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ADHD (attention deficit hyperactivity disorder)

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ABSTRACT:
Attention-deficit/hyperactivity disorder (ADHD) is a long-term condition that impacts millions of children and often continues into adulthood. It is characterized by challenges such as maintaining focus, excessive activity, and impulsive actions. According to DSM-IV criteria, ADHD affects approximately 6 to 7 percent of individuals under 18 years old. Using ICD-10 criteria, the rates are lower, around 1 to 2 percent for the same age group. Children in North America seem to have a higher prevalence of ADHD compared to those in Africa and the Middle East, though this difference may arise from variations in diagnostic practices. When identical diagnostic approaches are applied, the prevalence rates are relatively similar across nations. Although ADHD cannot be cured, its symptoms can be effectively managed through medications and behavioral strategies. Early diagnosis and intervention are key to achieving better outcomes.

Key words: ADHD, ICD 10 criteria, DSM- IV criteria

I. INTRODUCTION:

Attention deficit hyperactivity disorder (ADHD) is a condition that arises during childhood and adolescence, marked by severe, widespread, and enduring issues with attention, hyperactivity, and impulsivity. It is considered one of the most frequent reasons for mental health consultations with family doctors, pediatricians, pediatric neurologists, and specialists in child and adolescent psychiatry. While it was once believed that ADHD symptoms subsided during childhood, research has shown that these symptoms often persist through adolescence and into adulthood. The disorder is typically chronic, with about one-third to half of individuals continuing to experience it as adults. ADHD impacts several aspects of a child's normal development and daily life. Children with ADHD are more prone to challenges such as poor academic performance, social isolation, and disruptive behavior compared to their peers, and these difficulties often extend into adulthood, affecting their post-school lives**.(1).**

ADHD is believed to affect 4% to 12% of school-aged children globally. Data from surveys and epidemiological studies indicate that 4% to 5% of college students and adults also have ADHD. In recent times, there has been a rise in the recognition and diagnosis of ADHD in adults, though their treatment still lags significantly behind that of children. Unlike the higher prevalence of ADHD diagnoses in boys compared to girls during childhood, adulthood sees a shift, with men and women being diagnosed and seeking treatment in nearly equal proportions.Untreated ADHD is often linked to a significant prevalence of co-occurring psychiatric conditions, such as oppositional defiant disorder (ODD), conduct disorder, mood disorders, anxiety disorders, as well as tobacco and substance use disorders. Over a lifetime, the consequences of not addressing ADHD are substantial, impacting academic and career progress, contributing to delinquent behavior, increasing risks to motor vehicle safety, and creating challenges in personal relationships.

Attention-deficit hyperactivity disorder(ADHD) traditionally characterized as representing developmentally inappropriate levels of symptoms in 2 dimensions of neuropsycological functioning : inattention and hyperactivity - impulsivity. Recent reviews of scientific literature, however, have challenged this conceptualization of ADHD on the basis that involves emotional impulsitivity and deficient emotional self-regulations**. (2)**

Around 60% of children diagnosed with ADHD also experience additional mental, behavioral, or developmental disorders, a condition referred to as "complex ADHD." These individuals are more likely to encounter negative health effects, such as obesity, chronic illnesses, or accidental injuries, and tend to utilize healthcare services more frequently than those without ADHD. Monitoring ADHD diagnoses and treatment

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indicators through public health surveillance offers valuable insights into trends in diagnosis and treatment rates, helps identify disparities across demographic groups, assesses alignment between treatment practices and clinical guidelines, and tracks changes in service usage over time**.(3)**

TYPES OF ADHD

The three primary forms of ADHD are combined presentation, impulsive/hyperactive, and predominantly inattentive. Each name alludes to the main characteristics of the type.

Impulsivity, inattention, and hyperactivity are all possible symptoms of attention deficit hyperactivity disorder (ADHD). The type of ADHD a doctor diagnoses will depend on how frequently each of these specific symptoms occurs.

This article describes the three signs of the various forms of ADHD. It also looks at how doctors diagnose ADHD, what causes it, possible treatments, and more.

INATTENTIVE TYPE

A person who tends to be inattentivetypically exhibits too much impulsivity or hyperactivity for the other types to be taken into account. They will instead feel distracted.

Here are some indicators that someone may be inattentive:

- having trouble staying focused on tasks or activities
- getting quickly bored with a task or activity and having difficulties completing it
- seemingly not listening when spoken
- having difficulty following instructions
- showing signs of forgetfulness and making simple mistakes
- trouble with organization and planning ahead
- frequently losing or misplacing belongings
- not enjoying study or prolonged periods of mental effort.

Hyperactive-impulsive type

An individual with mostly hyperactive-impulsive type ADHD will exhibit both impulsive and hyperactiveconduct. Their level of inattention is insufficient compared to the other categories.

Impulsivity

Indicators of impulsivity in an individual may include:

Signs of impulsivity may include:

- Struggling to wait their turn
- Frequently interrupting conversations
- Speaking out of turn or saying inappropriate things before fully processing the situation
- Difficulty managing strong emotions, potentially leading to anger issues
- Engaging in risky behavior without considering the consequences

Hyperactivity

Signs of hyperactivity may include:

- Persistent fidgeting or restlessness
- Struggling to remain seated for extended periods
- Excessive talking
- Continuous movement, such as frequent running or climbing

Combined type

Combined type ADHD is the most prevalent form of the condition, characterized by a mix of inattention, impulsivity, and hyperactivity. Individuals with this type may struggle with focus, exhibit restless behavior, and act impulsively without considering consequences(4)

AT WHAT AGE IT IS CAUSED AND WHAT IS THE MAIN CAUSE:

Causes

The exact cause of ADHD remains unclear, but research continues to explore potential contributing factors. Genetics, environmental influences, and central nervous system development at key stages may all play a role in shaping the condition. Scientists are working to better understand how these elements interact in individuals with ADHD.

Risk factors

Possible risk factors for ADHD include:

- Having a close family member, such as a parent or sibling, with ADHD or another mental health disorder
- Exposure to environmental toxins like lead, commonly found in older buildings
- Prenatal exposure to substances such as alcohol, tobacco, or recreational drugs
- Premature birth

Although many believe sugar contributes to hyperactivity, scientific evidence does not support this claim. Childhood challenges can affect concentration, but they do not necessarily indicate ADHD.

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ADHD symptoms generally emerge before the age of 12, with signs often becoming noticeable as early as preschool. While genetics play a significant role in its development, researchers believe that environmental influences also contribute to the condition. Factors such as prenatal exposure to toxins, brain development, and family history may all interact to shape ADHD symptoms

Age of Onset:

ADHD symptoms typically appear before the age of 12, though some children may show signs as early as 3 years old. For a formal diagnosis, these symptoms must be present before the age of 12**.(5)**

ADHD and its Neuronal Background

ADHD is linked to various neurophysiological challenges, with recent theories suggesting that its symptoms arise from specific brain dysfunctions. Cognitive difficulties may stem from disruptions in the fronto-striatal or meso-cortical networks, while reward-processing issues may be associated with abnormalities in the mesolimbic dopaminergic system. Moreover, research indicates that ADHD-related deficits are present even in a resting brain state. A broader perspective suggests that excessive activity in the Default Mode Network (DMN)—typically dominant during rest—may interfere with brain functions needed for tasks, leading to difficulties in regulating attention and maintaining focus.

Cognitive Functions

Several cognitive theories suggest that executive function deficits play a central role in ADHD. Some models describe a "top-down" system responsible for inhibition, working memory, and cognitive flexibility, which becomes particularly active when complex tasks require adaptation and self-control. Barkley's theory proposes that children with ADHD may struggle with behavioral inhibition, leading to difficulties in working memory, self-regulation, internalized speech, and reconstitution. More recent "multiple pathway" models expand on this idea, emphasizing not only cognitive impairments but also challenges in motivation and reward processing**.(6)**

Research has consistently shown that children with ADHD experience cognitive challenges across various tasks. They often struggle with executive control, exhibiting slower and more inconsistent reaction times along with a higher rate of errors. These difficulties have been observed in key areas of executive function, such as cognitive flexibility, assessed through the Wisconsin Card-Sorting Task, and problem-solving abilities, evaluated using the Tower-of-Hanoi paradigm. However, findings related to interference control—measured through Stroop and Simon tasks—have been inconsistent, with some studies reporting minimal or no deficits. Further refinements in how interference susceptibility is analyzed may help clarify these results.**(7)**

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Action Monitoring and Response Inhibition

Action monitoring, a crucial component of executive functioning, becomes particularly relevant when task demands create response conflicts. Extensive electrophysiological research has shed light on the mechanisms involved. For example, when a task requires a response to one stimulus while suppressing a response to another, event-related potentials (ERPs) typically exhibit a fronto-central negative peak around 200–400 ms after stimulus onset. This negativity is more pronounced in the Nogo condition compared to the Go condition, especially when the Nogo condition is infrequent. A similar effect is observed when a target is preceded by either congruent or incongruent distractors.

The N2 component and its enhancement were initially linked to response inhibition; however, more recent studies indicate that they represent a broader action-monitoring or cognitive control process, even in situations where response inhibition is unnecessary. The neural origins of N2 activity observed in Go/Nogo and Flanker tasks have been identified in medial frontal brain regions.

Some studies using Continuous Performance Tests (CPT) or Go-Nogo tasks in children have not identified conflict-specific differences in N2 between those with ADHD and control groups. However, certain studies did

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observe differences, though these variations were attributed to comorbid externalizing disorders or only emerged after extended task durations. Consequently, detecting action-monitoring deficits in ADHD may necessitate particularly demanding tasks—such as those generating a significant number of performance errors—since typical CPT tasks may not effectively reveal such deficits.

The Flanker Task, which involves responding to a central target while ignoring surrounding congruent or incongruent flanker stimuli, has been widely utilized in ADHD research. A specialized version of this task designed to amplify the congruency effect revealed reduced N2 enhancement and impaired error processing in both children and adults with ADHD. Additionally, intermediate effects were observed in first-degree relatives without an ADHD diagnosis, suggesting that action monitoring may play a significant role in the developmental pathway linking genetic and environmental factors to ADHD.

Research on brain activity associated with response inhibition has produced varied results, likely due to differences in study methodologies. Investigations using the Stop-Task—which requires frequent responses that must be withheld when a Stop signal appears—indicate that the right inferior frontal gyrus plays a key role in successfully suppressing ongoing responses.

While multiple EEG and fMRI studies have found impairments in Stop-Task performance and stop-signal-related brain activity in individuals with ADHD, some studies involving treatment-naïve children have reported conflicting findings. Response inhibition difficulties in ADHD appear to persist across different age groups, with particularly distinct effects observed in adults.

Additionally, cognitive control processes—including N2 activity in the medial prefrontal cortex—and error processing mechanisms (error negativity) may function at theta frequencies, or potentially even lower delta frequencies.**(9)**

Pathophysiology of ADHD

Research across neuropsychology, pharmacology, and brain imaging has highlighted the role of dopamine and norepinephrine neurotransmitter systems within the frontostriatal circuit in ADHD. Individuals with the disorder typically exhibit a 3–5% reduction in overall brain volume, with gray matter being disproportionately affected. The most significant volume loss—closely linked to symptom severity—occurs in the prefrontal cortex, basal ganglia, and cerebellum, alongside delayed cortical maturation, particularly in prefrontal regions.

ADHD has a complex origin, reflected in a diverse range of brain structure abnormalities, neuropsychological impairments, and behavioral disturbances. Epidemiological studies suggest links between ADHD and environmental factors, including prenatal and perinatal influences such as maternal stress, smoking or alcohol consumption during pregnancy, low birth weight, and prematurity. Exposure to environmental toxins (e.g., organophosphates, polychlorinated biphenyls, and lead), adverse psychosocial conditions like early childhood deprivation and maternal hostility, and dietary factors are also associated with the disorder.

ADHD often runs in families, with first-degree relatives having an elevated risk of developing the condition. Structural and functional neuroimaging studies have explored deficits in the prefrontal cortex, revealing disruptions in dopaminergic and noradrenergic regulation, which impair inhibitory processes crucial for adaptive neural control of heart rate. Dysfunction in the prefrontal cortex may contribute to catecholaminergic regulation issues, while genetically driven neurotransmission abnormalities may underlie subtle dysfunctions in the prefrontal cortex, limbic system, locus coeruleus-noradrenergic system, and other brain structures involved in neuro-cardiac regulation.

Diagnosis

Action monitoring, a key component of executive functioning, becomes particularly relevant when tasks create response conflicts. Extensive electrophysiological research has identified some of the mechanisms involved. For example, when a task requires responding to one stimulus while withholding a response to another, event-related potentials (ERPs) typically display a fronto-central negative peak between 200 and 400 milliseconds after stimulus onset. This negativity is more pronounced in the Nogo condition compared to the Go condition, especially when the Nogo condition is infrequent. A similar pattern appears when the target is preceded by either congruent or incongruent distractors.

The N2 component and its enhancement were initially believed to indicate response inhibition. However, more recent studies suggest that they represent broader action-monitoring or cognitive control processes, even in situations where no response needs to be suppressed.

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Research has traced the neural origins of N2 activity observed in Go/Nogo and Flanker tasks to medial frontal brain regions.**(10)**

Clinical diagnosis and comorbidities

The way ADHD presents itself varies based on age and developmental stage, and cultural perspectives influence what level of activity and inattention is considered problematic. A formal diagnosis requires clear evidence that the condition significantly affects social, academic, or work-related functioning.

Among the different types, the predominantly inattentive form is more commonly seen in females. Children with the hyperactive-impulsive type often exhibit aggression and impulsivity, leading to peer rejection. The combined type tends to result in greater overall impairment compared to the other two. Adolescents with ADHD frequently struggle with low self-esteem, difficulties in social relationships, and an increased risk of early smoking and substance abuse.

Endophenotypes serve as markers to assess susceptibility to ADHD. They can help identify genetically similar subgroups, clarify distinct underlying mechanisms, and define broader spectrum traits for quantitative analysis. Cognitive impairments and difficulties in motor response inhibition are considered key endophenotype indicators in ADHD.

ADHD often occurs alongside other psychological conditions, making diagnosis and treatment more complex. It is common for individuals with ADHD to also experience oppositional defiant disorder, mood disorders, anxiety disorders, learning disabilities, tics, or intellectual disabilities. These coexisting conditions can influence the severity of ADHD symptoms and impact a person's ability to function in academic, social, and occupational settings. Understanding these overlaps is essential for providing effective, individualized care**.(11)**

Symptoms of ADHD

ADHD symptoms generally fall into two main categories: inattention—characterized by difficulty concentrating and staying focused—and hyperactivity, marked by excessive movement and impulsivity. While some individuals with ADHD experience challenges in both areas, others may struggle primarily with one. Emotional symptoms associated with ADHD include mood swings, low self-esteem, sensitivity to rejection, stress, anxiety, difficulty recovering from setbacks, procrastination, poor emotional regulation, and feeling overwhelmed. Notably, ADHD is diagnosed more frequently in males than in females.

Symptoms in Children and Teenagers

ADHD typically becomes noticeable in children and teenagers before the age of six and is often observed in various settings, such as home and school. Common symptoms include inattention, hyperactivity, impulsivity, or a combination of these traits.

Additionally, individuals with ADHD are at a higher risk of substance abuse, particularly during adolescence and adulthood. Their natural impulsivity and willingness to take risks may increase the likelihood of experimenting with drugs or alcohol. Studies suggest that these tendencies can also lead to other risky behaviors, such as reckless driving, engaging in unsafe sexual relationships, and participating in physically demanding activities.

Inattention specifically manifests as difficulty focusing, a short attention span, and frequent distractions, which can result in errors in schoolwork, careless mistakes, or frequently losing items. Completing repetitive tasks or following detailed instructions can also be challenging, making academic performance particularly difficult when assignments or expectations frequently change.

Hyperactivity and Impulsiveness in ADHD can manifest as difficulty staying still, frequent fidgeting, excessive physical movement, and constant talking. Individuals with ADHD may struggle to wait their turn, engage in impulsive behavior, and interrupt conversations, all of which can make it challenging to focus at work. Their sense of risk is often diminished or absent.

While adolescents and teenagers with ADHD may continue experiencing symptoms into adulthood, hyperactivity tends to decrease as responsibilities increase, while inattentiveness remains a challenge. In adulthood, ADHD symptoms are generally milder than in children. Adults with ADHD may display trouble with focus, careless mistakes, poor organization, difficulty prioritizing tasks, misplacing items frequently, forgetfulness, restlessness, and an inability to remain silent during discussions. They may also blurt out responses, interrupt conversations, and experience mood swings, irritability, short temper, difficulty managing stress, extreme impatience, and impulsive decision-making, often without considering potential consequences. Mood

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instability is a key contributor to irritability and emotional fluctuations in ADHD.(**12**)

Adults with ADHD frequently experience additional mental health conditions, such as mood disorders, anxiety disorders, substance use disorders, and antisocial personality disorder. The increased likelihood of ADHD symptoms in those experiencing distress or using antidepressants and antianxiety medications may be due to the high prevalence of comorbid conditions. In some cases, misdiagnosis of ADHD or the use of SSRIs for treatment might also contribute, as ADHD symptoms sometimes overlap with those of mood and anxiety disorders.

Individuals with ADHD are at a heightened risk for substance use, particularly cannabis and cocaine, with studies indicating a 40% lifetime prevalence of substance use disorders among ADHD patients. A meta-analysis revealed that young adults who were diagnosed with ADHD in childhood were significantly more likely to use cannabis and cocaine, though not alcohol. Findings suggest that those screening positive for ADHD show higher odds of cannabis use in the past year and lifetime cocaine use, but not necessarily signs of substance abuse based on AUDIT or ASSIST assessments.

Gender differences in ADHD-related outcomes were noted in areas such as prescription pain medication use, antisocial tendencies, vehicle collisions, and lifetime arrests for criminal offenses. These disparities may reflect variations in externalizing and internalizing behaviors between men and women with ADHD.(**13**)

TREATMENT

ADHD treatment usually consists of both medication and behavioral interventions. Stimulant and non-stimulant medications help regulate symptoms such as inattention, impulsivity, and hyperactivity. In addition to medication, non-pharmacological methods—like behavioral therapy and cognitive-behavioral therapy (CBT)—can effectively manage symptoms and enhance daily functioning.

Pharmacological Treatment:

Stimulants:

Medications such as methylphenidate (MPH) and amphetamine are the primary treatment options for ADHD. They function by boosting dopamine and norepinephrine levels in the brain, which enhances attention, focus, and impulse control.

Mechanism of action

Methylphenidate is a central nervous system (CNS) stimulant used to treat narcolepsy and attention deficit hyperactivity disorder (ADHD). It works by blocking the reuptake of dopamine and norepinephrine, leading to increased activity of these neurotransmitters in the prefrontal cortex, which may explain its effectiveness in managing ADHD symptoms.

This medication is available in different formulations, categorized as short-acting, intermediate-acting, and long-acting. When selecting the most appropriate formulation for a patient, two key factors must be considered: the time it takes for the medication to start working and how long its effects last.

Methylphenidate inhibits the reuptake of NE and DA

Methylphenidate regulates the function of dopamine and norepinephrine transporters (DAT and NET).

- **DAT** controls dopamine levels in the synaptic space.
- **NET** is responsible for norepinephrine reuptake from the synapse back into presynaptic neurons.

By blocking these transporters, methylphenidate increases the availability of dopamine and norepinephrine at the synapse, enhancing neurotransmission. Unlike amphetamine, which actively stimulates dopamine release from synaptic vesicles, methylphenidate primarily works by preventing the reuptake of these neurotransmitters.(**14**)

Non-stimulant medications can be a suitable option for children with ADHD, particularly when they have coexisting conditions such as tic disorders like Tourette Syndrome. In some cases, these treatments can effectively address both ADHD and the accompanying condition simultaneously. Commonly used non-stimulant alternatives to stimulant medications include **Atomoxetine**, **Guanfacine XR**, and **Clonidine XR**, which help manage ADHD symptoms while minimizing the risk of exacerbating tics or other related disorders.

Atomoxetine

Atomoxetine (Strattera) is a non-stimulant medication approved by the FDA for treating ADHD. It belongs to the **selective norepinephrine reuptake inhibitor (SNRI)** class and differs from stimulant medications in several ways. Since

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atomoxetine does not carry a risk of abuse, it is not classified as a controlled substance.

Although atomoxetine is a newer treatment, the research supporting its effectiveness is not as extensive as that of stimulant medications. Unlike stimulants, which typically work for a limited duration, atomoxetine provides continuous symptom management throughout the day. However, studies indicate that its effectiveness is roughly **two-thirds** that of stimulant-based treatments. Additionally, it may take **up to six weeks** after starting atomoxetine for it to reach its full therapeutic effect.

Possible side effects

Atomoxetine carries a warning that, in rare cases, it may contribute to suicidal thoughts within the first few weeks of treatment. However, it can be particularly beneficial for children with both ADHD and anxiety, as stimulants may worsen anxiety symptoms. While its side effects are generally mild, they can include decreased appetite, nausea, vomiting, tiredness, sleep disturbances, dizziness, and stomach discomfort. Jaundice is an extremely rare potential side effect, but taking atomoxetine with food can help reduce nausea and stomach issues.

For children who are also taking antidepressants like fluoxetine (Prozac) or paroxetine (Paxil), atomoxetine should be administered at a lower dosage, as these medications can increase its concentration in the bloodstream.

Atomoxetine is now recognized as a first-line treatment option for ADHD, making it the first non-stimulant in this category. Some parents opt for atomoxetine over stimulant medications due to concerns about the potential for stimulant misuse. It is also commonly used in children who have not responded well to stimulant treatments.

Long-acting guanfacine

Long-acting guanfacine (Intuniv) belongs to the class of **alpha agonists**, originally developed for managing high blood pressure. However, it has also been found effective in treating children with ADHD, particularly those experiencing tics, sleep disturbances, or aggressive behavior. The FDA recently approved it as a treatment option for ADHD in children.

This medication comes in pill form and must be swallowed whole—it **cannot** be crushed, chewed, or broken. Like atomoxetine, guanfacine is **not** classified as a controlled substance, meaning it has a lower risk of misuse or dependency.

Possible side effects

Long-acting guanfacine does not significantly affect appetite, making it a suitable option for children who experienced notable weight loss while taking stimulant medications. Common side effects include drowsiness, headaches, fatigue, stomach discomfort, nausea, lethargy, dizziness, irritability, reduced blood pressure, and decreased appetite. While sleepiness is a frequent side effect when starting the medication, it generally improves over time with continued use. The full therapeutic benefits of guanfacine may take **3 to 4 weeks** to become noticeable.

Long-acting clonidine

Long-acting clonidine (Kapvay) is an FDA-approved medication for ADHD treatment. It is taken **twice daily**, whereas long-acting guanfacine is **once daily**. Both medications belong to the **alpha agonist** class and have been studied for use as standalone treatments or as **add-ons** to stimulant therapy when stimulants alone do not fully manage ADHD symptoms.

Additionally, two **shorter-acting** alpha agonists—**clonidine (Catapres) and guanfacine (Tenex)**—are available, though they **are not FDA-approved for ADHD treatment**. These medications may be used as **adjunctive therapies** or considered when FDA-approved options have not been effective.

If standard ADHD treatments have not been successful, it is important to **re-evaluate the diagnosis** to confirm ADHD is the correct condition and assess for **any coexisting disorders** that could be contributing to symptoms.**(15)**

THERAPY

Cognitive-behavioral therapy (CBT) for ADHD can be conducted individually or in a group setting. Group therapy offers distinct advantages, such as the opportunity to connect with others facing similar challenges, exchange information, and gain insight into how different individuals manage their symptoms. This shared experience can foster support, motivation, and practical strategies for coping with ADHD-related difficulties.**(16)**

Cognitive-Behavioral Therapy for ADHD

Cognitive-behavioral therapy (CBT) is widely regarded as the **gold standard** for psychotherapy in ADHD treatment. While general CBT techniques can be beneficial, specialized **ADHD-focused CBT** is designed to address specific challenges associated with the condition.

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This therapy helps individuals improve **daily life skills**, including overcoming procrastination, managing time more effectively, and improving planning abilities. CBT teaches practical coping strategies while addressing the underlying emotions and behaviors that may hinder progress, ultimately fostering better self-regulation and overall functioning.**(17)**

CBT for ADHD: Core and Optional Modules

The **CBT model for ADHD** is structured around three **core modules** and two **optional** components:

- **Psychoeducation & Organizing/Planning** – Helps individuals understand ADHD and develop practical strategies for managing tasks and responsibilities.
- **Coping with Distractibility** – Focuses on techniques to improve attention control and reduce distractions in daily life.
- **Adaptive Thinking** – Encourages more flexible and positive thinking patterns to overcome self-defeating thoughts and improve emotional regulation.(**18**)

II. CONCLUSION

ADHD is a chronic neurodevelopmental disorder affecting individuals from childhood through adulthood.It is characterized by inattention, hyperactivity, and impulsivity, impacting academic, social, and professional life.ADHD prevalence varies by diagnostic criteria, with North America reporting higher rates due to differing diagnostic practices.Traditionally seen in children, research confirms symptoms often persist into adulthood.Boys are more frequently diagnosed in childhood, whereas adults of all genders seek treatment at similar rates.Untreated ADHD is associated with psychiatric conditions, academic struggles, and risky behaviors.Emotional impulsivity and deficient emotional regulation are emerging aspects of ADHD research.Management includes behavioral strategies, lifestyle modifications, and medication tailored to individual needs.Early diagnosis and intervention significantly improve outcomes and life quality.Public health research helps enhance awareness, diagnosis, and treatment to support affected individuals.**Stimulant medications** like methylphenidate and amphetamine are the primary ADHD treatments, boosting dopamine and norepinephrine to enhance focus and impulse control.**Methylphenidate works** by blocking the reuptake of dopamine and norepinephrine,increasing their activity in the prefrontal cortex to manage ADHD symptoms.**Non-stimulant options** like atomoxetine, guanfacine XR, and clonidine XR provide alternatives for individuals with coexisting conditions like tic disorders.**Atomoxetine**, a selective norepinephrine reuptake inhibitor, offers continuous symptom control without the risk of abuse but takes longer to show full therapeutic effects.**Treatment selection** depends on individual needs, symptom severity, and coexisting conditions, with early intervention improving ADHD management and daily functioning.

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