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Addiction Risk in Obsessive-Compulsive Disorder: A Comprehensive Neuropsychiatric Review

Sabri Yurdakul*

Yaprak Therapy Center, Adana, Türkiye

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***Corresponding author:** Sabri Yurdakul, Yaprak Therapy Center, Adana, Türkiye

Abstract

Obsessive-Compulsive Disorder (OCD) is a chronic psychiatric condition involving intrusive thoughts and repetitive compulsions. While traditionally framed within the anxiety spectrum, contemporary neuroscience highlights profound overlaps between OCD and addiction-related pathophysiology. These include dysregulation in reward circuitry, impaired inhibitory control, and maladaptive habit learning processes. This expanded review synthesizes evidence across neurobiological, neuropsychological, psychodynamic, behavioral, and clinical domains, illustrating the shared mechanisms driving compulsivity and addiction susceptibility in individuals with OCD. Particular focus is given to dopaminergic, serotonergic, and glutamatergic pathways; cortico-striatal-thalamo-cortical (CSTC) circuitry; and transdiagnostic endophenotypes. Integrated treatment strategies-including medication, psychotherapy, and neuromodulation-are explored in depth. This article aims to establish a comprehensive framework for understanding addiction vulnerability in OCD and to provide clinicians with practical implications for assessment and treatment.

Keywords: Obsessive-Compulsive Disorder; Addiction; Compulsivity; Dopamine; Glutamate; Reward Circuit; Neuropsychiatry; Habit Learning; Behavioral Addiction; Substance Use

Abbreviations: Obsessive-Compulsive Disorder (OCD); substance use disorders (SUDs); cortico-striatal-thalamo-cortical (CSTC); ventral tegmental area (VTA); selective serotonin reuptake inhibitors (SSRIs); N-acetylcysteine (NAC); Exposure and Response Prevention (ERP); Cognitive-Behavioral Therapy (CBT); Motivational Interviewing (MI); Acceptance and Commitment Therapy (ACT); repetitive Transcranial Magnetic Stimulation (rTMS); Direct Current Stimulation (tDCS); dorsolateral prefrontal cortex (DLPFC);

Introduction

Obsessive-Compulsive Disorder (OCD) affects an estimated 2–3% of the global population and is characterized by intrusive obsessions and compulsive behaviors aimed at reducing anxiety or preventing perceived harm. Historically, OCD has been conceptualized as an anxiety-driven disorder and classified alongside other anxiety disorders [1]. However, over the last two decades, converging evidence from neuroimaging, pharmacology, neuropsychology, and clinical phenomenology has suggested that OCD may be better understood as part of a broader spectrum of compulsivity-related conditions, which also encompasses behavioral and substance addictions. This reconceptualization is not merely semantic; it has direct implications for how clinicians conceptualize risk, comorbidity, and treatment. Both OCD and addiction involve repetitive behaviors that are difficult to control, even in the face of negative consequences. Both are sustained by dysfunctional reward processing and by habit learning mechanisms that become increasingly autonomous and insensitive to long-term goals. This paper expands upon existing frameworks by examining the multiple levels at which OCD and addiction overlap, including neurobiology, cognition, personality, and life history. Particular emphasis is placed on understanding why individuals with OCD may be especially vulnerable to both substance-related and behavioral addictions [2].

Epidemiology and Comorbidity

Epidemiological data indicate that individuals with OCD exhibit significantly higher rates of comorbid substance use disorders (SUDs) and behavioral addictions compared to the

general population. Clinical samples from tertiary care centers frequently show lifetime comorbidity rates of alcohol or drug misuse ranging from 20% to 40%, with even higher rates of subthreshold use or risky patterns of consumption. Behavioral addictions-particularly internet gaming, compulsive buying, and compulsive sexual behaviors-also appear more frequently among OCD patients than among healthy controls. The directionality of this association is complex. In some cases, addictive behaviors precede the onset of full-blown OCD, possibly reflecting a shared underlying vulnerability such as heightened impulsivity, emotional dysregulation, or exposure to early-life stressors [3,4]. In other cases, addictive behaviors emerge secondarily as maladaptive coping strategies in response to untreated or refractory OCD symptoms. For example, a person whose day is dominated by contamination fears and cleaning rituals may turn to alcohol or sedative medications in an attempt to obtain temporary relief. Over time, this pattern can solidify into a substance use disorder, adding another layer of complexity to treatment planning.

Dopaminergic Pathways and Reward Dysfunction

The mesolimbic dopamine system, which includes projections from the ventral tegmental area (VTA) to the nucleus accumbens and prefrontal cortex, is central to our understanding of reward, motivation, and reinforcement learning. In classical addiction models, repeated exposure to drugs of abuse sensitizes this system, leading to exaggerated responses to drug-related cues and a progressive narrowing of behavioral repertoire around substance use [5]. A parallel process appears to occur in OCD, where compulsive rituals-though ego-dystonic and not inherently pleasurable-are reinforced through the relief they provide from intense anxiety and distress. Functional neuroimaging studies have shown that the nucleus accumbens and orbitofrontal cortex can become hyper-responsive to obsession- and compulsion-related cues in OCD, much as they do to drug cues in addiction. Dopamine release is not limited to experiences of pleasure; it also encodes relief from threat and the successful avoidance of negative outcomes. When a compulsion is performed and the anticipated catastrophe fails to occur, this can be interpreted by the brain as a kind of negative reinforcement, strengthening the association between the ritual and the reduction of distress. Over time, this reinforcement loop may contribute to an addiction-like process in which the individual feels compelled to 'dose' themselves with rituals to manage internal states [6].

Serotonergic and Glutamatergic Systems in Compulsivity

Beyond dopamine, serotonergic and glutamatergic neurotransmitter systems play critical roles in both OCD and addiction. Serotonin (5-HT) has long been implicated in mood regulation, impulse control, and anxiety. The efficacy of selective serotonin reuptake inhibitors (SSRIs) in reducing OCD symptoms underscores the importance of this system. However, serotonergic modulation alone does not fully account for the complexity of compulsive behavior, and many patients exhibit partial or incomplete responses to SSRI treatment. Glutamate, the brain's primary excitatory neurotransmitter, has emerged as a key player in the pathophysiology of OCD. Elevated glutamate concentrations have been observed in the anterior cingulate cortex and orbitofrontal cortex of individuals with OCD, regions that also exhibit abnormalities in patients with substance addictions. Excessive glutamatergic activity within the cortico-striatal-thalamo-cortical (CSTC) loop is thought to enhance the rigidity of cognitive and behavioral patterns, making it difficult for the individual to disengage from compulsive thoughts or actions. The successful use of glutamate-modulating agents such as N-acetylcysteine (NAC) and memantine across both OCD and addiction further strengthens the hypothesis of shared excitatory dysregulation.

Psychodynamic Perspectives on Compulsivity and Addiction

From a psychodynamic perspective, both compulsions and addictions can be conceptualized as defenses against intolerable affect. OCD rituals may serve to neutralize unacceptable impulses or to restore a sense of control in the face of perceived chaos or contamination. Addictive behaviors, including substance use and behavioral addictions, may function as attempts to escape from feelings of emptiness, shame, or anxiety. In each case, the behavior provides short-term relief but perpetuates long-term dysfunction and dependency [7]. The classical psychodynamic cycle-tension, impulsive or compulsive act, relief, and guilt-is visible in both OCD and addiction. Patients often describe feeling driven to perform rituals or to use substances despite knowing that these behaviors are irrational or harmful. Perfectionism, excessive responsibility, and a harsh internal critic are frequently seen in OCD and may also contribute to addictive vulnerability by generating chronic self-criticism and emotional pain that the person attempts to numb or control.

Habit Learning, Cognitive Rigidity, and Behavioral Overlap

Neurocognitive models emphasize the transition from goal-directed to habitual control in both OCD and addiction. In goal-directed behavior, actions are chosen based on their anticipated outcomes and are sensitive to changes in reward value. In habitual behavior, actions are triggered by cues and well-learned stimulus–response associations, with minimal consideration of current goals. Evidence suggests that individuals with OCD show a bias toward habit-based responding, particularly in tasks that require flexible adjustment of behavior when contingencies change. Similarly, addiction can be understood as a shift from voluntary, reward-seeking drug use to compulsive, habit-driven consumption. Even when the individual no longer derives pleasure from the substance-or actively wishes to stop-automatic

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cue–response patterns and craving states drive continued use. This cognitive rigidity is mirrored in OCD, where patients often report that rituals continue even when their fear has diminished or when they intellectually recognize that the feared outcome is unlikely.

Types of Addictions in OCD: Substance and Behavioral

Addictive vulnerability in OCD is not limited to substances such as alcohol, benzodiazepines, or illicit drugs. Behavioral addictions, including pathological gambling, internet gaming, compulsive shopping, pornography use, and compulsive eating, also appear with increased frequency. These behaviors share with OCD a pattern of repetitive, time-consuming engagement and difficulty stopping despite negative consequences. For some individuals, behavioral addictions may become secondary forms of ritualization or self-soothing when primary OCD symptoms are partially treated or suppressed. The relationship between symptom content and addiction type can be clinically informative. For example, individuals with predominant symmetry or ordering obsessions may derive temporary relief or satisfaction from highly structured gaming environments, while those with sexual or religious obsessions may be particularly vulnerable to compulsive internet pornography use as a paradoxical repetition and avoidance strategy. Understanding these nuanced connections can help clinicians tailor assessment and intervention.

Assessment, Screening, and Risk Formulation

Given the elevated risk of addiction in OCD, comprehensive assessment should routinely include screening for both substance use and behavioral addictions. Clinicians are encouraged to ask detailed questions about alcohol, prescription medication, and illicit drug use, as well as digital behaviors such as gaming, social media, and online spending. Standardized instruments can be helpful but should be supplemented with clinical interviewing that explores the functional relationship between OCD symptoms and addictive behaviors. Risk formulation should consider biological predisposition (e.g., family history of addiction or mood disorders), personality traits (e.g., impulsivity, sensation seeking, harm avoidance), environmental factors (e.g., exposure to substances, peer influences, chronic stress), and developmental experiences including trauma or attachment disruptions. By integrating these factors, clinicians can identify patients at highest risk and implement early, targeted preventive strategies.

Clinical Implications and Integrated Treatment Approaches

Effective treatment of OCD in the context of addiction risk requires an integrated approach that addresses both sets of vulnerabilities simultaneously rather than sequentially. Pharmacologically, SSRIs remain first-line, particularly for obsessions and anxiety. When addiction is present or strongly suspected, adjunctive medications such as naltrexone or acamprosate for alcohol use, or NAC for both craving and compulsive urges, may be introduced with careful monitoring. Psychotherapeutically, Cognitive-Behavioral Therapy (CBT) with Exposure and Response Prevention (ERP) is the cornerstone of OCD treatment but can be challenging to implement when addiction is active. In such cases, combining ERP with Motivational Interviewing (MI) and relapse prevention strategies from addiction treatment can enhance engagement. Acceptance and Commitment Therapy (ACT) and mindfulness-based approaches may help patients develop a different relationship to both intrusive thoughts and craving sensations, emphasizing values-based action rather than symptom suppression.

Neurotechnological Interventions and Future Directions

Neurotechnological interventions such as repetitive Transcranial Magnetic Stimulation (rTMS), transcranial Direct Current Stimulation (tDCS), and Deep Brain Stimulation (DBS) have opened new avenues for treating refractory OCD and, increasingly, addiction. rTMS targeting the dorsolateral prefrontal cortex (DLPFC) aims to enhance executive control and top-down regulation of limbic and striatal regions. DBS of the nucleus accumbens or ventral capsule/ventral striatum has yielded promising results in severe, treatment-resistant OCD and is being explored in small studies for addiction. Future research is likely to move toward personalized neuromodulation protocols informed by individual neuroimaging profiles and electrophysiological markers. Transdiagnostic frameworks that cut across traditional diagnostic categories and focus on dimensions such as compulsivity, impulsivity, and cognitive control may guide the development of new interventions that target shared neural circuitry in OCD and addiction.

Conclusion

OCD and addiction, though traditionally classified in separate diagnostic categories, share a rich set of neurobiological, cognitive, and behavioral commonalities. Reward dysfunction, impaired inhibitory control, and maladaptive habit learning are key mechanisms that contribute to both compulsive rituals and addictive behaviors. Recognizing these overlaps enables clinicians to conceptualize OCD not only as an anxiety disorder but also as a condition with significant addiction vulnerability, requiring vigilance in assessment and creativity in treatment planning. By integrating pharmacological strategies, evidence-based psychotherapies, psychosocial interventions, and neuromodulation techniques, clinicians can better address the complex needs of OCD patients who are at risk for or already struggling with addiction. Future research should prioritize transdiagnostic constructs and shared endophenotypes, with the ultimate goal of developing more effective, individualized, and preventative approaches to both OCD and addiction.

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