

The Relationship of Temperament and Character with Substance Use

Ünal Erdem ELLİ*

Abstract

This review aims to synthesize the studies focusing on the relationship between the temperament and character dimensions of Cloninger's Temperament and Character Inventory and substance abuse. A literature search including research articles, meta-analysis, and longitudinal studies was conducted. The findings from the included studies suggest the temperament trait of Novelty Seeking emerging as a consistent risk factor for initiation and sustaining of use of multiple types of substances. Latest research also points to gender and substance type – specific differences in personality profiles of women with opioid addiction compared to women with alcohol addiction. The combination of high Novelty Seeking and low Harm Avoidance, predicts earlier onset substance abuse with relatively worse prognosis. Amongst character dimensions, low Self-Directedness emerges as an important factor to understand transition from substance use to addiction. Neurobiological evidence suggests overlapping neural circuits that modulate both personality traits and drug reward in the mesocorticolimbic dopamine system. In conclusion, TCI offers a strong framework to understand individual proneness, to identify at-risk populations, to individualize treatment approaches, and to predict treatment outcomes. The incorporation of personality assessment into clinical practice may have significant value for prevention and treatment of substance use disorders.

Keywords: Temperament and Character Inventory, TCI, substance use disorders, addiction, personality, novelty seeking.

Mizaç ve Karakter ile Madde Kullanımı İlişkisi

Öz

Bu derleme, Cloninger'in Mizaç ve Karakter Envanteri'nin (TCI) mizaç ve karakter boyutları ile madde kullanımı arasındaki ilişkiye odaklanan çalışmaları sentezlemeyi amaçlamaktadır. Araştırma makaleleri, meta-analizler ve boylamsal çalışmalar dahil olmak üzere bir literatür taraması gerçekleştirilmiştir. Dahil edilen çalışmalardan elde edilen bulgular, Yenilik Arayışı mizaç özelliğinin çeşitli türde maddelerin kullanımına başlama ve sürdürmede tutarlı bir risk faktörü olduğunu göstermektedir. Son araştırmalar ayrıca, opioid bağımlılığı olan kadınlarla alkol bağımlılığı olan kadınlar arasında cinsiyete ve madde türüne özgü kişilik profili farklılıklarını da ortaya koymaktadır. Yüksek Yenilik arayışı ile düşük Zarardan Kaçınma kombinasyonu, daha erken başlangıçlı madde kullanımını ve nispeten daha kötü prognozu öngörmektedir. Karakter boyutları arasında, düşük Kendini Yönetme, madde kullanımından bağımlılığa geçişi anlamak için önemli bir faktör olarak öne çıkmaktadır. Nörobiyolojik kanıtlar, hem kişilik özelliklerini hem de madde ödüllendirmesini modüle eden mezokortikolimbik dopamin sisteminde örtüşen nöral devreleri göstermektedir. Sonuç olarak, MKE, bireysel yatkınlığı anlamak, risk altındaki grupları belirlemek, tedavi yaklaşımlarını kişiselleştirmek ve tedavi sonuçlarını öngörmek için güçlü bir çerçeve sunmaktadır. Kişilik

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* Lecturer, Dr., Istanbul Gelisim University, Faculty of Health Sciences, Department of Child Development, Istanbul, Türkiye. E-mail: ueelli@gelisim.edu.tr **ORCID** <https://orcid.org/0009-0000-9413-7822>

değerlendirmelerinin klinik uygulamalara entegre edilmesi, madde kullanım bozukluklarının önlenmesi ve tedavisinde önemli bir değer taşıyabilir.

Anahtar Sözcükler: Mizaç ve Karakter Envanteri, MKE, madde kullanım bozuklukları, bağımlılık, kişilik, yenilik arayışı.

Introduction

Substance use disorders (SUDs) are one of the most significant global health issues of the twenty-first century, with approximately 400 million individuals affected. Together with alcohol use disorders, over 3 million deaths are related to substance use¹. SUDs are complex disorders, with high relapse rates and treatment resistance. This complexity requires a more nuanced understanding of the factors that may render certain individuals vulnerable to developing and maintaining the maladaptive patterns of substance use. Together with genetic predisposition, environmental stressors, and social factors, evidence also suggests that individual differences in personality traits constitute a significant dimension underlying susceptibility to substance abuse².

While there are various models aiming to capture the complexity of the personality as a whole, C. Robert Cloninger's psychobiological model emerges as a particularly valuable framework for understanding the multifaceted relationship between personality and substance abuse³. This model distinguishes between four heritable temperament dimensions; Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD), and Persistence (PE) together with three character dimensions considered to be more sensitive to be shaped through development and learning: Self-Directedness (SD), Cooperativeness (C), and Self-Transcendence (ST)⁴. The Temperament and Character Inventory (TCI) incorporates these seven dimensions. Over the four decades since its development, TCI has been utilized in addiction research alongside other areas, consistently demonstrating that specific personality profiles are associated with increased risk for SUDs, as well as particular patterns of substance use and differential treatment outcomes⁵.

Contemporary research has expanded our understanding of personality and addiction in several ways. Recent studies suggest that personality profiles may differ between men and women and with people using different substances. In particular, women with opioid use disorder tend to display distinctly more maladaptive personality patterns than women with alcohol use disorder⁶. Contemporary neuroscience has identified distinct phenotypes such as “sign-trackers” and “goal-trackers” that reflect individual differences in susceptibility to addiction. These phenotypes also correlate with specific personality traits, particularly Novelty Seeking⁷. Advances in neuroimaging and molecular genetics reveal the neurobiological substrates underlying the relationship between personality dimensions and addiction, with specific emphasis on the role of dopaminergic, serotonergic, and other neurotransmitter systems⁸.

This review integrates recent findings with well-established findings to provide clinicians and researchers with an updated understanding of how personality assessment can enhance addiction prevention, treatment planning, and recovery. By providing an overview of behavioral, neurobiological, and clinical findings, this paper seeks to highlight the utility of the TCI as a tool for understanding the complex phenomenon of addiction in clinical practice.

Material and Methods

The present study was conducted as a narrative review. A literature search was conducted in February 2026 to identify studies examining the relationship between personality and substance use, prioritizing the studies employing TCI. A literature search was conducted to identify studies examining the relationship between personality and substance use, prioritizing the studies employing TCI. The search was performed across major academic databases such as PubMed, ScienceDirect, EBSCOhost, Taylor & Francis Online, Google Scholar, and PsycINFO. The search employed the following keywords related to the core concepts of the review: “Temperament and Character Inventory”, “TCI”, “substance use disorders”, “addiction”, “personality”, “novelty seeking”. The studies to be included have been chosen based on the following criteria: (1) The study had to be an original research article, a meta-analysis, a systematic review, or a clinical report. (2) The article had to be published in a peer-reviewed journal. (3) Articles published in English were prioritized, although relevant studies in other languages were also considered.

No specific date restrictions were applied. This allowed for an overview of the research in this field over time. Special attention was given to recent publications that highlight substance-specific and sex-specific findings, neurobiological mechanisms, and treatment implications. The information compiled from these articles provides the foundation for this review. It is structured to cover the main temperament and character dimensions and their relationship with substance abuse, followed by a discussion of the clinical and neurobiological implications. The review concludes with recommendations for future research and clinical practice.

Results

Temperament Dimensions and Substance Abuse

Novelty Seeking (NS)

Across the majority of studies in three decades of research, high Novelty Seeking emerges as one of the most robust and consistent personality trait associated with a general vulnerability to substance use across multiple substance classes^{5,9}. High NS is characterized by impulsivity, exploratory excitability, a tendency to seek out new and thrilling experiences, usually together with a reduced capacity for behavioral inhibition. This trait has been linked to an increased likelihood of initiating the use of various substances, particularly during adolescence and young adulthood¹⁰. Longitudinal studies demonstrate that high NS in early adolescence is a significant predictor of the future

development of SUDs as well as a greater number of substance classes tried and a relatively quicker transition from initial use to dependence¹¹. The motivation for novel sensations appears to make the initial rewarding effects of drugs particularly salient for these individuals with higher NS, making them at-risk for repeated use and the development of compulsive use patterns.

Recent research has also enhanced our understanding about the mechanisms underlying this relationship between Novelty Seeking and addiction vulnerability at the neurobiological level. Individuals with high NS are thought to have a constitutionally underactive mesolimbic dopamine system. This tendency may lead individuals to pursue novel experiences and substances to increase dopaminergic tone and achieve feelings of satisfaction or euphoria^{5,12}. This neurobiological underpinning helps explain why they are more prone to experiment with drugs and are more sensitive to their reinforcing effects. This mechanism may also be involved in creating a powerful drive for repeated use. In addition to human research, research on other species such as rats has revealed that sign-trackers (organisms who approach reward-predictive cues rather than the reward itself) display heightened Novelty Seeking and impulsivity¹³ and thus may be more vulnerable to developing compulsive drug use. This phenotypic distinction in other species may provide a more nuanced understanding of the underlying biological mechanisms and help explain why some individuals who experiment with drugs transition to compulsive use, while others maintain controlled use patterns.

Harm Avoidance (HA)

The relationship between Harm Avoidance and substance abuse appears to be more complex and multifaceted than originally thought. HA reflects a tendency toward worry, pessimism, shyness, fear of uncertainty, and heightened anxiety sensitivity. This definition shares conceptual similarities with the well-established personality trait of Neuroticism. While some studies find no significant difference in HA between individuals with SUDs and controls, others report higher Harm Avoidance in clinical populations, more specifically on those with dependence on depressants such as alcohol and opioids^{14,15}. This finding can be and usually interpreted within a self-medication framework, in which individuals use substances to cope with negative affective states such as anxiety, tension, dysphoria or other symptoms of internalizing disorders that are characteristic of high HA. From this perspective, substances serve a regulatory role, temporarily reducing the distress associated with high Harm Avoidance.

On the other hand, a number of research suggests that low Harm Avoidance, particularly in combination with high Novelty Seeking, is a risk factor for early-onset, antisocial, and polysubstance abuse, as these individuals may be less inhibited by the potential negative consequences of their actions and are more likely to engage in drug experimentation¹⁶. This dual pathway model (with high HA driving negative reinforcement pathways and low HA combined with high NS driving positive reinforcement and impulsive pathways) has important implications for understanding the heterogeneity of addiction presentations, as well as for tailoring treatment interventions. Research has also identified that the combination of high NS and high HA may represent a particularly

vulnerable profile. This profile would experience both a stronger drive to seek novel experiences and higher levels of anxiety that could motivate substance use as a coping mechanism¹⁷.

Reward Dependence (RD) and Persistence (PE)

Reward Dependence, defined by characteristics of a tendency to be more sentimental, to seek social approval, and to form attachments with others, seems to yield inconsistent results regarding its relationship with substance use. Some studies report low Reward Dependence in individuals with SUDs^{14,18}. This may suggest that a reduced need for social attachment and approval may facilitate a turn towards the non-social rewards offered by drugs. This detachment also could lead to social isolation and reduced social support, further reinforcing substance use patterns. However, other studies have found no significant association or even elevated RD in certain substance-using populations. The role of this trait may be highly dependent on the specific substance, cultural context, comorbid psychiatric conditions, and the stage of addiction development¹⁹.

Persistence, which refers to perseverance and the ability to continue with goal-directed behavior despite frustration or fatigue, is generally found to be lower in individuals with SUDs^{11,18}. By definition, low PE is associated with an inability to delay gratification, a tendency to give up easily when faced with obstacles as well as reduced motivation for sustained effort. These characteristics can contribute to the cycle of addiction by making it difficult for individuals to maintain abstinence when faced with cravings or environmental triggers. Individuals with low PE may struggle to maintain the motivation required for long-term recovery and may be more prone to relapse when faced with challenges, setbacks, or cravings. The combination of low PE with high NS creates a particularly vulnerable profile for compulsive substance use, as the drive for novelty is not counterbalanced by the capacity for sustained goal-directed behavior²⁰. Other studies that do not use TCI but incorporate similar constructs with different measurement devices also represent similar findings²¹.

Character Dimensions and Substance Abuse

While temperament dimensions are considered to reflect heritable predispositions established early in life, character dimensions represent the development of the self and are considered to be more malleable and responsive to therapeutic intervention. Research consistently shows that individuals with SUDs tend to exhibit character profiles that distinguish them not only from healthy controls but also from individuals with other psychiatric disorders^{14,18}.

Low Self-Directedness (SD) is the most prominent character finding in addiction research and is considered the most robust predictor of treatment outcome²². Low SD reflects a difficulty in setting and pursuing meaningful goals, a lack of personal responsibility, an external locus of control, and an inability to regulate behavior in accordance with long-term values. Individuals with low SD struggle to organize their behavior around abstract goals and are highly susceptible to the immediate gratification

provided by substances. This deficit in self-regulation is thought to be a key mechanism linking personality to the chronic, relapsing nature of addiction.

Low Cooperativeness (C) is characterized by social intolerance, a lack of empathy, opportunistic behavior, and antagonism toward others, while higher scores point to social cooperation and relatively better interpersonal relationships. Lower scores on this trait is often associated with antisocial features and can lead to interpersonal conflict, social rejection, and a lack of social support, all of which are known risk factors for the maintenance and exacerbation of SUDs. Recent findings confirm the possible relationship of lower Cooperation with SUDs¹⁸. Individuals low in cooperativeness may engage in deceptive or manipulative behaviors to obtain drugs, further damaging their social relationships and support networks. Cooperation also plays a role in engagement and sustaining of therapy, with individual scoring lower on this character trait becoming more prone to early abandonment of treatment²⁰.

The role of Self-Transcendence (ST), which involves spiritual, mystical, or transpersonal feelings and a sense of connectedness to something larger than oneself, is complex and multifaceted. While some studies have linked high ST to certain types of substance use (e.g., hallucinogens)²³, other studies report lower scores in clinical samples of SUDs compared to normal populations¹⁸. On the other hand, it has also been suggested as a possible contributing factor in recovery, particularly within the framework of 12-step programs that emphasize spiritual awakening and connection to a higher power^{24,25}.

Substance and Sex-Specific Personality Patterns in Addiction

A recent study⁶ comparing women with alcohol addiction, women with opioid addiction, and healthy controls found that women with opioid addiction displayed a distinctly more maladaptive personality profile on both Cloninger's model and the Five-Factor Model of personality compared to women with alcohol addiction and healthy controls. Specifically, opioid-addicted women scored significantly higher on Novelty Seeking and Self-Transcendence, and lower on Self-Directedness and Cooperativeness. In contrast, women with alcohol addiction more closely resembled healthy controls on most personality dimensions, suggesting that the personality pathology associated with opioid addiction is more severe and pervasive. Although it utilized a different personality model, another study from 2025 also reported sex differences in individuals with Alcohol Use Disorder, specifically in certain personality disorders such as Dependent Personality Disorder²⁶.

These findings have important implications for understanding the differential vulnerability to different types of substance use and for developing individualized prevention and treatment strategies. Women with opioid addiction for instance, appear to represent a particularly high-risk group. They tend to show more pronounced personality difficulties (showing higher impulsivity, reduced self-regulation and difficulty with interpersonal relationships) than women with alcohol addiction, suggesting that opioid use may be linked to more fundamental disruptions in personality and self-regulation. These findings also highlight the importance of taking substance-

specific factors into account when examining the relationship between addiction and personality.

Neurobiological Mechanisms Linking Personality to Addiction

Contemporary neuroscience provides insights into the neurobiological substrates that underlie the relationship between personality dimensions and addiction vulnerability. The mesocorticolimbic reward pathway, which includes the ventral tegmental area, nucleus accumbens, prefrontal cortex, and amygdala, is considered central in personality expression and the rewarding effects of drugs of abuse²⁷. This overlap in neural circuits helps explain why personality traits and addiction vulnerability may be closely intertwined. Novelty Seeking is primarily modulated by the dopaminergic system, which is involved in reward anticipation, motivation, and the attribution of incentive salience to environmental cues. Individuals with high NS are thought to have a constitutionally underactive dopaminergic system, leading them to seek stimulation and reward more actively²⁸. When exposed to drugs, which potently activate the dopamine system, high-NS individuals experience particularly strong reinforcement and are more likely to develop compulsive use patterns⁵.

Harm Avoidance is primarily associated with the serotonergic system, which is involved in behavioral inhibition, anxiety regulation, and the processing of aversive stimuli. Individuals with high HA have heightened sensitivity to threat and punishment signals and may use substances to downregulate this hyperactive threat-detection system²⁹.

Recent research has also identified distinct neural phenotypes corresponding to sign-tracker and goal-tracker behavioral patterns. Sign-trackers, who display heightened novelty seeking and impulsivity, show enhanced responsiveness of the dopaminergic system to reward-predictive cues, leading to the attribution of excessive incentive salience to drug-related cues. This cue-induced sensitization is thought to underlie the strong cravings and compulsive drug-seeking behavior seen in addiction, as these individuals are likely to be more responsive to the cues associated with drugs. In contrast, goal-trackers maintain a more flexible and adaptive relationship with reward-predictive cues, showing less cue-induced sensitization and greater behavioral flexibility⁷. Gaining insight into these neurobiological mechanisms can help guide development of pharmacological and behavioral interventions tailored to the specific neurobiological vulnerabilities lined with different personality profiles.

Conclusion and Recommendations

The literature review reveals largely consistent patterns in the personality profiles of individuals with SUDs. The findings from the literature included in this review underscore the role of temperament and character in the etiology, maintenance, and treatment of SUDs. The TCI offers a valuable perspective that moves beyond categorical diagnoses to shed light on the underlying neurobiological and psychological vulnerabilities that predispose individuals to substance use. Integrating personality assessment into clinical practice would help clinicians better identify at-risk individuals,

enable personalized and targeted interventions, as well as monitor progress and character development throughout treatment, which will bring the potential to improve outcomes for patients.

In general, a pattern of high Novelty Seeking, low Self-Directedness, and low Cooperativeness appears to be a core personality profile for an increased vulnerability to SUDs. How this profile manifests may still be subject to variation depending on gender, age, cultural context, and other individual and environmental factors.

The strong association between high Novelty Seeking and substance use highlight the role of dopaminergic functioning in addiction vulnerability. The dual pathways to addiction (one driven by the positive reinforcement of the rewarding effects of drugs in high-NS individuals and another driven by the negative reinforcement of anxiety and distress relief in high-HA individuals) provide a framework for understanding the heterogeneity of addiction presentations, which would also allow for tailoring treatment interventions to address these specific vulnerabilities of different individuals. The findings related to character dimensions, particularly low Self-Directedness, appear important for understanding the transition from substance use to addiction and for guiding therapeutic intervention.

Recent research on gender-specific personality patterns and the sign-tracker/goal-tracker phenotypes expands our understanding of individual differences in addiction vulnerability and has implications for prevention and treatment. The finding that women with opioid addiction display more dysfunctional personality traits than women with alcohol addiction suggests that different substances may be associated with distinct personality profiles. Recognizing sign-tracker and goal-tracker phenotypes provides a possible explanation to why a subset of substance users develop compulsive use patterns more easily and quickly and offers potential targets for early identification and intervention.

Although an extensive literature accumulated over three decades on the topic is available, several limitations and areas for future investigation remain. Most of the available research is cross-sectional, which makes it difficult to establish causality or to determine the direction of the reported relationships. While longitudinal studies like those by Hartman et al.¹¹ and recent prospective studies provide stronger evidence for causal relationships, more such studies are needed, particularly with longer follow-up periods and larger, more diverse samples.

Future research could also focus more on the role of character dimensions in recovery and how specific therapeutic interventions can foster character development. While temperament dimensions are relatively stable throughout adulthood, character dimensions are thought to be more malleable and responsive to therapeutic intervention. Understanding how to effectively promote character development through targeted therapeutic approaches may be a key to improving long-term recovery outcomes. Additionally, research on the integration of personality assessment with other biomarkers (e.g., genetic markers, neuroimaging findings, and stress biomarkers) may

provide a more comprehensive understanding of addiction vulnerability and may allow for more precise prediction of treatment response and relapse risk.

Clinical Implications

The insights gained from TCI research have direct and significant clinical applications that can enhance the effectiveness of addiction treatment. Personality assessment with the TCI can be used to identify at-risk individuals by screening for high-risk personality profiles (e.g., high NS, low SD, low C) in adolescents and young adults, allowing for targeted prevention efforts before the development of SUDs. Understanding a patient's unique personality profile can help clinicians tailor therapeutic strategies to address the specific vulnerabilities and strengths of each individual. For example, a patient high in NS might benefit more from engaging in novel and healthy rewarding activities, such as adventure sports, creative pursuits, or volunteer work that provides stimulation and novelty in prosocial contexts. In contrast, a patient high in HA would benefit more from support in managing anxiety and stress through cognitive-behavioral techniques, mindfulness-based interventions, and development of healthy coping strategies. Individuals who are identified to be more sensitive to cues about rewards may be the target of behavioral interventions such as Cue Exposure Therapy with Response Prevention or Contingency Management.

Certain personality profiles may be associated with a higher risk of dropout from treatment or relapse following treatment completion, and this knowledge can help clinicians provide more intensive support and monitoring to these individuals. For example, individuals with very low SD may require more structured treatment environments and more frequent therapeutic contact to maintain engagement and adherence. Individuals with lower scores in Cooperation may be targeted to modify the therapeutic frame to reduce interpersonal threat, increase therapeutic alliance, and make engagement contingencies to reduce the higher likelihood of therapy abandonment in this group. TCI can also be used to track changes in character dimensions over the course of treatment, providing a measure of psychological growth and recovery. Improvement in SD and C over time may indicate genuine personality development and psychological maturation, which are likely to be associated with better long-term outcomes. Therapeutic approaches that specifically target character development, emphasize and focus on personal responsibility, goal-setting, and interpersonal skill-building may be particularly effective for individuals with dysfunctional character traits.

REFERENCES

1. World Health Organization. *Global Status Report on Alcohol and Health and Treatment of Substance Use Disorders*. Geneva: World Health Organization; 2024.

2. Piazza PV, Deminiere JM, Le Moal M, Simon H. Factors that predict individual vulnerability to amphetamine self-administration. *Science*. 1989;245(4925):1511-1513.
3. Cloninger CR. A systematic method for clinical description and classification of personality variants. *Arch Gen Psychiatry*. 1987;44(6):573-588.
4. Cloninger CR, Svrakic DM, Przybeck TR. A psychobiological model of temperament and character. *Arch Gen Psychiatry*. 1993;50(12):975-990.
5. Wingo T, Nesil T, Choi JS, Li MD. Novelty seeking and drug addiction in humans and animals: From behavior to molecules. *J Neuroimmune Pharmacol*. 2016;11(3):456-470.
6. Rakić D, Lalović N, Barišić J, Čelić I, Milovanović S. The relationship between personality dimensions and addiction type in women addicted to alcohol and opioids. *Sci Rep*. 2025;15:2050.
7. Flagel SB, Robinson TE. Neurobiological basis of individual variation in stimulus-reward learning. *Curr Opin Behav Sci*. 2017;13:122-128.
8. Kalivas PW, Volkow ND. The neural basis of addiction: A pathology of motivation and choice. *Am J Psychiatry*. 2005;162(8):1403-1413.
9. Howard MO, Kivlahan D, Walker RD. Cloninger's tridimensional theory of personality and substance use. *J Stud Alcohol*. 1997;58(1):48-66.
10. Wills TA, Vaccaro D, McNamara G. Novelty seeking, risk taking, and related constructs as predictors of adolescent substance use: An application of Cloninger's theory. *J Subst Abuse*. 1994;6(1):1-20.
11. Hartman C, Hopfer C, Corley R, Hewitt J, Stallings M. Using Cloninger's temperament scales to predict substance-related behaviors in adolescents: A prospective longitudinal study. *Am J Addict*. 2013;22(3):276-282.
12. Volkow ND, Wise RA. How can drug addiction help us understand obesity? *Nat Neurosci*. 2005;8(5):555-560.
13. Flagel SB, Clark JJ, Robinson TE, et al. A selective role for dopamine in stimulus-reward learning. *Nature*. 2011;469(7330):53-57.
14. Evren C, Evren B, Yancar C, Erkiran M. Temperament and character model of personality profile of alcohol- and drug-dependent inpatients. *Compr Psychiatry*. 2007;48(1):283-288.
15. Akvardar Y, Arkar H, Gul S, Akdede BB. Alkol kullanım bozukluklarında kişilik özellikleri. *National Psychiatry Congress*. 2003:603-604.

16. Cloninger CR. Temperament and personality. *Curr Opin Neurobiol.* 1994;4(2):266-273.
17. Berman S, Ozkaragoz T, Young RM, Noble EP. D2 dopamine receptor gene polymorphism discriminates two kinds of novelty seeking. *Pers Individ Dif.* 2002;33(6):867-882.
18. Shahini N, Talaei A, Salimi Z, et al. Temperament and character traits in substance use disorder in Iran: A case control study. *BMC Psychol.* 2021;9(1):138.
19. Le Bon O, Basiaux P, Streel E, et al. Personality profile and drug of choice: A multivariate analysis using Cloninger's TCI on heroin addicts, alcoholics, and a random population group. *Drug Alcohol Depend.* 2004;73(2):175-182.
20. Arnau MM, Mondon S, Santacreu JJ. Using the Temperament and Character Inventory (TCI) to predict outcome after inpatient detoxification during 100 days of outpatient treatment. *Alcohol Alcohol.* 2008;43(5):583-588.
21. Zaher A, Mourad G, Ibrahim F. Relapse risk, frustration tolerance, and motivational readiness for change in substance use disorders. *BMC Psychol.* 2025;13:1329.
22. Angres DH. The Temperament and Character Inventory in addiction treatment. *Focus.* 2010;8(2):187-195.
23. MacLean KA, Johnson MW, Griffiths RR. Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. *J Psychopharmacol.* 2011;25(11):1453-1461.
24. Sørensen T, Lien L. Significance of self-transcendence for rehabilitation and relapse prevention among patients with substance use disorder: A qualitative study. *Religions.* 2022;13(6):491.
25. Hai AH, Hang A, Franklin C, Park S, DiNitto DM, Aurelio N. The efficacy of spiritual/religious interventions for substance use problems: A systematic review and meta-analysis of randomized controlled trials. *Drug Alcohol Depend.* 2019;202:134-148.
26. Morera-Fumero AL, García-Gómez MN, Jiménez-Sosa A. Clinical personality patterns in alcohol use disorder: A study focused on sex differences. *J Clin Med.* 2025;14(14):5062.
27. Koob GF, Volkow ND. Neurobiology of addiction: A neurocircuitry analysis. *Lancet Psychiatry.* 2016;3(8):760-773.

- 28.** Hansenne M, Pinto E, Pitchot W, Reggers J, Scantamburlo G, Moor M, Ansseau M. Further evidence on the relationship between dopamine and novelty seeking: A neuroendocrine study. *Pers Individ Dif.* 2002;33(6):967-977.
- 29.** Peirson AR, Heuchert JW, Thomala L, Berk M, Plein H, Cloninger CR. Relationship between serotonin and the Temperament and Character Inventory. *Psychiatry Res.* 1999;89(1):29-37.