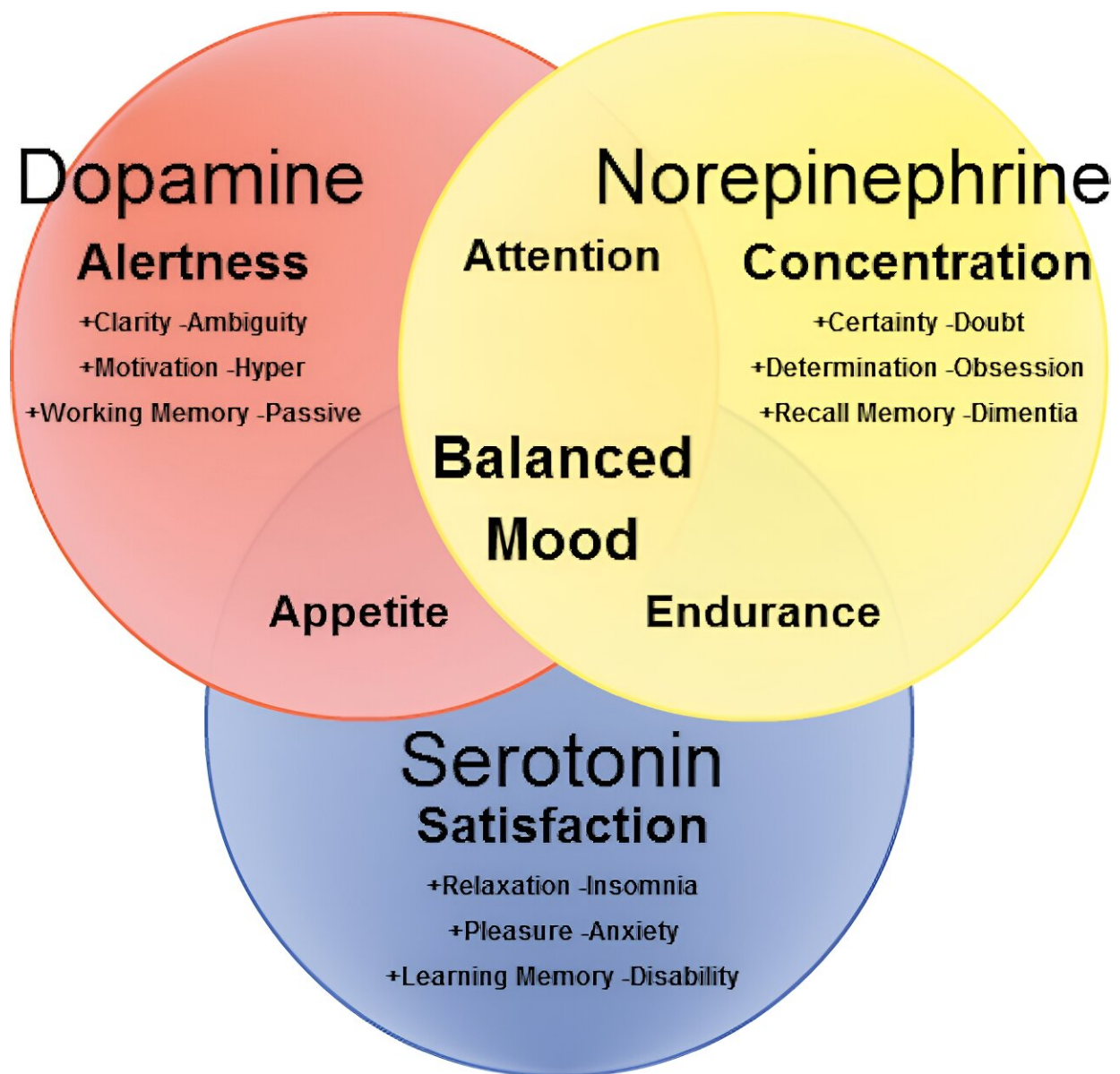


ADHD is highly treatable—a primary care nurse practitioner with ADHD explains the science

July 25 2024, by Kate Harrington



ADHD affects the presence of dopamine and norepinephrine. Credit: [Nikpapag/Wikimedia Commons, CC BY-SA](#)

"My brain has way too many tabs open."

"Why can't I complete tasks?"

"Why do I lose track of time?"

"Why can't I pay attention?"

These are all things people with attention-deficit/hyperactivity disorder, or ADHD, may ask themselves daily, if not hourly.

As a [family nurse practitioner in primary care](#), I have diagnosed and treated numerous patients with ADHD. I was also diagnosed with it at the age of 21.

Understanding how the wiring differs in a [brain](#) with ADHD and what improves functioning is critical to helping those struggling because of their brain's uniqueness.

How brains with ADHD differ

Research has identified multiple differences [in how brains with ADHD work](#).

Put simply, ADHD significantly affects executive function.

[Executive functioning](#) is a set of cognitive processes, including planning,

prioritizing, impulse control, flexibility, time management and emotional regulation, that help people achieve long-term goals.

These processes [occur in the prefrontal cortex](#)—the "personality center"—of the brain.

In addition to the [prefrontal cortex](#), ADHD affects other areas of the brain, including the [basal ganglia](#), an area that regulates communication within the brain, and the [cerebellum](#), which is responsible for movement and balance. All three work together to regulate attention, [executive function](#), [motor activity](#) and [impulse control](#).

Chemical messengers called neurotransmitters allow brain cells to communicate with each other. [Dopamine](#) and [norepinephrine](#) are two key neurotransmitters that play critical roles in the [executive functioning of the brain](#).

Dopamine controls [motivation, rewards and pleasure](#). We get a flood of [dopamine](#) from pleasurable things such as eating, drinking alcohol, having sex, and receiving affirmations or good grades. That flood also motivates us to repeat the "rewarding" behavior. Norepinephrine is responsible for [sustaining attention and helps with executive functioning](#).

People with ADHD [have lower levels of dopamine](#) and [norepinephrine](#) in brain regions, including the prefrontal cortex. This leads to difficulty in sustaining cognitive functions such as attention, [impulse control and motivation](#).

Studies show that people with ADHD have [more dopamine transporters in the brain](#). Think of transporters as vacuums that suck dopamine back up into the neuron, making it less available.

As a result, there is [less activation by dopamine and norepinephrine](#) in

the prefrontal cortex and [the mesolimbic pathway](#), the area that processes rewards and motivation. Less dopamine can drive people to seek out stimulating rewards such as technology, food or drugs.

Researchers have identified at least 27 possible genetic markers that [modulate dopamine regulation in the brain](#).

Diagnosing ADHD

Nearly everyone with or without ADHD shows some symptoms such as forgetfulness. For instance, when you can't tolerate sitting in a meeting for one moment longer or you can't remember why you came into a room.

A true ADHD [diagnosis takes into account multiple factors](#).

If you struggle with ADHD, you have [at least five to six symptoms](#) in the inattentive, hyperactive or impulsive categories, such as forgetfulness, trouble sitting still, losing items and getting easily distracted.

For a formal diagnosis, ADHD symptoms need to have been present before the age of 12, something that can be determined in childhood or, as in my case, much later.

Also, ADHD symptoms must negatively affect the person [in multiple settings](#), such as at home, in school or at work—and they can't be explained away by other conditions, such as [thyroid dysfunction, diabetes, sleep deprivation or anemia](#).

Research shows that girls with ADHD more often [display inattentive symptoms](#) along with characteristics not traditionally associated with ADHD, such as [shyness, perfectionism](#) and [eating disorders](#). Patients, [particularly women and girls](#), can develop depression or anxiety—or

both—because of untreated ADHD. Once ADHD is treated, anxiety and depression symptoms [are greatly reduced](#).

How ADHD medications alter neurotransmitters

The American Academy of Pediatrics provides [evidence-based guidelines](#) for the treatment of ADHD in children and teens.

The first U.S. guidelines for the treatment of adult ADHD are expected to be [released in fall 2024](#).

If patients are 6 or older, stimulant or nonstimulant medications may be used, along with behavioral therapy.

Stimulants are divided into two drug classes: amphetamines, such as Adderall and Vyvanse, and methylphenidates, such as Concerta, Ritalin and Focalin.

Nonstimulants such as Strattera are recommended if patients cannot tolerate or prefer not to take stimulant medications.

Stimulants [block the dopamine](#) and [norepinephrine transporters](#), preventing them from depleting those neurotransmitters, so more dopamine is available to activate key areas of the brain.

Amphetamines also increase the release of [dopamine and norepinephrine from neurons](#). These increased levels allow the brain to find challenging tasks, such as doing homework, more rewarding. Because more dopamine is available, the brain's desire for stimulating rewards decreases.

Methylphenidates are typically the [drug of choice for children](#), while amphetamines are most effective in adults.

[Numerous studies](#) have found that stimulants [improve ADHD symptoms](#), [patient motivation](#), parental quality of life and behavioral ratings from teachers. Stimulants [decrease anxiety](#) and [emotional dysregulation in children](#). Nonstimulants also [improve ADHD symptoms](#).

Improved outcomes

People with ADHD attempt suicide at [twice the rate of people without ADHD](#). They also have three times the rate of suicidal ideation and [six times the rate of completed suicide](#).

Treating patients with ADHD with stimulant medication, in addition to [behavioral therapy](#), has been shown to [decrease suicide attempts](#), [unplanned pregnancies](#) and [substance use](#). One study found that treating children with ADHD with methylphenidate [reduced their risk of burn injuries by 57%](#).

In addition to medication, [cognitive behavioral therapy for adults](#), [executive function training](#), [particularly in adolescents](#), and [positive parenting interventions](#) have been shown to be effective for ADHD symptoms. Most researchers agree that behavioral training is most effective when [combined with medication](#).

Positive parenting

Research has found significant improvement in the [quality of life for both parents and children](#) when parents [participated in positive parenting education](#). The effect is even more pronounced when [combined with medication](#).

One such model, called the "[Nurtured Heart Approach](#)," has been used [by families](#), [schools](#), [foster care organizations](#) and [behavioral health](#)

[groups](#), including the [New Jersey Children's System of Care](#). It emphasizes praise and encouragement, the setting of clear boundaries for acceptable behavior, and teaches children to self-regulate emotions and behaviors.

As a medical provider, I have witnessed such models work wonders in families and classrooms.

Dietary supplements

Multiple studies have demonstrated that children with ADHD have [lower levels of vitamin D](#) in their bloodstream.

Having adequate iron in one's body, stored in the protein [ferritin](#), is important to create [dopamine and norepinephrine](#), the neurotransmitters that are lacking in ADHD. Research has demonstrated that [low levels of ferritin cause a disruption in dopamine activity](#). Children with [lower levels are more likely to be diagnosed with ADHD](#).

For this reason, it's important for providers to check ferritin levels and not serum iron, which is often used incorrectly to diagnose [iron deficiency](#).

Taking steps forward

If you think your child or you may have ADHD, speak with a health care provider who is familiar with ADHD treatment. For school accommodations, the first place to start is with your provider.

Research is still ongoing, but high intake of processed foods may worsen [ADHD symptoms](#).

Pay attention to sleep; [sleep apnea](#) and [sleep disordered breathing](#) are common in people with ADHD.

And make sure to get in lots of exercise, because it [can improve executive functioning and impulse control](#) while boosting dopamine and norepinephrine levels.

Though overwhelming, I'm happy to say that living with ADHD can be rewarding.

[ADHD comes with multiple benefits](#): We are resilient, unconventional and creative. We have intense energy that, once harnessed, can be used for incredible good.

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Provided by The Conversation

Citation: ADHD is highly treatable—a primary care nurse practitioner with ADHD explains the science (2024, July 25) retrieved 26 July 2024 from <https://medicalxpress.com/news/2024-07-adhd-highly-treatable-primary-nurse.html>

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