential.

Keywords: Circadian rhythm, epilepsy, learning, memory, melatonin, seizures.

ÖZ

Epilepsi Araştırmalarında Sirkadiyen Ritim ve Melatoninin Etkileri

İnsan sağlığını ve yaşam kalitesini olumsuz yönde etkileyen epilepsi tedavisine yönelik önemli miktarda klinik ve deneysel araştırma yapılmaktadır. Sirkadiyen ritim gün ışığına bağlı olarak yaklaşık 24 saatlik periyottaki bazı vital değişimleri ifade etmektedir. Melatonin seviyesi bu mekanizmanın en önemli rolünü üstlenmekte ve salınımı günün farklı saatlerinde değişkenlik göstermektedir. Bu derleme, sirkadiyen ritme bağlı melatonin seviyesindeki değişimlerin, epilepsi araştırmalarındaki verilere potansiyel etkisini değerlendirmeyi amaçlamaktadır. Yayın araştırmasında PubMed, Google Scholar ve Web of Science veri tabanları kullanıldı. İncelemede 2025'e kadar yayımlanan makaleler dikkate alındı. Melatonin glutamaterjik iletimi azaltarak ve GABA-erjik sinir iletimini artırarak nöronların elektriksel aktivitesini modüle eder. İnsanlarda melatoninin nöbetleri hafiflettiği ve çocukluk çağı dirençli epilepsinin tedavisindeki olumlu etkileri bildirildi. Buna ilaveten fiziksel, duygusal, bilişsel ve sosyal işlevleri de iyileştirdiği tespit edildi. Deneysel çalışmaların önemli bir kısmı melatoninin antikonvülzan özelliklerini doğrulamaktadır. Birkaç çalışmada melatonin doğrudan veya dolaylı prokonvülzan etki gösterdi. Bu inceleme ile epilepsi araştırmalarından elde edilen verilerin bazen birbirleri ile tam zıt yönde olduğu anlaşıldı. Bu araştırmalarda test edilen nöbet parametreleri ile bilişsel ve davranışsal özelliklerin sirkadiyen ritim dediğimiz günlük değişimlerden etkilenebileceği değerlendirildi. Söz konusu çalışmaların yürütülmesi sırasında sirkadiyen ritme bağlı değişkenleri dikkate almanın, tüm modelleme ve planlamanın buna göre yapılmasının zorunluluk olduğu kanaatine varıldı.

Anahtar Kelimeler: Epilepsi, hafıza, öğrenme, melatonin, nöbetler, sirkadiyen ritim.

Cite this article as:
Demirtaş C. Effects of Circadian Rhythm and Melatonin on Epilepsy Research. J Cogn Behav Psychother Res 2026;15(1):43–54.

Address for correspondence:
Cumaali Demirtaş.
Sağlık Bilimleri Üniversitesi, Hamidiye Sağlık Bilimleri Enstitüsü, Fizyoloji Anabilim Dalı, İstanbul, Türkiye
Phone: +90 216 777 87 77
E-mail:
cumaali.demirtas@sbu.edu.tr

Submitted: 20.11.2025
Revised: 14.01.2026
Accepted: 13.02.2026
Available Online: 27.02.2026

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

INTRODUCTION

Epilepsy is one of the most common diseases worldwide, with 74.5 million cases, one-fifth of which occur in developed countries (Ngugi et al., 2010). It comes from the Greek word "epilambanein" and means "taking possession." (Magiorkinis et al., 2010). The causes of many cases in developed countries remain unknown (Beghi, 2020). Brain injury, stroke, brain tumor, and congenital malformations are among the identified causes (Bhalla et al., 2011). Excessive alcohol consumption is also a cause of epilepsy (Pandolfo, 2011). Epilepsy is caused by abnormal, transient electrical activity of the brain's nerve cells. Underlying mechanisms include oxidative stress, glutamate excitotoxicity, and mitochondrial disorders (Vishnoi et al., 2016). Melatonin may be an additional treatment for epilepsy (Molina-Carballo et al., 1997).

Circadian rhythm is a mechanism that allows organisms to adapt to cyclical changes in their environment (Ouyang et al., 1998; Hut & Beersma 2011). The circadian rhythm is self-sustaining and is derived from the Latin words "circa" and "dies." It is a period of approximately 24 hours (Welsh et al., 1995; Czeisler et al., 1999). Circadian rhythms in single-celled organisms depend solely on genetic mechanisms and stimuli called Zeitgebers (Moore & Lenn 1972). The SCN integrates the information it receives from the retinal ganglion cells with other non-photic temporal cues (Challet & Pévet 2003). In this way, it synchronizes dependent oscillators in other brain regions by generating and maintaining a rhythm (Yamazaki et al., 2000). Light affects retinal ganglion cells and stimulates the SCN. Cells that transmit melanopsin participate in the circadian rhythm (Berson et al., 2002). The SCN regulates melatonin release. This light-triggered system also sends signals to the SCN and other brain regions that regulate sleep (Hughes et al., 2012). The hypothalamus controls hunger, thirst, sleep, body temperature, and some hormones (Cardinali et al., 1998). Melatonin, which is also considered a vitamin when consumed with food, is synthesized in the pineal gland (Tan et al., 2003; Banach et al., 2011; Akyuz et al., 2021).

The human body has a specific balance of temporal distribution. This balance, called the circadian rhythm, must function smoothly for a healthy life. Endogenous melatonin synthesis is crucial for this balance. Disruption of this rhythm due to decreased secretion of melatonin can lead to many diseases. The normal functioning of the epiphysis depends on the rhythmic regulation of the SCN. SCN activity decreases at night compared with that during the day. Melatonin release occurs as SCN activity decreases in the evening. The gradual working order in the hypothalamus forms the circadian rhythm of mammals (Gunata et al., 2020). Disrupted circadian rhythm negatively affects melatonin levels and the health of the elderly (Poeggeler, 2005).

Melatonin has both preventive and therapeutic effects in many diseases, including neurological diseases. Studies have demonstrated the prophylactic and therapeutic effects of melatonin in neurological diseases. Neurologists and administrators must work together to develop melatonin therapy for patients with neurological problems. Melatonin may offer a solution to this problem (Gunata et al., 2020).

Animal studies investigating the relationship between melatonin and epileptogenesis primarily support the anticonvulsant effect hypothesis. However, human studies vary in their design and use small numbers of participants, and the results do not always clearly confirm this hypothesis (Vasileva, 2021).

Current research focuses on the use of melatonin as an adjunct therapy for epilepsy. While some recent randomized controlled trials have shown beneficial results with adjunct melatonin therapy for epilepsy, the validity of these results is not universally accepted for various reasons. Adjunctive melatonin therapy improves sleep onset time and seizure severity in epileptic patients (Liu et al., 2024). Endogenous melatonin levels vary at different times of the day due to the circadian rhythm. This review aims to clarify the potential impact of circadian rhythm and resulting changes in melatonin levels on epilepsy research data.

SEARCH AND SELECTION STRATEGIES

The PubMed, Google Scholar, and Web of Science databases were used to search for articles on the subject. The following keywords are used: epilepsy, experimental epilepsy, seizures, circadian rhythm, melatonin, learning memory, and behavior. The review considered articles published upto and including 2025, as well as older articles that still retain their relevance. We examined 90 articles and books related to rodent epilepsy models. This research focused on the effects of circadian rhythm-related variables on research outcomes.

CIRCADIAN RHYTHM AND MELATONIN

Melatonin may also function as a neurotransmitter through receptor-mediated mechanisms. Melatonin facilitates transmission via ATP-sensitive potassium channels experimental studies have shown that mice lacking the KATP channel subunit are sensitive to hypoxia and have a low seizure threshold (Bal et al., 2018). Melatonin can suppress glutamate-mediated excitation through NMDA glutamatergic receptors, increase GABA concentrations, and increase GABAA receptor sensitivity (Banach et al., 2011). However, endogenous melatonin may inhibit dopaminergic transmission in the brain, leading to increased seizure activity (Stewart, 2001). Melatonin is active in the cerebrospinal fluid (CSF), as it is in many other tissues (Agez et al., 2009).

Melatonin is produced in the absence of light, which limits movement during the night. Melatonin secretion in night-active organisms continues throughout the night. This leads to an increase in spontaneous movements. Melatonin plays an important role in establishing the circadian rhythm (Gunata et al., 2020).

Like many biochemicals in the body, plasma melatonin levels fluctuate over a 24-hour period. Pineal functions are acutely suppressed at night (Liebmann et al., 1997). Melatonin concentrations are much higher at night than during the day. Melatonin production usually starts at 21:00 and peaks at 04:00. Its level begins to decrease at approximately 07:00 in the morning. The secretion rate is 29 mg/day (Sack et al., 1998).

EFFECTS OF CIRCADIAN RHYTHM AND MELATONIN IN EXPERIMENTAL SEIZURE MODELS

Numerous studies have identified the anticonvulsant effects of melatonin in various seizure models. Melatonin (50 mg/kg) increased the maximum threshold of electroconvulsion in mice. Similarly, low-dose melatonin (25 mg/kg) increased the positive effects of carbamazepine and phenobarbital on electroshock-induced convulsions in mice (Borowicz et al., 1999). When administered at doses starting from 75 mg/kg, melatonin shortened the duration of generalized seizures by raising the post-discharge threshold in rats stimulated via the amygdala (Mevissen & Ebert, 1998). It also reduced PTZ-induced seizures in mice and guinea pigs (Yahyavi-Firouz-Abadi et al., 2007; Solmaz et al., 2009). Other experimental studies have also confirmed the anticonvulsant activity of melatonin against PTZ seizures (Mosińska et al., 2016; Tchekalarova et al., 2019; Hosseinzadeh et al., 2022). Melatonin (60 mg/kg) was effective against kainate-induced convulsions (Tchekalarova et al., 2022). Ramelteon, a melatonin receptor agonist, has been studied in two experimental studies. It reversed hippocampal excitability in a rat model. Ramelteon administered at 200 mg/kg reduced the seizure period and frequency in Kcna1-null mice. Improvements in the circadian rhythms of rest and activity were also detected (Fenoglio-Simeone et al., 2009). In a study examining intrahippocampal kainate administration in mice, ramelteon was reported to reduce oxidative stress, restore glutathione homeostasis, decrease microglia activation, and alleviate pro-inflammatory phenotypic changes in hippocampal astrocytes. In addition to these effects, ramelteon exerted a neuroprotective effect in the hippocampus, reducing memory impairment and depression-like behaviors (Park et al., 2024). Two studies of SE induced by electrical stimulation found more seizures during the day than at night (Quigg et al., 1998; Bertram & Cornett, 1994). The Kindling model has shown that seizure susceptibility in experimental epilepsy varies according to the time of day. Two studies on pilocarpine-induced SE found a significant increase in seizure rates during the day (Cavalheiro et al., 1991; Arida et al., 1999). A few in vitro reports have demonstrated the potential proconvulsive effects of endogenous melatonin. It has been reported that a concentration of 1 µmol melatonin increases epileptiform activity in hippocampal slices of rats. The proconvulsive effect is observed only during the daylight (Musshoff & Speckmann, 2003). Injecting melatonin receptor antagonists into the hippocampus in rats with pilocarpine-induced convulsions resulted in an increased latency to the dark phase, but this effect was not observed in the light phase. This effect may be due to endogenous melatonin's proconvulsive activity (Stewart & Leung, 2005).

Pilocarpine-induced status epilepticus causes chronic, spontaneously recurring seizures resembling temporal lobe epilepsy in humans. Experimental models have suggested that the frequency of behaviorally monitored seizures covaries with the circadian rhythm and increases over time. However, in a SE study conducted on 30-day-old rats, continuous video EEG recordings were obtained. Seizure frequency was not correlated with time of day in 11 chronic epileptic rats monitored on a fixed 12-hour light/dark cycle after SE. Although seizure distribution according to the circadian rhythm was not reported in this study, long-term observations showed regular or clustered patterns. This finding suggests that clusters with seizure-free intervals form in pilocarpine-induced spontaneous seizures. Therefore, short-term recordings may lead to errors in estimating seizure frequency. Accordingly, longer recording periods are needed to adequately assess an animal's seizure frequency (Bajorat et al., 2011). Unlike other studies, the lack of a significant difference in seizure frequency between light and dark periods is considered to be due to the chronic epilepsy model. In addition, ambiguities have arisen in studies using the universe model. One study found no difference in seizure occurrence between daytime and nighttime (Hellier & Dudek, 1999). Another study with similar total seizure frequency found that daytime seizures were more frequent (Raedt et al., 2009). These results do not eliminate the possibility that circadian influences indirectly determine seizure frequency, as more seizures occur during periods of inactivity/rest (Quigg et al., 1998; Hellier & Dudek, 1999; Quigg et al., 2000).

CIRCADIAN RHYTHM AND MELATONIN EFFECTS IN CLINICAL STUDIES

When melatonin was administered as an adjunctive treatment to six adult and pediatric patients with intractable seizures, five experienced a reduction in seizures, and two children showed decreased epileptic activity in their electroencephalogram (EEG) recordings (Peled et al., 2001). In one study, patients with generalized seizures were divided into two groups. The control

group received valproate and placebo, and the test group received valproate and melatonin. The melatonin-treated group had a lower seizure rate and improved quality of life (Verma et al., 2021). Sixty patients with idiopathic generalized seizures receiving valproate monotherapy were administered melatonin or placebo at 2-week intervals. Melatonin effectively reduced the mean severity score of epilepsy. Epileptic seizures did not decrease, but sleep quality improved (Maghbooli et al., 2023). Melatonin, administered as an adjunctive treatment, has shown beneficial effects against infantile epileptic spasm syndrome. Melatonin was added to adrenocorticotropic hormone and magnesium sulfate treatment at a dose of 3 mg per day. The patients' sleep quality improved. Although 85.7% of the patients slept regularly, this rate was 42.9% in the placebo group (Sun et al., 2024). Fewer studies have addressed melatonin's proconvulsive potential. One study administered melatonin (5 mg daily) to six neurologically impaired children with sleep disorders. Although sleep quality improved significantly, seizure activity increased in four children. This increase returned to baseline values after melatonin discontinuation (Sheldon, 1998). A 21-year-old woman who had several generalized tonic-clonic seizures was taking 600 mg carbapenem, 200 mg phenytoin, and 1,500 mg valproate daily. Proconvulsive effects were observed in the magnetoencephalography recordings after the administration of 1.5 mg melatonin. Furthermore, the patient experienced four brief seizures after taking melatonin (Sandyk et al., 1992).

The data regarding the effects of melatonin on seizures are conflicting. This indolamine may increase the seizure threshold and the protective effect of some antiseizure medications. Several studies have suggested that the effect of melatonin on seizures is attenuated (in vitro) with respect to both anticonvulsant and proconvulsant effects. Exogenous melatonin may have anticonvulsant effects, whereas endogenous indolamine may have proconvulsive effects (Kamieniak et al., 2024). Seizure activity may be associated with an increase in melatonin levels in the brain due to the circadian cycle (Stewart, 2001).

EFFECTS OF CIRCADIAN RHYTHM AND MELATONIN ON EPILEPTIC DISCHARGE

Under normal conditions, the electrical activity of the brain is not synchronized. Synchronized neuronal discharges represent the neurobiology basis of epilepsy. These synchronized discharges are usually associated with a group of neurons in the cortex and form epileptic foci. Over time, they can spread to different parts of the brain, causing epilepsy, including abnormal behaviors and thoughts (Conde-Blanco et al., 2021). Convulsive seizures may occur because neurons are stimulated at a higher frequency than normal. Furthermore, epilepsy is associated with a low neuronal excitability threshold (Khan et al., 2018).

Antiseizure medications exert their effects through inhibitory actions on voltage-modulated ionic channels (mainly sodium channels), enhancement of inhibitory transmission (GABAergic), and suppression of excitatory transmission (especially glutamatergic transmission) (Khan et al., 2018). In the first of these effects, voltage-dependent sodium channels open during stimulation, causing rapid depolarization, which in turn triggers neurotransmitter release at the axon terminal and then close rapidly. New stimulation may be possible by reopening these channels. Some antiseizure medications prolong the inactivated of these channels (Kaplan, 2016; Catterall, 2014). Excessive stimulation is blocked by gamma-aminobutyric acid neurons (Treiman, 2001). Antiseizure drugs prevent the excessive activation of N-methyl-D-aspartate receptors by glutamate and glycine (Zhou & Sheng, 2013).

Studies have shown that a significant portion of melatonin is localized in the cell nucleus. Melatonin has specific binding sites in the cell nucleus (Penev & Zee 1997). Quantitative in vitro studies have shown that melatonin receptors are present in the brain and peripheral tissues (Gunata et al., 2020). Furthermore, it may reduce epilepsy by closing voltage-dependent Ca channels and suppressing neuronal activity (Choi et al., 2014).

CIRCADIAN RHYTHM AND MELATONIN'S EFFECT ON SLEEP

Although epileptic activity is sometimes considered sudden, it recurs regularly at similar times each day or during a particular wakefulness state. This review focuses on the role of the 24-hour circadian rhythm in the occurrence of seizures and the sleep-wake cycle associated with seizures. Circadian rhythmicity is a key factor in adaptation to approximately 24-h environmental cycles. Several physiological processes and similar pathological events occur within a specific circadian range. Brain activity, neuronal excitability, and stress hormones that trigger seizures follow a circadian pattern. This also applies to epilepsy in general (Smyk & van Luijtelaar 2020). Seizures were initially classified as diurnal, nocturnal, or diffuse, with no specific time of day characteristics (Gowers 1885; Langdon-Down & Brain 1929). More recent studies have linked the temporal pattern of seizures to the epileptic focus location. For example, seizures originating from the temporal lobe are most common during the day, whereas those originating from the frontal and parietal lobes are more common at night (Quigg et al., 1998; Quigg & Straume, 2000; Pavlova et al., 2004; Durazzo et al., 2008; Hofstra et al., 2009a; Karafin et al., 2010; Zarowski et al., 2011; Loddenkemper et al., 2011; Kaleyias et al., 2011; Nzwalo et al., 2016). The typical 24-hour rest/activity cycle in humans and the day/night preference for seizures may reflect a predisposition to a particular alertness state. Indeed,

different levels of brain excitability and sleep-wakefulness are important factors affecting the seizure threshold (Steriade & Contreras 1995). Temporal and occipital lobe seizures were more common during wakefulness and frontal lobe seizures during sleep in patients with focal epilepsy (Pavlova et al., 2004; Hofstra et al., 2009a; Kaleyias et al., 2011; Crespel et al., 1998; Herman et al. 2001; Hofstra et al. 2009b; Yildiz et al., 2012). Interestingly, this pattern varies with age. Frontal lobe seizures are more common in infants when they are awake, whereas they are more common during sleep in adolescents (Ramgopal et al. 2014). Generalized seizures occur more frequently during wakefulness (Zarowski et al. 2011; Loddenkemper et al., 2011; Winawer et al., 2016). The cyclical repetition of when people are asleep and awake is a circadian rhythm. The temporal organization of sleep also depends on homeostatic mechanisms. Retrospective analyses of EEG, video EEG, or intracranial recordings taken over several days for diagnostic or epileptic surgery have reported inhomogeneous seizure distribution and a relationship between seizures and sleep and wakefulness. With new technological developments, long-term monitoring of epileptic activity outside the clinic, up to several years, has now become possible. Such studies have confirmed the existence of stable 24-hour rhythms but also longer rhythms in epileptic seizures. These rhythms vary depending on the epileptic focal point location and patient characteristics (Spencer et al., 2016; Karoly et al., 2016, 2017, 2018; Baud et al., 2018; Weisdorf et al., 2019). Recent studies in humans and rat models have revealed that seizures recur consistently in epileptic events, depending on the phase of circadian and multidynamo rhythms, suggesting endogenous mechanisms of such periodic rhythms, their co-regulation, and the interrelationship between seizures and IEDs (Karoly et al., 2017; Baud et al., 2019).

Internal and external synchronization are important for human health. For example, disruption of circadian rhythms due to shift work can lead to health problems and increased risks of cancer, metabolic, neurodegenerative, cardiovascular, or mental illnesses (Hedström et al., 2011; Kecklund & Axelsson 2016; Wyse et al. 2017; Stenvers et al., 2019). Deviations from the established rhythm, such as inconsistency between sleep and wakefulness, are signs of serious pathological changes in the body (Musiek et al., 2018; Smagula et al., 2019). Cardiovascular diseases, such as stroke, myocardial infarction, arrhythmia, and sudden cardiac death, are more likely to occur in the early hours of the day (Karmarkar & Tischkau 2013; Buurma et al., 2019). Nervous system-related symptoms are also associated with circadian modulation. Mood deterioration generally occurs in the morning in patients with migraine and major depressive disorder (Murray 2008; Morris et al., 2009; Baksa et al., 2019). In some patients with AD, behavioral symptoms deteriorate during sunset, afternoon, and evening hours. This is related to the rhythm of body temperature (Volicer et al., 2001; Bachman & Rabins 2006; de Jonghe et al., 2010). Epilepsy is a brain disease with epileptic seizures and circadian phenotypic expression. Numerous studies have demonstrated that epilepsy is closely related to sleep. Treating sleep disorders also positively impacts epilepsy. Preclinical studies have demonstrated that melatonergic compounds, such as agomelatine, have a positive effect on seizures and anticonvulsant effects. However, these findings need to be tested in clinical studies (Tchekalarova et al., 2015). Melatonin showed a potent anticonvulsant effect when administered with sodium valproate in an experimental rat study (Savina et al., 2006). Human studies and a significant number of experimental animal studies suggest that melatonin is an effective antiepileptic agent. Indoleamine may be effective against circadian rhythm-independent seizures (Kamieniak et al., 2024). Melatonin can be administered as an adjuvant in patients with epilepsy and comorbid sleep disorders (Vimala et al., 2014; Jiang et al., 2024; Singh et al., 2025).

EFFECTS OF CIRCADIAN RHYTHM AND MELATONIN ON COGNITIVE ACTIVITY AND MEMORY LEARNING IN EPILEPSY

Melatonin treatment during epileptogenesis increased seizure latency in a kainate-induced temporal lobe epilepsy model (10 mg/kg diluted in drinking water for 8 weeks) It reduces the frequency of spontaneous uncontrollable seizures and attenuates seizure activity. It does not affect disrupted circadian rhythms and behavioral disorders due to epilepsy (Petkova et al., 2014). In a study in which melatonin (10 mg/kg), administered 3 days after kainate injection and for 1 week, decreased the frequency of spontaneous seizure activity recorded by EEG compared with a single dose. Repeat indolamine injections reduced the number and severity of spontaneous behavioral convulsions. In addition, mice pretreated with melatonin showed improvements in cognition, learning, and memory tasks, and a neuroprotective effect was also detected in the hippocampus (Li et al., 2023).

Chronic intraperitoneal melatonin administration increases neuronal GluR2 surface expression in the CA1 region, which may reduce Ca2+ permeability, alleviate epilepsy-induced LTP deficits, and save neurons from death. This may also alleviate cognitive dysfunction in rats with chronic-phase epilepsy (Ma et al., 2017). This study highlights the role of melatonin in the prevention of epilepsy-related cognitive impairments.

A study investigating the quality of life of 31 children treated with valproate alone, 16 of whom received additional melatonin, reported significant improvements in memory and language subscales, cognitive function, and anxiety-like behaviors in the

melatonin group (Gupta et al. 2004a). The paucity of human studies, coupled with the small number of controlled clinical studies, leaves some topics unanswered (Sanchez-Barcelo et al., 2010). According to current scientific data, melatonin can change the electrical activity of neurons. However, its effect on the CNS has not yet been fully elucidated (Leon et al., 2000). Studies on this topic indicate that melatonin improves the condition of patients with epilepsy. A study has shown that melatonin application has a positive effect on children with epilepsy. Melatonin was associated with physical function, emotional recovery, and behavioral improvements (Gupta et al. 2004b).

EFFECTS OF CIRCADIAN RHYTHM ON BIOLOGICAL DATA IN EXPERIMENTAL EPILEPSY MODELS

The effects of circadian clock genes on the pathophysiology of epilepsy and behavioral disorders caused by epilepsy need to be investigated. A study involving female rats characterized the nighttime expression of these genes. This study demonstrated that circadian dysfunction is a fundamental consequence of epilepsy and emphasized that future studies and a comprehensive assessment of circadian disruption will shed light on the feasibility of chronotherapy interventions in patients with epilepsy (Yamakawa et al., 2023).

The circadian clock also modulates aging-associated systems, such as the oxidative stress response and DNA repair (Kondratova & Kondratov 2012). Disrupted circadian rhythms affect melatonin production, which negatively impacts the health of older individuals (Poeggeler, 2005). Aging causes changes in the daily expression of various clock genes in the SCN. Melatonin is effective in correcting age-related changes. Clock gene mRNA expression at 3, 12, and 24 months demonstrates that age-dependent circadian changes In an experimental study, 11 days of melatonin administration restored Per2, Cry1, Cry2, and Bmal1 to normal rhythms (Jenwitheesuk et al., 2014). This literature suggests a causal link between clock genes and molecular factors that cause nerve damage.

PRACTICAL RESULTS, CHALLENGES, CHRONOTROPY-BASED EPILEPSY TREATMENTS, AND FUTURE OUTLOOK

Melatonin may exert this effect because of its biological and chemical properties. Melatonin exerts antioxidant, free radical scavenging, immune regulation, and anti-inflammatory effects and regulates the circadian rhythm (Sahna et al., 2005).

According to the literature, melatonin has both positive and negative effects on epilepsy (Gunata et al., 2020).

This review focuses on melatonin's lipophilic and hydrophilic properties, its ability to easily cross the blood-brain barrier, and its effects on the neurological system. According to one study, 50–100 mg of melatonin per day is sufficient for the treatment of neurological diseases (Cardinali et al. 1998). One of the most important issues in studies investigating the effectiveness of melatonin, a neuroprotective agent, is accurately determining the optimal dose. Using significantly higher doses in experimental animals than in clinical studies affects the results. Further research is needed to increase the therapeutic efficacy of existing treatment methods, reduce their side effects and toxicity, and investigate the protective and therapeutic effects of melatonin in neurological diseases (Gunata et al., 2020). The temporal organization of epileptic seizures and their predominance during wakefulness offer promising practical implications for diagnosis, treatment, and new approaches. Sleep deprivation and sleep fragmentation are currently recognized as triggering factors in some seizure types (Rosenow et al., 2015). The variation in seizure timing across the sleep-wake cycle is considered a promising criterion for determining the epileptic zone in intractable epilepsies (Klimeš et al. 2019).

Pharmacology can also be used to study the rhythmic distribution of epileptic reflexes. Timed drug administration, a branch of chronopharmacology, is already used for treating cardiovascular diseases (Smolensky & Peppas 2007). Studies have investigated the effects of the circadian cycle on the pharmacokinetics and anticonvulsant effects of antiepileptic drugs in patients with epilepsy (Hofstra et al., 2012; Ramgopal 2013). Studies with fully validated data, carefully selected patient populations, and well-designed preclinical models can reveal the relationship between circadian rhythm and epilepsy. Obtaining homogeneous patient groups for investigating circadian rhythms in epilepsy is challenging, and most studies are retrospective. Furthermore, it is challenging to make a clear distinction regarding observed rhythmicity, whether in standard clinical settings or in home settings. Therefore, the circadian timing system influences both sleep need and duration. Observational studies that consider seizure timing may not fully explain whether the endogenous clock or the sleep-wake cycle drives the epileptic activity cycle (Smyk & van Luijtelaar 2020).

Patients with epilepsy commonly experience cognitive, learning, memory, anxiety-like behavioral problems, and general behavioral problems due to seizures and neurodegeneration. Various treatment trials and research are being conducted to treat patients with epilepsy and, if possible, completely cure or at least alleviate such problems. However, the data obtained from these studies sometimes report contradictory results. It is impossible for the seizure parameters and cognitive and behavioral characteristics tested in these studies to be unaffected by the circadian rhythm. This has been demonstrated in numerous studies.

CONCLUSION

In clinical studies, it is essential to pay attention to characteristics such as age, race, gender, and lifestyle that may affect the biological parameters of the patients under study. All criteria, including the cause of epilepsy, its focus, mechanism, and study duration, should be considered. Otherwise, the interpretation of the obtained data may lead to erroneous interpretations. This is because daily light exposure, sleep quality and duration, and other stress factors or advantages will influence the results of these studies.

Criteria such as age, species, breed, gender, and housing conditions of the animals used in experimental studies will also influence the research results. Animal diet, exposure to light, additional stress, or the opposite will also affect the results. It is important to remember that rodents, which are particularly active at night, rest during the day. Sleep deprivation and the conduct of tests and procedures that cannot be completed simultaneously, especially behavioral tests, in different sessions can make it difficult to implement the rule of performing the same procedure in the same timeframe. However, the effects of these negative situations can be minimized with good planning by performing the same procedures for all groups in the same timeframe. Otherwise, the reliability of the obtained data will be reduced.

The mechanisms of action of the drugs used in treatment trials should also be carefully examined and considered in the evaluation of the tests. For example, benzodiazepine-induced stimulation of the GABAergic system reduces melatonin levels at night (Monteleone et al., 1997). Furthermore, melatonin levels should be monitored after drug administration because dopaminergic agonists or opioid receptor blockers can alter melatonin release (Gunata et al., 2020).

In conclusion, for the accuracy and interpretation of data used in intergroup comparisons, circadian rhythm and, consequently, the variable serum melatonin concentration must be considered in clinical or experimental studies on epilepsy treatment. The parameters studied cannot be unaffected by the circadian rhythm and melatonin concentration.

Informed Consent: Not applicable.

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

Financial Disclosure: No funding was received for the preparation, writing, or publication of this study.

Use of AI for Writing Assistance: Not declared.

Peer-review: Externally peer-reviewed.

REFERENCES

Agez, L., Laurent, V., Guerrero, H. Y., Pevet, P., Masson-Pevet, M., & Gauer, F. (2009). Endogenous melatonin provides an effective circadian message to both the suprachiasmatic nuclei and the pars tuberalis of the rat. *Journal of Pineal Research, 46*(1), 95–105.

Akyuz, E., Polat, A. K., Eroglu, E., Kullu, I., Angelopoulou, E., & Paudel, Y. N. (2021). Revisiting the role of neurotransmitters in epilepsy: An updated review. *Life Sciences, 265*, 118826.

Arida, R.M., Scorza, F.A., de Araujo Peres, C., & Cavalheiro, E.A. (1999) The course of untreated seizures in pilocarpine model of epilepsy. *Epilepsy Res* 34: 99–107.

Bachman, D., & Rabins, P. (2006). "Sundowning" and other temporally associated agitation states in dementia patients. *Annual Review of Medicine, 57*, 499–511.

Bajorat, R., Wilde, M., Sellmann, T., Kirschstein, T., & Köhling, R. (2011). Seizure frequency in pilocarpine-treated rats is independent of circadian rhythm. *Epilepsia, 52*(9), e118–e122.

Baksa, D., Gecse, K., Kumar, S., Toth, Z., Gal, Z., Gonda, X., & Juhasz, G. (2019). Circadian variation of migraine attack onset: A review of clinical studies. *BioMed Research International, 2019*, 4616417.

Bal, R., Ozturk, G., Etem, E. O., Him, A., Cengiz, N., Kuloglu, T., Tuzcu, M., Yildirim, C., & Tektemur, A. (2018). Modulation of excitability of stellate neurons in the ventral cochlear nucleus of mice by ATP-sensitive potassium channels. *Journal of Membrane Biology, 251*, 163–178.

Banach, M., Gurdziel, E., Jedrych, M., & Borowicz, K. K. (2011). Melatonin in experimental seizures and epilepsy. *Pharmacological Reports, 63*, 1–11.

Baud, M. O., Ghestem, A., Benoliel, J. J., Becker, C., & Bernard, C. (2019). Endogenous multidien rhythm of epilepsy in rats. *Experimental Neurology, 315*, 82–87.

Baud, M. O., Kleen, J. K., Mirro, E. A., Andrechak, J. C., King-Stephens, D., Chang, E. F., & Rao, V. R. (2018). Multi-day rhythms modulate seizure risk in epilepsy. *Nature Communications, 9*, 88.

Beghi, E. (2020). The epidemiology of epilepsy. *Neuroepidemiology, 54*, 185–191.

Berson, D. M., Dunn, F. A., & Takao, M. (2002). Phototransduction by retinal ganglion cells that set the circadian clock. *Science, 295*(5557), 1070–1073.

Bertram, E.H., & Cornett, J.F. (1994) The evolution of a rat model of chronic spontaneous limbic seizures. *Brain Res 661*, 157–162.

Bhalla, D., Godet, B., Druet-Cabanac, M., & Preux, P. M. (2011). Etiologies of epilepsy: A comprehensive review. *Expert Review of Neurotherapeutics, 11*, 861–876.

Borowicz, K. K., Kaminski, R., Gasior, M., Kleinrok, Z., & Czuczwar, S. J. (1999). Influence of melatonin upon the protective action of conventional antiepileptic drugs against maximal electroshock in mice. *European Neuropsychopharmacology, 9*, 185–190.

Buurma, M., van Diemen, J. J. K., Thijs, A., Numans, M. E., & Bonten, T. N. (2019). Circadian rhythm of cardiovascular disease: The potential of chronotherapy with aspirin. *Frontiers in Cardiovascular Medicine, 6*, 84.

Cardinali, D. P., & Pevet, P. (1998). Basic aspects of melatonin action. *Sleep Medicine Reviews, 2*(3), 175–190.

Catterall, W. A. (2014). Sodium channels, inherited epilepsy, and antiepileptic drugs. *Annual Review of Pharmacology and Toxicology, 54*, 317–338.

Cavalheiro, E.A., Leite, J.P., Bortolotto, Z.A., Turski, W.A., Ikonomidou, C., & Turski, L. (1991) Long-term effects of pilocarpine in rats: structural damage of the brain triggers kindling and spontaneous recurrent seizures. *Epilepsia 32*, 778–782.

Challet, E., & Pévet, P. (2003). Interactions between photic and nonphotic stimuli to synchronize the master circadian clock in mammals. *Frontiers in Bioscience, 8*, 246–257.

Choi, T. Y., Kwon, J. E., Durrance, E. S., Jo, S. H., Choi, S. Y., & Kim, K. T. (2014). Melatonin inhibits voltage-sensitive Ca^{2+} channel-mediated neurotransmitter release. *Brain Research, 1557*, 34–42.

Conde-Blanco, E., Reyes-Leiva, D., Pintor, L., Donaire, A., Manzanares, I., Rumia, J., Roldan, P., Boget, T., Bargalló, N., & Gil-Lopez, F. J. (2021). Psychotic symptoms in drug-resistant epilepsy patients after cortical stimulation. *Epilepsy Research, 173*, 106630.

Crespel, A., Baldy-Moulinier, M., & Coubes, P. (1998). The relationship between sleep and epilepsy in frontal and temporal lobe epilepsies: Practical and physiopathologic considerations. *Epilepsia, 39*, 150–157.

Czeisler, C. A., Duffy, J. F., Shanahan, T. L., Brown, E. N., Mitchell, J. F., Rimmer, D. W., Ronda, J. M., Silva, E. J., Allan, J. S., Emens, J. S., Dijk, D. J., & Kronauer, R. E. (1999). Stability, precision, and near-24-hour period of the human circadian pacemaker. *Science, 284*, 2177–2181.

de Jonghe, A., Korevaar, J. C., van Munster, B. C., & de Rooij, S. E. (2010). Effectiveness of melatonin treatment on circadian rhythm disturbances in dementia: Are there implications for delirium? A systematic review. *International Journal of Geriatric Psychiatry, 25*, 1201–1208.

Durazzo, T. S., Spencer, S. S., Duckrow, R. B., Novotny, E. J., Spencer, D. D., & Zaveri, H. P. (2008). Temporal distribution of seizure occurrence from various epileptogenic regions. *Neurology, 70*, 1265–1271.

Fenoglio-Simeone, K., Mazarati, A., Sefidvash-Hockley, S., Shin, D., Wilke, J., Milligan, H., Sankar, R., Rho, J. M., & Maganti, R. (2009). Anticonvulsant effects of the selective melatonin receptor agonist ramelteon. *Epilepsy & Behavior, 16*, 52–57.

Gowers, W. (1885). Course of epilepsy. In W. Gowers (Ed.), *Epilepsy and other chronic convulsive diseases: Their causes, symptoms and treatment* (pp. 157–164). New York, NY: William Wood.

Gunata, M., Parlakpinar, H., & Acet, H. A. (2020). Melatonin: A review of its potential functions and effects on neurological diseases. *Revue Neurologique, 176*(3), 148–165.

Gupta, M., Aneja, S., & Kohli, K. (2004a). Add-on melatonin improves quality of life in epileptic children on valproate monotherapy: A randomized, double-blind, placebo-controlled trial. *Epilepsy & Behavior, 5*(3), 316–321.

Gupta, M., Gupta, Y. K., Agarwal, S., Aneja, S., Kalaivani, M., & Kohli, K. (2004b). Effects of add-on melatonin administration on antioxidant enzymes in children with epilepsy taking carbamazepine monotherapy: A randomized, double-blind, placebo-controlled trial. *Epilepsia, 45*, 1636–1639.

Hedström, A. K., Åkerstedt, T., Hillert, J., Olsson, T., & Alfredsson, L. (2011). Shift work at young age is associated with increased risk for multiple sclerosis. *Annals of Neurology, 70*, 733–741.

Hellier, J.L., & Dudek, F.E. (1999) Spontaneous motor seizures of rats with kainate-induced epilepsy: effect of time of day and activity state. *Epilepsy Res 35*, 47–57.

Herman, S. T., Walczak, T. S., & Bazil, C. W. (2001). Distribution of partial seizures during the sleep–wake cycle: Differences by seizure onset site. *Neurology, 56*, 1453–1459.

Hofstra, W. A., Grootemarsink, B. E., Dieker, R., van der Palen, J., & de Weerd, A. W. (2009a). Temporal distribution of clinical seizures over the 24-h day: A retrospective observational study in a tertiary epilepsy clinic. *Epilepsia, 50*, 2019–2026.

Hofstra, W. A., Spetgens, W. P. J., Leijten, F. S. S., van Rijen, P. C., Gosselaar, P., van der Palen, J., & de Weerd, A. W. (2009b). Diurnal rhythms in seizures detected by intracranial electrocorticographic monitoring: An observational study. *Epilepsy & Behavior, 14*, 617–621.

Hofstra, W. A., van der Palen, J., & de Weerd, A. W. (2012). Morningness and eveningness: When do patients take their antiepileptic drugs? *Epilepsy & Behavior, 23*, 320–323.

Hosseinzadeh, A., Dehdashtian, E., Jafari-Sabet, M., & Mehrzadi, S. (2022). The effects of vitamin D3 and melatonin combination on pentylenetetrazole-induced seizures in mice. *Central Nervous System Agents in Medicinal Chemistry, 22*, 118–124.

Hughes, S., Hankins, M. W., Foster, R. G., & Peirson, S. N. (2012). Melanopsin phototransduction: Slowly emerging from

the dark. In *Progress in Brain Research* (Vol. 199, pp. 19–40). Elsevier.

Hut, R. A., & Beersma, D. G. M. (2011). Evolution of time-keeping mechanisms: Early emergence and adaptation to photoperiod. *Philosophical Transactions of the Royal Society B: Biological Sciences, 366*, 2141–2154.

Jenwitheesuk, A., Nopparat, C., Mukda, S., Wongchitrat, P., & Govitrapong, P. (2014). Melatonin regulates aging and neurodegeneration through energy metabolism, epigenetics, autophagy, and circadian rhythm pathways. *International Journal of Molecular Sciences, 15*(9), 16848–16884.

Jiang, J., Wu, Y. J., Yan, C. H., Jin, Y., Yang, T. T., Han, T., & Liu, X. W. (2024). Efficacy and safety of agomelatine in epilepsy patients with sleep and mood disorders: An observational, retrospective cohort study. *Epilepsy & Behavior, 152*, 109641.

Kaleyias, J., Loddenkemper, T., Vendrame, M., Das, R., Syed, T. U., Alexopoulos, A. V., Wyllie, E., & Kothare, S. V. (2011). Sleep–wake patterns of seizures in children with lesional epilepsy. *Pediatric Neurology, 45*, 109–113.

Kamieniak, M., Kośmider, K., Miziak, B., & Czuczwar, S. J. (2024). Oxidative stress in epilepsy: Focus on melatonin. *International Journal of Molecular Sciences, 25*(23), 12943.

Kaplan, D., Isom, L., & Petrou, S. (2016). Role of sodium channels in epilepsy. *Cold Spring Harbor Perspectives in Medicine, 6*, a022814.

Karafin, M., St. Louis, E. K., Zimmerman, M. B., Sparks, J. D., & Granner, M. A. (2010). Bimodal ultradian seizure periodicity in human mesial temporal lobe epilepsy. *Seizure, 19*, 347–351.

Karmarkar, S. W., & Tischkau, S. A. (2013). Influences of the circadian clock on neuronal susceptibility to excitotoxicity. *Frontiers in Physiology, 4*, 313.

Karoly, P. J., Freestone, D. R., Boston, R., Grayden, D. B., Himes, D., Leyde, K., Seneviratne, U., Berkovic, S., O'Brien, T., & Cook, M. J. (2016). Interictal spikes and epileptic seizures: Their relationship and underlying rhythmicity. *Brain, 139*, 1066–1078.

Karoly, P. J., Goldenholz, D. M., Freestone, D. R., Moss, R. E., Grayden, D. B., Theodore, W. H., & Cook, M. J. (2018). Circadian and circaseptan rhythms in human epilepsy: A retrospective cohort study. *The Lancet Neurology, 17*, 977–985.

Karoly, P. J., Ung, H., Grayden, D. B., Kuhlmann, L., Leyde, K., Cook, M. J., & Freestone, D. R. (2017). The circadian profile of epilepsy improves seizure forecasting. *Brain, 140*, 2169–2182.

Kecklund, G., & Axelsson, J. (2016). Health consequences of shift work and insufficient sleep. *BMJ, 355*, i5210.

Khan, S., Nobili, L., Khatami, R., Loddenkemper, T., Cajochen, C., Dijk, D.-J., & Eriksson, S. H. (2018). Circadian rhythm and epilepsy. *The Lancet Neurology, 17*, 1098–1108.

Klimeš, P., Cimbálník, J., Brázdil, M., Hall, J., Dubeau, F., Gotman, J., & Frauscher, B. (2019). NREM sleep is the state of vigilance that best identifies the epileptogenic zone in the interictal electroencephalogram. *Epilepsia, 60*, 2404–2415.

Kondratova, A. A., & Kondratov, R. V. (2012). The circadian clock and pathology of the ageing brain. *Nature Reviews Neuroscience, 13*(5), 325–335.

Langdon-Down, M., & Brain, W. (1929). Time of day in relation to convulsions in epilepsy. *The Lancet, 213*, 1029–1032.

Leon, J., Macias, M., Escames, G., Camacho, E., Khaldy, H., Martin, M., Espinosa, A., Gallo, M. A., & Acuña-Castroviejo, D. (2000). Structure-related inhibition of calmodulin-dependent neuronal nitric oxide synthase activity by melatonin and synthetic kynurenines. *Molecular Pharmacology, 58*(5), 967–975.

Li, P., Ji, X., Shan, M., Wang, Y., Dai, X., Yin, M., Liu, Y., Guan, L., Ye, L., & Cheng, H. (2023). Melatonin regulates microglial polarization to M2 cells via the RhoA/ROCK signaling pathway in epilepsy. *Immunity, Inflammation and Disease, 11*, e900.

Liebmann, P. M., Wölfler, A., Felsner, P., Hofer, D., & Schauenstein, K. (1997). Melatonin and the immune system. International *Archives of Allergy and Immunology, 112*(3), 203–211.

Liu, Z., Zhu, J., Shen, Z., Ling, Y., Zeng, Y., Yang, Y., & Jiang, G. (2024). Melatonin as an add-on treatment for epilepsy: A systematic review and meta-analysis. *Seizure, 117*, 133–141.

Loddenkemper, T., Vendrame, M., Zarowski, M., Gregas, M., Alexopoulos, A. V., Wyllie, E., & Kothare, S. V. (2011). Circadian patterns of pediatric seizures. *Neurology, 76*, 145–153.

Ma, Y., Sun, X., Li, J., Jia, R., Yuan, F., Wei, D., & Jiang, W. (2017). Melatonin alleviates the epilepsy-associated impairments in hippocampal LTP and spatial learning through rescue of surface GluR2 expression at hippocampal CA1 synapses. *Neurochemical Research, 42*(5), 1438–1448.

Maghbooli, M., Najafabadi, S. A., Malekmahmoudi, G., & Molseghi, M. H. (2023). Effect of add-on melatonin on seizure outcomes and quality of sleep in epilepsy with idiopathic generalized tonic-clonic seizures alone in adult patients: Cross-sectional, randomized, double-blind, placebo-controlled clinical trial. *Brain and Behavior, 13*, e2860.

Magiorkinis, E., Sidiropoulou, K., & Diamantis, A. (2010). Hallmarks in the history of epilepsy: Epilepsy in antiquity. *Epilepsy & Behavior, 17*, 103–108.

Mevissen, M., & Ebert, U. (1998). Anticonvulsant effects of melatonin in amygdala-kindled rats. *Neuroscience Letters, 257*, 13–16.

Molina-Carballo, A., Muñoz-Hoyos, A., Reiter, R. J., Sánchez-Forte, M., Moreno-Madrid, F., & Rufo-Campos, M. (1997). Utility of high doses of melatonin as adjunctive anticonvulsant therapy in a child with severe myoclonic epilepsy: Two years' experience. *Journal of Pineal Research, 23*(2), 97–105.

Monteleone, P., Tortorella, A., Borriello, R., Natale, M., Cassandro, P., & Maj, M. (1997). Suppression of nocturnal plasma melatonin levels by evening administration of sodium valproate in healthy humans. *Biological Psychiatry, 41*(3), 336–341.

Moore, R. Y., & Lenn, N. J. (1972). A retinohypothalamic projection in the rat. *Journal of Comparative Neurology, 146*, 1–4.

Morris, D. W., Trivedi, M. H., Fava, M., Wisniewski, S. R., Balasubramani, G. K., Khan, A. Y., Jain, S., & Rush, A. J. (2009). Diurnal mood variation in outpatients with major depressive disorder. *Depression and Anxiety, 26*, 851–863.

Mosińska, P., Socała, K., Nieoczym, D., Laudon, M., Storr, M., Fichna, J., & Wlaź, P. (2016). Anticonvulsant activity of melatonin, but not melatonin receptor agonists Neu-P11 and Neu-P67, in mice. *Behavioural Brain Research, 307*, 199–207.

Murray, G. (2008). Major depressive disorder: Afternoon and evening diurnal mood variation is common. *Evidence-Based Mental Health, 11*, 59.

Musiek, E. S., Bhimasani, M., Zangrilli, M. A., Morris, J. C., Holtzman, D. M., & Ju, Y. S. (2018). Circadian rest–activity pattern changes in aging and preclinical Alzheimer disease. *JAMA Neurology, 75*, 582–590.

Musshoff, U., & Speckmann, E. J. (2003). Diurnal actions of melatonin on epileptic activity in hippocampal slices of rats. *Life Sciences, 73*, 2603–2610.

Ngugi, A. K., Bottomley, C., Kleinschmidt, I., Sander, J. W., & Newton, C. R. (2010). Estimation of the burden of active and lifetime epilepsy: A meta-analytic approach. *Epilepsia, 51*, 883–890.

Nzwalo, H., Menezes Cordeiro, I., Santos, A. C., Peralta, R., Paiva, T., & Bentes, C. (2016). 24-hour rhythmicity of seizures in refractory focal epilepsy. *Epilepsy & Behavior, 55*, 75–78.

Ouyang, Y., Andersson, C. R., Kondo, T., Golden, S. S., & Johnson, C. H. (1998). Resonating circadian clocks enhance fitness in cyanobacteria. *Proceedings of the National Academy of Sciences of the United States of America, 95*, 8660–8664.

Pandolfo, M. (2011). Genetics of epilepsy. *Seminars in Neurology, 31*, 506–518.

Park, J. H., Hwang, Y., Nguyen, Y. N. D., Kim, H. C., & Shin, E. J. (2024). Ramelteon attenuates hippocampal neuronal loss and memory impairment following kainate-induced seizures. *Journal of Pineal Research, 76*, e12921.

Pavlova, M. K., Shea, S. A., & Bromfield, E. B. (2004). Day/night patterns of focal seizures. *Epilepsy & Behavior, 5*, 44–49.

Peled, N., Shorer, Z., Peled, E., & Pillar, G. (2001). Melatonin effect on seizures in children with severe neurologic deficit disorders. *Epilepsia, 42*, 1208–1210.

Penev, P. D., & Zee, P. C. (1997). Melatonin: A clinical perspective. *Annals of Neurology, 42*(4), 545–553.

Petkova, Z., Tchekalarova, J., Pechlivanova, D., Moyanova, S., Kortenska, L., Mitreva, R., Popov, D., Markova, P., Lozanov, V., Atanasova, D., Lazarov, N., & Stoynev, A. (2014). Treatment with melatonin after status epilepticus attenuates seizure activity and neuronal damage but does not prevent disturbance in diurnal rhythms and behavioral alterations in spontaneously hypertensive rats in a kainate model of temporal lobe epilepsy. *Epilepsy & Behavior, 31*, 198–208.

Poeggeler, B. J. E. (2005). Melatonin: Aging and age-related diseases. *Endocrine, 27*(2), 201–212.

Quigg, M., & Straume, M. (2000). Dual epileptic foci in a single patient express distinct temporal patterns dependent on limbic versus nonlimbic brain location. *Annals of Neurology, 48*, 117–120.

Quigg, M., Straume, M., Menaker, M., & Bertram, E. H., III. (1998). Temporal distribution of partial seizures: Comparison of an animal model with human partial epilepsy. *Annals of Neurology, 43*, 748–755.

Ramgopal, S., Powell, C., Zarowski, M., Alexopoulos, A. V., Kothare, S. V., & Loddenkemper, T. (2014). Predicting diurnal and sleep/wake seizure patterns in pediatric patients of different ages. *Epileptic Disorders, 16*, 56–66.

Ramgopal, S., Thome-Souza, S., & Loddenkemper, T. (2013). Chronopharmacology of anticonvulsive therapy. *Current Neurology and Neuroscience Reports, 13*, 339.

Raedt, R., Van Dycke, A., Van Melkebeke, D., De Smedt, T., Claeys, P., Wyckhuys, T., Vonck, K., Wadman, W., & Boon, P. (2009) Seizures in the intrahippocampal kainic acid epilepsy model: characterization using long-term video-EEG monitoring in the rat. *Acta Neurol Scand 119*, 293–303.

Rosenow, F., Klein, K. M., & Hamer, H. M. (2015). Non-invasive EEG evaluation in epilepsy diagnosis. *Expert Review of Neurotherapeutics, 15*, 425–444.

Sack, R. L., Lewy, A. J., & Hughes, R. J. (1998). Use of melatonin for sleep and circadian rhythm disorders. *Annals of Medicine, 30*(1), 115–121.

Sahna, E., Parlakpinar, H., Turkoz, Y., & Acet, A. (2005). Protective effects of melatonin on myocardial ischemia/reperfusion-induced infarct size and oxidative changes. *Physiological Research, 54*(5), 491–495.

Sanchez-Barcelo, E. J., Mediavilla, M. D., Tan, D. X., & Reiter, R. J. (2010). Clinical uses of melatonin: Evaluation of human trials. *Current Medicinal Chemistry, 17*(19), 2070–2095.

Sandyk, R., Tsagas, N., & Anninos, P. A. (1992). Melatonin as a proconvulsive hormone in humans. *International Journal of Neuroscience, 63*, 125–135.

Savina, T. A., Balashova, O. A., & Shchipakina, T. G. (2006). Effect of chronic consumption of sodium valproate and melatonin on seizure activity in Krushinskii–Molodkina rats. *Bulletin of Experimental Biology and Medicine, 142*(5), 601–604.

Sheldon, S. H. (1998). Pro-convulsant effects of oral melatonin in neurologically disabled children. *The Lancet, 351*, 1254.

Singh, M., Maru, S., Sugunan, S., Pandit, A., Wadhwa, P., & Rajput, P. (2025). Exploring melatonin's therapeutic potential in neurological disorders: A review of current evidence. *Biological Rhythm Research, 56*(1), 1–17.

Smagula, S. F., Gujral, S., Capps, C. S., & Krafty, R. T. (2019). A systematic review of evidence for a role of rest–activity rhythms in dementia. *Frontiers in Psychiatry, 10*, 778.

Smolensky, M. H., & Peppas, N. A. (2007). Chronobiology, drug delivery, and chronotherapeutics. *Advanced Drug Delivery Reviews, 59*, 828–851.

Smyk, M. K., & van Luijtelaar, G. (2020). Circadian rhythms and epilepsy: A suitable case for absence epilepsy. *Frontiers in Neurology, 11*, 245.

Solmaz, I., Gurkanlar, D., Gokcil, Z., Cuneyt, G., Ozkan, M., & Erdogan, E. (2009). Antiepileptic activity of melatonin in guinea pigs with pentylenetetrazol-induced seizures. *Neurological Research, 31*, 989–995.

Spencer, D. C., Sun, F. T., Brown, S. N., Jobst, B. C., Fountain, N. B., Wong, V. S., et al. (2016). Circadian and ultradian patterns of epileptiform discharges differ by seizure onset location during long-term ambulatory intracranial monitoring. *Epilepsia, 57*, 1495–1502.

Stenvers, D. J., Scheer, F. A. J. L., Schrauwen, P., la Fleur, S. E., & Kalsbeek, A. (2019). Circadian clocks and insulin resistance. *Nature Reviews Endocrinology, 15*, 75–89.

Steriade, M., & Contreras, D. (1995). Relations between cortical and thalamic cellular events during transition from sleep patterns to paroxysmal activity. *Journal of Neuroscience, 15*, 623–642.

Stewart, L. S. (2001). Endogenous melatonin and epileptogenesis: Facts and hypothesis. International *Journal of Neuroscience, 107*, 77–85.

Stewart, L. S., & Leung, L. S. (2005). Hippocampal melatonin receptors modulate seizure threshold. *Epilepsia, 46*, 473–480.

Sun, Y., Chen, J., Shi, X., Li, Z., Wan, L., Yan, H., Chen, Y., Wang, J., Wang, J., Zou, L., Reiter, R., Zhang, B., &Yang, G. (2024). Safety and efficacy of melatonin supplementation as an add-on treatment for infantile epileptic spasms syndrome: A randomized, placebo-controlled, double-blind trial. *Journal of Pineal Research, 76*, e12922.

Tan, D. X., Manchester, L. C., Hardeland, R., Lopez-Burillo, S., Mayo, J. C., Sainz, R. M., & Reiter, R. J. (2003). Melatonin: A hormone, a tissue factor, an autocoid, a paracoid, and an antioxidant vitamin. *Journal of Pineal Research, 34*, 75–78.

Tchekalarova, J., Angelova, V. T., Todorova, N., Andreeva-Gateva, P., & Rangelov, M. (2019). Evaluation of the anticonvulsant effect of novel melatonin derivatives in the intravenous pentylenetetrazol seizure test in mice. *European Journal of Pharmacology, 863*, 172684.

Tchekalarova, J., Moyanova, S., Fusco, A. D., & Ngomba, R. T. (2015). The role of the melatoninergic system in epilepsy and comorbid psychiatric disorders. *Brain Research Bulletin, 119*, 80–92.

Tchekalarova, J., Stoyanova, T., Tzoneva, R., Angelova, V., & Andreeva-Gateva, P. (2022). The anticonvulsant effect of a novel indole-related compound in kainate-induced status epilepticus in mice: The role of antioxidant and anti-inflammatory mechanisms. *Neurochemical Research, 47*, 327–334.

Treiman, D. (2001). GABAergic mechanisms in epilepsy. *Epilepsia, 42*(Suppl. 3), 8–12.

Vasileva, Z. (2021). Melatonin and epilepsy. *Folia Medica, 63*(6), 827–833.

Verma, N., Maiti, R., Mishra, B. R., Jha, M., Jena, M., & Mishra, A. (2021). Effect of add-on melatonin on seizure outcome, neuronal damage, oxidative stress, and quality of life in generalized epilepsy with generalized onset motor seizures in adults: A randomized controlled trial. *Journal of Neuroscience Research, 99*, 1618–1631.

Vimala, P. V., Bhutada, P. S., & Patel, F. R. (2014). Therapeutic potential of agomelatine in epilepsy and epileptic complications. *Medical Hypotheses, 82*, 105–110.

Vishnoi, S., Raisuddin, S., & Parvez, S. (2016). Glutamate excitotoxicity and oxidative stress in epilepsy: Modulatory role of melatonin. *Journal of Environmental Pathology, Toxicology and Oncology, 35*(4), 365–374.

Volicer, L., Harper, D. G., Manning, B. C., Goldstein, R., & Satlin, A. (2001). Sundowning and circadian rhythms in Alzheimer's disease. *American Journal of Psychiatry, 158*, 704–711.

Weisdorf, S., Duun-Henriksen, J., Kjeldsen, M. J., Poulsen, F. R., Gangstad, S. W., & Kjaer, T. W. (2019). Ultra-long-term subcutaneous home monitoring of epilepsy: 490 days of EEG from nine patients. *Epilepsia, 60*, 2204–2214.

Welsh, D. K., Logothetis, D. E., Meister, M., & Reppert, S. M. (1995). Individual neurons dissociated from rat suprachiasmatic nucleus express independently phased circadian firing rhythms. *Neuron, 14*, 697–706.

Winawer, M. R., Shih, J., Beck, E. S., Hunter, J. E., Epstein, M. P., & EPGP Investigators. (2016). Genetic effects on sleep/wake variation of seizures. *Epilepsia, 57*, 557–565.

Wyse, C. A., Celis-Morales, C. A., Graham, N., Fan, Y., Ward, J., Curtis, A. M., Mackay, D., Smith, D. J., Bailey, M. E. S., Biello, S., Gill, J. M. R., & Pell, J. P. (2017). Adverse metabolic and mental health outcomes associated with shift work in a population-based study of 277,168 workers in UK Biobank. *Annals of Medicine, 49*, 411–420.

Yahyavi-Firouz-Abadi, N., Tahsili-Fahadan, P., Riazi, K., Ghahremani, M. H., & Dehpour, A. R. (2007). Melatonin enhances the anticonvulsant and proconvulsant effects of morphine in mice: Role for nitric oxide signaling pathway. *Epilepsy Research, 75*, 138–144.

Yamakawa, G. R., Patel, M., Lin, R., O'Brien, T. J., Mychasiuk, R., & Casillas-Espinosa, P. M. (2023). Diurnal circadian clock gene expression is altered in models of genetic and acquired epilepsy. *Epilepsia Open, 8*(4), 1523–1531.

Yamazaki, S., Numano, R., Abe, M., Hida, A., Takahashi, R., Ueda, M., Block, G. D., Sakaki, Y., Menaker, M., & Tei, H. (2000). Resetting central and peripheral circadian oscillators in transgenic rats. *Science, 288*, 682–685.

Yildiz, F. G., Tezer, F. I., & Saygi, S. (2012). Temporal relationship between awakening and seizure onset in nocturnal partial seizures. *Journal of the Neurological Sciences, 315*, 33–38.

Zarowski, M., Loddenkemper, T., Vendrame, M., Alexopoulos, A. V., Wyllie, E., & Kothare, S. V. (2011). Circadian distribution and sleep/wake patterns of generalized seizures in children. *Epilepsia, 52*, 1076–1083.

Zhou, Q., & Sheng, M. (2013). NMDA receptors in nervous system diseases. *Neuropharmacology, 74*, 69–75.

Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi
Journal of Cognitive-Behavioral Psychotherapy and Research
DOI: 10.14744/JCBPR.2026.31837
J Cogn Behav Psychother Res 2026;15(1):55–64

Embrained Normativity: How Cultural Norms can Modulate Neural Correlates in the Brain

Vehbi Metin Demir

Department of Philosophy, Bursa Uludağ University, Faculty of Literature, Bursa, Türkiye

ABSTRACT

Cultural neuroscience is a new discipline that investigates how cultural norms and practices affect brain neural activities and structures. Some of these studies have focused on the interaction between cultural/normative self-construal and the neural correlates of the representation of the self in the brain. In this article, I discuss some studies on the cultural neuroscience of the self to show that cultural norms can reshape and modulate brain structures responsible for the representation of the self and others. By conceptualizing the results of these studies as embrained normativity, I argue that norms and values of a specific culture can be traceable within the brain, implying that norms not only reside in the intersubjective mental sphere but also diffuse into the brain. The concept of embrained normativity may open new ground for re-interpreting both the Hegelian idea of second nature and the results of the self's cultural neuroscience.

Keywords: Cultural neuroscience, habit, Hegel, neural correlates of self, second nature, self-construal.

ÖZ

Beyinlenmiş Normativite: Kültürel Normlar Beyindeki Nöral Korelatlarını Nasıl Biçimlendirebilir?

Kültürel nörobilim, kültürel normlar ve pratiklerin beyindeki yapılar ve nöral aktiviteleri nasıl etkilediğini araştıran yeni bir disiplindir. Bu araştırmaların bir kısmı, kültürel/normatif benlik yorumu ve beyindeki benlik temsilinin nöral bağlantılarının karşılıklı etkileşimini araştırır. Bu makalede, benlik ve ötekinin temsilinden sorumlu beyin yapılarının kültürel normlar tarafından nasıl yeniden biçimlendirilip şekillendirildiğini gösterebilmek için benliğin kültürel nörobilimine dair çalışmaların bazıları incelendi. Bu çalışmaların sonuçları beyinlendirilmiş normativite olarak kavramsallaştırılarak belirli bir kültürün norm ve değerlerinin beyinde takip edilebileceği iddia edildi. Bu da normların sadece özneler arası zihinsel alanda yer almadığına aynı zamanda beynin içine de yayıldığına işaret eder. Beyinlenmiş normativite hem Hegel'in ikinci doğa fikrini hem de benliğin kültürel nörobiliminin sonuçlarını yeniden yorumlamak için yeni bir zemin açabilir.

Anahtar Kelimeler: Alışkanlık, benlik yorumu, benliğin nöral bağlantıları, ikinci doğa, kültürel nörobilim, Hegel.

Cite this article as:
Demir VM. Embrained Normativity: How Cultural Norms can Modulate Neural Correlates in the Brain. J Cogn Behav Psychother Res 2026;15(1):55–64.

Address for correspondence:
Vehbi Metin Demir.
Bursa Uludağ Üniversitesi, Edebiyat Fakültesi, Felsefe Bölümü, Bursa, Türkiye
Phone: +90 224 294 1825
E-mail: vmetindemir@uludag.edu.tr

Submitted: 11.06.2025
Revised: 29.11.2025
Accepted: 01.01.2026
Available Online: 27.02.2026

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

NEURAL CORRELATES OF THE SELF AND SELF'S CULTURAL NEUROSCIENCE

Cultural neuroscience is an emerging area of research that investigates the interaction between culture and neurobiology. This field investigates how cultural values and practices shape neurobiology and how neurobiological mechanisms facilitate the emergence and transmission of cultural traits. (Chiao 2009). The subject matter of cultural neuroscience is not only the brain but also the *enculturated brain* (Lende & Downey 2012). The concept of an enculturated brain implies a dynamic and dialectical relationship between culture and the

brain. Cultural neuroscience bridges two distinct questions. The first section delves into the realm of cultural psychology, exploring how culture shapes the mind and behavior. The second stems from social neuroscience, which investigates how brain structures and chemicals influence social norms. Consequently, cultural neuroscience endeavors to understand the dynamic interplay between culture and the brain as they co-construct each other within a research framework. Kitayama and Uskul (2011) highlight that "neuro-culture interaction" is bidirectional. One aspect of it is *cultural entrainment*, meaning that cultural values do reside in the intersubjective mental sphere but are observable in the brain. Another aspect involves brain enculturation, indicating that the brain is molded by the cultural environment in which an individual lives. One of the major implications of cultural neuroscience is that the brain is not only a biological organ but also has normativity. While patterned cultural practices, values, and norms are continually being materialized under the skull (embrainment of culture), these normative practices equally reshape and modulate our brain's biology. Although ample studies have examined different aspects of the culture–brain relationship,[1] this article exclusively focuses on examples from cultural neuroscience research concerning the neural representations of the self, which vary across cultural contexts.

In the last two decades, a succession of new discoveries has been made on the neural correlates of self-representation in the brain. Studies in the field of cognitive neuroscience have shown that the self and its related processes occur in a distributed rather than a modular network. Recent brain imaging studies reveal that the representation of the self in the brain is organized in dynamic, parallel, process-based networks, which debunk the idea of a distinctly localizable Cartesian self. For example, Damasio's (2010) famous book, *Self Comes to Mind*, suggests a three-layered idea of the self. Damasio hypothesizes that the self is stratified as the primitive self (proto-self), the core-mental self, and the autobiographical self, each corresponding to physiological, psychological, and spiritual levels. In a similar vein, another scholar investigating the self within the brain, George Northoff, confirmed the existence of a three-level organization responsible for representing the self in the brain. Northoff (2011) argued that the physiological/primitive self, which mostly regulates affective and sensory-motor functions, is connected to the periaqueductal gray matter, colliculi, and tectum. The psychological core self is associated with cortical regions, such as the thalamus and the ventromedial prefrontal cortex. The emergence of the autobiographical self depends on regions such as the hippocampus, the cingulate cortex, and the frontal lobes. Thus, neuroscientists infer that the self in the brain is not a distinct, localizable, substance-like entity. Instead, it is a layered, fluid, and dynamic active construct consisting of the brain's inner and outer activities.

Conventionally, when neuroscientists attempt to find brain regions related to the self, they perform a self-related cognitive task to observe which brain regions are activated while performing a self-referential semantic process. Studies have revealed that activities related to the self are mostly concentrated in cortical midline structures (CMS). However, Northoff shows that the CMS is active when performing a task, and that a degree of activation can be observed in the absence of any given task. In both the human and chimpanzee brains, the default mode network system maintains its activity with spontaneous fluctuation in this region, in a high resting state where no task is performed (Damoiseaux 2006; Fransson 2005). The perigenual anterior cingulate cortex is active in the self-related resting state (Qin & Northoff 2011). Therefore, the self-related activities occurring in the brain are, to some extent, independent of any cognitive task. The dynamic flow of physical and mental processes between self-related brain regions is constantly balanced. The CMS comprises medial cortical structures (the ventromedial and dorsomedial prefrontal cortex, anterior and posterior cingulate cortex, superior temporal gyrus, and hippocampus) and subcortical structures (the periaqueductal gray, superior colliculi, hypothalamus, and dorsomedial thalamus) (Northoff 2011). These essential regions regulate self-related brain operations.

Northoff et al. (2006) argued that self-related processes are domain independent. In other words, the CMS involve various verbal, spatial, or sensory-motor domain activities (Northoff et al., 2006). Hence, the self is not a meta-perception or apperception that integrates all sensory data. Instead, the self is a special code or mode that operates both higher- and lower-level cognitive activities (Han & Northoff 2009).

The self-associated CMS system appears as an active agent at multiple levels. Thus, if the self modulates or orients sensory information, our perception of the surrounding world is peculiarly associated with our sense of the self. Correspondingly, if the sense of self can change depending on culture and life experiences, then culture is also expected to be active in all cognitive processes related to the self.

Hundreds of neuroimaging studies in this field have been devoted to uncovering the neural correlates of cognitive processes related to the self, as well as brain structures that

[1]For the different aspects of cultural neuroscience research see: (Chiao 2009; Chiao et al. 2016).

Table 1. Conceptual Distinctions between Independent and Interdependent Self-Construals*

Feature compared	Independent self-construal	Interdependent self-construal
Core concepts	Self-understood as autonomous and distinct	Self-understood as relational and socially embedded
Structure	Coherent, bound, and relatively stable	Flexible, changable
Salient attributes	Inner traits such as beliefs, preferences, and emotions	Social roles, relationships, and positions
Normative Task	Emphasizing uniqueness and self-expression Be direct and "say what's on your mind."	Emphasis on belongingness and social attunement Be indirect; "read others' mind"
Typical behavioral tendencies	Acting according to internal goals and preferences; direct communication	Behavior adjustment to social expectations; indirect communication
Basis of self-esteem	Affirmation of personal abilities and consistency	Maintenance of harmony, responsiveness, and relational balance

*: Adapted from Kitayama and Markus 2011.

play a role in resting-state activity in humans. However, self-representation is not only a neural activity but also a function of a psychological and social whole. In this respect, social and cultural psychology studies have attempted to shed light on different aspects of self-representation. To this end, the research conducted by Markus and Kitayama has attracted significant attention in the field of cultural neuroscience. Markus and Kitayama (2011) reviewed a great deal of social and cultural psychology literature and depicted two types of self-representations. They classified two different self-conceptions concerning the boundaries between the self and the other as independent and interdependent. According to them, these self-construal systems determine the basic traits of individual experiences, such as cognition, emotion, and motivation. For example, Asian cultures have an understanding of individuality that is deeply interconnected with others. This interdependent self-construal emphasizes harmony with others and sets tasks and values according to this ideal of integrity. In contrast, American culture places little emphasis on this kind of overt connectedness among individuals. In American culture, expressing the difference between the self and others and paying more attention to individuals' inner emotions and opinions are priorities. While independent self-construal accentuates individualist, egocentric, separate, and autonomous characteristics, interdependent self-construal focuses on holistic, sociocentric, collective, contextualist, and relational attributes. Individuals in interdependent cultures perceive themselves as part of larger social relations and evaluate their thoughts, feelings, and actions in relation to others. In these cultures, "the self is viewed not as a hedged closure but as an open field." A comparison of the two distinct forms of self-construal can be seen in Table 1, adopted from Markus and Kitayama (1991):[2]

The table shows that the diverging forms of self-construal in the two cultures may influence how individuals perceive themselves in relation to others, what they should do in concrete situations, what they value, and what they should feel.

The question of whether these two forms of self-construal might cause variation in neural functions leads researchers to prepare new experimental setups. Previous imaging studies on self-representation in the brain have also been integrated into these experimental frameworks. In an important study by Craik et al., participants undergoing PET were asked to make judgments about a range of character traits. The subjects were asked to respond to the following questions: a) "How much does this adjective describe you?," b) "How does this adjective describe the Canadian prime minister?," c) "Is this adjective socially valuable?," and d) "Non-semantic numbers or syllables?" (How many syllables are in this adjective?). Thus, the experiment involved four conditions: three semantic and one non-semantic. Semantically processed adjectives were better remembered than traits processed under other conditions. The encoding of both self-related and other-related adjectives elicited activation in the left frontal lobe, whereas self-related encoding specifically activated the right frontal lobe (Craik et al., 1999). This study reveals that self-related encodings use a different pattern in episodic memory retrieval processes.

Another study extending Craik's experimental results, which used event-related fMRI, found that self-related processes are dissociated from other semantic operations in the brain. Participants were scanned while making judgments about self-related, other-related, and neutral adjectives. Imaging results demonstrated that judgments on self-related

[2]The table is adopted from this article: (Markus and Kitayama 1991).

adjectives activated the left inferior frontal cortex and anterior cingulate cortex more than neutral judgments. Moreover, the medial prefrontal cortex has been associated specifically with self-related judgment tasks (Kelley et al., 2002). Subsequent studies have repeatedly demonstrated that medial prefrontal activity consistently and selectively engages in self-related tasks, suggesting that selfhood is functionally distinguished from other-related processing in the human brain (Heatherton et al., 2006; Moran et al., 2006; Macrae et al., 2004). However, further research has shown that the distinction between the self and others in the brain is not a categorical distinction. Instead, dynamic differentiation fluctuates along a continuum depending on the context. Mitchell et al. found increased activation in the ventral medial prefrontal cortex (vMPFC) when subjects performed self-related tasks. In contrast, the dorsal medial prefrontal cortex (dMPFC) was activated while performing other-related tasks (Mitchell et al., 2006).

EMBRACING CULTURE: EFFECTS OF CULTURAL VARIATION ON THE BRAIN'S REPRESENTATION OF THE SELF AND THE OTHER

Despite the converging results of prior studies suggesting that the self and the other are clearly dissociable in the brain, a study comparing American and Chinese participants yielded a surprising result. In this experiment, participants were asked to make judgments about their own character traits (such as being brave or childish), their mothers, and a public figure. As in Craik's study, both Chinese and American participants remembered self-related character traits better. However, the same pattern did not fully apply to the Chinese group, as they recalled traits about their mothers just as well as about themselves. Consistent with previous research, stronger activation in the medial prefrontal cortex (MPFC) and anterior cingulate cortex (ACC) was observed in fMRI results during self-versus-other judgments. Nonetheless, judgments about mothers triggered strong activation in the MPFC only in Chinese subjects but not in Westerners. Based on these imaging results, Zhu et al. (2007) concluded that

> *"Our findings suggest that Chinese individuals use MPFC to represent both the self and the mother, whereas Westerners use MPFC to represent the self exclusively, providing neuroimaging evidence that culture shapes the functional anatomy of self-representation."*

The MPFC activity of American participants increases while they make a self-related judgment, yet decreases during other-related and mother-related judgments. No difference was observed between mother-related judgments and judgments about President Bush among American participants. Only increased MPFC activation, which is specific to self-related judgments, was detected. Thus, Chinese participants represent both their mothers and themselves in the same brain regions, whereas American participants distinguish between the two As a result, the Chinese participants consider their mothers as "like-me," whereas the American subjects see their mothers as "like the other." In sum, while the MPFC is exclusively activated in self-judgments in Americans, both the representation of the mother and the self in Chinese individuals strongly activate the MPFC. Hence, the Chinese interdependent self-construal may lead individuals to perceive their mothers as identical to themselves, whereas the American independent self-construal emphasizes separation between the self and others. Interestingly, the effects of these different worldviews are traceable in the brain's neural networks involved in self-representation (Wang et al., 2012).

In both Chinese and American participants, judgments about the self and the mother induced activity in the ACC, which plays a significant role in evaluating one's own physical appearance (Kjaer 2002), recognizing one's own face (Kircher 2001), and emotional self-control (Allman 2001). Considering these studies, it is conceivable that thinking about oneself might induce ACC activity. Both American and Chinese participants showed activation in the MPFC and ACC when making self-related judgments; however, additional activation in the left prefrontal cortex (LPFC) emerged in Chinese participants. Furthermore, when Chinese individuals make judgments about their mothers, activation in the LPFC and ACC is observed, which is not observed in American participants. This result indicates that some additional brain structures are involved in Chinese subjects compared with those in Americans. In other words, culture-specific self-construal can affect the preference for existing neural pathways and the recruitment of new structures for the same task. Hence, it is possible to say that, to some extent, different neural components support Western and Asian forms of self-construal.

The aforementioned fMRI studies suggest that habitually acquired cultural values and normative differences can be visibly reflected in neural processes. In addition, it may be inferred that the "self and the other" are not categorically separated. Instead, a spectrum of the self and the other exists on a continuum from "self-like" to "other-like" (from ventral to dorsal MPFC) (Han & Northoff 2009). On this spectrum, for the Chinese subjects, their mothers appear much more "like-me," while Americans conceive their mothers more "like-other." This suggests that cultural values may alter how we perceive and encode those around us by recruiting different neural circuits in the brain. The cultural neuroscience of the self indicates that norms and values not only reside in our minds but are also embedded—carved into the very tissue of our brains.

Another study using a similar experimental template with Nisbett and Zhu's results recently found that Chinese self-construal is supported by different neural circuits compared to those of Danish subjects. Ma et al. (2014) scanned Chinese and Danish subjects with fMRI, while they were making judgments about physical, social, and mental attributes of both themselves and a public figure to observe the influence of cultural variation on self-referential cognitive processing. In this study, participants were asked to assess a group of character/mental adjectives (such as hardworking and talkative), physical qualities (such as a wrinkled face and curly hair), and social positions (such as professor) of themselves and a well-known public figure. As expected from earlier studies, both Chinese and Danish participants showed strong activity in the medial prefrontal cortex (MPFC), but this activity was much stronger in Danish subjects, who belong to a more individualistic cultural background. Moreover, when the Chinese participants made judgments about their social attributes, they displayed stronger activity in the temporoparietal junction (TPC), which is generally associated with social thinking (Saxe & Kanwisher, 2003). This implies that compared with Danish participants, Chinese participants conceive of their social position from the lens of others. Much greater activation in bilateral TPJ together with vMPFC functioning is observed during judgments about social roles in Chinese subjects than in Danes (Han & Ma 2016). Thus, the involvement of the TPJ in the self-reflection task depends on the task content (social or physical) and cultural variation.

These experimental results demonstrate that different forms of self-construal depending on social norms might determine which neural circuits would be chosen in a given task. Who would be regarded as "like-me" (vMPFC) and who as "like-other" (dMPFC) might vary depending on a specific culture's self-construal. The most radical example of this is that social norms and prejudices can dehumanize some people. Socially excluded people are marginalized over time until they are no longer perceived as human beings. For instance, in the United States, homeless persons and drug addicts are not perceived as normal individuals. Some people are perceived so much as others that they are perceived as non-human without even entering into the self-other scale. While MPFC activity is observed in all kinds of social perceptions about the self and the other, Americans do not react when they see homeless people in this region. An imaging study revealed that lower-class people fail to elicit a neural reaction in the dorsal medial prefrontal cortex (dMPFC), which is normally engaged in perceiving the other and the other's mind (Harris & Fiske 2006). American subjects show reduced mPFC activation along with increased insula and amygdala activity, which usually react in cases of aversive and disgusting emotional states (Hart et al., 2000; Krendl et al., 2006; Phelps et al., 2000). This indicates that many Americans no longer consider a homeless person as human beings. Although the person in front of our eyes is objectively a human being, he or she is not categorized as a person in the brain when the person is not pertinent to our culture's self-construal. Hence, the extent to which our perception of self and the other can be variable depends on the dominant self-construal of a culture, class, and social status.

Another interesting psychological tendency discovered about the self in recent years is "face recognition advantage." Recognition of self-face is remarkably faster and more accurate compared with strangers' faces and is noticed in various different experimental tasks (Ma & Han 2010). In comparative studies, it has been observed that the British give a greater ERP response in recognizing their own faces (Sui et al., 2009). In addition, self-face recognition advantage can also be modulated by the psychological method of cultural priming. An experimental setup was prepared with Chinese and British subjects to observe whether the ERP responses of the neural regions responsible for recognizing one's own face and the face of others were affected when they primed with independent or interdependent cultural self-construal. Both British and Chinese display similar ERP responses (an early frontal negative activity at 220–340 ms, anterior N2 response) when they perceive their own face. However, when British participants primed with an interdependent self-construal (for example, giving a long text including too many words like "we" and "together"), their default anterior N2 response to their own faces was reduced. Conversely, Chinese subjects primed with an independent self-construal suppressed anterior N2 to their friends' faces. Other studies also confirm that the neural correlates of self-face recognition can be modulated by changing cultural priming (Sui & Han 2007). Studies using priming techniques on bicultural individuals have found that neural activation in self-face recognition regions might change as a result of independent or interdependent priming. Based on this study, it is possible to infer that the same person unconsciously slips into one cultural mindset to another in the priming process (Ng et al., 2010). Their brains flexibly opt for one cultural framework in a certain context.

These results evince that the self-construal of different civilizations might also change or modulate neural activities. However, the purpose of cultural neuroscience is not to make an essentialist biological justification by comparing East–West cultures in an orientalist fashion. The differentiation regarding self-construal is not only due to culture. A similar differentiation can be observed as a result of organized behavioral patterns, such as socioeconomic class and religious

structures. Studies have shown that individuals in the same cultural geography may use different modes of self-construal when they make judgments about themselves or their mothers (Ray et al., 2010). Therefore, the issue here is not biological determinism but patterned behavior (Roepstorff et al., 2010). For example, people who travel a lot or who have to immigrate tend to have a much more individualistic self-construal, pay less attention to their surroundings, and usually focus on their own characteristics (Oishi 2010; Chen et al., 2015). In other words, one's relationship with the surrounding environment or lifestyle might change one's self-conception. Similarly, different behavioral patterns caused by different religious affiliations within the same culture can change the self-perception of individuals.

Han et al. tested the assumption that religious belief can also change the neural correlates of self-referential processing (Han et al., 2008). Non-religious and Christian subjects were scanned when they made judgments about themselves and others. Imaging results showed that while making judgments about themselves, non-religious participants showed stronger activation in the MPFC, whereas religious individuals showed increased activity in the dMPFC. In addition, the activity in the dorsal MPFC was stronger in those who gave more importance to Jesus' judgment in their subjective evaluation of a person's personality. According to the researchers, since in Christianity, a person constantly has to judge himself from God's perspective, the neural coding of the ego-related stimuli in religious Christian participants decreased, while the neural activity in the dorsal MPFC increased, which is active in the evaluation of other-related processes (Han et al., 2008). In other words, religious people are more prone to judge themselves through the eyes of others. Hence, religious practices shape our mentality, ultimately affecting the use of different neural pathways.

Another experiment comparing religious and secular Danish participants showed that religious participants who performed improvised prayer showed greater activation in the temporopolar region, MPFC, temporoparietal junction, and precuneus (Schjoedt et al., 2009). These brain regions are typically activated during engagement in social relations. Based on this fact, the researchers speculate that religious individuals during prayer consider God as a real person in direct relation to them, so that they recruit brain areas of social cognition. What is significant here is that a patterned religious praxis can change the degree of activation of the same brain region and can sometimes change the brain region used in a certain task.

DISCUSSION: RECONSIDERING THE CULTURAL NEUROSCIENCE OF THE SELF WITH THE HELP OF THE HEGELIAN SECOND NATURE

In the preceding discussion, I reviewed the neural structures involved in self-representation and demonstrated that they are dynamic systems engaged in multilayered functions rather than static ones. By combining cultural psychology's idea that different forms of self-construal might change the mental representation of the self with the dynamically changing neurobiology of the self, cultural neuroscience enables us to ask whether different forms of self-construal could change the neural activity of self-representation in the brain. I have presented a range of empirical brain imaging studies demonstrating that different cultural norms and practices can change, modulate, or reorganize self-representation-related neural activity. The brain may recruit different neural components or exhibit varying degrees of activity in the same regions depending on cultural self-construal. The neural representation of the self and the other in the brain can vary depending on the culturally shaped self-construal.

These empirical findings in cultural neuroscience open new avenues for discussing the relationship between culture and our biological nature. Cultural norms are not merely external impositions upon the body. Instead, they diffuse into the body and actively reconfigure it. This plastic relationship between the brain and culture can be best understood through Hegel's concept of second nature. Hegel develops his idea of second nature in two places in his Encyclopedia. In *anthropology*, he says that habit (*die Gewohnheit*) is second nature, which plays a crucial role in the transition from nature to culture (Hegel 1978a, p. 391). He also uses the term "second nature" to describe his theory of ethical life (*Sittlichkeit*) (Hegel 1978b, p. 108). In both contexts, Hegel shows that human nature is not only a natural animal body but also posited by the spirit. In his *anthropology*, he calls this intermingling "nature-spirit" (Natur-Geist). Habits, in this context, enable the incorporation of our practices into the body so that our actions become part of our bodily capacities. Habits can change our mental abilities by reshaping our bodily existence.[3] Thus, with the help of the brain's plasticity, which underlies the capacity to form habits, the body takes shape from cultural practices and gives shape to our cultural behaviors.

In this article, I draw attention to the dialectical relationship between the brain and culture by demonstrating how the representation of the self's neural correlates may diversify across individuals from distinct cultural backgrounds. This dialectical relationship is examined along two dimensions: culture entrainment and brain enculturation. From the perspective of

[3]For the details of the Hegelian idea of second nature, see: (Wolff 1992; Pippin 2008; Pinkard 2012; Testa 2013; Lumsden 2013; Khurana 2016; Ranchio 2016; Novakovic 2017).

cultural entrainment, cultural difference leaves indelible traces on the brain, suggesting that it cannot be easily transformed. However, from the perspective of the enculturated brain, the human mind does not operate through a universal or necessary mechanism; perceptual, emotional, and cognitive capacities are not governed by *a priori* Kantian necessity but can instead be shaped by the material, socio-cultural, and politico-economic milieu in which the individual lives. If culture diffuses in to our brains, then cultural differences are deep-seated and unchangeable. However, in another sense, the plastic cultural shaping of the brain also reveals the inevitability of change—precisely because plasticity is an activity-dependent mechanism.

This article also resists a prevalent metaphysical assumption among neuroscientists. Almost all researchers in the field of cultural neuroscience, whether consciously or not, are committed to a naturalist metaphysics. Chiao acknowledges this in her book *The Philosophy of Cultural Neuroscience*, which states, "As empirical science relies on the science of the mind and the social processes of the scientific community, naturalism seeks to address the philosophical issues that arise with the advancement of scientific theory and evidence-based knowledge" (Chiao 2017, p. 94). However, even though most cultural neuroscientists assume a naturalist framework, their findings disclose—perhaps unintentionally—that *human nature is not entirely natural*. Cultural neuroscience underscores that human nature is fundamentally biosocial. Sociality is not an accidental feature of the brain but a constitutive and intrinsic property.

Most neural processes are profoundly shaped by lifelong practices, habits, and the cultural context in which individuals live. Our way of life, our habits, and the culture in which we are raised manifest themselves in the brain by influencing hormonal activity, prompting the use of different neural regions, or by volumetrically altering certain brain tissues. Consequently, cultural neuroscience implies that there is no such thing as a human essence, as opposed to liberal theories that posit a single universal human nature; individuals vary according to the cultural values, civilizational frameworks, and class-based habitus that shape their sense of self. Thus, we might draw this bold conclusion considering contemporary scientific evidence: human nature cannot be grasped within a strictly physicalist naturalism.

If the historical and social dimensions were merely epiphenomenal to the biological, they would exert no transformative influence upon it. However, cultural neuroscience itself demonstrates that emergent structures arising from natural processes can retroactively alter the very natural substrates from which they emerged. *Culture is not entirely natural, yet it is not reducible to nature alone*. That culture arises from and is influenced by natural conditions does not entail its reducibility to the natural. Thus, the *non-naturalist orchestration of biology and culture* revealed by cultural neuroscience can be understood through a Hegelian speculative lens of the "identity of identity and non-identity." The data produced by cultural neuroscientists cannot be adequately explained from within their metaphysical assumptions. Hegel's speculative metaphysics and his concept of "second nature" are particularly fruitful here.

Cultural neuroscience also shows that norms are embrained, which means that norms can be inscribed in the brain's tissue. The *biosocial* (*Natur-Geist*) character of the human brain cannot be neglected (Han et al., 2013). Hegelian dialectical ontology can be re-evaluated in the light of plasticity (Malabou, 2004). The second nature Hegelian plastic ontology should be reconsidered as the best approach for interpreting the results of cultural neuroscience.

CONCLUSION

This article has examined how neural processes involved in self-representation should be understood as dynamic and context-sensitive rather than fixed or universal. Drawing on findings from cultural neuroscience, it has shown that different forms of self-construal are associated with variations in the neural activity underlying self-related cognition. Empirical studies reviewed in the preceding sections suggest that culturally sustained norms and practices can modulate how the brain differentiates between self and other, as well as which neural regions are recruited during self-referential tasks. Notably, the evidence that cultural norms systematically influence the recruitment and organization of self-related neural processes shows that normative cultural structures can be observed in the brain.

By conceptualizing these findings as embrained normativity, the study highlights the significance of norms and culture in the brain and its operations. Rather than treating cultural norms as external influences acting upon an otherwise stable biological substrate, the evidence indicates that culture becomes integrated into bodily and neural processes through long-term habits and practices. The interpretations in this article indicate the potential value of future collaboration between neuroscience and the social sciences.

Informed Consent: Not applicable.

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

Financial Disclosure: No funding was received for the preparation, writing, or publication of this study.

Use of AI for Writing Assistance: I declare that OpenAI (GPT-4) was used only to correct grammar and improve the clarity of writing.

Peer-review: Externally peer-reviewed.

REFERENCES

Allman, J. M., Hakeem, A., Erwin, J. M., Nimchinsky, E., & Hof, P. (2001). The anterior cingulate cortex: The evolution of an interface between emotion and cognition. *Annals of the New York Academy of Sciences, 935*, 107–117.

Chen, P., Heatherton, T. F., & Freeman, J. B. (2015). Brain-as-predictor approach: An alternative way to explore acculturation processes. In J. Y. Chiao (Ed.), *Neuroscience in intercultural contexts* (pp. 143–170). New York, NY: Springer.

Chiao, J. Y. (2009). Cultural neuroscience: A once and future discipline. *Progress in Brain Research, 178*, 287–304.

Chiao, J. Y. (Ed.). (2009). *Cultural neuroscience: Cultural influences on brain function* (Vol. 178). Amsterdam, Netherlands: Elsevier Academic Press.

Chiao, J. Y. (2017). *Philosophy of cultural neuroscience*. New York, NY: Routledge.

Chiao, J. Y., Li, S.-C., Seligman, R., & Turner, R. (Eds.). (2016). *The Oxford handbook of cultural neuroscience*. New York, NY: Oxford University Press.

Craik, F. I. M., Moroz, T. M., Moscovitch, M., Stuss, D. T., Winocur, G., Tulving, E., & Kapur, S. (1999). In search of the self: A positron emission tomography study. *Psychological Science, 10*(1), 26–34.

Damasio, A. (2010). *Self comes to mind: Constructing the conscious brain*. New York, NY: Vintage Books.

Damoiseaux, J. S., Rombouts, S. A. R. B., Barkhof, F., Scheltens, P., Stam, C. J., Smith, S. M., & Beckmann, C. F. (2006). Consistent resting-state networks across healthy subjects. *Proceedings of the National Academy of Sciences of the United States of America, 103*(37), 13848–13853.

Fransson, P. (2005). Spontaneous low-frequency BOLD signal fluctuations: An fMRI investigation of the resting-state default mode of brain function hypothesis. *Human Brain Mapping, 26*(1), 15–29.

Han, S., & Ma, Y. (2016). Cultural neuroscience studies of self-reflection. In J. Y. Chiao, S.-C. Li, R. Seligman, & R. Turner (Eds.), *The Oxford handbook of cultural neuroscience* (pp. 197–208). New York, NY: Oxford University Press.

Han, S., & Northoff, G. (2009). Understanding the self: A cultural neuroscience approach. *Progress in Brain Research, 178*, 203–212.

Han, S., Mao, L., Gu, X., Zhu, Y., Ge, J., & Ma, Y. (2008). Neural consequences of religious belief on self-referential processing. *Social Neuroscience, 3*(1), 1–15.

Han, S., Northoff, G., Vogeley, K., Wexler, B. E., Kitayama, S., & Varnum, M. E. (2013). A cultural neuroscience approach to the biosocial nature of the human brain. *Annual Review of Psychology, 64*, 335–359.

Harris, L. T., & Fiske, S. T. (2006). Dehumanizing the lowest of the low: Neuroimaging responses to extreme outgroups. *Psychological Science, 17*(10), 847–853.

Hart, A. J., Whalen, P. J., Shin, L. M., McInerney, S. C., Fischer, H., & Rauch, S. L. (2000). Differential response in the human amygdala to racial outgroup versus ingroup face stimuli. *NeuroReport, 11*(11), 2351–2355.

Heatherton, T. F., Wyland, C. L., Macrae, C. N., Demos, K. E., Denny, B. T., & Kelley, W. M. (2006). Medial prefrontal activity differentiates self from close others. *Social Cognitive and Affective Neuroscience, 1*(1), 18–25.

Hegel, G. W. F. (1978a). *Philosophy of subjective spirit: Anthropology* (M. J. Petry, Trans.). Dordrecht, Netherlands: D. Reidel.

Hegel, G. W. F. (1978b). *Hegel's philosophy of right* (T. M. Knox, Trans.). London, England: Oxford University Press.

Kelley, W. M., Macrae, C. N., Wyland, C. L., Caglar, S., Inati, S., & Heatherton, T. F. (2002). Finding the self? An event-related fMRI study. *Journal of Cognitive Neuroscience, 14*(5), 785–794.

Khurana, T. (2016). Die Kunst der zweiten Natur: Zu einem modernen Kulturbegriff nach Kant, Schiller und Hegel. *WestEnd: Neue Zeitschrift für Sozialforschung, 13*(1), 35–55.

Kircher, T. T., Senior, C., Phillips, M. L., Rabe-Hesketh, S., Benson, P. J., Bullmore, E. T., Brammer, M., Simmons, A., Bartels, M., & David, A. S. (2001). Recognizing one's own face. *Cognition, 78*(1), B1–B15.

Kitayama, S., & Uskul, A. K. (2011). Culture, mind, and the brain: Current evidence and future directions. *Annual Review of Psychology, 62*(1), 419–449.

Kjaer, T. W., Nowak, M., & Lou, H. C. (2002). Reflective self-awareness and conscious states: PET evidence for a common midline parietofrontal core. *NeuroImage, 17*(2), 1080–1086.

Krendl, A. C., Macrae, C. N., Kelley, W. M., Fugelsang, J. A., & Heatherton, T. F. (2006). The good, the bad, and the ugly: An fMRI investigation of the functional anatomic correlates of stigma. *Social Neuroscience, 1*(1), 5–15.

Lende, D. H., & Downey, G. (2012). The enculturated brain: Development, case studies and methods. In D. H. Lende &

G. Downey (Eds.), *The enculturated brain: An introduction to neuroanthropology* (pp. 3–23). Cambridge, MA: MIT Press.

Lumsden, S. (2013). Between nature and spirit: Hegel's account of habit. In D. S. Stern (Ed.), *Essays on Hegel's philosophy of subjective spirit* (pp. 121–137). Albany, NY: State University of New York Press.

Ma, Y., & Han, S. (2010). Why we respond faster to the self than to others? An implicit positive association theory of self-advantage during implicit face recognition. *Journal of Experimental Psychology: Human Perception and Performance, 36*(3), 619–633.

Ma, Y., Bang, D., Wang, C., Allen, M., Frith, C., Roepstorff, A., & Han, S. (2014). Sociocultural patterning of neural activity during self-reflection. *Social Cognitive and Affective Neuroscience, 9*(1), 73–80.

Macrae, C. N., Moran, J. M., Heatherton, T. F., Banfield, J. F., & Kelley, W. M. (2004). Medial prefrontal activity predicts memory for self. *Cerebral Cortex, 14*(6), 647–654.

Malabou, C. (2004). *The future of Hegel: Plasticity, temporality, and dialectic*. New York, NY: Routledge.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*(2), 224–253.

Mitchell, J. P., Macrae, C. N., & Banaji, M. R. (2006). Dissociable medial prefrontal contributions to judgments of similar and dissimilar others. *Neuron, 50*, 655–663.

Moran, J. M., Macrae, C. N., Heatherton, T. F., Wyland, C. L., & Kelley, W. M. (2006). Neuroanatomical evidence for distinct cognitive and affective components of self. *Journal of Cognitive Neuroscience, 18*(9), 1586–1594.

Ng, S. H., Han, S., Mao, L., & Lai, J. C. L. (2010). Dynamic bicultural brains: fMRI study of their flexible neural representation of self and significant others in response to culture primes. *Asian Journal of Social Psychology, 13*(2), 83–91.

Northoff, G. (2011). The brain and its self: Concepts of self and the cortical midline structures. In S. Han & E. Pöppel (Eds.), *Culture and neural frames of cognition and communication* (pp. 41–65). Heidelberg, Germany: Springer.

Northoff, G., Heinzel, A., de Greck, M., Bermpohl, F., Dobrowolny, H., & Panksepp, J. (2006). Self-referential processing in our brain: A meta-analysis of imaging studies on the self. *NeuroImage, 31*(1), 440–457.

Novakovic, A. (2017). *Hegel on second nature in ethical life*. Cambridge, England: Cambridge University Press.

Oishi, S. (2010). The psychology of residential mobility: Implications for the self, social relationships, and well-being. *Perspectives on Psychological Science, 5*, 21–25.

Phelps, E. A., O'Connor, K. J., Cunningham, W. A., Funayama, E. S., Gatenby, J. C., Gore, J. C., & Banaji, M. R. (2000). Performance on indirect measures of race evaluation predicts amygdala activation. *Journal of Cognitive Neuroscience, 12*(5), 729–738.

Pinkard, T. (2012). *Hegel's naturalism: Mind, nature, and the final ends of life*. Oxford, England: Oxford University Press.

Pippin, R. (2008). *Hegel's practical philosophy: Rational agency as ethical life*. Cambridge, England: Cambridge University Press.

Qin, P., & Northoff, G. (2011). How is our self related to midline regions and the default-mode network? *NeuroImage, 57*(3), 1221–1233.

Ranchio, F. (2016). *Dimensionen der zweiten Natur: Hegels praktische Philosophie*. Hamburg, Germany: Felix Meiner Verlag. [Article in German]

Ray, R. D., Shelton, A., Hollon, N. G., Matsumoto, D., Frankel, C., Gross, J. J., & Gabrieli, J. D. E. (2010). Interdependent self-construal and neural representations of self and mother. *Social Cognitive and Affective Neuroscience, 5*(2–3), 318–323.

Roepstorff, A., Niewöhner, J., & Beck, S. (2010). Enculturing brains through patterned practices. *Neural Networks, 23*(8–9), 1051–1059.

Saxe, R., & Kanwisher, N. (2003). People thinking about thinking people: The role of the temporo-parietal junction in theory of mind. *NeuroImage, 19*(4), 1835–1842.

Schjoedt, U., Stødkilde-Jørgensen, H., Geertz, A. W., & Roepstorff, A. (2009). Highly religious participants recruit areas of social cognition in personal prayer. *Social Cognitive and Affective Neuroscience, 4*(2), 199–207.

Sui, J., & Han, S. (2007). Self-construal priming modulates neural substrates of self-awareness. *Psychological Science, 18*(10), 861–866.

Sui, J., Liu, C. H., & Han, S. (2009). Cultural difference in neural mechanisms of self-recognition. *Social Neuroscience, 4*(5), 402–411.

Testa, I. (2013). Hegel's naturalism or soul and body in the encyclopedia. In D. S. Stern (Ed.), *Essays on Hegel's philosophy of subjective spirit* (pp. 19–35). Albany, NY:

State University of New York Press.

Wang, G., Mao, L., Ma, Y., Yang, X., Cao, J., Liu, X., Wang, J., Wang, X., & Han, S. (2012). Neural representations of close others in collectivistic brains. *Social Cognitive and Affective Neuroscience, 7*, 222–229.

Wolff, M. (1992). *Das Körper-Seele Problem: Kommentar zu Hegel*. Frankfurt, Germany: Klostermann.

Zhu, Y., Zhang, L., Fan, J., & Han, S. (2007). Neural basis of cultural influence on self-representation. *NeuroImage, 34*(3), 1310–1316.

KARE
MEDYA