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ANXIETY DISORDERS IN ADULTS WITH ADHD

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ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) and anxiety disorders often coexist in the adult population, generating significant impacts on the functionality and quality of life of individuals. This study conducts a narrative review of the literature to investigate the relationship between these conditions, highlighting the underlying neurobiological mechanisms, diagnostic challenges, and clinical implications. The findings suggest that structural alterations in the amygdala, hippocampus, and orbitofrontal cortex are associated with greater vulnerability to anxiety in individuals with ADHD, possibly mediated by dopaminergic and hypothalamic-pituitary-adrenal axis dysregulations. The concomitant presence of anxiety contributes to greater cognitive difficulties, including deficits in working memory and inhibition of impulsive responses, impairing academic, professional, and social performance. The differential diagnosis between ADHD and anxiety disorders remains a challenge due to the symptomatological overlap, making it difficult to accurately identify both conditions. Treatment should be individualized, encompassing pharmacological interventions, such as stimulants and selective serotonin reuptake inhibitors, and nonpharmacologic therapies, such as cognitive behavioral therapy (CBT) and mindfulness-based approaches. The combination of therapeutic strategies shows promise to mitigate the negative impacts of comorbidity between ADHD and anxiety, highlighting the importance of early diagnosis and effective interventions to improve clinical prognosis.

Keywords: ADHD. Anxiety. Adults. TCC.

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INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a widely prevalent neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity, and impulsivity. Initially identified in children, ADHD often persists into adulthood, impacting several areas, such as academic performance, work efficiency, and interpersonal relationships. Symptoms can vary significantly between individuals and are often influenced by environmental factors and by co-occurring conditions such as anxiety and depression. Studies indicate that ADHD affects approximately 2.5% to 6.7% of the adult population globally, which suggests both a high prevalence and a possible underdiagnosis of the disorder due to various social and clinical limitations (Banaschewski et al., 2023).

A meta-analysis of population studies revealed a pooled prevalence of approximately 3.10%, reinforcing that ADHD is not only a childhood disorder but also a significant issue in the adult population (Ayano et al., 2023).

The relationship between ADHD and comorbid psychiatric disorders, such as anxiety and mood disorders, makes its epidemiology even more complex. For example, about 54.7% of adults in residential treatment centers for chemical dependency have symptoms of ADHD, evidencing a strong comorbidity between the disorder and substance-related disorders (McMahon, 2023). In addition, the presence of ADHD can aggravate the course of other mental illnesses. For example, adults who have both ADHD and post-traumatic stress disorder (PTSD) tend to manifest more severe symptoms and greater functional impairments (Magdi et al., 2025).

The prevalence of anxiety disorders in individuals with ADHD varies among studies, being influenced by factors such as age, diagnostic criteria, and evaluation methods. In a study conducted with medical school students in China, Shen Y et al. identified a high prevalence of anxiety (19.9%), with significant associations between ADHD symptoms (inattention and hyperactivity) and elevated levels of anxiety (Shen et al., 2020), which underscores the considerable overlap between these conditions, especially in populations subjected to high levels of stress.

Another study, conducted by Adzrago D et al. in the United States, looked at children and found a considerably higher prevalence of anxiety and depression in children with ADHD (37.34%) compared to those without the disorder (7.42%) (Adzrago, 2025). This significant difference highlights the increased risk of anxiety in children with ADHD. However, the methodology used in these studies, which is based on self-reported measures, may be subject to bias (Shen et al., 2020; Adzrago, 2025).

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In addition, the specific types of anxiety disorders diagnosed varied between studies, which makes it difficult to directly compare prevalence rates. For example, Wang F et al. identified generalized anxiety disorder (GAD) as the most common anxiety disorder among school-age children and adolescents in China, with a prevalence of 1.3% (Wang et al., 2024), while other studies may point to different subtypes of anxiety as more prevalent. This variation in prevalence rates highlights the need for standardized diagnostic criteria and uniform assessment tools to ensure more consistent and comparable results across studies.

Anxiety disorder is common in patients with ADHD, but the causal relationship between them is still unclear. It is not yet known whether ADHD is configured as a risk factor for the development of anxiety disorder or whether the impacts of ADHD on the patient's social and personal life generate anxiety symptoms (D'Agati et al., 2019).

This study offers a narrative review of the existing literature on the prevalent relationship between anxiety disorders in adults with ADHD, to explore and discuss the relationship between these situations, highlighting the underlying mechanisms, the particularities of this comorbid relationship, and the implications for diagnosis and treatment, seeking to deepen the understanding of this complex relationship, contributing to the dissemination of the importance of proper diagnosis and more effective interventions that can mitigate the negative impacts associated with adult individuals with ADHD.

NEUROBIOLOGICAL CHANGES

Several studies point to structural differences in brain regions associated with emotional processing and regulation as possible neurobiological contributors to anxiety in individuals with ADHD. One consistent finding involves the amygdala, a fundamental brain structure for processing fear and other emotions (Yang et al., 2021; Roelofs et al., 2024). Seguin et al. observed that children and adolescents with ADHD had higher anxiety scores than typically developing children and that those with higher levels of anxiety also had larger volumes of the right central nuclei of the amygdala (Seguin et al., 2022). Similarly, Nárai et al. reported smaller bilateral amygdala volumes in adolescents at risk for ADHD, even after controlling for comorbidities such as anxiety (Nárai et al., 2024). Although most studies are on children, these findings suggest that the structure of the amygdala may play a role in the anxiety experienced by individuals with ADHD, even in adults.

Corroborating this hypothesis, Connaughton et al. observed reduced amygdala volumes in children and adolescents with ADHD, compared to controls, throughout

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development (ages 9 to 14 years). This reduction in amygdala volume was associated with greater severity of ADHD symptoms (Connaughton et al., 2024), suggesting a link between structural abnormalities in this region, crucial for emotional processing, and the severity of the disorder's symptoms, which often include anxiety.

In addition to the amygdala, other structures of the limbic system also have structural changes in ADHD. The longitudinal study by Connaughton et al. revealed reduced volumes in the hippocampus, cingulate gyrus, and orbitofrontal cortex in children and adolescents with ADHD, regions that are key to emotional regulation and memory consolidation, and their atypical development may contribute to both ADHD symptoms and a higher incidence of anxiety in this population. Reduced volume in these areas may reflect impaired development or altered functioning, which may lead to difficulties in processing and regulating emotions, thereby increasing vulnerability to anxiety (Connaughton et al., 2024).

The basal ganglia, another essential brain region, are also implicated in the pathophysiology of ADHD. Shvarzman et al. identified a reduction in tissue iron concentration in the basal ganglia limbic circuit in school-age children with ADHD, and this reduction correlated with greater severity of the disorder's symptoms and anxiety/depressive symptoms. Iron plays a critical role in dopaminergic function, and these findings suggest that iron deficiency in the basal ganglia may compromise dopaminergic pathways involved in both ADHD and anxiety. This underscores the possibility of a neurochemical mechanism underlying the comorbidity between the two disorders (Shvarzman et al., 2022).

Studies using functional magnetic resonance imaging (fMRI) have revealed changes in brain connectivity in individuals with ADHD, further reinforcing the neurobiological basis of anxiety in this population. Research focused on dynamic functional connectivity (dHR) demonstrates that children with ADHD have altered dHR patterns in subregions of the amygdala when compared to healthy controls (Yang et al., 2021). Specifically, the right superficial amygdala in children with ADHD exhibited significantly greater dynamic functional connectivity with areas such as the right prefrontal cortex (Yang et al., 2021), suggesting a neurobiological pathway related to difficulties in emotion regulation that may contribute to anxiety. The instability of functional connectivity of the amygdala has also been associated with cognitive functions in children with ADHD (Yang et al., 2021).

In addition, a study investigating resting-state functional connectivity (rs-FC) in adolescents with internalizing disorders (including anxiety and depression) found a differential development of connectivity in subregions of the laterobasal amygdala (BAL)

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when compared to healthy controls (Roelofs et al., 2024). Changes in the functional connectivity of the right BAL were associated with changes in symptoms (Roelofs et al., 2024), suggesting a direct link between amygdala connectivity and anxiety symptoms.

Neurochemical imbalances also play a significant role in the development of anxiety in individuals with ADHD. The dopaminergic system, often implicated in ADHD, is also crucial for emotion regulation. Dysregulation in dopamine signaling can affect the amygdala and other brain regions involved in anxiety, increasing anxiety symptoms (Shvarzman et al., 2022). In addition, Greenfield et al. observed a reduction in the ability to induce emotion regulation in adults with ADHD, accompanied by anomalous patterns of brain activation during emotion regulation and a lower gray matter volume in limbic and paralimbic areas (Greenfield et al., 2024). Notably, these impairments have not been normalized with the use of stimulant medication (Greenfield et al., 2024), highlighting the complexity of the neurobiological mechanisms involved and the limitations of current therapeutic approaches.

The hypothalamic-pituitary-adrenal (HPA) axis, a fundamental system in the response to stress and anxiety, may also be dysregulated in ADHD. Berens et al. found an association between ADHD symptoms and cumulative elevated daytime cortisol levels, even after controlling for comorbidity with anxiety, suggesting that altered activity of the HHA axis may be a common mechanism underlying ADHD and, potentially, comorbid anxiety disorders (Berens et al., 2023). This indicates that the stress response system may be overactive in ADHD, contributing to a greater vulnerability to anxiety.

Cognitive deficits, especially in executive functions and working memory, are often seen in ADHD and may indirectly contribute to anxiety. Kofler et al. demonstrated that deficits in working memory in children with ADHD largely affect their ability to inhibit impulsive tendencies, potentially leading to anxiety-enhancing situations (Kofler et al., 2024). The interaction between working memory and inhibition suggests that improvements in working memory may have a positive effect on anxiety levels. These cognitive mechanisms, while not directly neurobiological, are closely linked to underlying brain structures and functions, thus contributing to the neurobiological understanding of anxiety in ADHD.

CLINICAL IMPACT OF THE ASSOCIATION BETWEEN ANXIETY DISORDERS AND ADHD

Adults with ADHD tend to face more adversity throughout their lives due to their symptoms such as poor performance and difficulty in social relationships, contributing to

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negative thoughts, negative mood leading to an expectation of failure, and anticipatory anxiety (Grogan et al., 2018).

Rauch et al. demonstrated a distinct relationship between anxiety symptoms and deficits in working memory in adults with ADHD. Specifically, anxiety symptoms predicted poorer performance in working memory, while depression symptoms showed no such relationship, indicating a specific detrimental effect of anxiety on cognitive abilities. These cognitive deficits can significantly impact daily functionality, academic performance (where applicable), and professional success. The difficulty in concentrating and processing information, already characteristic of ADHD, is further aggravated by the presence of anxiety. This emphasizes the need for clinical assessments that consider the influence of specific symptoms on cognitive functioning (Rauch et al., 2025).

The overlap of symptoms between ADHD and anxiety disorders creates diagnostic challenges. Alarachi et al. found a significant overlap in symptoms, especially within the hyperactivity factor of the Self-Rating Scale for Adults with ADHD (ASRS-v1.1), making differentiation between the two conditions more difficult, which suggests the importance of identifying ADHD-specific symptoms that are not shared with anxiety disorders for accurate diagnosis and effective treatment (Alarachi et al., 2024). The presence of overlapping symptoms can lead to misdiagnosis or a delay in the diagnosis of both conditions, hindering proper management and potentially worsening clinical outcomes.

Anxiety can significantly impair social functioning in adults with ADHD. Store et al. observed that individuals with social anxiety disorder (SAD) and ADHD had greater social and clinical impairments, negatively affecting their quality of life and overall functioning (Store et al., 2024). This is corroborated by Palmini, who emphasizes that ADHD symptoms in adults go beyond attention deficits, significantly impacting social functioning and leading to difficulties in various aspects of life (Palmini, 2024). Difficulties in social interactions, already present in ADHD due to impulsivity and difficulty in interpreting social cues, are aggravated by avoidance and social isolation often associated with anxiety.

Difficulties in relationships are a common consequence of both ADHD and anxiety. Fischer and Nilsen. Point out that ADHD in older adults is associated with challenges in relationships and social isolation, which are exacerbated by anxiety symptoms (Fischer and Nilsen, 2024). The combination of impulsivity and difficulty in emotional regulation of ADHD with the avoidance and social isolation of anxiety can generate interpersonal conflicts, withdrawal, and reduced social support. Palmini also highlights the wide range of difficulties

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faced by adults with ADHD, impacting their relationships and their overall success in life (Palmini, 2024).

The combined effects of ADHD and anxiety can generate significant occupational challenges. Namasse et al. points out that ADHD imposes difficulties in the social, professional, and environmental spheres, which are aggravated by comorbidities such as anxiety and depression (Namasse et al., 2025). Difficulties with attention, impulsivity, and emotional regulation, characteristic of ADHD, are further exacerbated by anxiety-related avoidance, procrastination, and difficulties in interpersonal interactions in the workplace (Palmini, 2024). This can result in reduced productivity, job dissatisfaction, and increased risk of unemployment.

Social isolation and loneliness are often reported among adults with ADHD, and anxiety contributes significantly to these experiences. Fischer et al. highlight the link between ADHD in older adults, relationship difficulties, and social isolation, a condition that can be aggravated by anxiety. Capp et al. observed that autistic and neurodivergent adults, including those with ADHD, reported high levels of loneliness, a situation that in this study was possibly intensified by the COVID-19 pandemic (Capp et al., 2022), suggesting that this symptom association may be exacerbated in any more intense situation of social stress. Avoidance behaviors associated with anxiety can further contribute to social isolation by reducing opportunities for social interaction and support.

The presence of anxiety symptoms can contribute to the delay in the diagnosis and treatment of ADHD. Kandeger et al. suggest that maladaptive daydreaming (MD), a coping mechanism sometimes associated with anxiety, may mask the symptoms of ADHD, resulting in a late diagnosis only in later life (Kandeger et al., 2025). This delay in diagnosis can have significant long-term consequences, both clinically and socially, since untreated symptoms can impact several areas of life.

SPECIFICITIES OF THE TREATMENT

Pharmacological interventions represent a significant component in the treatment of ADHD and anxiety. Stimulant medications, commonly prescribed for ADHD, can indirectly impact anxiety symptoms by improving focus and reducing impulsivity (Young et al., 2025). A retrospective cohort analysis demonstrated that an extended-release formulation of amphetamine is associated with reduced need for supplementation with immediate-release formulations and improved ADHD and anxiety symptoms in adults with ADHD (Young et al., 2025). This suggests that greater control of ADHD symptoms may contribute to better

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management of anxiety. However, it is important to highlight that the study emphasized the need for individualized therapeutic decisions, considering comorbid disorders and treatment responses (Young et al., 2025).

Non-stimulating options also play a relevant role. Viloxazine, a norepinephrine reuptake inhibitor that also modulates the serotonergic system, is presented as a potentially beneficial non-stimulant medication for adults with ADHD and comorbid anxiety (Williams et al., 2023). Its side-effect profile, which is considered more favorable compared to stimulants, may make it a preferable choice for individuals with associated anxiety, especially those who experience adverse effects from stimulant use. However, it is essential to conduct close follow-ups in individuals with liver or cardiovascular disease, as well as those with a personal or family history of bipolar disorder (Williams et al., 2023).

In addition, the inclusion of antidepressants, particularly selective serotonin reuptake inhibitors (SSRIs), may be considered in the management of comorbid anxiety. A study investigating the combination of methylphenidate and SSRIs in adults with ADHD and comorbid depression did not find a significant increase in the risk of adverse events compared to methylphenidate use alone (Lee et al., 2024). This suggests that this combination may be a safe and effective option for some individuals; however, it is critical to remember that this study focused on depression rather than anxiety (Lee et al., 2024). The effectiveness of this approach for the treatment of anxiety still requires further investigation. Finally, L-theanine supplementation has shown potential in reducing psychiatric symptoms in individuals with anxiety disorders and ADHD (Moshfeghinia et al., 2024), suggesting a complementary therapeutic option, although this option requires further studies to prove its efficacy.

Non-pharmacological treatments offer crucial therapeutic approaches and can be used as a complement or alternative to drug treatment. Cognitive behavioral therapy (CBT) consistently stands out as a highly effective intervention for both ADHD and anxiety (Nasri et al., 2023; Corrales et al., 2024; Yang et al., 2025; Zhang et al., 2025). A systematic review and network meta-analysis demonstrated the significant efficacy of CBT in reducing anxiety symptoms in adults with ADHD, with substantial short- and long-term effects (Yang et al., 2025). Studies indicate that both shorter CBT programs (with six sessions) and longer programs (with twelve sessions) result in significant improvements in ADHD severity, as well as comorbid anxiety and depression, with sustained benefits at follow-up later (Corrales et al., 2024).

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Internet-based cognitive behavioral therapy (CBT) emerges as an accessible and scalable alternative, with efficacy comparable to that of face-to-face CBT (Nasri et al., 2023; Zhang et al., 2025). One study found that the combination of CBT and medication resulted in more significant improvements in anxiety symptoms than the use of the medication alone, with benefits maintained for up to 12 months (Zhang et al., 2025). In addition, a study comparing iCBT to internet-based applied relaxation training (iART) and treatment as usual (TAU) demonstrated significant improvements in ADHD symptoms for both iCBT and iART, compared to treatment as usual, with effects maintained over 12 months (Nasri et al., 2023).

Mindfulness-based interventions, such as Mindfulness-Based Cognitive Therapy (MBCT), have also been explored. MBCT has been suggested as a preferable option for adults with ADHD without comorbidities (Yang et al., 2025). However, the evidence base for these interventions in adults with ADHD and comorbid anxiety is still relatively limited.

Other non-pharmacological approaches, such as neurofeedback training (NFT) (Whitehead et al., 2022) and wearable technologies, such as the Doppel device (Bartlett et al., 2024), have some potential but require more research to prove their effectiveness and understand their mechanisms of action. Neurofeedback training, whether conducted in person or through app-based systems, is effective in reducing anxiety symptoms and improving attention and executive functions in some individuals (Whitehead et al., 2022). The Doppel wearable device, on the other hand, although it did not demonstrate clear superiority over a comparator, showed reductions in anxiety and improvements in focus in a young adult population with ADHD (Bartlett et al., 2024). These findings suggest promising alternative therapeutic pathways, but further investigations are needed to validate their efficacy in larger and more diverse samples.

CONCLUSION

The relationship between anxiety disorders and ADHD in adults is complex and multifaceted, involving neurobiological, cognitive, and environmental factors that interact and enhance the impacts of both disorders. Scientific evidence points to structural and functional changes in brain regions responsible for emotional processing, such as the amygdala, hippocampus, and orbitofrontal cortex, as well as dysfunctions in the dopaminergic and stress response systems. These alterations may contribute to deficits in emotion regulation and vulnerability to the development of anxiety in individuals with ADHD.

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From a clinical standpoint, the concomitant presence of anxiety and ADHD can exacerbate the daily challenges faced by these individuals, negatively impacting their social, academic, and professional functionality. The overlapping of symptoms makes differential diagnosis difficult and may result in undertreatment or inappropriate therapeutic approaches. Thus, a careful and comprehensive evaluation becomes essential to ensure a more accurate and effective therapeutic approach.

Treatment of ADHD and comorbid anxiety should be individualized, considering both pharmacologic interventions and nondrug therapies. Stimulant and non-stimulant medications may offer benefits, but close follow-up is required to monitor for potential adverse effects and optimize therapeutic outcomes. In addition, cognitive behavioral therapy is highly effective in reducing the symptoms of both disorders, as well as emerging approaches, such as mindfulness-based interventions and assistive technologies, which can be promising alternatives.

Given the high prevalence of comorbidity between anxiety and ADHD, expanding knowledge about this intersection is essential for improving diagnostic and therapeutic strategies. The continuity of research in this area may contribute to more effective management and the improvement of the quality of life of these individuals. In addition, it is essential to have greater involvement of health institutions in improving the detection and treatment of these disorders in adults, ensuring that health professionals are adequately trained to identify and intervene in these comorbid conditions.

More than just treating isolated symptoms, it is necessary to adopt an individualized, attentive, and welcoming approach, which takes into account the particularities of each individual. This promotes more humanized and person-centered care, which is essential for the success of treatment and the overall well-being of affected individuals.

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