# Attention Deficit Hyperactivity Disorder in Adulthood: A Comprehensive

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**Abstract:** Attention-deficit hyperactivity disorder (ADHD) in adults is a neurodevelopmental disorder marked by persistent symptoms, including inattention, emotional dysregulation, impulsivity, and restlessness. In adults, ADHD can result in unstable interpersonal relationships, impaired academic or occupational performance, and diminished self-esteem, thereby adversely affecting quality of life. This paper provides an overview of the literature on the etiology, diagnosis, and treatment of adult ADHD. Diagnosis is frequently delayed until adulthood or misunderstood. Assessment challenges include subtler symptom presentation compared to children and diagnostic overshadowing by medical and psychiatric comorbidities. Pharmacotherapy is the first-line treatment for adults with ADHD. Cognitive Behavioral Therapy is the most widely used psychological intervention.

**Keywords**: Adulthood ADHD, Adults, Attention hyperactivity disorder, DSM-5, Psychological interventions, Psychiatric comorbidities, Medical comorbidities, Attention, Impulsivity, restlessness, Hyperactivity.

## RATIONALE AND OBJECTIVES

Diagnostic assessment of adult ADHD is complex. Adult symptoms are often subtler than those in childhood. Medical and psychiatric comorbidities further complicate diagnosis. This paper reviews literature on the etiology and differential diagnosis of adult ADHD. Given the lack of standardized protocols for adult ADHD treatment, this paper also examines prevalent psychological interventions.

## METHOD

This review was undertaken as a non-systematic literature review using primary electronic databases (*e.g.*, PubMed) and employing relevant keyword searches (*e.g.*, "ADHD in adulthood," "psychological interventions for ADHD in adults").

## ADULT ADHD DEFINITION

Diagnosing adult ADHD (APA, 2013) requires a continuous pattern of inattention (*e.g.*, difficulty paying attention to details or during conversations, following verbal instructions, losing items, trouble with time management, and planning) and/or hyperactivity/impulsivity. Hyperactivity/impulsivity may include restlessness, difficulty staying seated, engaging in many activities, talking excessively, trouble waiting, or failing to respect turn-taking in conversation. Not all symptoms must be present. Symptoms must begin before age 12 and be present in at least two life contexts (home, school/work, relationships, or other activities). There must also be impairment or reduction in the individual's functioning (social, academic, or occupational).

There are three forms of ADHD: a predominantly inattentive form, a predominantly hyperactive/impulsive form, and a mixed form. The characteristics of the ADHD phenotypes are summarized in Table **1**.

## DIFFERENTIAL DIAGNOSIS

The symptoms of adult ADHD overlap with various psychological and medical conditions, necessitating consideration during differential diagnosis. Relevant medical conditions include hearing impairments, thyroid disorders, lead toxicity, hepatic disease, sleep apnea, and pharmacological interactions (Post & Kurlansik, 2012). Certain agents, such as corticosteroids, antihistamines, anticonvulsants, caffeine, and nicotine, may negatively affect attention.

As for psychiatric conditions, the most common are mood disorders, other neurodevelopmental disorders, anxiety disorders, substance use disorders, and personality disorders (Asherson *et al*., 2014; Katzman *et al*., 2017; Oroian *et al*., 2024; Townes *et al*., 2023; Koyuncu *et al*., 2022; APA, 2013; Weiner *et al*., 2019; Ditrich *et al*., 2021; Duarte *et al*., 2024; Giannakopoulos, 2025; Eisenbarth *et al*., 2008; Retz, 2020; Storebø & Simonsen, 2016). Below are described the primary psychiatric differential diagnoses of ADHD in adulthood (see Table **2**).

## PREVALENCE OF ADHD FROM CHILDHOOD TO ADULTHOOD

The prevalence rate of ADHD reported in the literature varies significantly. This is due to the use of different assessment methods (*e.g.*, diagnostic vs.

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**Table 1: Presentation Type of ADHD in Adulthood (Kooij, 2022)**

| Presentation Type | Predominantly Inattentive Presentation Type | Predominantly Hyperactive/Impulsive Presentation type | Combined Presentation Type |
|---|---|---|---|
| **Criteria** | At least five symptoms of inattention and fewer than five symptoms of hyperactivity/impulsivity present in the past 6 months. | At least five symptoms of hyperactivity/impulsivity and fewer than five symptoms of inattention present in the past 6 months | At least five symptoms of both inattention and hyperactivity/impulsivity have been present in the past 6 months. |
| **Description** | This is ADHD with a predominant manifestation of inattention symptoms, also called attention deficit disorder (ADD). These adults appear absent-minded, may be introverted, and are often distracted. They can be slow, rigid, and doubtful. Sometimes they may implement specific strategies to cope with their difficulties and become perfectionists or compulsive. They are easily distracted, suffer from fear of failure, and may panic when they lose control. They do not usually exhibit symptoms of hyperactivity or impulsivity. This form of ADHD can easily go unrecognized in childhood. Intelligent patients with ADD often manage to compensate for their attention problems for many years. | The hyperactive-impulsive form of ADHD present as busy, impulsive people. Attention deficits are not reported. It may manifest as reduced control over one's behavior, leading to acting or speaking without considering the consequences, and excessive physical agitation, such as difficulty sitting still or restlessness. This form is usually more easily identified in childhood. In adulthood, motor hyperactivity may be more hidden and partially replaced by a sense of internal agitation. This restlessness can often be temporarily channeled into intensive sports. | These are ADHD symptoms of inattention, hyperactivity, and impulsivity. Attention deficit and impulsive behavior seem to be the ones that change the least over time. Hyperactivity may be present during childhood, but it often diminishes or becomes more manageable over time. Many patients without apparent hyperactivity continue to experience constant inner turmoil or agitation. |

symptom-based tools, self-report vs. other assessment, or both). The diagnostic criteria themselves have also evolved (*e.g*., DSM-IV vs. DSM-5).

Research indicates that the prevalence and severity of ADHD symptoms tend to decline with age (Song *et al*., 2021; Vos & Hartman, 2022).

The overall ADHD diagnosis rate is 7.6% for children and 5.6% for adolescents (Salari *et al*., 2023). In adults, a global prevalence rate of 3.1% was reported based on 57 studies and 21 million participants (Ayano *et al*., 2023). Over the past decade, both prevalence and incidence rates of adult ADHD have increased significantly (Chung *et al*., 2019). Song *et al*. (2021) reported a 2.58% prevalence for diagnosed adult ADHD and a 6.76% rate for symptomatic adults, regardless of childhood onset.

Estimates of adult ADHD symptom persistence range widely, from 4.0% to 77.0%, depending on the assessment method. Studies indicate that about one-third of children and adolescents continue to experience persistent ADHD symptoms in adulthood (Faraone *et al*., 2006; Simon *et al*., 2009). When diagnosis includes reports from multiple informants, considers impairment, and applies an age-appropriate symptom threshold, persistence rates drop to 40-50% (Sibley *et al*., 2016).

## ETIOLOGY

An important aspect of ADHD is its strong genetic component. This is highlighted by various studies on families, twins, and adoptions (Boomsma *et al*., 2010; Bonvicini *et al*., 2016). Children with parents who have ADHD are seven times more likely to develop symptoms than those without this family history (Larsson *et al*., 2013). The estimated heritability is around 30%. Attention symptoms account for a higher percentage (35%) than hyperactivity symptoms (23%; Boomsma *et al*., 2010; Saviouk *et al*., 2011). Meta-analyses of twin studies estimate heritability at 70-80% (Nikolas & Burt, 2010). Genetic factors also contribute to ADHD symptom persistence from childhood through adolescence (Pingault *et al*., 2015). The most extensive study of adult twins with ADHD (Larsson *et al*., 2014) used ICD-10 diagnoses or ADHD medication prescriptions and observed substantial heritability across the lifespan, with 72% in adulthood.

Several environmental, perinatal, and postnatal factors are known to increase the risk, severity, or persistence of ADHD (Faraone *et al*., 2014). These include perinatal exposure to neurotoxic substances (*e.g*., organic solvents, pesticides, flame retardants, heavy metals), as well as maternal cigarette smoking or alcohol use during pregnancy. After birth, stressful events such as early emotional deprivation or strict, coercive parenting can play a pathogenic role. Other risks include belonging to a low social class, marital discord, large families, paternal criminality, maternal mental disorders, or foster care situations (Franke *et al*., 2018). Exposure to stress from adverse life events or daily problems can worsen ADHD symptoms and contribute to their persistence (van Deer Meer *et al*.,

**Table 2: Primary Differential Diagnosis of ADHD in Adulthood (Asherson *et al*., 2014; Katzman *et al*., 2017; Oroian *et al*., 2024; Townes *et al*., 2023; Koyuncu *et al*., 2022; APA, 2013; Weiner *et al*., 2019; Ditrich *et al*., 2021; Duarte *et al*., 2024; Giannakopoulos, 2025; Eisenbarth *et al*., 2008; Retz, 2020; Storebø & Simonsen, 2016)**

| Neighboring Diagnosis | Features Similar to ADHD | Features Differentiating ADHD |
|---|---|---|
| **Autism spectrum disorder** | • Executive function deficits<br>• Self-stimulatory behaviors<br>• Interpersonal difficulties<br>• Sensory sensitivity<br>• Decreased eye contact<br>• Irritability | • Alexithymia and empathy deficiency<br>• Less variability in the expression of mood swings or affective states related to depression and elation<br>• Tendency to focus intensely on a single interest or activity<br>• Sensory sensitivity and eye contact are not associated with attentional processes<br>• Higher frequency and intensity of stimming behaviors, with motor stimming predominating, followed by vocal and sensory manifestations<br>• Seek familiarity, not novelty<br>• Preference for routine and predictability<br>• Decreased manifestation of facial emotional expressions<br>• Difficulties with allistic social cues and social reciprocity |
| **Bipolar disorders** | • Mood swings with elation and deflation<br>• Attention difficulties<br>• Distractibility<br>• Irritability<br>• Emotional dysregulation<br>• Impulsivity<br>• Sensation seeking<br>• Risky behaviors and use of substances<br>• More talkative<br>• Restlessness<br>• Low self-esteem<br>• Sleep difficulties<br>• Fatigue or loss of energy | • Adolescent/ adult onset<br>• Low insight into illness<br>• Episodic course, change from premorbid state<br>• Mood swings or affective states related to maniac/hypomanic and depressive phases.<br>• Psychotic symptoms<br>• Manic episodes associated with: grandiosity/elated, reduced need for sleep, flight of ideas/racing thoughts, increased goal-directed activity, reports high level function, not reflecting behavior<br>• Depression episodes associated with: thoughts of death/ suicidality, psychomotor slowdown, insomnia/hypersomnia, loss of pleasure from pleasurable activities |
| **Depression** | • Attention difficulties<br>• Poor concentration<br>• Time perception is impacted<br>• Irritability<br>• Low self-esteem<br>• Deflected mood<br>• Sleep difficulties<br>• Fatigue or loss of energy<br>• Social isolation tendencies | • The age of onset is predominantly in teens<br>• Primarily a disturbance in mood<br>• Difficulties in attention and concentration associated with depressive episodes<br>• Static depressed affect<br>• Changes in sleep and appetite<br>• Weight loss/gain<br>• Psychomotor retardation<br>• Hypersomnia/insomnia<br>• Loss of interest in pleasure<br>• Thoughts of death/ suicidality |
| **Anxiety disorders** | • Inattention<br>• Distractibility<br>• Difficulty in concentrating<br>• Irritability<br>• Psychomotor agitation<br>• Mood instability<br>• Sleep difficulties | • Executive dysfunction and hyperactivity/impulsivity are not the primary symptoms<br>• Problems with concentration and attention are caused by worry and rumination<br>• Constantly feeling nervous, tense, and on edge<br>• Impending sense of doom or danger<br>• Physiological signal of anxiety<br>• No other symptoms attributable to ADHD are detected (*e.g*., being forgetful and losing things, inability to prioritize, organize, and plan, inability to sit still and constant restlessness, interrupting conversations, inability to wait for one's turn) |

| | | |
|---|---|---|
| **Borderline Personality Disorder** | • Chronic-like trait<br>• Pervasive across situations<br>• Affective lability<br>• Impulsivity<br>• Novelty seeking<br>• Harm Avoidance<br>• Use of substance<br>• Rejection Sensitive Dysphoria | • Early adult/adolescent onset<br>• Inattention is not a core feature<br>• Impulsivity is typically stress-dependent and refers to self-harm<br>• Recurrent suicidal behavior, gestures, or threats, or self-mutilating behavior<br>• Unstable interpersonal relationships characterized by idealization and devaluation, and fear of abandonment<br>• Unstable self-image influenced by relational triggers<br>• Chronic feelings of emptiness |
| **Narcissistic Personality Disorder** | • Chronic-like trait<br>• Impulsivity<br>• Mood swings and emotional dysregulation<br>• Interpersonal issues<br>• Self-centered<br>• Sensitivity to criticism | • Ego-syntonic pattern<br>• Deep need for admiration<br>• Law level of empathy<br>• A grandiose sense of self-importance<br>• A preoccupation with fantasies of success, power, or “perfect” love<br>• A need for immediate gratification or validation drives impulsivity.<br>• Arrogant/aggressive behaviors and attitudes without guilt<br>• A tendency to take advantage of people to achieve their goals |
| **Antisocial Personality Disorder** | • Interpersonal and workplace issues<br>• Impulsivity<br>• Emotional and behavioral dysregulation<br>• Risky behaviors<br>• Substance abuse<br>• Sensation seeking<br>• Aggressive behaviors | • Callous and unemotional components<br>• Psychopathic traits<br>• Affective component of psychopathy<br>• Disregard for social norms<br>• Lack of empathy and remorse<br>• Deceitfulness<br>• Manipulation<br>• Aggression<br>• Impulsiveness is not a core symptom<br>• Absence of Emotional Outbursts<br>• aggressive and violent acts are not strictly related to impulsivity<br>• normal attention skills |
| **Substance abuse disorder** | • Deficits in attention and working memory, slowed mental processing, and Difficulty with focus<br>• Impulsivity<br>• Restlessness<br>• Reward System Dysfunction<br>• Novelty-seeking<br>• Mood swings<br>• Risky behaviors<br>• Impaired social, occupational and familial functioning | • Abuse onset in adolescence or early adulthood<br>• Compulsive drug seeking and use<br>• Symptoms mimicking ADHD are explained by the use of the substance(s)<br>• Psychological and physiological tolerance & withdrawal symptoms upon cessation |

2014). However, environmental risk factors, like genetic ones, have only a moderate impact.

## PRESENTATION OF ADULT ADHD

Adults have more responsibilities than children and adolescents. Adults have people depending on them and must handle tasks independently. This creates more situations where functional difficulties from ADHD may arise. The following is a summary of the primary challenges associated with ADHD that are reported in adulthood.

## DAILY ROUTINE

The quality of life and daily functioning of adults with ADHD are substantially compromised (Kooij *et al*., 2019; Agarwal *et al*., 2012; Stern *et al*., 2017). ADHD is characterized by impairment in instrumental activities (Faraone *et al*., 2004), including planning, task commitment, scheduling, making payments, and maintaining appointments. Consequently, adults with ADHD often experience persistent difficulties in financial management (Antshel & Barkley, 2009; Bangma *et al*., 2019).

## ACADEMIC LIFE AND WORKPLACE

Young adults and adults may achieve poor academic results at university (Arnold *et al*., 2020; Weyandt *et al*., 2013) and experience difficulties in their professional careers. Compared to those without ADHD, adults with ADHD report lower work productivity, greater job instability, lower professional achievements, and lower incomes (Gordon & Fabiano, 2019; Joseph *et al*., 2019). Adamou *et al*. (2013) note that procrastination, poor organization, and poor time management can often compromise work performance, especially in administrative tasks (Webster *et al*., 2018). The study conducted by Fuermaier and colleagues (2021), which analyzes the differences between adults with and without ADHD, highlights how workers with ADHD report a statistically significantly higher number of work-related difficulties. These include failure to meet professional standards and perceived potential, problems in performing required tasks and taking on new tasks, difficulty in obtaining a pay raise, difficulties in working in teams, problems with absenteeism, tardiness, and negative performance evaluations, as well as difficulty in maintaining employment (Fuermaier *et al*., 2021). On the contrary, the study conducted by Lasky *et al*. (2016) highlights how individuals with ADHD can thrive in specific workplaces, particularly those that encourage autonomy and allow them to contribute directly to organizational change.

## SOCIAL RELATIONSHIPS

In general, adults with ADHD report experiencing interpersonal relationships as stressful and conflictual (Asherson *et al*., 2012). Compared to their peers without ADHD, they seem to have fewer social skills, more difficulty making friends, greater difficulty relating to the opposite sex, and report a greater sense of loneliness (Harpin *et al*., 2016; McKee, 2017; Stickley *et al*., 2017). Adults with ADHD report fewer social contacts (Holst & Thorell, 2020), greater difficulty managing interpersonal conflicts and providing emotional support in relationships, and lower-quality relationships overall (Holst & Thorell, 2020; McKee, 2017; Sacchetti & Lefler, 2017). Behavioral manifestations of ADHD in social settings can provoke adverse reactions and rejection in others (Paulson *et al*., 2005).

Relationship difficulties also occur in the romantic sphere; adults with ADHD are more likely to have shorter relationships, greater difficulty adapting to married life, and higher levels of conflict than adults without ADHD. (Wymbs *et al*., 2021; Eakin *et al*., 2004; Ersoy & Topçu Ersoy, 2019).

## INTELLECTUAL LEVEL

ADHD can occur in people with normal, lower, or higher IQs (Antshel *et al*., 2008; Antshel *et al*., 2006). Research has shown that individuals with ADHD who also have above-average intelligence seem more capable of compensating for difficulties related to executive functions. From a clinical standpoint, it is also important to evaluate this aspect for a correct diagnosis of ADHD (Milioni *et al*., 2014).

## RISKY BEHAVIORS

There is an association between ADHD and risky behaviors (Shoham *et al*., 2019), including substance use (Faraone *et al*., 2007; Rooney *et al*., 2012), unprotected sex with strangers (Flory *et al*., 2006; Hosain *et al*., 2012), and gambling (Theule *et al*., 2019). Furthermore, they engage in reckless and distracted driving (Fuermaier *et al*., 2017; Randell *et al*., 2020), with a significant number of car accidents and traffic violations (Merkel *et al*., 2016). They are also more likely to engage in drunk driving (Koisaari *et al*., 2015) than adults without ADHD. Finally, adults with ADHD appear to have higher mortality rates than adults without ADHD (London & Landes, 2016; London & Landes, 2022), which could be explained in part by their greater involvement in risky behaviors and the inattention shown by adults with ADHD.

## PSYCHOLOGICAL SYMPTOMS

ADHD in adulthood is associated with increased levels of anxiety and depression (Nelson & Liebel, 2018), psychological distress (Landes & London, 2021), emotion dysregulation (Retz *et al*., 2012), and other psychiatric comorbidities (Anker *et al*., 2018).

## SELF-ESTEEM

Some symptoms of ADHD that relate to productivity (such as attention difficulties, procrastination, and organizational difficulties) are often misinterpreted as laziness by those around them (*e.g*., teachers, parents, partners). These social labels can be internalized, hurting self-esteem and self-efficacy (Newark *et al*., 2016) and leading the individual to perceive themselves as inadequate (Webster *et al*., 2018).

Contrary to the label of “lazy” often applied to them, individuals with ADHD often worked harder than those without it to manage the difficulties in organizing their daily lives, leading to disappointment and frustration (Webster *et al*., 2018). Adults with ADHD may report low self-esteem, increased self-criticism, and sensitivity to criticism, perhaps due to the higher levels of criticism they have experienced throughout their lives (Beaton *et al*., 2022).

## COMORBIDITIES

ADHD is associated with a variety of medical and psychiatric comorbidities (Katzaman *et al*., 2017; Anastopoulos *et al*., 2018; Ginsberg *et al*., 2014). The most common medical comorbidities in adults with ADHD are obesity, sleep disorders, asthma, and migraine (Ginsberg *et al*., 2014; Istanes *et al*., 2018). Tentative findings also suggest an association with celiac disease (Istanes *et al*., 2018).

About 70% of adults with ADHD also suffer from another psychiatric condition (Katzman *et al*., 2017).

### Autism Spectrum Disorders (ASD)

Autism spectrum disorders are part of neurodevelopmental conditions and have their onset in childhood. The degree of persistence of ASD in adulthood is 99% (Billstedt *et al*., 2005). ASD and ADHD frequently co-occur; approximately 28–44% of adults diagnosed with ASD also meet the criteria for ADHD (Lai *et al*., 2014). Both conditions can have a significant negative impact on the daily lives of those affected and their families (Holden *et al*., 2013), particularly when they occur concurrently (Anckarsäter *et al*., 2006).

### Anxiety Disorders

More than half of adults with ADHD experience anxiety disorders (Quenneville *et al*., 2022). The prevalence of anxiety disorders ranges from 4.3% to 47.1% in adults with ADHD from the general population, and 3.9% to 84% in the clinical population (Choi *et al*., 2022).

The presence of concomitant anxiety disorders appears to be associated with a lower level of education and a more severe clinical picture (suicide attempts, greater predisposition to anger, higher rate of hospital admissions, and psychotic symptoms; Quenneville *et al*., 2022). Social phobia (30.3%) seems to be the most common anxiety disorder, followed by panic disorder (28.05%) and post-traumatic stress disorder (21.81%; Quenneville *et al*., 2022). Other disorders associated with ADHD are Generalized anxiety disorder (18.98%), obsessive-compulsive disorder (9.35%), and agoraphobia (9.63%) (Quenneville *et al*., 2022).

### Mood Disorders

The prevalence of depressive disorders in adults with ADHD from the general population ranges from 8.6% to 55% and from 15.4% to 39.7% in the clinical population (Choi *et al*., 2022). The prevalence of bipolar disorders in adults with ADHD from the general population ranges from 4.48% to 35.3% and from 7.4% to 80.0% in the clinical population (Choi *et al*., 2022). One of the most common disorders is Depressive disorder (18.6%-59.77%) (Kessler *et al*., 2006; Torgersen *et al*., 2006; Quenneville *et al*., 2022). Those with depression and ADHD experience higher disease burden, longer illness duration, and reduced quality of life compared to those with either disorder alone. Bipolar disorder is also common in adults with ADHD (7.95-21.2%) (Kessler *et al*., 2006; Schiweck *et al*., 2021; Quenneville *et al*., 2022), with a higher prevalence of bipolar disorder type I (52-92%), followed by type II (6-48%) (Schiweck *et al*., 2021). Almost 15% of adults with ADHD reported psychotic symptoms (Quenneville *et al*., 2022), and 35% of them reported a history of suicide attempt (Quenneville *et al*., 2022). The onset of bipolar disorder in ADHD is generally early, and the coexistence of the disorders leads to a worse clinical course (Nieremberg *et al*., 2005; Tamam *et al*., 2008).

### Substance use Disorders (SUD)

The prevalence of substance use disorders (alcohol, opioids, stimulants, cannabis, anxiolytics, and nicotine) in adults with ADHD from the general population ranges from 2.3% to 41.2% and from 0 to 82.9% in the clinical population (Choi *et al*., 2022; Quenneville *et al*., 2022). The risk of substance abuse and addiction is also linked to attempts at self-medication. This is especially true in the case of stimulants (*e.g*., amphetamines and cocaine), which have positive effects on attention span (Mariani *et al*., 2014).

### Personality Disorders

The prevalence of personality disorders in adults with ADHD from the general population ranges from 0.31% to 33.8% and from 21.9% to 65.95% in the clinical population (Choi *et al*., 2022; Quenneville *et al*., 2022). A recent study conducted by Adamis and colleagues (2023) examined the clinical personality patterns, as assessed using the Millon Clinical Multiaxial Inventory-III (Millon, 1997), most commonly associated with adults diagnosed with ADHD at a specialized clinic. A percentage of 31.5% had one personality disorder, 24.0% had 2, and 28% had three or more. The most common personality pattern associated with ADHD seems to be the dependent (39.5%), followed by the depressive (30.6%), the avoidant (25.9%), the borderline (20.4%), the antisocial (19.7%), and the negativistic (19%). Combined subtype ADHD seems to be more associated with sadistic, antisocial, and negativistic (passive/aggressive) personality patterns. The hyperactive/impulsive subtype seems more associated with a masochistic (self-defeating) personality pattern, and those with the

inattentive subtype are more likely to have a dependent personality pattern and significantly less likely to have sadistic PD.

## THE ROLE OF NEUROTRANSMITTERS AND THE PHARMACOLOGICAL TREATMENT OF ADULT ADHD

Norepinephrine and dopamine are the neurotransmitters most involved in the therapeutic action of ADHD medications. Dopamine is involved in regulating motor activity and limbic function, as well as in attention and cognition, particularly in executive functioning and reward processing (Volkow *et al*., 2009). It plays a crucial role in behavioral adaptation and in the anticipatory processes necessary to prepare for voluntary action following an intention. Norepinephrine (whose transport is closely linked to the dopaminergic system) regulates important cognitive functions, such as working memory and inhibitory control (Del Campo *et al*., 2011).

Among the active ingredients, the most commonly used are psychostimulants (*e.g*., amphetamines, methylphenidate), atomoxetine, and bupropion. In recent years, there has been an increase in the use of these drugs in adults (Raman *et al*., 2018).

## PSYCHOLOGICAL INTERVENTIONS

Below is a brief description of the primary psychological interventions used with adults with ADHD.

## PSYCHOEDUCATIONAL INTERVENTIONS

Psychoeducation (see Hirvikovski *et al*., 2017; Vaag *et al*., 2019) is not intended to reduce the symptoms of the disorder but aims to provide people with ADHD and their partners/caregivers with the appropriate knowledge about the nature and management of the disorder. Psychoeducation interventions can be carried out individually or in groups of 8-10 people. They typically consist of 8-12 sessions, held once a week initially.

The main objectives of psychoeducation for adult patients are: i) to increase knowledge and awareness of the disorder; ii) to stimulate awareness of past difficulties, which can be reinterpreted in light of newly acquired information; iii) to encourage perspectives other than those previously adopted towards oneself and one's difficulties; iv) to reduce feelings of guilt, frustration, and helplessness; v) strengthening internal resources, stimulating potential; vi) improving quality of life and overall functioning; vii) promoting greater psychological and social well-being.

The contents of a psychoeducation intervention are the following:

- Psychological and pharmacological treatments
- Cognitive models of ADHD: the role of executive functions
- Attention in ADHD
- Planning in ADHD Problem-solving in ADHD
- Behavioral aspects of ADHD: impulsivity and restlessness
- Emotional aspects of ADHD
- Structure and strategies for coping with difficulties in daily life, academic life, or work
- Living with ADHD: implications for self-image, acceptance, and change
- ADHD in relationships
- Factors involved in lifestyle: sleep, nutrition, and physical activity
- Strengths of ADHD

A study conducted by Vidal and colleagues (2013) compared two groups of adults with ADHD, one receiving drug therapy and the other psychoeducation. Both treatments lead to statistically significant improvements in inattention, hyperactivity, impulsivity, and self-esteem. Patients in both groups showed a decrease in anxiety and depressive symptoms, a statistically significant improvement in quality of life, and less overall impairment. Psychoeducation proved to be an effective treatment in reducing the main symptoms of ADHD (Vidal *et al*., 2013).

## COGNITIVE BEHAVIORAL THERAPY (CBT)

The cognitive behavioral approach consists of interventions aimed at learning and practicing compensatory skills, in conjunction with cognitive interventions to address distortions in thinking and the resulting unpleasant emotions that contribute to maintaining the avoidance and procrastination typical of adults with ADHD (Safren *et al*., 2005). The CBT approach offers a valuable framework for understanding how repeated life experiences of failure can negatively impact one's self-perception and self-esteem, ultimately leading to the formation of negative beliefs about one's abilities and sense of self-efficacy. The resulting frustration promotes the onset of problems related to anxiety and depression, as well as difficulties in emotional regulation, with consequent negative repercussions on motivation (Weiss *et al*., 2012). This approach aims to modify certain dysfunctional behaviors by teaching individuals with ADHD new behavioral and cognitive skills, as well

as new habits or ways of thinking. CBT is an effective intervention for the management of ADHD (Jensen *et al*., 2016; Knouse *et al*., 2017; Lopez-Pinar *et al*., 2018). Some studies have suggested that CBT treatment may also be effective as the sole form of treatment for ADHD in adults (Weiss *et al*., 2012), particularly in terms of improving quality of life, as well as ADHD symptoms and related symptoms (Pan *et al*., 2019).

## DIALECTICAL BEHAVIORAL THERAPY (DBT)

DBT is a cognitive-behavioral approach developed for the treatment of borderline personality disorder (Linehan, 1993) and was subsequently adapted and used for adults with ADHD (Hesslinger *et al*., 2002). The rationale for using DBT to treat ADHD in adults lies in the fact that it shares specific characteristics with borderline personality disorder, such as difficulty in regulating emotions, controlling impulses, interpersonal relationships, risk of substance abuse, and low self-esteem. DBT aims to promote acceptance and understanding of ADHD and related symptoms, as well as change and self-management skills, emotional regulation and motivation skills, and more adaptive behavior (Hesslinger *et al*., 2002). Several studies have demonstrated the effectiveness of CBT/DBT interventions on core ADHD symptoms, both in patients who respond to drug therapy and in non-responders (Philipsen *et al*., 2007; Hirvikoski *et al*., 2011; Fleming *et al*., 2015).

## MINDFULNESS-BASED THERAPY (MBT)

Mindfulness is based on the fundamental principles of acceptance, present-moment awareness, and self-compassion, which are developed through meditation. The mindfulness-based approach emphasizes the experiential nature of the process. The origins of mindfulness can be traced back to Buddhist practices; however, in recent years, it has been secularized and applied in various forms within mental health services. The aim is to increase awareness of one's thoughts, emotions, and physical sensations, without acting or reacting to them, but rather by accepting them (Zylowska *et al*., 2008). Mindfulness-based interventions, combined with cognitive interventions to enhance self-control skills and improve self-esteem, are effective in alleviating the core subjective and objective symptoms of ADHD, including emotional dysregulation and executive function deficits (Mitchell *et al*., 2017; Zylowska *et al*., 2008).

## COMPASSION-FOCUSED THERAPY (CFT)

Self-compassion is a healthy way of relating to oneself during emotional or physical suffering (Neff, 2003a). Neff (2003b) operationalizes self-compassion based on three fundamental elements. Each element balances responses to oneself in times of difficulty along a spectrum ranging from i) self-kindness and self-judgment (being kind and understanding vs. being critical and judgmental); ii) mindfulness and hyper-identification (taking a mindful and balanced attitude toward thoughts and feelings vs. being consumed by negative reactivity); and iii) common humanity and isolation (recognizing that all human beings experience suffering vs. believing that suffering is isolated to oneself). Having a high level of self-compassion means showing kindness and understanding towards oneself in times of suffering, much as a person would show compassion towards others (Neff, 2003a). Therefore, when an individual responds with self-compassion, they recognize that all people have negative experiences, can take a balanced view of these experiences, and treat themselves with acceptance and kindness, without being judgmental, without feeling as if bad things only happen to them, or without overly identifying with the negative feelings they experience.

## NEUROFEEDBACK (NFB)

NFB is a behavioral technique that detects brain electrical activity and presents it visually in real time to the individual via a screen, since each cortical activity corresponds to a different type of brain wave (Arns *et al*., 2014). By observing feedback on the monitor, individuals can learn about brain functioning and subsequently attempt to modify their electroencephalographic activity to achieve the desired cognitive state. In this way, the individual acquires a self-regulation strategy, thereby improving cognitive, attentional, and behavioral performance (Monastra *et al*., 2006).

## CONCLUSION

ADHD in adults is a complex condition that has recently attracted increased attention. Diagnosing ADHD in adults is challenging because symptoms are often more subtle than in children, and they overlap with other psychological or medical conditions. The presence of comorbidities further complicates the diagnostic process. Adults with ADHD experience various daily difficulties that extend beyond the core symptoms. Currently, no specific psychological intervention protocols exist for this group. It is important to ensure adequate support for adults with ADHD. Raising awareness among mental health professionals is essential, and further research is required to develop targeted treatments and to advance understanding of the unique features of adult ADHD.

## CONFLICTS OF INTEREST

The author declared no conflicts of interest.

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