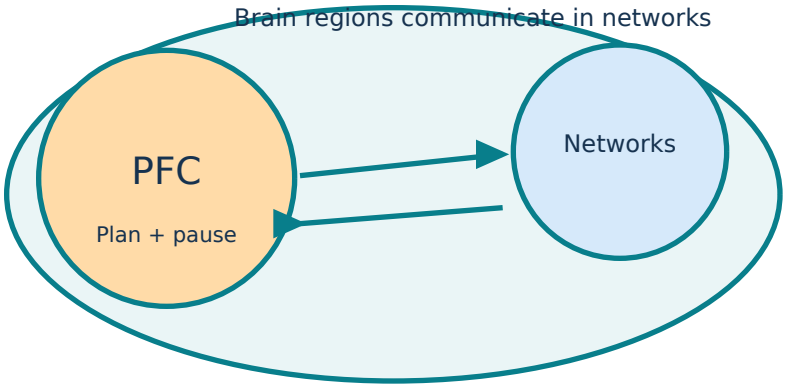
Understanding Executive Function & ADHD



A friendly guide for children, teens, parents, and adults

Imagine your brain is a busy school. It needs a principal to help everyone know what to do, when to do it, and how to work together. Executive functions are the brain skills that help with that job.

What is inside?

Easy examples, large brain drawings with arrows, medicine explanations, safety reminders, family activities, a glossary, and detailed references.

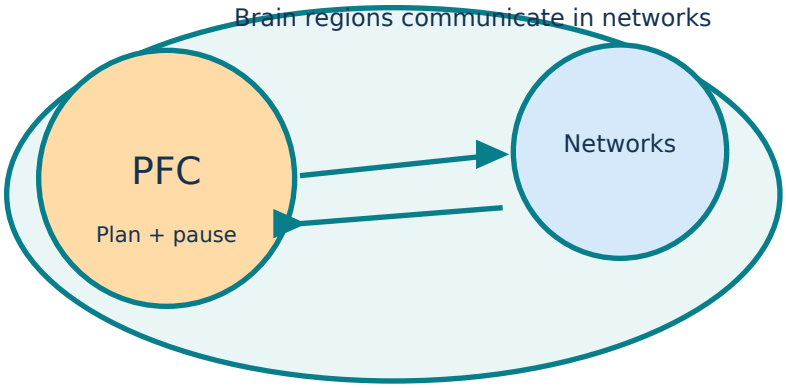
A promise to readers

ADHD does not mean someone is lazy, unintelligent, or a bad person. Different brains need different tools. Medicine is one possible tool, not the whole toolbox.

Prepared for

24-7 Shalom Psychiatry PLLC. Educational material only; individual diagnosis and treatment require a qualified healthcare professional.

1. Meet Your Brain’s Management Team



The planning skill

Helps decide what to do first. Example: packing a schoolbag the night before.

The starting skill

Helps begin a job even when it feels boring. Example: opening a workbook instead of waiting until bedtime.

The memory helper

Working memory holds instructions briefly. Example: remembering “get your shoes, coat, and water bottle.”

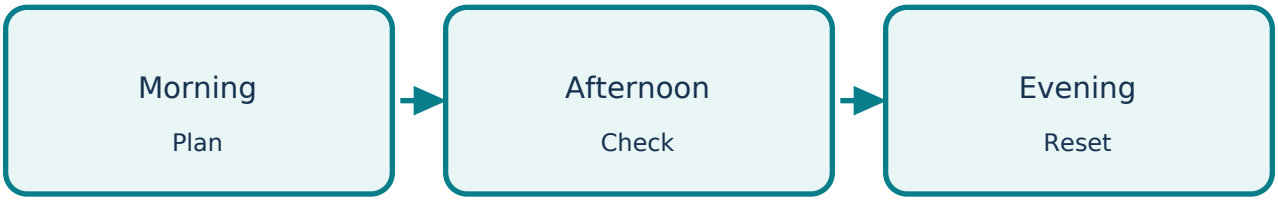
The pause button

Inhibition helps stop and think before speaking, spending money, or clicking a distracting video.

The switching skill

Cognitive flexibility helps change plans when the bus is late or the teacher changes an assignment.

2. ADHD in Real Life



Small repeatable routines reduce memory load

At school

A child may understand the lesson but lose the worksheet, forget a deadline, or interrupt a classmate.

At home

A teen may plan to clean a room, notice a toy, start another activity, and forget the original goal.

At work

An adult may do excellent creative work but struggle to prioritize emails or arrive on time.

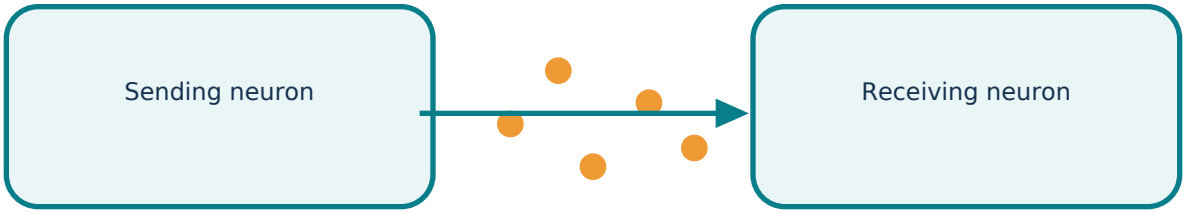
Important distinction

Executive-function difficulty can happen without ADHD. Sleep problems, anxiety, depression, trauma, learning disorders, and medical conditions can also affect these skills.

A strength-based view

People with ADHD can have many talents. Good support identifies strengths and builds practical systems around challenges.

3. How Brain Messages Travel



Dopamine / norepinephrine messages

Transporters help recycle chemical signals

Neurons are messengers

Brain cells called neurons communicate using electrical activity and chemical messengers called neurotransmitters.

A tiny gap

At many connections, a sending neuron releases neurotransmitter molecules into a small gap called a synapse. Receptors on another cell respond to the signal.

Clean-up and recycling

Transporter proteins such as DAT (dopamine transporter) and NET (norepinephrine transporter) help take chemical messengers back into cells.

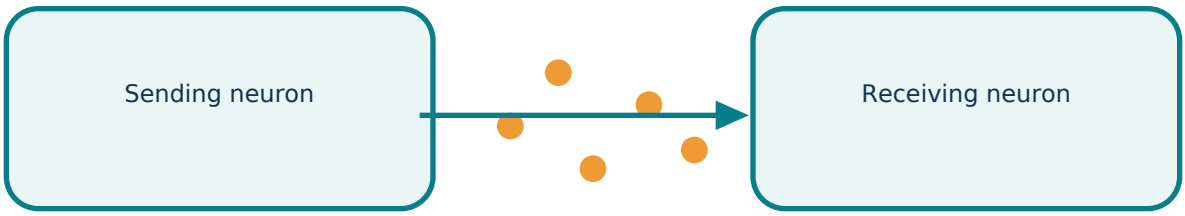
Why this matters

Some ADHD medications change how long dopamine or norepinephrine signals remain available, or how brain cells respond to those signals.

Do not oversimplify

ADHD is not diagnosed by a blood test for “low dopamine.” Brain chemistry is complex, and no single neurotransmitter level explains every symptom.

4. Dopamine: The Motivation Messenger



Dopamine / norepinephrine messages

Transporters help recycle chemical signals

What dopamine helps do

Dopamine participates in reward learning, motivation, movement, and selecting useful actions. It is not simply a “happiness hormone.”

Child-friendly example

Imagine earning points for each completed step in a game. Dopamine signaling helps the brain learn which actions matter and which rewards are worth working toward.

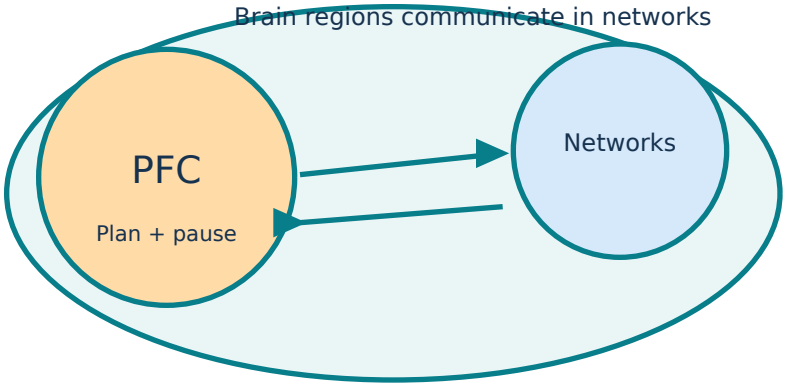
How it relates to ADHD

Dopamine circuits are among several systems implicated in ADHD. A person may find a highly rewarding game easier to sustain than a long assignment with delayed rewards.

What medicine may do

Some medicines strengthen dopamine signaling in relevant circuits. This can improve attention and impulse control, but responses vary and medicine does not automatically teach organization.

5. Norepinephrine: The Alert-and-Focus Messenger



What it does

Norepinephrine helps regulate alertness, attention, and the strength of communication in prefrontal networks.

The flashlight analogy

Imagine a flashlight that helps you notice the important page instead of every sound in the room. Norepinephrine helps tune attention, although too much or too little signaling can be unhelpful.

The prefrontal cortex

This front part of the brain helps hold goals in mind, inhibit distractions, and guide decisions. It works with many other regions.

Important note

Norepinephrine is both a neurotransmitter and, in other body contexts, a hormone. ADHD medications are primarily discussed here for their effects on neural signaling.

6. Methylphenidate Medicines



Methylphenidate blocks DAT and NET reuptake

More signal may remain available between neurons

Examples

Ritalin, Concerta, Metadate CD, Aptensio XR, Jornay PM, and several generic formulations contain methylphenidate; dexmethylphenidate products include Focalin and Focalin XR. Formulations are not interchangeable milligram for milligram.

What happens at the synapse

Methylphenidate inhibits dopamine and norepinephrine transporters (DAT and NET), reducing reuptake. The result is increased extracellular signaling in relevant pathways.

A child-friendly picture

Think of a classroom where helpful messages disappear too quickly. The medicine slows some of the message clean-up so the signal has more opportunity to be heard.

Possible benefits

Better sustained attention, reduced impulsivity, and improved ability to start or complete tasks for some people.

Possible downsides

Reduced appetite, insomnia, headache, irritability, faster pulse or higher blood pressure. The prescriber monitors response and growth in children.

7. Amphetamine Medicines



Amphetamine acts on transporters and vesicular handling

Simplified mechanism; effects vary by dose and brain region

Examples

Adderall and Adderall XR contain mixed amphetamine salts; Vyvanse contains lisdexamfetamine, a prodrug converted to dextroamphetamine; Dexedrine and Zenzedi contain dextroamphetamine; Mydayis is a longer-acting mixed amphetamine product.

How they work

Amphetamines interact with DAT and NET, affect intracellular handling of monoamines including VMAT2-related vesicular processes, and can promote dopamine and norepinephrine release. Their effects are more complex than merely blocking reuptake.

A simple analogy

If methylphenidate mainly slows the cleanup crew, amphetamine medicines can also change how messages are moved and released.

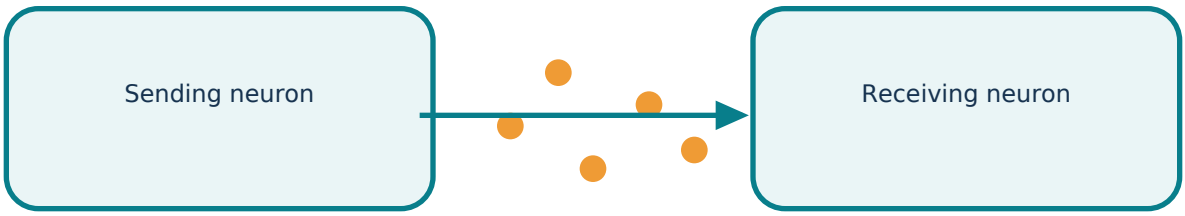
What families may notice

Improved task persistence or reduced interruptions may occur, but the right dose is individualized. More is not always better.

Safety

Possible appetite suppression, sleep disruption, cardiovascular changes, mood changes, and misuse or diversion risk. These are controlled medications in the United States.

8. Atomoxetine: A Nonstimulant Option



Dopamine / norepinephrine messages

Transporters help recycle chemical signals

Example

Strattera (atomoxetine), including generic atomoxetine.

Mechanism

Atomoxetine selectively inhibits the norepinephrine transporter (NET). In the prefrontal cortex, where dopamine clearance also relies substantially on NET, it can increase norepinephrine and dopamine availability.

What is different?

It is not a stimulant and does not usually work immediately. Benefits commonly build over several weeks.

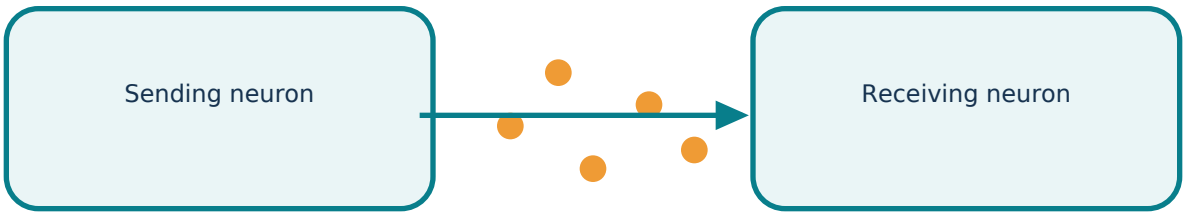
Who might discuss it

A clinician may consider it when stimulants are unsuitable, poorly tolerated, or not preferred.

Important precautions

Monitor appetite, heart rate, blood pressure, mood, and suicidal thinking in children and adolescents because of its boxed warning. Rare serious liver injury has been reported.

9. Viloxazine Extended Release



Dopamine / norepinephrine messages

Transporters help recycle chemical signals

Example

Qelbree (viloxazine extended release).

How it works

Viloxazine modulates norepinephrine signaling, including norepinephrine reuptake inhibition. Other receptor effects have been described, but the exact mechanism responsible for ADHD benefit is not fully established.

In simple words

It changes how certain attention-related messages are handled. It is not the same medicine as atomoxetine.

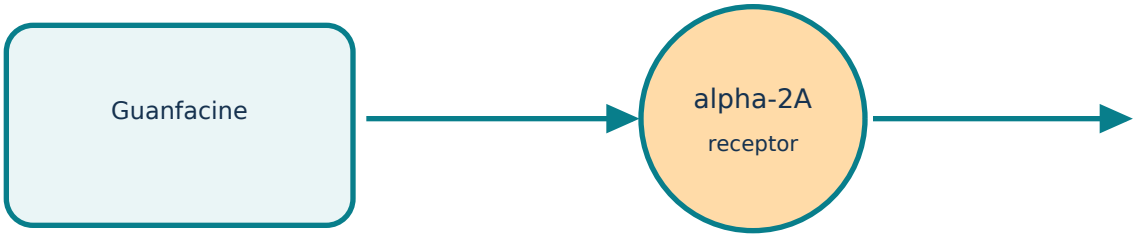
Important precautions

Monitor mood and suicidal thoughts, especially early in treatment or after dose changes. Review drug interactions carefully: viloxazine can strongly inhibit CYP1A2 and affect concentrations of other medicines.

Remember

Only the prescribing professional should choose a formulation, dose, or change in treatment.

10. Guanfacine Extended Release



Supports prefrontal network regulation

Example

Intuniv (guanfacine ER), including generic extended-release products.

Mechanism

Guanfacine is an alpha-2A adrenergic receptor agonist. Activation of these receptors can strengthen regulation of prefrontal cortical networks. It does not work by directly increasing dopamine release like amphetamines.

A child-friendly analogy

Think of helping the brain’s “pause and plan” team communicate more clearly.

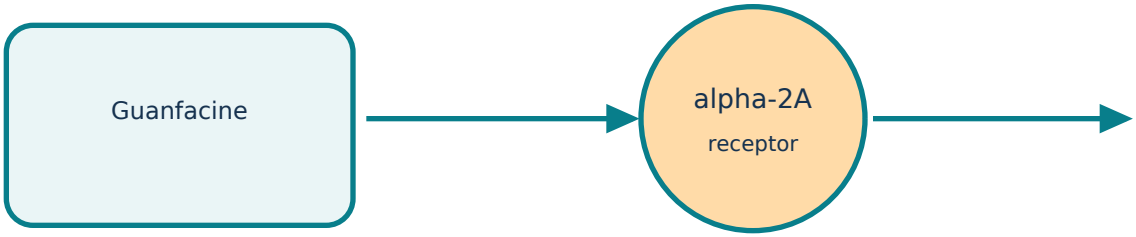
Possible benefits

May reduce hyperactivity and impulsivity and help some children with attention or emotional reactivity. It can be used alone or sometimes alongside a stimulant.

Safety

Sleepiness, dizziness, low blood pressure, and slow heart rate can occur. Stopping abruptly can cause rebound hypertension; tapering must be clinician-guided.

11. Clonidine Extended Release



Supports prefrontal network regulation

Example

Kapvay (clonidine ER), including generic extended-release formulations.

Mechanism

Clonidine stimulates alpha-2 adrenergic receptors and reduces sympathetic outflow; its ADHD effects involve regulation of noradrenergic signaling and associated networks.

Simple explanation

This medicine can help calm overactive signaling and support behavioral control for some children.

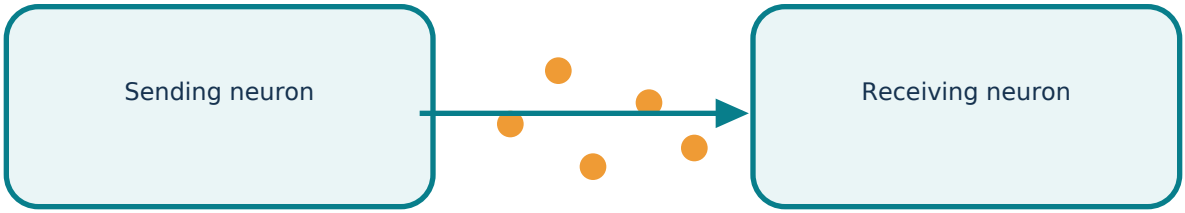
How it differs from guanfacine

Clonidine is less selective for alpha-2A receptors. Both can cause sedation and blood-pressure effects, but they are not dose-equivalent.

Safety

Monitor blood pressure, heart rate, sleepiness, and dizziness. Never stop suddenly without medical guidance because rebound hypertension can occur.

12. Which Brain Chemical Does Each Medicine Affect?



Dopamine / norepinephrine messages

Transporters help recycle chemical signals

A comparison to remember

Methylphenidate: blocks DAT and NET reuptake. Amphetamines: alter transporter function and release of dopamine and norepinephrine. Atomoxetine: blocks NET; also increases prefrontal dopamine indirectly. Viloxazine ER: modulates norepinephrine signaling, with additional mechanisms under investigation. Guanfacine ER: stimulates alpha-2A receptors. Clonidine ER: stimulates alpha-2 adrenergic receptors.

What about serotonin?

Serotonin influences mood and other functions, but standard ADHD medicines are not best described as simply “serotonin boosters.” Viloxazine has additional serotonergic receptor actions in preclinical studies, with uncertain contribution to clinical benefit.

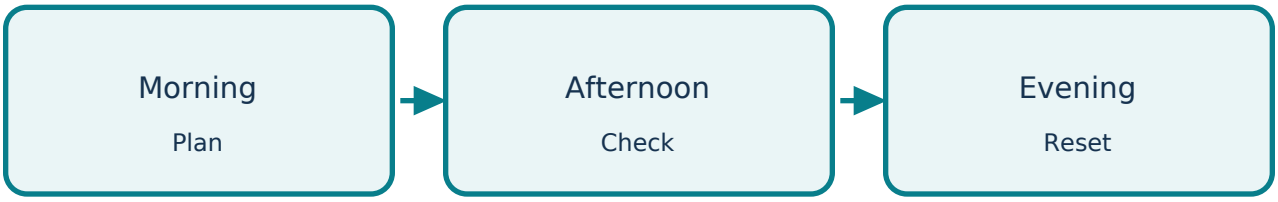
What about cortisol?

Cortisol is a stress hormone, not a primary treatment target for approved ADHD medicines. Medicines can influence sleep, stress, and physiology indirectly; they are not prescribed to “fix cortisol” in ADHD.

What about acetylcholine?

Acetylcholine also supports attention, but the approved medicines listed here are not primarily cholinergic treatments.

13. What Changes Might Families Actually See?



Small repeatable routines reduce memory load

Before treatment

A child knows the homework answer but cannot stay seated long enough to finish; an adult forgets to pay bills despite reminders.

With an effective plan

The person may pause before interrupting, finish more assignments, or manage a routine with fewer prompts.

What medicine does not do

Medicine cannot replace teaching, relationships, adequate sleep, or learning skills. It does not create intelligence, guarantee grades, or erase ADHD.

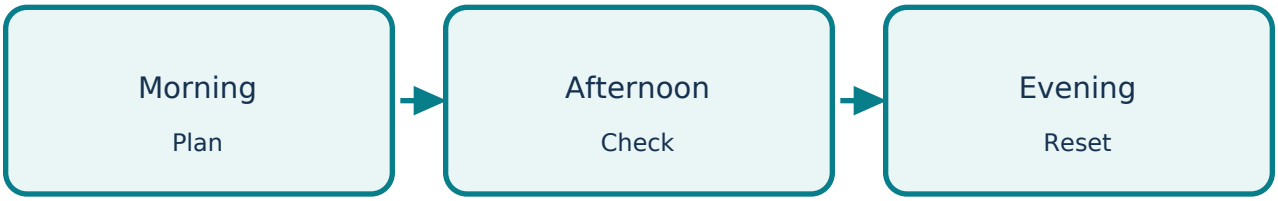
How to measure benefit

Choose two or three observable goals: assignments submitted, mornings completed on time, interruptions during class, or tasks completed without repeated reminders.

Individual response

Some people respond well to one class and poorly to another. Lack of benefit may call for reassessing diagnosis, sleep, comorbidities, dose, timing, adherence, or medication choice.

14. How Clinicians Choose and Monitor Treatment



Small repeatable routines reduce memory load

Diagnosis first

An ADHD evaluation considers childhood onset, symptoms in multiple settings, impairment, developmental history, and alternative explanations. Rating scales support but do not replace clinical assessment.

Medication selection

Age, symptom pattern, co-occurring disorders, family preferences, cardiovascular history, sleep, appetite, interactions, and misuse risk all matter.

Before and during medication

Clinicians commonly review personal and family cardiac history, blood pressure, pulse, height/weight in growing children, psychiatric symptoms, and other medications. ECG or labs are not universally required; order them when indicated.

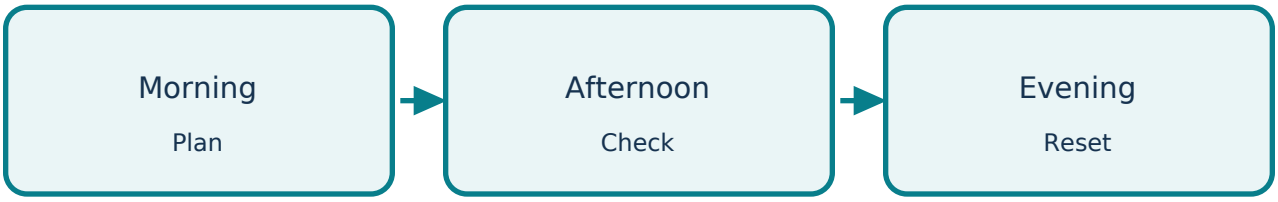
Follow-up

Monitor real-world function and adverse effects, not just whether the person “feels” a medicine working.

Urgent concerns

Chest pain, fainting, severe agitation, new psychosis, or suicidal thoughts warrant prompt medical attention. Seek emergency services for immediate danger.

15. Why Sleep, Food, and Movement Matter



Small repeatable routines reduce memory load

Sleep is brain maintenance

Poor sleep can worsen concentration, emotional regulation, and memory. A consistent schedule supports executive skills.

Food and hydration

Regular meals help with energy and routine. Some ADHD medicines reduce appetite, so clinicians may discuss meal timing and growth monitoring.

Movement

Age-appropriate physical activity can support mood, sleep, and overall functioning, though it does not replace indicated ADHD treatment.

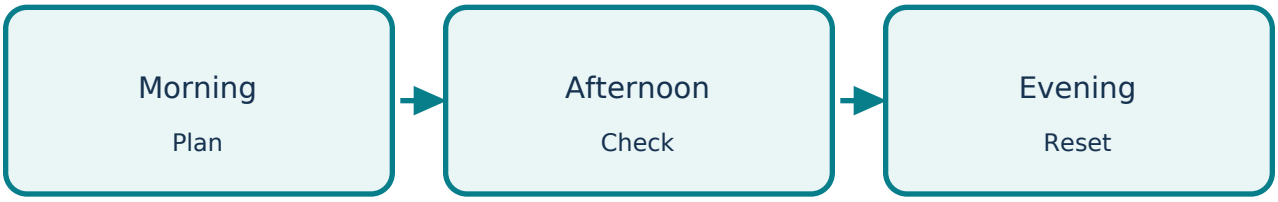
Stress

Stress can make planning and working memory harder. Supportive routines, predictable transitions, and breaks can reduce overload.

Screen habits

Reduce unnecessary notifications during homework or important work. Use a timer and a planned stopping point rather than relying only on willpower.

16. A Child-Friendly Executive Function Toolkit



Small repeatable routines reduce memory load

The 3-step mission

1. Pick one job. 2. Make the first step tiny. 3. Check off the result.

The backpack launchpad

Put your backpack, shoes, and water bottle in one place each night.

The traffic-light pause

Red: stop. Yellow: ask “what happens next?” Green: choose the helpful action.

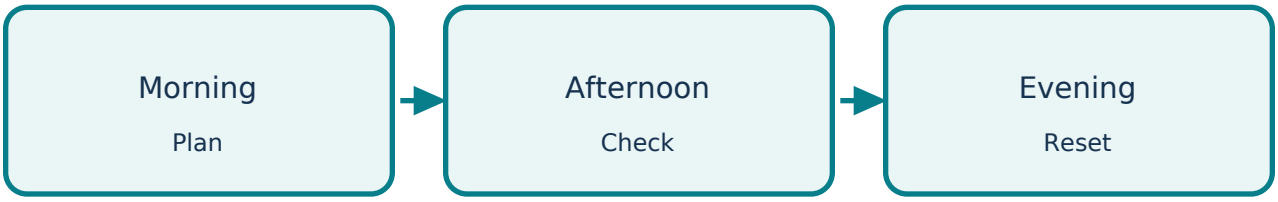
The five-minute start

Set a five-minute timer and begin. Starting is the goal; finishing everything at once is not.

Praise what works

Adults can say, “You used your checklist and remembered your folder,” rather than labeling a child careless or lazy.

17. For Teens and Adults: Make Time Visible



Small repeatable routines reduce memory load

Plan backward

For a project due Friday, choose what must happen Monday through Thursday.

Use one capture system

Keep tasks in one calendar or app, not on scattered scraps of paper.

Protect the first ten minutes

Start with a defined action: open the document, write the title, or gather materials.

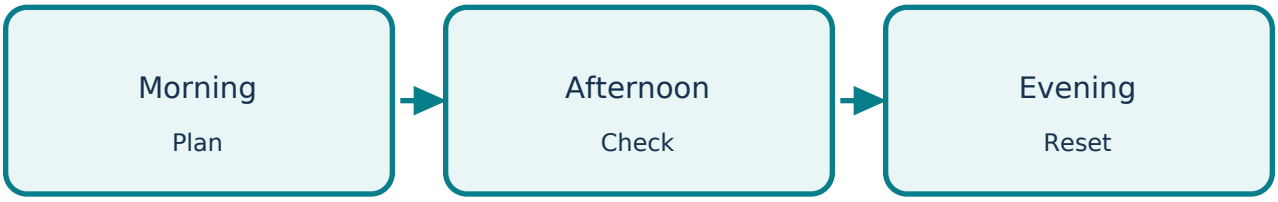
Build in recovery

Leave time for interruptions, meals, and breaks. A plan that requires perfection will be hard to maintain.

Review weekly

Ask: What helped? What was too complicated? What can be made simpler next week?

18. Therapy, Coaching, and School Supports



Small repeatable routines reduce memory load

CBT for ADHD

Structured cognitive behavioral therapy can teach organization, planning, task initiation, and ways to respond to discouraging thoughts.

Behavioral parent training

Parents learn clear instructions, predictable routines, reinforcement, and collaborative problem-solving.

School supports

Teachers can offer written directions, chunked assignments, visual schedules, check-ins, and reduced-distraction environments. In the United States, eligible students may receive Section 504 accommodations or an IEP.

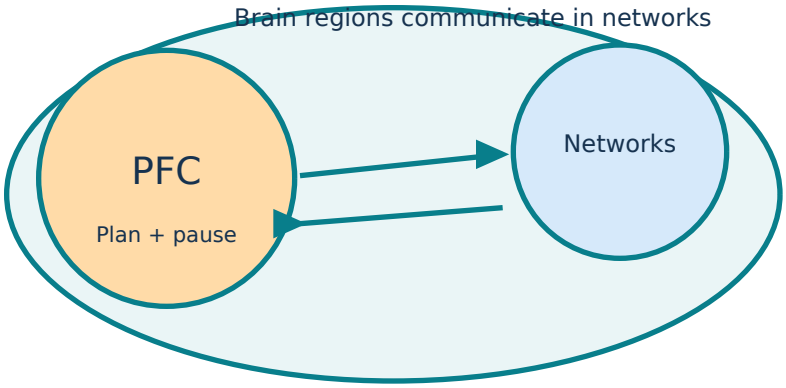
Coaching

Coaching may support accountability and routine-building, but it is not a replacement for medical assessment or evidence-based therapy.

Family message

The goal is to build independence with support, not to demand instant perfection.

19. Questions Kids and Families Often Ask



“Does ADHD mean my brain is broken?”

No. ADHD describes a pattern of differences in attention and self-regulation that can make some daily tasks harder.

“Will I need medicine forever?”

Not necessarily. Treatment is individualized and periodically reviewed with a clinician.

“Will medicine change who I am?”

The aim is to reduce impairing symptoms while preserving personality and wellbeing. Tell your clinician about feeling flat, irritable, or unlike yourself.

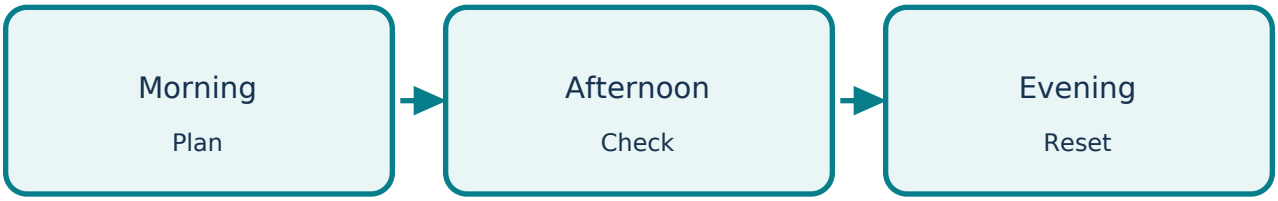
“Why can I play games but not do homework?”

Interesting tasks often provide immediate feedback and rewards, while homework may require more self-directed effort. This pattern is not proof of laziness.

“Can adults have ADHD?”

Yes. ADHD can persist into adulthood, although symptoms and coping methods may change.

20. Family Activity: Build a One-Week Experiment



Small repeatable routines reduce memory load

Choose one goal

Example: “Get to school with my folder four mornings this week.”

Choose one support

Example: a picture checklist beside the door.

Make it measurable

Put a check mark on the calendar for each successful morning.

Celebrate effort

Notice what helped, even if the week was imperfect.

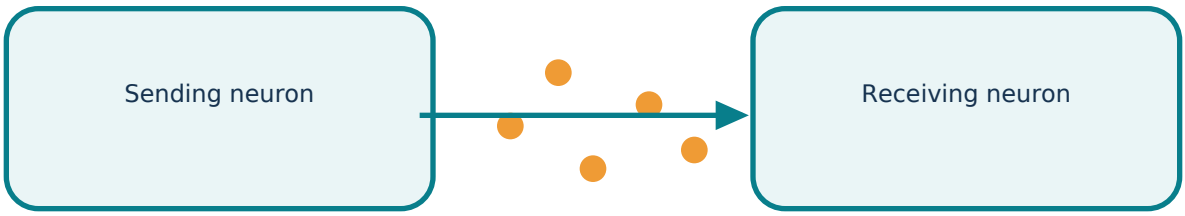
Review together

Keep the helpful strategy, change the difficult one, and ask for professional support when problems are persistent or impairing.

Remember

The best plan is understandable, practical, and kind.

21. Picture Dictionary: Words Made Easy



Dopamine / norepinephrine messages

Transporters help recycle chemical signals

Executive function

The brain’s skills for planning, starting, remembering, pausing, and finishing.

Neuron

A brain cell that sends or receives messages.

Synapse

A tiny communication gap between cells.

Neurotransmitter

A chemical messenger, such as dopamine or norepinephrine.

Receptor

A protein that responds to a chemical message.

Transporter

A protein that moves chemical messengers across a cell membrane.

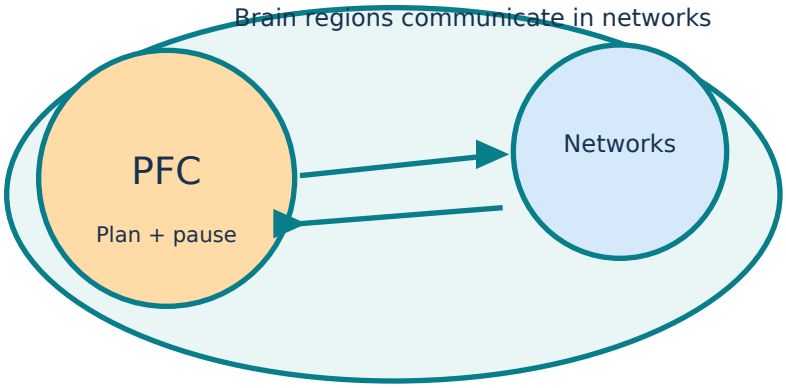
Reuptake

The process of moving released neurotransmitter back into a cell.

Stimulant / nonstimulant

Two broad medication categories with different pharmacological properties. Neither category is automatically best for every person.

22. Scientific References: How to Read Them



Why references matter

These sources explain what researchers have found, what is established, and where questions remain. Research on brain chemistry is more complex than any single picture.

Understanding the source types

A clinical guideline helps clinicians choose care. A randomized trial tests an intervention. A scientific review brings together many studies. FDA prescribing information gives product-specific warnings and approved indications.

A caution about diagrams

All brain and medication illustrations in this booklet are original educational schematics, not photographs of a particular person’s brain or exact images of medicine packaging.

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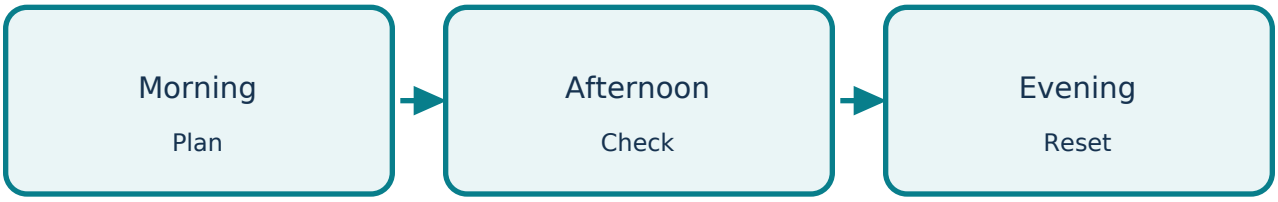
https://www.ed.gov/laws-and-policy/individuals-disabilities/section-504

Final Message: You Can Build Skills



Small repeatable routines reduce memory load

For children

Your brain can learn helpful routines. Asking for support is a strength.

For families

Be curious about what makes a task hard. Make the next step easier to see.

For adults

Use tools that reduce friction: reminders, checklists, schedules, and collaborative support.

For clinicians

Treat the person, not only the symptom score. Reassess function, tolerability, preferences, and diagnostic alternatives.

Educational disclaimer

This guide does not prescribe a medication, dose, or individual treatment. Medication labels and clinical guidance may change. Consult current official labeling and a qualified prescriber.