Understanding Common Personality Disorders: the Neurological Basis of OCD, NPD, and BPD

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Abstract

Historically, the complexity of personality disorders has posed challenges to both diagnosis and treatment; however, with advances in technology, various studies have begun making new developments to elucidate the neurobiological causes of many of the most common personality disorders, such as obsessive-compulsive disorder (OCD), narcissistic personality disorder (NPD), and borderline personality disorder (BPD). By understanding the neurobiological causes of these disorders, further therapeutic and pharmaceutical treatment options can be developed, and information about these disorders can become widespread.

What is a personality disorder?

According to the Diagnostic and Statistical Manual of Mental Disorders: 5th Edition (DSM-5), a personality disorder is defined by the disruption in at least two of the areas of cognition, affectivity, interpersonal control, and impulse control, with these behaviors carrying throughout a variety of situations and being tracked back to adolescence or early adulthood (5th ed.; DSM–5; American Psychiatric Association, 2013). The three most prevalent personality disorders in the United States include obsessive-compulsive disorder, borderline personality disorder, and narcissistic personality disorder; however, the broader diagnosis that encompasses all personality disorders is general personality disorder.

General personality disorder follows a broad pattern of behaviors for a diagnosis, which as the DSM-5 defines, is "when personality traits are inflexible and maladaptive and cause significant functional impairment or subjective distress" (5th ed.; DSM–5; American Psychiatric Association, 2013). Because of the vast range of behaviors that can be characterized as general personality disorders, symptoms are sorted into three clusters, labeled Cluster A, Cluster B, and Cluster C. Cluster A personality disorders are considered the more "severe" types of personality disorders, with symptoms including "odd beliefs, unusual perceptual experiences, odd thinking and speech, paranoid ideation, and odd or eccentric appearance or behavior" (Esterberg, Goulding, & Walker, 2010). Cluster B personality disorders are characterized as "dramatic, emotional, or erratic," and often have connotations of a lack of empathy (Kraus & Reynolds, 2001). Cluster C personality disorders consist of three personality disorders: avoidant personality disorder, dependent personality disorder, and obsessive-compulsive personality disorder, with all of the disorders including avoidance and control as coping strategies and an inability to form close relationships with others (Bachrach & Artnz, 2021).

Obsessive-Compulsive Disorder (OCD)

Obsessive-compulsive disorder is the most common Cluster C personality disorder, as well as the most common personality disorder in the United States, with 2.3% of American individuals having diagnoses of lifetime OCD, and 1.2% of Americans having diagnoses of 12-month OCD (Ruscio, Stein, Chiu, & Kessler, 2010). OCD is diagnosed based on the presence of obsessions, which are manifested by intrusive thoughts or images that increase anxiety, and by compulsions, which are performed to reduce this anxiety (Stein, 2002).

Although the diagnosis of obsessive-compulsive disorder is made based on behaviors, research has established neurobiological and genetic factors as key underlying causes. In a Cambridge University neuroimaging study, researchers found that patients with OCD tend to have hyperactivity of the ventral cognitive circuit, specifically in the basal ganglia and thalamus, which control sensory function, executive functions, and behaviors (Westenberg, Fineberg, & Denys 2014). Additionally, patients with OCD have been found to have elevated glutamate and glycine levels in their cerebrospinal fluid as compared to controls, meaning that these patients had an increase in excitatory neurotransmitters, which produce alerting signals to be transmitted throughout the nervous system. There have also been increased findings of serotonin, a modulator of glutamate, in OCD patients (Bhattacharyya, Khanna, Chakrabarty, Mahadevan, Christopher, & Shankar, 2009). These findings suggest that the symptoms of OCD are produced by a framework in which more excitatory neurotransmitters are released, leading to increased activity within the ventral cognitive circuit, thus contributing to the elevated feelings of anxiety and obsessions that are only subdued by engaging in compulsions. Furthermore, researchers have found potential genetic ties to OCD: a study with monozygotic (identical) as compared to dizygotic (fraternal) twins found that it is more common for both the monozygotic twins, with identical DNA to have an onset of OCD if at least one twin does, with a rate of 80-87% than for both the dizygotic twins, which have a 47-50% rate of both having OCD if one twin has it. The study concluded that these findings serve as evidence of a dominant or codominant mode of transmission of OCD; however, the particular allele that this would affect has not been found (Jenike, 2004).

Though obsessive-compulsive disorder has been linked to neural activity, the most common methods of treatment are behavioral interventions. However, pharmacologic approaches–including neuroleptic augmentation of antidepressants, and neuromodulation, including deep-brain stimulation–have found positive outcomes (Hirschtritt, Bloch, & Mathews 2017).

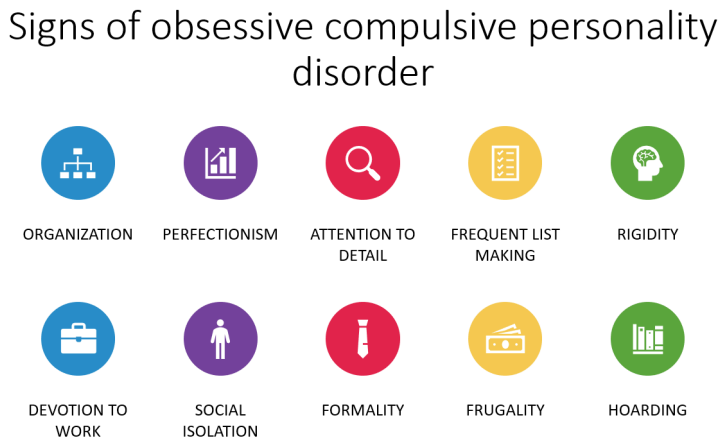

Figure 1. Signs of OCD
Some common characteristics of OCD include organization, perfectionism, and attention to detail (Wikimedia Commons, 2022).

Narcissistic Personality Disorder (NPD)

Narcissistic personality disorder is the most common Cluster B personality disorder in the United States, with a lifetime prevalence rate of 6% in the general population, as found by the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions (Ronningstam, 2010). Diagnosis of narcissistic personality disorder is based on behaviors of one of two subtypes: overt or covert. The overt subtype is characterized by “grandiosity, attention seeking, entitlement, arrogance, and little observable anxiety,” whereas the covert subtype is characterized by being “inhibited, manifestly distressed… shy, outwardly self-effacing, and hypersensitive to slights” (Caligor, Levy, & Yeomans, 2015).

Similar to other personality disorders, narcissistic personality disorder is diagnosed based on a pattern of behaviors, yet it does have a neurological basis. Although not much research has been conducted on the effect of neurotransmitters on NPD, some studies have found links of narcissism to lower levels of serotonin. In a German study conducted by Paraskevi Mavrogiorgou, 74 healthy control patients and 74 patients with depressive disorders completed two personality assessments and an EEG for analysis of serotonergic transmissions (Mavrogiorgou, Seltsam, Kiefner, Flashback, & Juckel, 2022). The results dictated that individuals from either group that tested positive for narcissism tended to have lower serotonergic neurotransmissions.

For NPD, no psychotherapy nor pharmacotherapy treatments have been found to be effective, with a 63-64% drop-out rate for psychotherapy and no current approved pharmacological approaches to increase the number of serotonergic neurotransmissions in narcissistic personality disorder patients (Weinberg & Ronningstam, 2022).

Borderline Personality Disorder (BPD)

Borderline Personality Disorder is another Cluster B personality disorder, which has a prevalence of 0.5-5.9% in the general United States population (Leichsenring, Leibing, Kruse, New, & Leweke, 2011). Clinical signs of borderline personality disorder include emotional dysregulation, repeated self-injury, and chronic suicidal tendencies (Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004).

According to the DSM-5, while the root cause of BPD is not confirmed, genetic factors and adverse events during childhood, such as abuse, contribute to the onset of the disorder. However, recent studies have begun to prove the significance of serotonin in BPD. In particular, a study conducted at the Mount Sinai School of Medicine found that dysfunction of the serotonin (5-HT) system has been linked with borderline personality disorder (Gurvits, Koenigsberg, & Siever, 2005). This connects to the behavioral traits of those with the disorder, as this type of dysfunction has been associated with both self-directed and non-self-directed impulse aggression. Additionally, it has been found that the instability found in individuals with BPD may be affected by dysregulations in cholinergic, noradrenergic (NE) or gamma-aminobutyric acid (GABA)-minergic systems. These systems regulate inhibitory pathways, which suppress signals; therefore, if these are dysfunctional, patients will be much more alert and reactive to stimuli (Gurvits, Koenigsberg, & Siever, 2005).

BPD has no effective pharmaceutical treatment to combat symptoms because there is so little known about it. However, common alternatives include psychotherapy, which includes dialectical behavioral therapy and cognitive behavioral therapy, in addition to family therapy (NIMH, 2023).

Figure 2. Signs of BPD
Some common characteristics of BPD include fear of abandonment, unstable relationships, and unstable sense of identity (Wikimedia Commons, 2024).

Conclusion

Neurotransmitters prove to be crucial in determining the symptoms of the three most commonly diagnosed personality disorders, obsessive-compulsive disorder, narcissistic personality disorder, and borderline personality disorder. In particular, serotonin plays a significant role in determining behavioral tendencies, with higher levels leading to greater sources of anxiety, and lower levels leading to increased apathy. Although the DSM-5 has yet to validate the link between neurotransmitters and these personality disorders, new studies continue to suggest that serotonin does have an impact on behaviors. If the impact of serotonin is eventually validated by the DSM-5, the detection of these disorders would become much more objective, as it would be dependent on serotonergic levels rather than a psychologist or physician's perception of behaviors. Additionally, the production of medications to alleviate the symptoms of these disorders and normalize serotonin levels could prove impactful for the large percentages of Americans impacted by these disorders. Affected individuals will have new means of receiving treatments and diagnostic methods for these disorders will evolve as the observed role of neurotransmitters in these disorders increases.

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