CLEVERINI SERIES

ATTENTION

PRACTITIONER GUIDE



Focus, distraction and daily practice

DAVID PETROSIAN MKERVALI

MINDCRAFT INC.

Attention

Practitioner Guidebook

David Petrosian Mkervali

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Author's preface

At school, I could be interested in a lesson and still lose track of it. A thought would lead me somewhere else, then another would take its place. By the time I returned to what the teacher was saying, I had missed something I needed to understand the rest.

It was tiring. I wanted to learn, but keeping my mind on the task could take more effort than the task itself. My memory was unreliable, too, and following a chain of reasoning was difficult when my attention kept breaking away from it.

My family worked in science and education. Growing up around that work shaped how I understood my difficulties. Learning was something we could examine and find better ways to support. My father was developing computer programs for training mental abilities, and the possibility of working on those abilities became important to me personally.

I began to wonder why the skills needed for learning received so little deliberate attention. A student might struggle through a subject for years without being helped to understand what was making it difficult. I wanted education to make room for that question.

This became a central concern of my doctoral research. I argued that the abilities underlying learning should receive attention early, before we place increasingly complicated demands on them. Attention was especially important to me because I knew how much could go wrong when I couldn't stay with what I was doing.

With the help of learning tools and a better understanding of my own difficulties, I gradually caught up. It took work. I had to keep returning to things that were hard for me, and progress was uneven. Still, the experience changed what I believed was possible for myself.

That is the experience I bring to this book.

Perhaps you recognize something of yourself in it. You may find yourself rereading a page because your thoughts were elsewhere, or struggling to finish work you genuinely care about. You may be reading on behalf of a child whose curiosity is much easier to see than their ability to sit through a lesson.

I want this guide to give you something useful to do with those difficulties. We will look at attention closely enough to understand what we are asking of it, then work with practical methods you can try in your own circumstances.

Give yourself a specific reason to practice. Perhaps you would like to follow a conversation without repeatedly losing the thread. Or there is a piece of work you keep abandoning halfway through. Keep that situation in mind as you read. It will help you decide which exercises deserve more of your time.

Cleverini, our free educational platform, provides another place to practice through games. The work also belongs in the ordinary situations where you need your attention. Try a method while studying.

Notice what happens when you use it during a difficult task. Adjust it when it doesn't fit.

I believe people should have access to this kind of support regardless of what they can afford. I was fortunate to grow up around people who took learning seriously and helped me find ways forward. I would like these books to make some of that help available to others.

There is no need to rush through the pages. I would be happier to know that you spent time with one exercise and found it useful than that you finished the whole book without trying anything. Begin with a difficulty you recognize, and give yourself time to work on it.

David Petrosian Mkervali

How to Use This Book

THIS BOOK IS ABOUT one skill of the mind, attention. **It is one book in a series on the core skills of the mind**, and the other books cover memory, intellect and creativity. Each book can be read on its own.

> **Key Concept:**
>
> Core skills of the mind. The four skills this series covers are **memory, attention, intellect and creativity**.

Core skills of the mind



The book is organised in nine modules, and each one builds on the one before it.

1. Foundations of Attention
2. How Attention Works with Memory, Intellect and Creativity
3. Core Techniques for Training Attention

4. Practical Attention Exercises
5. Attention in Context
6. Overcoming Attention Challenges
7. Technology and the Attention Economy
8. Attention and Lifestyle
9. Attention Practitioner Levels

The first module explains what attention is and how the brain handles it. **Module 2 shows how attention works with memory, intellect and creativity.**

Modules 3 to 8 turn these ideas into practice. They cover your desk, your work, other people, your phone and how you sleep, move and eat. **Module 9 lets you check your own level** and plan what to work on next.

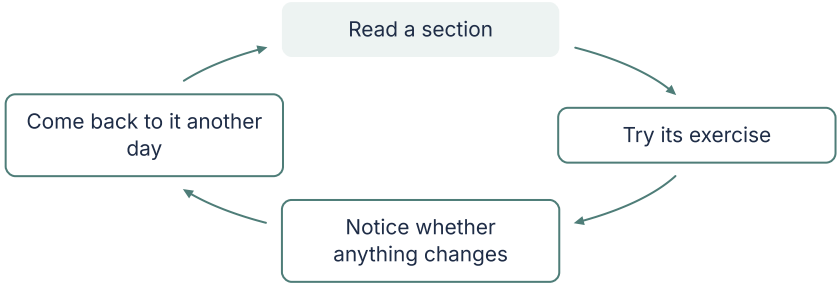
A few boxes appear again and again, and each has one job. A Science Says box gives a research finding with its source. A Key Concept box defines a term in a sentence or two. An Exercise box gives you steps to try.

Each section also ends with a Key idea line that sums up its main point. Some sections add a quick check with a few short questions.

The book is built on research and names where each claim comes from. When the evidence is weak or mixed, the section says so, and you can decide how much weight to give it.

You need **no background** to start. Read one section, then try its exercise before you move on. Notice whether anything changes over the next few days, and come back to the section if it doesn't.

Read, try, notice, come back



Attention grows with practice, so a method tried once tells you little. Pick one exercise and use it for a week where you most need focus. Then decide whether to keep it, change it or try another.

Key idea:

Read a section, try its exercise, and give each method a fair week of practice.



Module

1

Foundations of Attention



1.1 How Attention Has Been Understood

1.1.1 Contemplative Traditions and the Training of Focus

People were training their attention **two thousand years before anyone had a brain scanner**. How did they do it, and what were they hoping for?

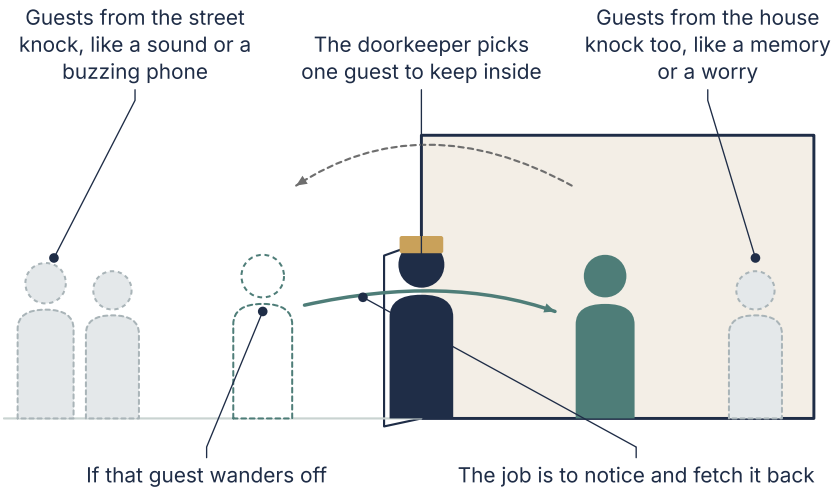
> **Exercise:**
>
> A ten-second test. I want you to try this before you read on. Pick one word, such as "calm", and hold it in mind for ten seconds. You may find that **another thought slips in** before the time is up. A noise or a thought about lunch pushes the word aside. The old

teachers knew this problem well, and they built whole practices around it.

Attention works like **a doorkeeper at the door of a small room**. The room is where your thinking happens. Guests from the street knock, like a sound or a buzzing phone. Guests from the house knock too, like a memory or a worry.

The doorkeeper picks one guest to keep inside. If that guest wanders off, the job is to **notice and fetch it back**. Many old texts describe practice the same way. Pick one thing, notice when the mind drifts, and bring it back.

Notice and fetch it back



We know these methods **from old texts, written long before any lab tests**. The texts tell us what each tradition taught and what it hoped for. Whether the methods work is a question for the lab, and the lab came much later.

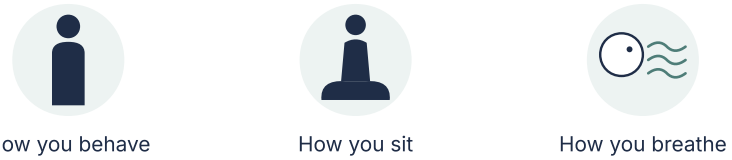
Eastern Paths: India, Tibet, China and Japan

> **Key Concept:**
>
> Concentration. The oldest advice on attention is to **hold the mind on one thing**. In India, Patañjali wrote the *Yoga Sūtras*, an old book of short teachings on yoga. One step of practice in it means tying attention to a single object. Its name is *dhāraṇā*, and in English it is usually given as concentration.

The goal is a mind gathered on one point, a mind that stays put and **stops jumping around**. The book's word for this goal is *ekāgratā*, which means a mind on one point.

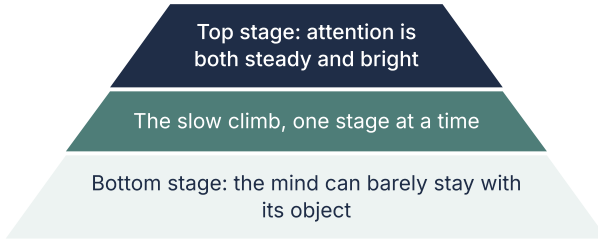
That step is **one part of a longer path**. The path also covers how you behave, how you sit and how you breathe (Bryant, 2009). Focus sits inside a whole way of living, next to good habits and a still body.

One part of a longer path



> **Key Concept:**
>
> Calm abiding. Tibetan teachers mapped the slow climb toward a mind on one point, **one stage at a time**. Their practice is *śamatha*, which means calm abiding, or resting calmly. At the bottom stage, the mind can barely stay with its object. At the top, attention is both steady and bright (Wallace, 2006).

Calm abiding, one stage at a time



Tibetan teachers call the practice śamatha, which means calm abiding (Wallace, 2006).

Think of learning to ride a bike. At first you wobble and often put a foot down. Then you ride a little further each time, until **balance feels easy**. The Tibetan map of calm abiding describes a climb like that, from a mind that keeps falling off its object to one that stays on with little effort (Wallace, 2006).

The author practises calm abiding himself. His book tells how the tradition describes the stages, **without testing whether they are real**.

One early Chinese text is called the *Nei-yeh*, a title that means Inward Training. It gives advice on breathing, on how to hold your body and on **stilling the mind** (Roth, 1999).

Two Chinese schools of thought, the Confucians and the Daoists, valued **effortless action**, which they called *wu-wei*. It is the ease of someone so skilled that the work seems to do itself (Slingerland, 2003). Picture a pianist whose fingers seem to find the notes on their own.

> **Science Says:**
>
> Chinese writers described effortless action long before anyone measured it. It sounds a lot like **what scientists later called flow**, a state of attention so deep that you get lost in the task and it feels easy (Csikszentmihalyi, 1990). That compares two goals. It does not show that the practices train attention.

Careful attention, **full of respect**, was the teaching of Zhu Xi, a later teacher who gave Confucius's old ideas new life. He called it *jing*, and he paired it with "quiet sitting" (Zhu, 1990).

Early Chinese schools



Inward Training: stilling the mind



Effortless action: a pianist whose fingers find the notes



Careful attention, full of respect, with quiet sitting

Chan Buddhism, a Chinese school of Buddhism, moved from China to Japan, **where it became Zen**. Historians still work to tell its old stories apart from what really happened (McRae, 2003).

For the practice itself, the main Japanese source is the teacher Dōgen. His manuals teach seated meditation, called *zazen*. They show how to sit, and they ask for **"just sitting"**, which means sitting and doing nothing else (Bielefeldt, 1988).

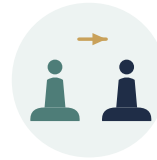
Eastern paths of focus



India: tying attention to a single object (Yoga Sūtras)



Tibet: calm abiding, a climb one stage at a time



China: Chan Buddhism, which moved to Japan and became Zen



Japan: Dōgen's seated meditation, "just sitting"

Each tradition had its own goal and its own method for training attention.

Western and Middle Eastern Paths: Stoic, Christian, Sufi and Jewish Practice

> **Key Concept:**
>
> Attention to oneself. The Stoic thinkers of Greece and Rome **kept a watch going all day**. They called it attention to oneself, or *prosochē*. It was a daily "spiritual exercise", something they did every day and not now and then (Hadot, 1995).

The watch covered their own judgements, the quick opinions they formed about events, and the present moment. That way they could **catch an angry or scared thought** before it ran off with them. Imagine someone pushes in ahead of you. The Stoic move is to spot the first hot thought, "How rude!", while it is still small.



The Stoics called this watch attention to oneself, a daily exercise (Hadot, 1995).

A thought is easiest to handle when it is small, like a spark before it becomes a fire. The Stoic watch was **a habit of catching the spark** in your own judgements, all day long (Hadot, 1995).

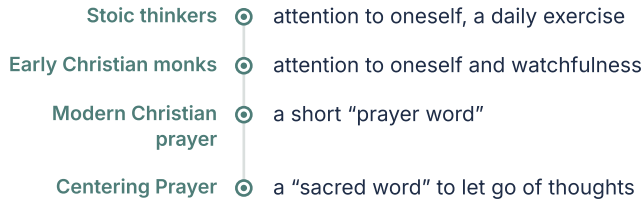
Early Christian monks **kept up the Stoic habit**. Among them were the Desert Fathers, who lived in the desert, and the monk Evagrius. They used the same word, *prosochē*, and they added *nepsis*, which means watchfulness, to guard their own thoughts (Graiver, 2018).

> **Science Says:**
>
> When thoughts pushed in without being asked, early Christian monks called them attacks by demons. To one historian, that demon talk was **an early theory of distraction** and unwanted thoughts (Graiver, 2022). That is her reading of the old texts, and nobody tested it.

Modern Christian prayer still draws on these sources. One scholar who practises it ties it back to watchfulness and **a short "prayer word"** (Laird, 2006).

> **Key Concept:**
> A sacred word. The best-known modern method of Christian prayer is Centering Prayer. It uses a "sacred word" as **a gentle signal to let go of thoughts** (Keating, 2006). When a thought comes, the word is a soft cue to set the thought down and return.

From the Stoics to Centering Prayer



There is no single word for meditation in Islam. Sufism, the inner side of Islam, has practices that **train the heart and attention**. One is remembrance, called *dhikr*, which means repeating words from the Qur'an or God's names.

Murāqaba is a quiet focus on God's presence, done without any words at all. *Sama'* is **listening as a kind of meditation**.

The tradition says these practices all aim to **free you from a false picture of yourself** (Kugle, 2021; Schimmel, 1975). Those are the tradition's own aims, and no study here tells us what the practices do for attention.

Three Sufi practices



Murāqaba: a quiet focus on God's presence, done without any words



Samaʿ: listening as a kind of meditation



Remembrance (dhikr): repeating words from the Qur'an or God's names

> **Key Concept:**
>
> Many paths, one move. A breath, a word, a name of God, a sacred word in prayer. Each tradition gives **one thing to come back to**, and each one asks you to notice when the mind has left it.

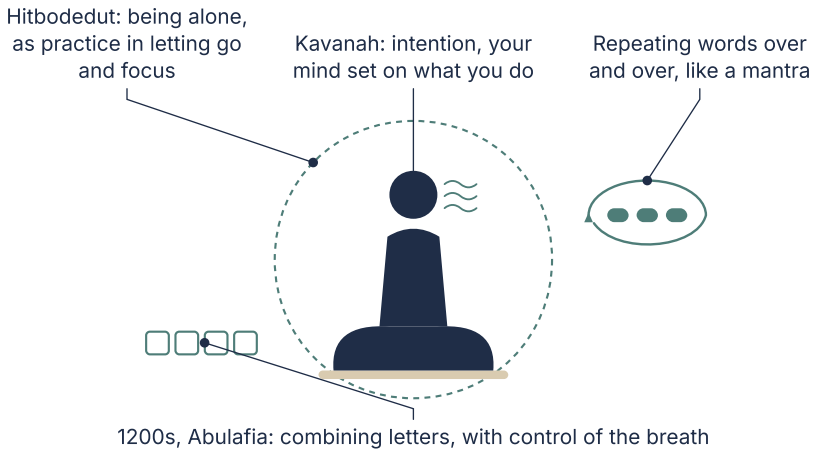
In Jewish practice, **letters and breath became tools for focus**. In the 1200s, Abraham Abulafia, a teacher of Kabbalah, the Jewish inner tradition, taught methods of combining letters. He joined them with control of the breath and focusing the mind (Idel, 1988).

Later Jewish writers looked for **focus in being alone**. Writing from a few hundred years ago describes *hitbodedut*, which means being alone, as practice in letting go and focus. It describes *perishut*, which means keeping apart from the world, the same way (Koch, 2023).

> **Science Says:**
>
> One scholar argues that *hitbodedut*, being alone, was **a three-step meditation done alone**. Its aim was *devekut*, which means holding close to God (Weil, 2024). That is one scholar's view, and it is not settled.

A popular guide for people who practise covers being alone and *kavanah*, which means intention, or having your mind set on what you do. It also covers **repeating words over and over**, like a mantra, a word said again and again in meditation (A. Kaplan, 1995). The guide describes what the tradition teaches and does not measure any effect on attention.

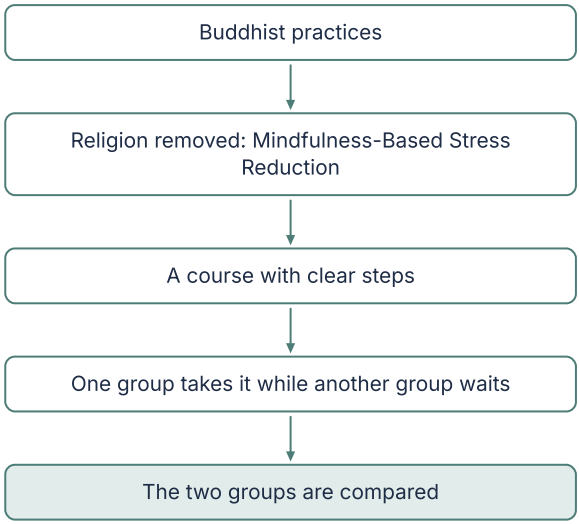
Jewish paths of focus



From Tradition to Clinic and Lab

In the late 1900s, a new course took Buddhist practices and **removed the religion**. Jon Kabat-Zinn built it and called it Mindfulness-Based Stress Reduction, or MBSR. Being mindful means keeping your mind on what is happening now. It centres on tasks such as the body scan and watching your breath (Kabat-Zinn, 1990, 2003).

From tradition to clinic and lab



Each step takes the practice further from religion and toward a controlled test (Kabat-Zinn, 1990, 2003).

> **Key Concept:**
>
> The body scan. In the body scan, you **move your attention slowly through the body**, region by region. You notice what you feel without trying to change it (Kabat-Zinn, 1990).

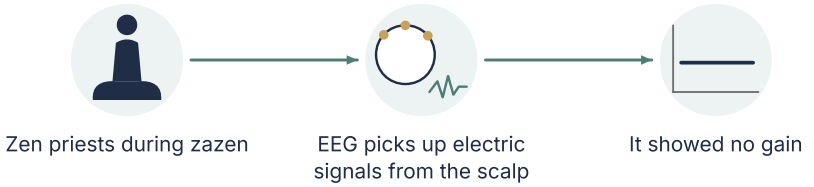
Once a practice was a course with clear steps, **people could test it**. That makes it fair to ask what the lab has found, for the course and for the older practices too.



Many cultures found ways of training attention, each with its own word for the practice.

Zen is one of the few traditions studied in the lab, **always in small studies**. In the 1960s, researchers recorded Zen priests' brain waves during *zazen*. They used EEG, which picks up electric signals from the scalp. It matters as history, though it showed no gain (Kasamatsu & Hirai, 1966).

Zen priests in the 1960s lab



Science Says:

A team studied 13 people who did Zen often and 13 similar people who didn't. In those who didn't, **two things dropped with age**, as expected. One was grey matter, the brain tissue where much thinking happens. The other was the score on a computer test of staying focused. In the Zen group, neither clearly dropped (Pagnoni & Cekic, 2007).

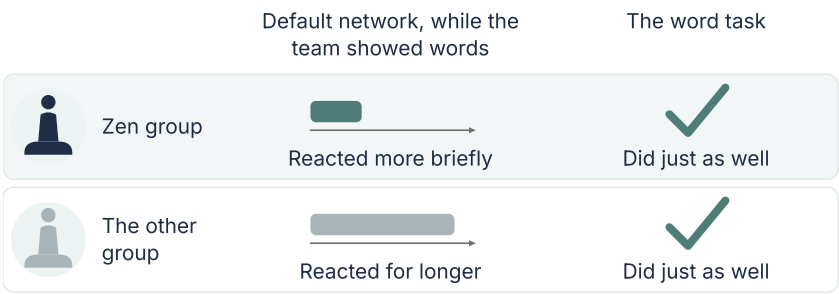
This is the only study here that tested attention with a task. It looked at two small groups once, so **it can't show the cause**. One look cannot tell whether Zen kept the scores up or whether people who keep their scores are the ones who stay with Zen.

People at a gym are often fit. The gym may make them fit, or fit people may like going to gyms. **One look at the gym can't tell you which**, and one look at the Zen group can't either.

> **Key Concept:**
>
> The default network. Some parts of your brain **get busy whenever your mind drifts off**, say to lunch. Scientists call them the default network.

The default network works a bit like a screensaver that comes on when you stop working on a task. The same team showed words to people during seated meditation. In the Zen group, the default network **reacted more briefly**. Even so, both groups did just as well as each other on the word task (Pagnoni et al., 2008).

Zen in the lab

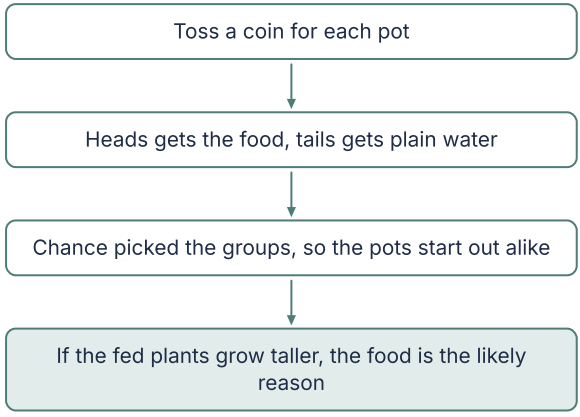


Two small groups, one word task (Pagnoni et al., 2008).

> **Key Concept:**
> A controlled test. In a controlled test, chance decides who trains and who does not, and then the two groups are compared. None of the three Zen studies above is **a controlled test of attention training**.

Say you want to know if a plant food works. You toss a coin for each pot. Heads gets the food, tails gets plain water. Because **chance picked the groups**, the two sets of pots start out alike. If the fed plants grow taller, the food is the likely reason. A controlled test of attention training works the same way.

A controlled test, like a plant food test



> **Science Says:**
> Christian prayer has been tested **only in a few small studies**. A six-week Centering Prayer class was tried on nine people. There was no group to compare with. Their scores for stress and worry fell, but we can't tell why (J. Fox et al., 2016).

A small trial split college students by chance into two groups. One did a non-religious “centering meditation”, and the other waited. The first group said they felt less stress than the waiting group (Dorais & Gutierrez, 2021). Neither of these two studies **measured attention with a task** of any kind.

Two small studies of prayer and centering

Study	Group to compare with	What fell
Six-week Centering Prayer class, nine people (J. Fox et al., 2016)	No group to compare with	Scores for stress and worry
College students split by chance (Dorais & Gutierrez, 2021)	A group that waited	Stress, compared with the waiting group

What fell in both studies was stress; neither one measured attention.





What the traditions teach comes from their own texts. The few lab studies are small. None of them is a controlled test of attention training.

Common Threads: What Modern Science Takes from the Traditions

Scientists sort these practices into **two simple kinds** (Lutz et al., 2008). In focused-attention meditation, the doorkeeper keeps one chosen guest in the room. When that guest drifts out, the doorkeeper brings it back. In open-monitoring meditation, you notice guests come and go without letting any take over.

Focused-attention practice keeps your attention on one chosen object, moment by moment. To do that, it works **three small skills** (Lutz et al., 2008). You keep watch for distractions without losing your focus. You let go of a distraction without following it. Then you bring your focus straight back to the object.

Two kinds of meditation

	Focused attention	Open monitoring
The doorkeeper	Keeps one chosen guest in the room	Notices guests come and go
Three small skills	Keep watch, let go of a distraction, bring your focus straight back	Notice whatever comes up without reacting to it
It is like	Keeping the hose on one plant	Sitting by a road and watching cars go past

Each row shows the two kinds side by side (Lutz et al., 2008).

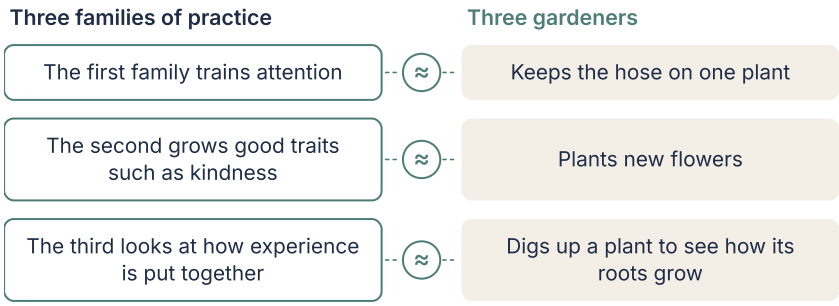
Open monitoring works another way. You notice whatever comes up, such as sounds, feelings in the body and thoughts, **without reacting to it** or getting carried off by it (Lutz et al., 2008; Dahl et al., 2015). It is like sitting by a road and watching cars go past without climbing into any of them.

Key Concept:

Three families. A wider scheme sorts practices into **three families** (Dahl et al., 2015). The first family trains attention. The second grows good traits such as kindness. The third looks at how experience is put together.

Picture a garden. One gardener learns to **keep the hose on one plant**. Another plants new flowers. A third digs up a plant to see how its roots grow. The three families of practice differ in the same way.

Three families, three gardeners



Each gardener is like one family of practice (Dahl et al., 2015).

Science Says:

Studies of meditation often **describe practices loosely**, use weak groups to compare with and lean on what people say about themselves (Davidson & Kaszniak, 2015).

A loose description is like a recipe that says “add some spice”. Two cooks can follow it and make **very different dishes**. Two studies of “meditation” can likewise test very different practices.

Where meditation studies are weak



Practices described loosely, like a recipe that says “add some spice”



Weak groups to compare with

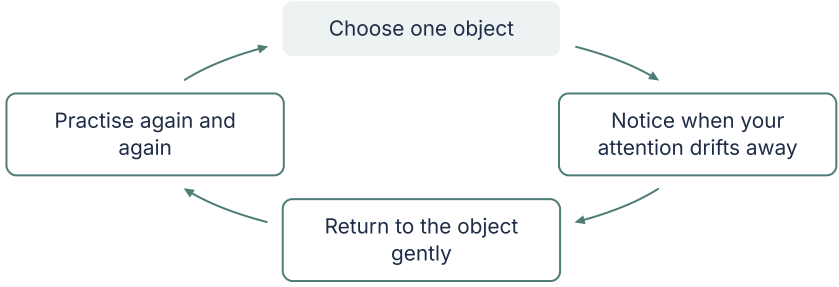


Leaning on what people say about themselves

> Definition:
>
> **MEDITATION:** methods people use on themselves to change from the inside (Eifring, 2013).

This plain meaning comes from **a book that compares many traditions** (Eifring, 2013). It sets meditation apart from prayer and ritual. Across all these texts, the same few moves keep turning up.

The same few moves





The same moves turn up again and again in the old texts. They were taught long before anyone measured them. You choose, you notice, you return.

- Choose one object, such as a breath, a word, a sacred name or your judgements.
- Notice when your attention drifts away.
- Return to the object gently, without drama.
- Practise again and again, often every day.
- Expect to get better in stages, a little at a time.

> **Exercise:**
>
> Three-minute return practice.
>
> 1. Sit comfortably and choose one object, such as your breath.
> 2. Set a timer for three minutes and rest your attention on the breath.
> 3. Each time you notice that your mind has drifted, gently bring it back, without scolding yourself.

4. When the timer ends, write down roughly how many times you came back.

Each return is **the move these traditions practise**. A high count means you noticed often.

Table 1.1: Contemplative traditions and the training of focus

Tradition	What the training was for	Main methods	Main source
India (Yoga Sūtras)	A mind gathered on one point, as part of a wider path	Tying attention to one object (dhāraṇā)	Bryant (2009)
Tibetan Buddhism	Attention that stays put and is bright, reached in stages	The stages of calm abiding (śamatha)	Wallace (2006), a text by someone who practises
Stoicism (Greece and Rome)	Watching your own judgements and the present moment	Attention to oneself (prosochē) as a daily exercise	Hadot (1995)
China (Daoist and Confucian)	A still mind; easy skill that seems to do itself; careful, respectful attention	Breathing and how you hold your body (Inward Training); effortless action (wu-wei); careful attention (jing) and quiet sitting	Roth (1999); Slingerland (2003); Zhu (1990)
Chan and Zen	"Just sitting" with an upright back	Seated meditation (zazen)	McRae (2003); Bielefeldt (1988)
Christian monks and Centering Prayer	Watching over thoughts; letting thoughts go	Attention to oneself, watchfulness (nepsis); a sacred word or prayer word	Graiver (2018); Laird (2006); Keating (2006)
Sufism	Freeing the self from a false picture of itself	Remembrance (dhikr), wordless focus on God's presence (murāqaba), listening (samaʿ)	Schimmel (1975); Kugle (2021)

Tradition	What the training was for	Main methods	Main source
Jewish traditions	Letting go, focus, holding close to God	Combining letters, breath; being alone (hitbodedut), intention (kavanah), repeating words	Idel (1988); Koch (2023); Weil (2024)
Non-religious mindfulness (MBSR)	Less stress, with no religious frame	Body scan, watching the breath	Kabat-Zinn (1990, 2003)

Key idea:

We know a lot about what these traditions taught. We know very little, from experiments, about what the practices do for attention.

Quick check:

1. What are the two simple kinds of meditation? Answer: Focused attention, where you keep one chosen object and bring the mind back, and open monitoring, where you notice what comes and goes without letting it take over (Lutz et al., 2008).
2. Why can the study of 13 Zen practisers not show that Zen caused the difference? Answer: It looked at two small groups only once.
3. Which moves turn up again and again in the old texts? Answer: Choose one object, notice when attention drifts, return gently, practise often and expect to improve in stages.

1.1.2 From William James to Modern Attention Research

You are at a noisy party. Everyone is talking at once, music is playing and glasses clink. Then **someone across the room says your name**, and you hear it. How did your name get through all that noise?

Scientists have puzzled over this for **more than a hundred years**, and the first step was a definition.

A definition of attention opens William James's chapter on it. James was a scientist of the mind. "Every one knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought" (James, 1890).

The party puzzle



> **Key Concept:**
>
> Picking one out of many. In plain words, **attention means picking one thing out of many**. People still quote James's words. Every study since then asks how the picking works and what the picking costs.

Think of the moment you look for your keys on a messy table. Your eyes pass over a pen and a cup, and then the keys **seem to jump out**. You picked one thing, and the rest faded. James was describing that everyday act.

Picking one thing out of many



A pen



A cup



The keys seem to jump out

One cost showed up during the Second World War. People watching radar screens sat through long shifts. They looked for rare blips. The longer they watched, **the more blips they missed**.

Norman Mackworth turned that job into a lab test. It was called **the "clock test"**. A pointer ticks around a dial, one step at a time. Now and then, it jumps two steps.



The person watching has to spot each double jump. It sounds easy. Yet as time goes on, **people spot fewer and fewer** (Mackworth, 1948).

The vigilance decrement



A lifeguard scanning the water has the same kind of job (Mackworth, 1948).

> 🗝 **Key Concept:**
>
> The vigilance decrement. A lifeguard scanning the water and someone checking a long document for mistakes have **the same kind of job**. Each one watches for rare things over a long time. Scientists call the drop that Mackworth found the vigilance decrement, which means a drop in watchfulness.

The Cocktail Party and the Filter Debate (1950s–60s)

The party puzzle went into the lab next. Colin Cherry played people **two spoken messages at once**. One message went into the left ear. A different one went into the right ear.

This setup has a name, dichotic listening, which means a different sound in each ear. People had to say one message out loud as they heard it. **They did that well.**

> **Science Says:**
> In a two-voice test, people heard a different message in each ear and repeated one of them out loud. From the ear they were not repeating, people caught **only the sound of the voice**. They usually noticed if a man's voice there turned into a woman's. They noticed if it became a tone. They missed the words, even when the words switched to German (Cherry, 1953).

What got through the other ear

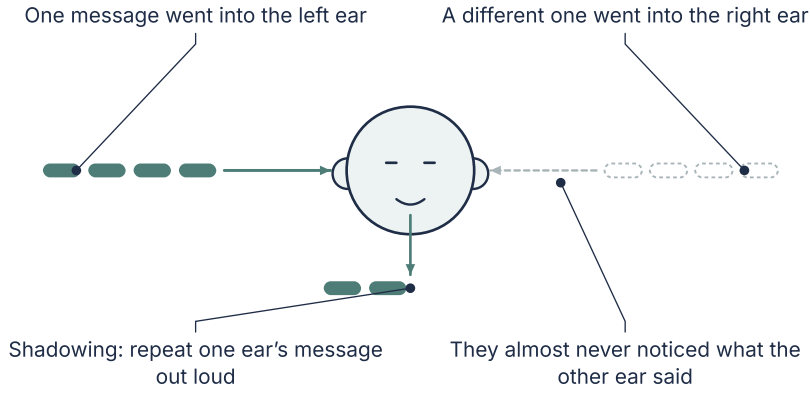
Usually noticed	Missed
⊕ A man's voice turning into a woman's	⊖ The words
⊕ The voice became a tone	⊖ Even when the words switched to German

The other voice stayed out for a reason, according to Donald Broadbent. Picture **a strict doorkeeper** at the door of your mind. It lets in one voice and checks only simple things, like which ear or which voice. This idea is called early selection (Broadbent, 1958).

> **Key Concept:**
> Early selection. Early selection means the choice comes early, **before the meaning of the words**. Only where the sound came from counts. What the sound says plays no part.

Listeners in Neville Moray's tests repeated one ear's message out loud, like in Cherry's test. This is called shadowing, because you follow the voice like a shadow. They **almost never noticed what the other ear said**.

Shadowing



> **Science Says:**
>
> One thing sometimes got through from the ignored ear. It was **their own name** (Moray, 1959). Across Moray's study and a later one, about a third of listeners said they heard their own name in the message they were not following (Conway, Cowan & Bunting, 2001). Nothing from that ear was supposed to get in, so early selection could not explain it.

A softer doorkeeper came from Anne Treisman. It lets the other voices in, but only as a soft murmur. Every word has **its own doorbell**. The bell rings once enough sound reaches it. Very important words, like your name, have extra-sensitive bells. Even a murmur can ring them.

Moray's test of the strict doorkeeper

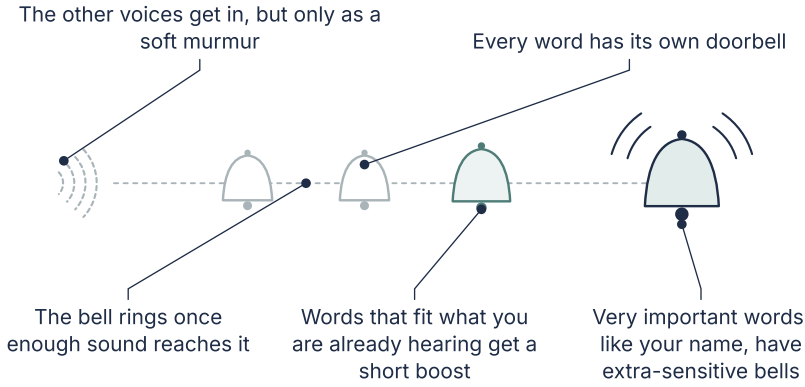
Hypothesis	Test	Result
Early selection: nothing from the other ear is supposed to get in	Shadowing: listeners repeat one ear's message out loud	Their own name sometimes got through; early selection could not explain it

About a third of listeners heard their own name (Conway, Cowan & Bunting, 2001).

> **Key Concept:**
>
> Attenuation. Attenuation is an old word for **turning a sound down**. Here it means the voices you are not following still get in, only more weakly (Treisman, 1960, 1964).

Words that fit what you are already hearing get **a short boost**. Say you hear "peanut butter and...". Your brain is already waiting for "jelly". That word gets through more easily (Treisman, 1960, 1964).

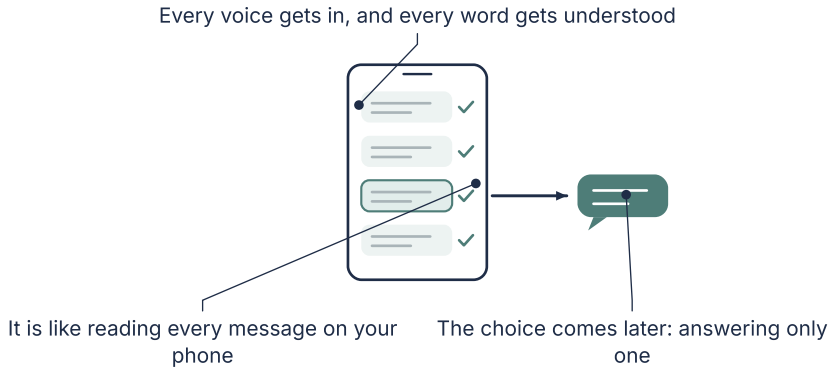
Treisman's doorbells



A third answer **moved the choice even later**. J. Anthony Deutsch and Diana Deutsch said every voice gets in, and every word gets understood.

The choice comes later, when you decide what to act on. It is like reading every message on your phone and answering only one.

Late selection



> **Key Concept:**
>
> Late selection. Late selection is the idea that the choice comes **after the meaning of the words**, once every word is understood (Deutsch & Deutsch, 1963).



The strict doorkeeper is early selection. The soft doorkeeper is attenuation. The last one lets everyone in, which is late selection. Unlike a door, the brain may filter at several points.

Real brains are messier than one door, though. A door decides once for each guest, while the brain may filter at several points at once. In daily life, you take in **little from voices you are not following**. Your name, and words that fit what you expect, can still slip through.

The filter debate, side by side

	Broadbent (1958)	**Treisman** (1960, 1964)	**Deutsch & Deutsch** (1963)
Name	Early selection	Attenuation	Late selection
The doorkeeper	Strict: lets in one voice	Soft: lets other voices in as a murmur	Lets every voice in
When the choice comes	Before the meaning of the words	Important words can still ring a bell	When you decide what to act on
Your own name	Could not explain it	Extra-sensitive bell	Understood with every word

Each answer moved the choice to a different point.

> **Exercise:**
>
> Two-voice test.
>
> 1. Play two talk recordings at the same time, one from your phone and one from a laptop.
> 2. Follow only one of them for two minutes.
> 3. Stop and write down everything you remember from the other one.

Notice **how little got through** from the voice you did not follow, and whether anything did, such as a name.

From Limited Effort to Brain Networks (1970s–today)

The filter debate was about where the brain blocks things out. Daniel Kahneman changed the question. He asked **how much attention there is to go around**.

> **Key Concept:**
>
> Attention as effort. Daniel Kahneman saw **attention as effort**. You only have so much. Doing two jobs at once means each job gets less. Scientists call this capacity or resource theory (Kahneman, 1973). Capacity means how much something can hold. A resource is something you can run out of.

Effort works like pocket money. Say you have ten coins for the day. Spend seven on lunch, and only three are left for the bus and a drink. Kahneman's idea works the same way. **Two jobs share one limited amount of effort**, so the more one takes, the less is left for the other (Kahneman, 1973).

Kahneman changed the question

The filter debate	Capacity or resource theory
Where the brain blocks things out	How much attention there is to go around
A doorkeeper that filters	Limited effort: doing two jobs at once means each job gets less

He saw attention as effort, and you only have so much (Kahneman, 1973).

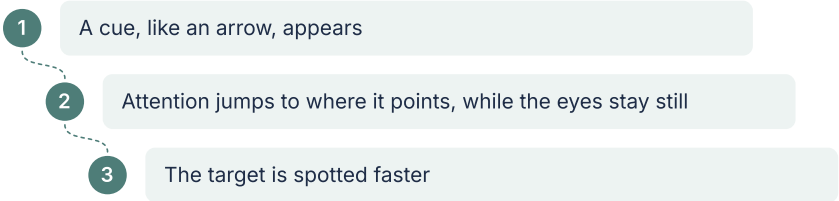
I want you to try a hard sum in your head while someone tells you a story. You may lose the thread of the story, or the sum. Both jobs draw on **the same limited effort**, so each one gets less.

The next puzzle was where attention moves. Michael Posner showed people a cue, like an arrow, before a target appeared. People **spotted the target faster** when it came where the arrow pointed.

> 🗝 **Key Concept:**
>
> Covert orienting. People spotted a cued target faster even when their eyes stayed still. Attention can jump to a spot **without the eyes moving**. Scientists call this hidden jump covert orienting, which means moving attention without moving your eyes (Posner, 1980).

You do this when you keep looking at your teacher while you pay attention to a friend at the side. Your eyes stay put, and your attention **moves to the side**.

Covert orienting

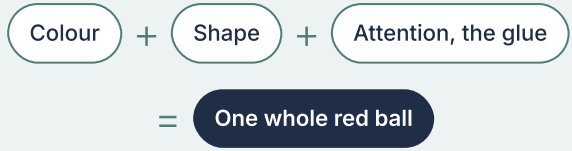


The eyes stay put; only attention moves, and the target is still spotted faster (Posner, 1980).

> **Science Says:**
> Once attention lands on something, it has a job to do. Look at a red ball. Anne Treisman and Garry Gelade suggested the brain takes in colour and shape separately. Attention **glues them into one whole ball** (Treisman & Gelade, 1980).

Without attention, details can be mixed up or missed. In a rushed glance at a busy street, you might not be sure **which colour belonged to which coat**.

Attention as glue

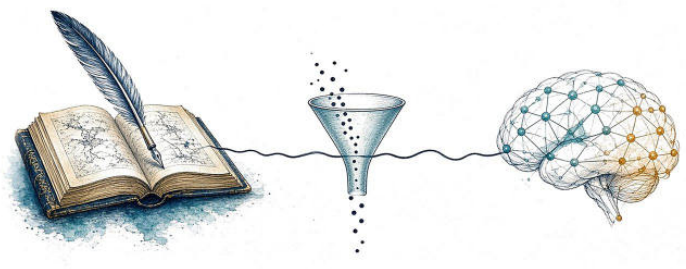


In a rushed glance, colour and shape can be mixed up (Treisman & Gelade, 1980).

> **Key Concept:**
> Brain networks. Brain networks came next, in work by Posner and Steven Petersen. They described attention as **several brain networks**. A network is a group of brain parts that work together. Each one has its own job (Posner & Petersen, 1990).

Think of a football team. Each player has a job, and the team wins **only when the players work together**. Attention networks are groups of brain parts in the same way, each doing its own part.

Studies of attention to things we see kept piling up, enough to fill **one big review of 25 years of work** (Carrasco, 2011). James's question, how the mind picks one thing out of many, is still the question.



The science of attention moved from a definition to filters and limits. Then it moved to brain networks.

Table 1.2: Milestones in attention research

Researcher (Year)	Main idea	What it means for you
James (1890)	Attention is the mind picking one of several possible things or thoughts	Attention is about choosing; something is always left out
Mackworth (1948)	The vigilance decrement. Spotting rare things gets worse over a long watch	Long watching tasks get harder over time
Cherry (1953)	Dichotic listening. We follow one voice and miss most of the other	We take in little from what we are not following
Broadbent (1958)	Early selection. A filter lets one voice through, judged by simple things like which ear	What we are not following may be blocked early
Treisman (1960, 1964)	Attenuation. Other voices are turned down to a murmur; important words (like your name) need less sound to be heard	Explains why your name can break through (Moray, 1959, found this)
Deutsch & Deutsch (1963)	Late selection. Everything is understood, then a choice is made	Distractions may be taken in more than we realise
Kahneman (1973)	Attention as limited effort	Hard tasks share one limited amount of effort

Researcher (Year)	Main idea	What it means for you
Posner (1980)	Cues; attention moves without moving the eyes	Attention can shift without moving the eyes
Treisman & Gelade (1980)	Attention glues colour and shape into whole objects	Without attention, details can be mixed up or missed
Posner & Petersen (1990)	Attention as several brain networks	Attention is several jobs done by different brain parts

Key idea:

The picking has costs. A long watch wears it down, and two jobs share one limited amount of effort.

Quick check:

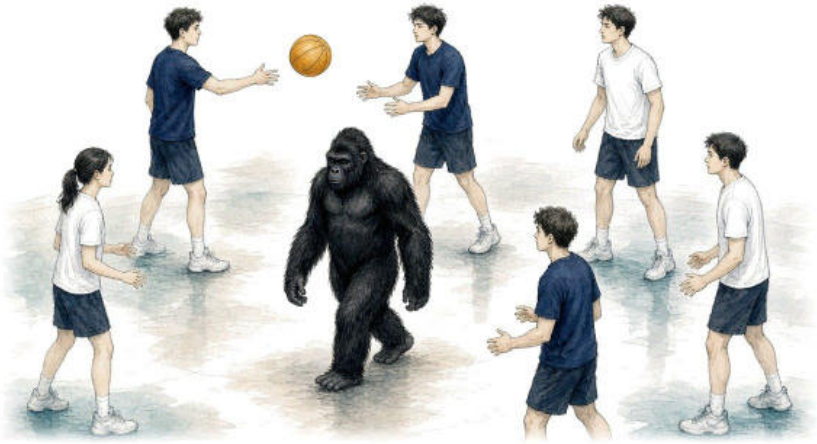
1. What did Mackworth's clock test show? Answer: As time goes on, people spot fewer and fewer double jumps (Mackworth, 1948).
2. Why could your own name get through to the ear you were not following? Answer: In Treisman's idea, very important words have extra-sensitive doorbells, so even a murmur can ring them (Treisman, 1960, 1964).
3. What is covert **orienting**? Answer: Moving attention to a spot without moving your eyes (Posner, 1980).

1.2 Understanding Attention

1.2.1 What Attention Is and Why It Matters

MOST OF US ARE sure we would see **something odd right in front of our eyes**. One study put that to the test.

People watched a short video of basketball players. They counted the passes made by one team. Partway through, a person in a gorilla suit walked through the scene. Many of the counters **never saw the gorilla** (Simons & Chabris, 1999).



Science Says:

Experts can miss a gorilla. Twenty-four radiologists, doctors who read body scans, looked through lung scans for small spots, a job they do every day. In the last scan, a gorilla 48 times the size of a spot was pasted in. **Eighty-three percent of them did not see it.** Eye tracking showed that most of those who missed it looked right at the spot where it was (Drew et al., 2013). It was a small study, with 24 doctors.

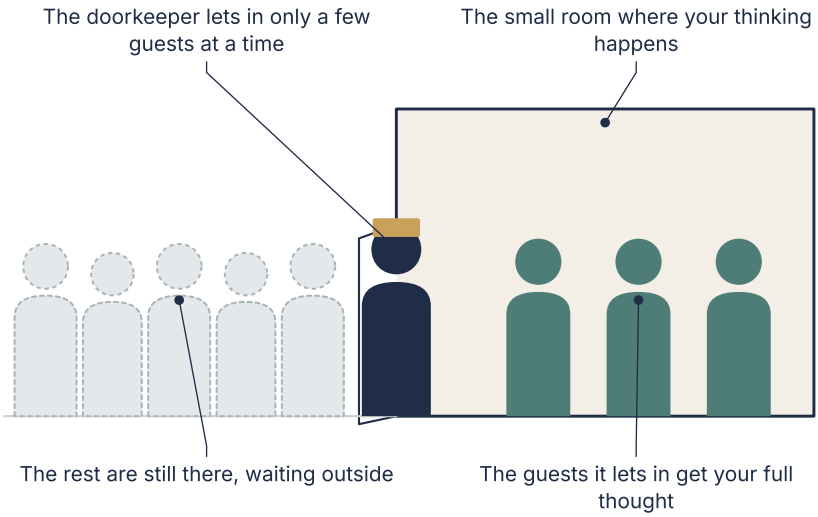
Even experts miss the gorilla

1999	2013	Eye tracking
many of the counters never saw the gorilla	eighty-three percent of twenty-four radiologists did not see it	most looked right at the spot

Attention as a Doorkeeper

To explain the gorilla, I need **a picture of attention**. I use the doorkeeper from earlier. It stands at the door of the small room where your thinking happens, and it lets in only a few guests at a time. The guests it lets in get your full thought. The rest are still there, waiting outside.

A picture of attention: the doorkeeper



This picture helps explain why many counters never saw the gorilla.

> **Science Says:**
>
> Long ago, William James wrote that attention **takes one thing out of many** and holds it clearly in the mind (James, 1890).

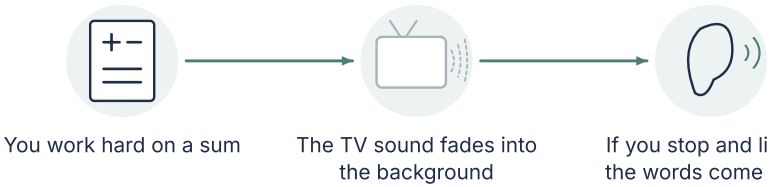
> **Definition:**
>
> **ATTENTION:** your mind putting its limited effort on a few things, letting the rest fade and getting ready to act on what it picked (American Psychological Association, 2018).

That meaning comes from **a dictionary of psychology**, the science of the mind. The dictionary's own words say attention is "a state in which cognitive resources are focused on certain aspects of the environment rather than on others and the central nervous system is in a state of readiness to respond to stimuli" (American Psychological Association, 2018).

I want you to see it in your own home. Say you are doing homework while **a TV plays in the next room**.

While you work hard on a sum, the TV sound **fades into the background**. If you stop and listen, the words come back. The sound was there all along, and your mind had simply not picked it. The radiologists missed the gorilla in the same way.

Homework while a TV plays



Attention can point outward at the world, and it can also **point inward, at your own mind**. The doorkeeper shows both. Its guests come from the street and from inside the house.

> **Key Concept:**
> External and internal attention. Choosing among things that come in through your senses is called **external attention**. Choosing among your own thoughts and memories, plus the rules of your task, is called internal attention (Chun et al., 2011).

Searching a crowd for a friend is **external attention**. Hunting through your memory for their phone number is internal attention.

External and internal attention

	External attention	Internal attention
Where they come from	Your senses	Your own thoughts and memories, plus the rules of your task
Job	Searching a crowd for a friend	Hunting through your memory for their phone number

What each kind chooses among, and one job for each (Chun et al., 2011).

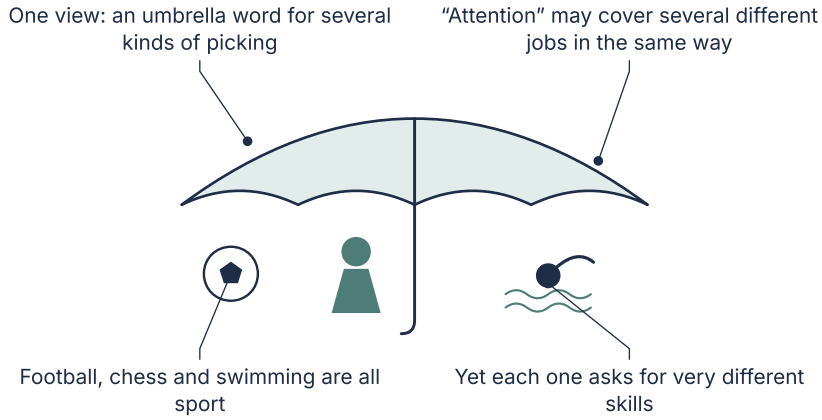


Attention can select from the outside world or from inside your own mind.

Whether "attention" is one single thing is **still argued over**. One team says it may be an umbrella word that covers several kinds of picking in the brain (Hommel et al., 2019).

Think of the word “sport”. Football, chess and swimming are all sport, yet each one asks for **very different skills**. Nobody trains for “sport” in general. They train for one game. “Attention” may cover several different jobs in the same way (Hommel et al., 2019).

Is “attention” one thing?



> **Science Says:**
>
> One scientist says attention is **the result of how the brain handles things** (Anderson, 2011). In this view, attention is the outcome and does not cause anything as a separate force. The debate is not settled.

A traffic jam does not push the cars or slow them down. **A traffic jam is what you see** when many cars slow down at once. In Anderson’s view, attention is like the jam, the pattern you see, and the brain’s work is like the cars.

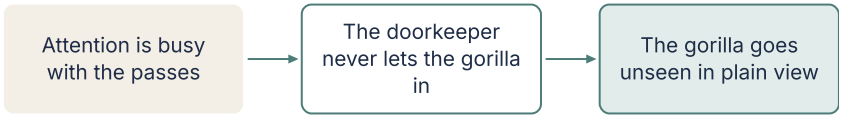
The useful lesson, for anyone who practises, is to **name the exact skill**. Holding focus is one skill. Ignoring distractions is another, and

switching is a third. When focus fails, I want you to talk about the skill that slipped, and leave the one lump called “attention” aside.

Why Attention Matters

Missing the gorilla has a name. Scientists call it inattentional blindness. It means **not seeing something in plain view** because attention is busy elsewhere (Simons & Chabris, 1999). The doorkeeper was busy with the passes, so the gorilla never got in.

Inattentional blindness



Busy attention is the cause; the unseen gorilla is the result (Simons & Chabris, 1999).

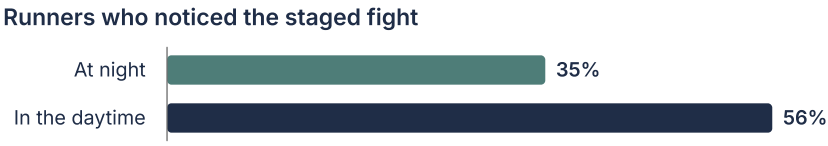


When attention is locked on one task, even a large, unexpected event can go unseen.

The same blindness can happen **on a real street at night**. A Boston police officer once chased a suspect on foot. He ran past a brutal assault and later said he had not seen it.

He was charged with **lying under oath**, which means lying after promising a court to tell the truth. A jury found him guilty, and he was sentenced to jail. He later won an appeal, and the government decided not to try him again.

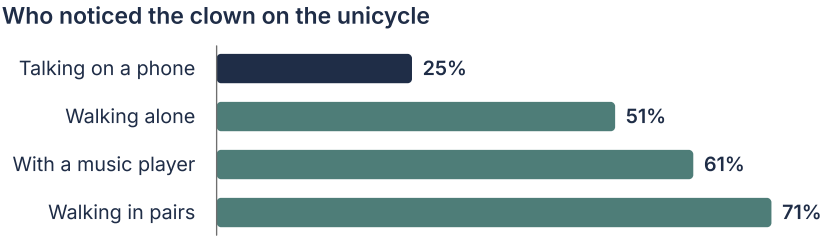
> **Science Says:**
>
> Researchers set up a staged fight next to a jogging route. People ran behind a researcher and counted how often he touched his head. At night, only 35% of the runners noticed the fight. In the daytime, 56% noticed. When the counting job was made harder, **even fewer people noticed** (Chabris et al., 2011). The study shows that a Boston police officer's claim not to have seen an assault he ran past during a chase could have been true. It cannot show that it was true.



Phones do the same thing on an ordinary day. Researchers had **a clown ride a unicycle** near people who were walking. Then they asked the walkers whether they had seen him.

Science Says:

Only 25% of walkers talking on a phone **had noticed the clown on a unicycle**. In the other groups, about half or more had seen it. That was 51% of people walking alone, 61% of people with a music player and 71% of people walking in pairs (Hyman et al., 2010).



Fewer people on the phone noticed, but people picked their own group (Hyman et al., 2010).

This study was done **out in the real world**, outside any lab. People chose for themselves whether to be on the phone, so the phone users may have differed in other ways too (Hyman et al., 2010). Still, the pattern fits the gorilla.

Exercise:

Look up for one block.

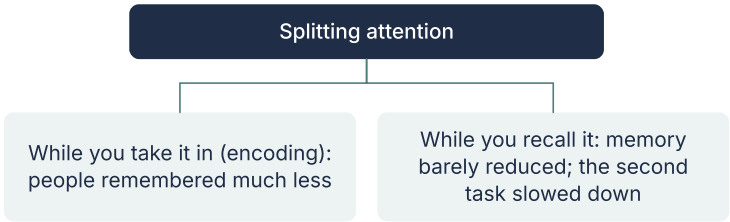
1. On a walk you take often, put your phone away for one block or one corridor.
2. Look around as you go.
3. At the end, write down one thing you saw that you had never noticed before.

If you find something new, it was there all along. **Your attention had simply not picked it.**

What gets in also decides **what you learn**. In one study, people learned new things while their attention was split. Later, they remembered much less of it (Craik et al., 1996).

Recall held up better. Splitting attention while people **recalled the material** barely reduced how much they remembered. What slowed down was the second task they were doing at the same time (Craik et al., 1996).

When a split costs most



The cost comes while taking things in, not while recalling them (Craik et al., 1996).

> **Key Concept:**
> Encoding. Taking information in is called encoding, and it is **the stage at which divided attention does the most damage** to memory. Divided attention means splitting your attention between two things at once.

Encoding is like recording a song. If someone talks loudly while you record, **the noise is stuck in the recording**. Playing the song back later while someone talks is different. The talking slows you down, but the song itself is fine.

> **Key Concept:**
> Full attention on the way in. Give full attention **while you take something in**, such as a name or a lesson. That is the moment when a split costs most (Craik et al., 1996).

> **Science Says:**
> Attention at the start of school goes with later school results. Six large studies followed children from the start of school. The skills that best predicted later school results were maths, reading and attention, **in that order** (Duncan et al., 2007).

Duncan's team found **skills that go together over time**. The findings do not show that attention caused the later results (Duncan et al., 2007).

What best predicted later school results



> **Science Says:**
> There is **only so much attention to go around**. Herbert Simon was an economist, someone who studies how people share out money and other things there is not enough of. In 1971 he warned that "a wealth of information creates a poverty of attention" (Simon, 1971).

The more there is to take in, **the less attention each thing gets**. It is like one pizza at a party. The more people share it, the smaller each slice. Every new message takes a slice of the same pizza.

The same sharing happens on the road and with the people around you. Talking on the phone while driving costs attention, **even hands-free** (Strayer & Johnston, 2001). Being there for someone starts with where your attention is.

Why attention matters



Each of these starts from where your attention is.

Where attention goes reaches all the way to your mood. Where your mind wanders **goes along with how you feel** (Killingsworth & Gilbert, 2010). The writer Winifred Gallagher made one idea popular. Your life, in a real sense, is what you pay attention to (Gallagher, 2009).

> **Exercise:**
>
> Name the skill.
>
> 1. Think of three moments this week when your focus slipped.
> 2. For each one, write which skill failed. Was it holding focus, ignoring a distraction or switching between jobs?
> 3. Next to each, write one small change to the setting that would have helped, such as closing a tab or moving away from a TV.

Naming the skill turns "I can't focus" into a problem you can work on.

Key idea:

Your mind can't work on everything at once. What the doorkeeper lets in is what you see, and it decides what you learn.

Quick check:

1. What is inattentional **blindness**? Answer: Not seeing something in plain view because attention is busy elsewhere (Simons & Chabris, 1999).
2. What share of the radiologists missed the gorilla in the lung scan? Answer: Eighty-three percent (Drew et al., 2013).
3. When does splitting attention hurt memory most? Answer: While you take information in (Craik et al., 1996).
4. What is the difference between external and **internal attention**? Answer: External attention chooses among things coming in through the senses. Internal attention chooses among your own thoughts, memories and task rules (Chun et al., 2011).

1.2.2 The Main Types of Attention: Sustained, Selective, Divided and Alternating

Is "paying attention" one skill or several? Think about **four people**. A night-shift guard watches the screens for something that almost never happens. A parent picks out their own child's voice in a noisy playground.

Someone chats with a friend while cooking a meal they know by heart. Both the chat and the cooking get a little worse. A cook moves back and forth between chopping and checking the oven. All four are paying attention, yet each one is doing **something quite different**.



Four everyday faces of attention.

Each one uses **a different type of attention**. The guard uses sustained attention, and the parent uses selective attention. Chatting while cooking is divided attention, and switching tasks is alternating attention.

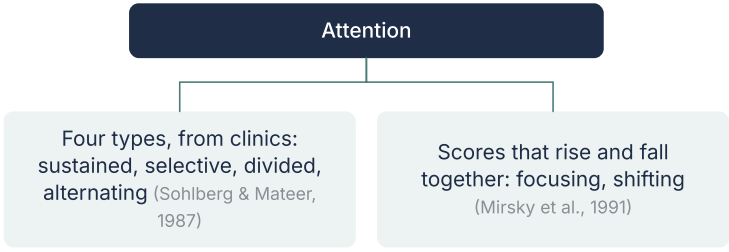
Four types of attention over time



These four types come from clinics that help people **recover after a brain injury**. Therapists, people trained to help patients win back skills, drew up this map of attention for a training course called Attention Process Training (Sohlberg & Mateer, 1987).

It is a useful map. Other scientists **sort attention in other ways**, and no one list is agreed.

Ways to sort attention



It is a useful map, and no one list is agreed.

> **Science Says:**
>
> In one study, many people took a pile of attention tests, and the researchers looked at **which scores rise and fall together** (Mirsky et al., 1991). The scores fell into separate groups, such as focusing, holding focus over time and shifting.

Think of a school report. A pupil who does well on one spelling test tends to do well on other spelling tests, while their running times may tell a different story. When test scores **group like that**, it suggests separate skills underneath. The idea of several attention skills holds up well, even if the exact list varies.

I find the four names useful for one reason. When you say “I can’t focus”, you can ask **which of the four is failing**. Each one breaks in its own way, and each one may need its own fix.

> **Key Concept:**
>
> Four types, four questions. Sustained means **holding on over time**. Selective means picking one thing and ignoring the rest. Divided means two jobs at the same moment. Alternating means one job, then the other, back and forth.

Holding and Picking: Sustained and Selective Attention

The first two types are about holding focus and picking a target. Sustained attention is **keeping focus on one task over time**. It is hardest when what you watch for is rare, or when it is dull. Like Mackworth’s radar watchers, people tend to slip as the watch goes on.

Scientists call this slow drop the vigilance decrement, or **the drop in watchfulness** (Mackworth, 1948; Fortenbaugh et al., 2017). For the doorkeeper, it is like standing at the door through a long, quiet night.

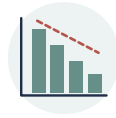
Sustained attention



Keeping focus on one task over time



As the watch goes on, people tend to slip



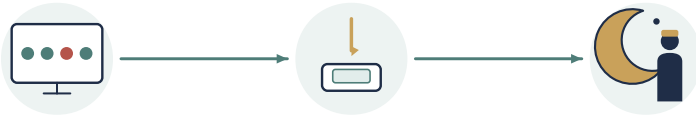
The drop in watchfulness

Key Concept:

Continuous performance test. In the lab, one common test is a continuous performance test, a test that **keeps going for minutes**. Letters show up one at a time, and you press only when a rare target letter appears (Rosvold et al., 1956).

In the first version, the letters showed through a small window on a turning drum. Today the test runs on a screen. It is **a small, safe copy of the guard's night shift**.

A night shift in the lab



Letters show up one at a time

Press only when a rare target letter appears

A small, safe copy of the guard's night shift

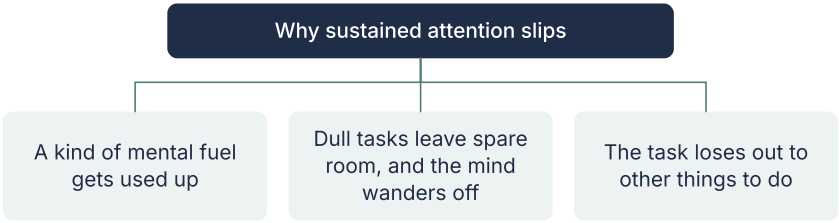
Science Says:

Rare things get missed. In a lab search task, people looked through picture after picture for a target object. **When the target was rare, people often missed it** when it did appear (Wolfe et al., 2005). The authors had jobs like checking bags at airports in mind, but the people tested were ordinary volunteers in a lab. No real bag checkers took part.

> **Science Says:**
> Researchers offer **competing explanations** for the vigilance decrement, the slow drop in watchfulness over a long watch (Esterman & Rothlein, 2019). One says a kind of mental fuel gets used up. Another says dull tasks leave spare room, and the mind wanders off.

A third says the brain keeps weighing the task against other things to do. The task starts to lose, a bit like a boring film losing out to your phone. **None of the three has won yet**.

Competing explanations for the slow drop

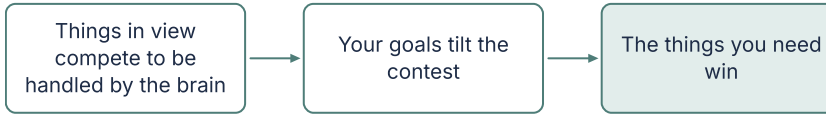


For the doorkeeper, the slow drop is like a long, quiet night at the door (Esterman & Rothlein, 2019).

Selective attention is about choosing. It means picking out what you need and **ignoring the rest**. The parent at the playground does this, like the listener at Cherry's cocktail party (Cherry, 1953). Here the doorkeeper picks which guest gets in and turns the others away.

> **Key Concept:**
>
> Biased competition. One leading idea about how the choosing works is called **biased competition** (Desimone & Duncan, 1995). Things in view compete with each other to be handled by the brain. Your goals tilt the contest, so the things you need win.

Biased competition



First the contest, then your goals, then what wins (Desimone & Duncan, 1995).

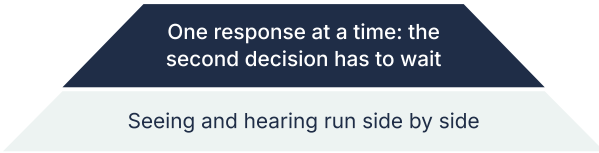
Think of a playground full of voices. Each voice competes to be heard. Because the parent wants their own child, **that one voice wins** the contest, and the others fade into the background.

Doing Two Things at Once: Divided Attention

Divided attention is doing two things at once. At least one tends to suffer. Scientists call this dual-task interference, which means **two tasks getting in each other's way**.

> **Key Concept:**
>
> The central bottleneck. Lab tests of simple tasks point to **a central bottleneck**, a narrow point that everything must pass through (Pashler, 1994). In these tests, the brain can choose only one response at a time. The second decision has to wait.

A central bottleneck



Seeing and hearing can run together; choosing a response cannot (Pashler, 1994).

Picture a shop with one checkout. Two customers can shop at the same time but still **pay one by one**. In Pashler's lab tests, seeing and hearing run side by side, but each choice of what to do waits its turn (Pashler, 1994).

The wait in those tests lasts only a split second per decision. Yet split seconds **add up** when decisions keep coming one after another.

Phones and driving have been tested many times. In one study, people did **a pretend driving task on a computer**. They used a joystick to keep a dot on a moving target, and they had to react to pretend traffic signals.

> **Science Says:**
>
> While talking on a phone, people **missed twice as many signals** and reacted more slowly to the ones they caught. This happened with handheld and hands-free phones alike (Strayer & Johnston, 2001). The authors say the talk pulled attention away from the driving task.

The cost is in attention, so **freeing your hands does not remove it**. Your hands are free, but your attention is in the conversation.

Why hands-free does not help



People missed twice as many signals, with handheld and hands-free phones alike (Strayer & Johnston, 2001).

A friend in the passenger seat is different. In a later driving study, people made **the most driving errors while on the phone** (Drews et al., 2008). Passengers talked about the traffic more, and both people used simpler speech when the traffic got harder.

The difference is that **a passenger can see the road**. Someone on the phone can't see a lorry pulling out in front of you.

> **Science Says:**
>
> Texting is worse news still. One study combined 28 studies with 977 people in all. Typing and reading texts while driving **hurt almost everything** that was measured, from where people looked to how fast they reacted and how often they crashed (Caird et al., 2014).

Typing alone did about as much harm as typing and reading together. Reading alone did less harm (Caird et al., 2014). Most of these studies used **driving simulators and lab tests**.

What the driving studies show



On the phone: the most driving errors (Drews et al., 2008)



Texting hurt almost everything measured (Caird et al., 2014)



Supertaskers: rare exceptions (Watson & Strayer, 2010)



People who multitask most: the worst at it (Sanbonmatsu et al., 2013)

> **Key Concept:**
>
> Supertaskers. One simulator study asked whether some people are immune, which here means untouched by the cost of a second task (Watson & Strayer, 2010). Only a few showed no cost at all from a hard second task. These "supertaskers" come from one study only, so treat them as **rare exceptions**. They are not a type anyone can become.

In a later study, **the people who multitasked most tended to be the worst at it** (Sanbonmatsu et al., 2013). They also rated their own skill far higher than it was. The study measured students at one university at one time, so it shows a link and cannot show a cause.

Switching Between Tasks: Alternating Attention

> **Key Concept:**
>
> The switch cost. Alternating attention is moving back and forth between tasks. Each switch has a price, called the switch cost. Just after a change, you are **a bit slower and make more mistakes**. Your mind has to drop one set of rules and pick up another (Monsell, 2003).

Say you change from football boots to ice skates. Each change takes a moment, and **the first few steps are wobbly**.

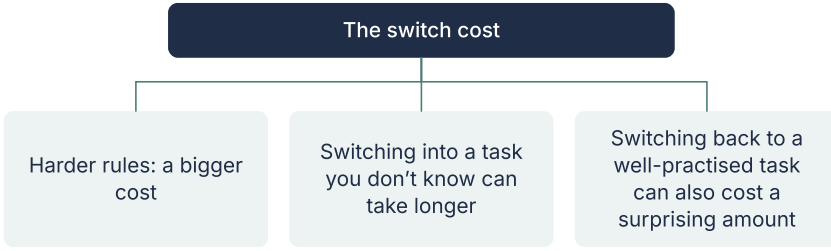
The switch cost

Drop one set of rules, pick up another	**Just after a change:** slower

The cost has several parts, like readying the new task and dropping the old (Kiesel et al., 2010). Each time, the doorkeeper sends one guest off and lets the next settle in. The harder the rules of the tasks, **the bigger the cost** (Rubinstein et al., 2001).

> **Science Says:**
> How well you know each task counts, **in a surprising way**. Switching into a task you don't know can take longer (Rubinstein et al., 2001). Yet switching back to a well-practised, "stronger" task can also cost a surprising amount (Monsell, 2003).

What changes the switch cost



Three things that make the switch cost bigger (Monsell, 2003).

It is a bit like coming back to your home language after a week of speaking a new one. You might expect it to be instant, yet **it can take a moment** to get going again.

Getting ready helps a little. Preparing for a switch **reduces its cost but does not remove it** (Monsell, 2003). Knowing what comes next gives your mind a head start on the new rules.

In divided attention, two tasks really overlap in time. In alternating attention, you do one, then the other. Each change costs a small toll. People who say they are "multitasking" are **usually doing this, very quickly**.

Divided or alternating?



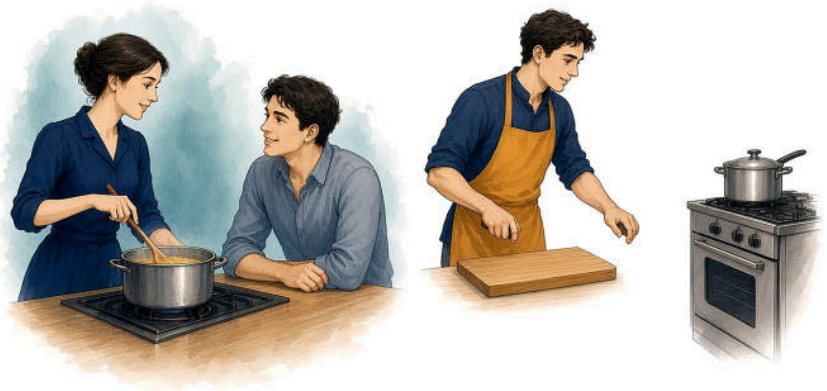
Divided: a podcast while washing up



Alternating: an email, then a spreadsheet



"Multitasking": usually alternating, very quickly

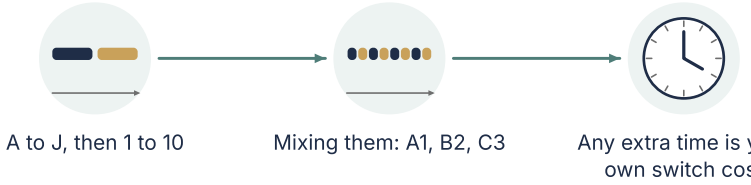


Divided attention means two tasks overlap. Alternating attention means one, then the other, with a small cost at each switch.

A normal day uses all four types.

- Sustained attention keeps you going on a long empty motorway or through a long report.
- Selective attention means reading in a noisy café or finding one name in a long list.
- Divided attention is listening to a podcast while washing up, or talking while driving.
- Alternating attention is moving between an email and a spreadsheet. A teacher uses it when switching between explaining and answering questions.

Feel the switch cost



Exercise:

Feel the switch cost.

1. Time yourself writing the letters A to J, and then the numbers 1 to 10.
2. Now time yourself mixing them, as A1, B2, C3 and so on, up to J10. Timing single lists against a mixed one follows a comparison Jersild (1927) introduced.
3. Compare the two times, and count any mistakes.

The same twenty marks are written both ways. Any extra time in the mixed version is **your own switch cost**.

Table 1.3: The four types of attention

Type	What it is	Everyday example	Common lab test	What gets in its way
Sustained	Keeping focus on one task over time	Watching security screens overnight	Continuous Performance Test (CPT); Sustained Attention to Response Task (SART), where you press for most items and hold back for a rare one (Rosvold et al., 1956; Robertson et al., 1997)	Long, dull tasks; time on task; mind-wandering
Selective	Focusing on what counts and ignoring distractions	Hearing your child in a noisy playground	Stroop task, naming the ink colour of colour words; flanker task, judging a middle letter between others (Stroop, 1935; Eriksen & Eriksen, 1974)	Strong or eye-catching distractions
Divided	Doing two tasks at the same time	Talking while driving	Two-task tests	Two tasks needing decisions at once
Alternating	Switching between tasks	Moving between email and a report	Trail Making Test part B, joining numbers and letters in turn; task-switching tests (Reitan, 1958)	Many switches; hard or new tasks

Key idea:

Sustained, selective, divided and alternating attention each work in their own way, so when focus slips, name the type first.

Quick check:

1. Which type of attention does a night-shift guard use? Answer: Sustained attention, keeping focus on one task over time.
2. Why does a hands-free phone still cost a driver attention? Answer: The cost is in attention. The talk pulls attention away from the driving (Strayer & Johnston, 2001).
3. What is the switch cost? Answer: Just after a change of task, you are a bit slower and make more mistakes (Monsell, 2003).

1.2.3 Attention Span, Capacity and Limits

How much can you hold in mind at once? The phrase "attention span" makes it sound like **a fixed number of seconds**. Picture someone reading you a new phone number and then asking a question before you can write it down. The number may fall apart.

Real Limits: Capacity and Bottlenecks

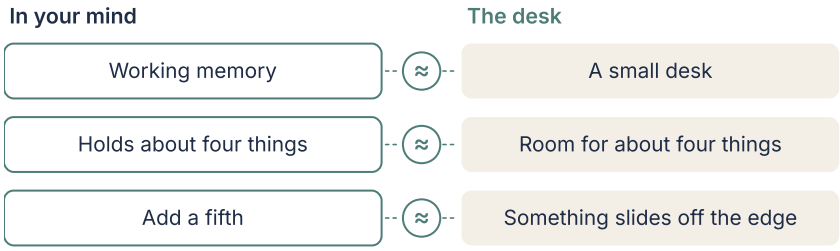
You have **only so much mental effort** to spread over everything you are doing (Kahneman, 1973). The doorkeeper can only let in so much at once. I want you to ask where each limit sits and how tight it is.

Definition:

CAPACITY: the most your mind can hold or handle at one time.

The first limit is how much you can hold. Imagine a small desk with **room for about four things**. Put down a fifth, and something slides off the edge. The desk stands for working memory.

Working memory, like a small desk



Each row links one part of the mind with one part of the desk.

Key Concept:

Working memory. **Working memory** is the space in your mind where you hold facts while you use them. You use it when you keep a phone number in mind while you dial it, or carry a number while you add up in your head.

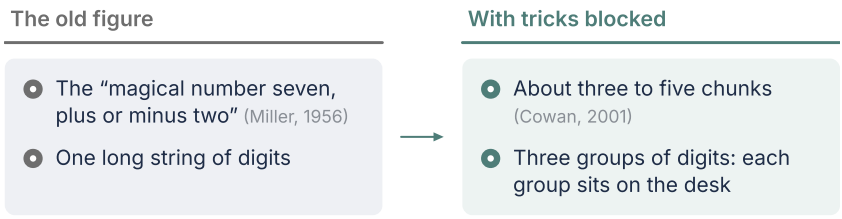
An older figure was the "magical number seven, plus or minus two" (Miller, 1956). That figure is **now history**.

Science Says:

Some tricks help, such as grouping items into bigger units called chunks. When researchers block such tricks, the limit of working memory is **about three to five chunks** (Cowan, 2001).

Chunks are why a phone number can feel easier as three groups of digits than as one long string. Each group sits on the desk as **one thing**, so the desk holds more digits without holding more things.

From seven to three to five chunks



Grouping items into chunks lets the desk hold more digits without holding more things.

Think of carrying shopping. Ten loose apples are hard to hold. Put them in one bag, and **you carry one thing**. A chunk is that bag for your mind.

Attention and working memory work closely together. Visual working memory, the desk for things you see, holds **only about three or four objects** at once, and attention decides what gets into it (Awh et al., 2006). The doorkeeper chooses which guests reach the small desk.

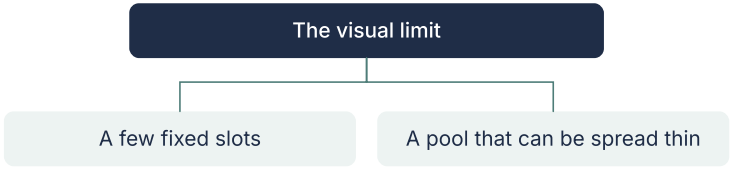
> **Science Says:**
>
> The limit counts objects. In one test, people could keep only about four colours in mind at a time. Yet they could keep **both the colour and the tilt of four objects**, which is eight details spread over four things (Luck & Vogel, 1997).

People differ, though. Across people, this visual limit ran from about one and a half objects to about five. Brain activity in people with a small

limit **levelled off sooner** as more objects were added (Vogel & Machizawa, 2004).

Scientists still argue about **what the limit is made of**. Some think of a few fixed slots, and others of a pool that can be spread thin (Awh et al., 2006). Either way, the limit is real.

What the limit is made of



Two ideas about what the visual limit is made of (Awh et al., 2006).

The desk is not the only tight spot. Researchers have found **three narrow spots** in all (Marois & Ivanoff, 2005). The first shows up when two targets flash by, one quickly after the other.

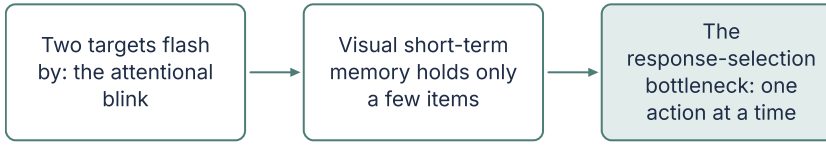
> 🔑 **Key Concept:**
>
> The attentional blink. People often miss the second of two quick targets if it comes a few tenths of a second later. Scientists call this **the attentional blink** (Raymond et al., 1992).

You may notice the blink when two words flash past on a fast advert or a busy sign. You catch the first and **the second is simply gone**. The doorkeeper, still busy with the first guest, needs a moment before opening again.

The second spot is visual short-term memory, the brief memory of what we just saw. It holds **only a few items**.

The third spot is about choosing what to do. Scientists call it the response-selection bottleneck. It means we choose **one action at a time** (Pashler, 1994).

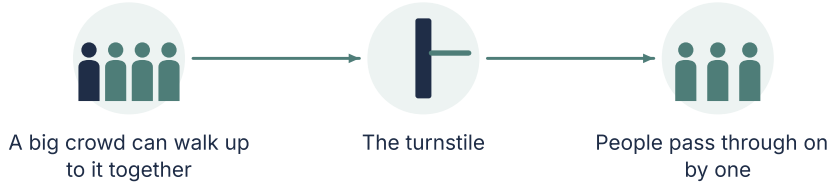
Three narrow spots



Each spot, from seeing to choosing an action, is narrow in its own way (Marois & Ivanoff, 2005).

Picture a turnstile at a stadium. A big crowd can walk up to it together, yet **people pass through one by one**. Your choices of what to do go through a turnstile like that.

The turnstile



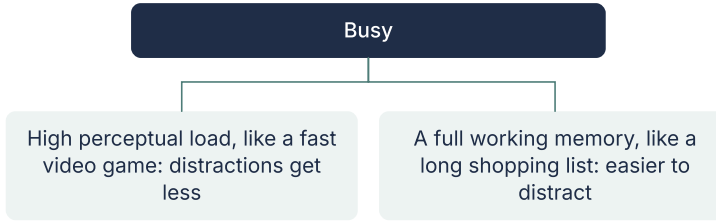


Lots goes in. Only a few things can be held in mind. Responses come out one at a time.

> **Key Concept:**
>
> Perceptual load. A task can be very busy for the eyes. Scientists call this high perceptual load, where load means **how much a task asks of you**. Then little room is left over, so distractions get less of a look-in.

A full working memory works the other way (Lavie, 2005). It makes you **easier to distract**. The part of the mind that keeps you on track is busy elsewhere.

Two kinds of busy



Busy eyes and a busy desk work the other way round (Lavie, 2005).

Think of two kinds of busy. A fast video game fills your eyes, and the room around you tends to fade. Holding a long shopping list in your head fills your desk, and **small noises pull at you** more easily.



Busy can help or hurt. A task busy for the eyes keeps distractions out. A loaded-up working memory lets them in.

I want you to **write things down** to free your desk. Keep instructions and to-do items few, so less has to sit in working memory at once.

Is There Such a Thing as an "Attention Span"?

> **Key Concept:**
>
> Attention span. Attention span is about time. There is **no single attention-span number** in your head. Reviews of lecture studies found no good evidence for a fixed limit like "ten minutes" (Bradbury, 2016; Wilson & Korn, 2007). Attention rose and fell mainly with the teacher.

Age and the task make a difference. One study tested 57 children aged 5 to 12. Their scores on all the tests **grew fast up to about age 8 or 9**. Sustained attention kept improving to about age 10, then levelled off. All ages did worse on harder tasks (Betts et al., 2006).

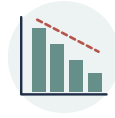
Sustained attention with age



Ages 5 to 8 or 9: grew fast



From around age 10: levelled off



All ages: worse on harder tasks

That was a small study, and it tested **different children at different ages** once each. It did not follow the same children as they grew (Betts et al., 2006).

A "short attention span" can hide another problem. Teachers rated 52 children with low working-memory scores. Most of them were judged to have **short attention spans** and to be easily distracted (Gathercole et al., 2008).

The authors suggest the small desk may be part of the cause. The study used teacher ratings and shows a link, so **the cause is not proven** (Gathercole et al., 2008).

> **Science Says:**
>
> Crowds lose interest faster. The attention crowds give to a topic online now fades faster. How long a hashtag or film stays popular **has grown shorter** (Lorenz-Spreen et al., 2019). That finding is about crowds as a whole. It says nothing about one person's focus.

No single attention-span number



Lecture studies: no good evidence for a fixed limit like "ten minutes"



Online crowds: a topic now fades faster



That finding says nothing about one person's focus

Three kinds of studies, and no one number for all people (Bradbury, 2016; Wilson & Korn, 2007).

Take songs in the charts. A song may drop out of the charts faster than songs did years ago. That does not mean **any one listener's ears got worse**.

A scientist named Gloria Mark tracks how long people stay on one screen before switching. Researchers first watched workers with a stopwatch, in 2004 (González & Mark, 2004). Mark later said people stayed on one screen for about 2.5 minutes **on average** back then (American Psychological Association [APA], 2023b).

Computer logs from around 2012 put it at about 75 seconds (Mark et al., 2012). The numbers **kept falling** after that.

> **Science Says:**
> Gloria Mark tracks how long people stay on one screen before switching. She later said it was about 2.5 minutes in 2004 (APA, 2023b) and about 75 seconds around 2012 (Mark et al., 2012). Asked in a 2023 interview about the five or six years before, she gave an average of about 47 seconds, **shorter than the earlier figures**. The median, or middle value, was 40 seconds (Mark, Iqbal, Czerwinski, Johns, & Sano, 2016; American Psychological Association [APA], 2023b; Mark, 2023).

College students switched screens **about twice as often as office workers** who handle information on screens (Mark et al., 2014).

> **Key Concept:**
> Switching habits. Screen-switching figures measure time on one screen before switching. They come from small groups of workers and students. They record **switching habits**, which is a different thing from how long someone can focus.

How often you open the fridge says little about **how much you can eat**. In the same way, how often you switch screens says little about how long you could focus if you chose to.

They are averages, and Mark notes that people sometimes **focus much longer**. She says others have repeated her figures but does not name them (APA, 2023b).

> **Key Concept:**
>
> Fragmented work. You may have read that it takes 23 minutes to refocus after an interruption. When researchers watched office workers, work was highly fragmented, which means **broken into short pieces** by interruptions and switches (Mark et al., 2005).

What the popular figures measure

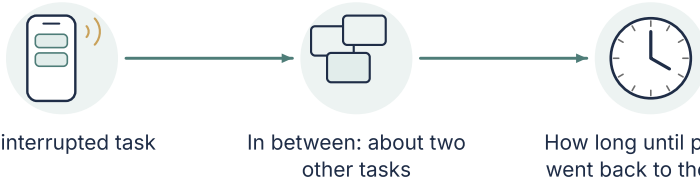
Figure	What it measures	What it does not measure
Time on one screen	Switching habits, as averages from small groups	How long someone can focus
The 23-minute figure	How long until people went back to the task	How long it takes to refocus

The figures are real, but they answer other questions (APA, 2023b).

An interrupted task that was picked up again the same day took on average 25 minutes 26 seconds before people returned to it. **The spread was huge** (Mark et al., 2005).

In between, people usually worked on about two other tasks (Mark et al., 2005). The "23 minutes 15 seconds" comes from a 2006 magazine interview (Robison, 2006). Both figures measure **how long until people went back to the task**.

From interruption back to the task



> **Science Says:**
> "Humans now have a shorter attention span than a goldfish." The claim says we focus for **eight seconds**, and a goldfish for nine. The claim traces back to a 2015 marketing report by Microsoft Canada. That report named a website called "Statistic Brain" as its source. **No data behind it have been found** (Maybin, 2017). Attention researchers also doubt that one "average attention span" means anything (Bradbury, 2016).

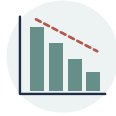
> **Science Says:**
> Two claims from the book Stolen Focus need care (Hari, 2022). "Our individual attention spans are shrinking" **is not supported**. A critic points out that Hari himself admits there are no long-term studies tracking people's focus over time (Ritchie, 2022). Mark's falling figures measure screen switching. They don't measure how long you are able to focus.

"College students switch tasks every 65 seconds" **goes too far**. It comes from one small study of switches between content on a single computer (Yeykelis et al., 2014). That study reports switches every 19 seconds. It tracked what people did, without testing how well they could focus.

Three popular claims, checked



A goldfish: no data behind it have been found



Attention spans are shrinking: not supported



Every 65 seconds: goes too far

How long you stay focused **depends on the task, the setting and what pulls at you**. You can change all three.

> **Exercise:**
>
> Count your switches.
>
> 1. Pick a 20-minute stretch of normal screen work.
> 2. Each time you move to another window, app or screen, make a tally mark on paper.
> 3. At the end, note the task, the setting and what pulled you away each time.
>
> The tally shows **your own switching habit**. It is a record of the setting as much as of you, so change one thing about the setting and count again another day.

Table 1.4: Limits of attention

Limit	What studies found	What it means for you
How much working memory holds	About 3 to 5 chunks (Cowan, 2001); the old figure was 7, give or take 2 (Miller, 1956)	Keep instructions and to-do items few; write things down
Attentional blink	A second target a split second after the first is often missed (Raymond et al., 1992)	Fast streams of information get lost; space out the main points
Response bottleneck	One action is chosen at a time (Pashler, 1994)	"Doing two things at once" usually means waiting your turn
Load	A task busy for the eyes cuts distraction; a full working memory adds to it (Lavie, 2005)	Clear the clutter from your desk when distractions pull at you
"Attention span"	No fixed span; screen-switching times describe habits (Bradbury, 2016; Mark, 2023)	Change the task and the setting, and stop blaming a fixed span

Key idea:

With tricks blocked, working memory holds about three to five chunks, and we choose one action at a time. There is no single attention-span number in your head.

Quick check:

1. How many chunks can working memory hold when tricks are blocked? Answer: About three to five (Cowan, 2001).
2. What do Gloria Mark's falling figures measure? Answer: Time on one screen before switching, which records switching habits.
3. Does a full working memory make you easier or harder to distract? Answer: Easier, because the part of the mind that keeps you on track is busy elsewhere (Lavie, 2005).

1.3 The Science of Attention

1.3.1 How the Brain Selects What Matters: Bottom-Up and Top-Down Control

A SIREN GRABS YOU EVEN when you are busy. A red coat, though, jumps out only when you look for a friend in red. Why does one thing pull at you on its own, while another waits until you go looking? These two moments show **two ways the brain decides** what the doorkeeper lets in.

Pulled by the World, Steered by Goals

> **Key Concept:**
> Bottom-up attention. A siren that grabs you even when you are busy is bottom-up attention, **the world pulling at you**. Things that stand out sharply from what is around them are called salient. A loud noise or a flash is salient, and so is a single moving object.

Picture a page of black words with one word printed in bright red. Your eyes go to the red word **before you choose to read it**. That word is salient on that page. Put the same red word on a page full of red words, and it no longer stands out.

What is salient

Stands out	No longer stands out
One red word on a page of black words	The same red word on a page full of red words
A loud noise, a flash or a single moving object	Nothing stands out sharply from what is around it

Standing out depends on what is around a thing.

> **Science Says:**
> Sudden things grab you. In a classic search test, people looked for a letter among other letters. When the target was a letter that **suddenly appeared** on the screen, people found it faster than a letter that had been there all along (Yantis & Jonides, 1984).

The saliency map



A heat map of what stands out in a scene



The reddest spot: whatever stands out most



The model predicts that attention goes to the hottest spot

> **Key Concept:**
>
> The saliency map. One computer model of vision builds **a saliency map** (Itti & Koch, 2001). It is a heat map of what stands out in a scene. The model predicts that attention goes to the hottest spot.

Think of a weather map on the news, with the hottest places in red. The saliency map is like that, with **the reddest spot** being whatever stands out most. One researcher argues that salient things can grab attention, whatever your goals (Theeuwes, 2010).

> **Key Concept:**
>
> Top-down attention. A red coat that jumps out only when you look for a friend in red is top-down attention, your goals telling you what to look for. The prefrontal cortex, the outer layer of the brain at the very front, **keeps your current goal active**. It sends signals that tilt the brain's work in that goal's favour (Miller & Cohen, 2001).

The prefrontal cortex works a bit like a satnav. A satnav holds the place you want to reach. At every turning, **it gives a small push** toward that place. Your goal works the same way. It is held in the front of the brain, and it nudges each small choice of what to look at.

Bottom-up and top-down attention

	Bottom-up	Top-down
What drives it	The world pulling at you	Your goals telling the doorkeeper what to look for
In the brain	A saliency map: attention goes to the hottest spot	The prefrontal cortex keeps your current goal active

This fits the idea of biased competition. Your goal tips the contest, so **things that match it win** (Desimone & Duncan, 1995). Posner's cueing studies showed the same steering in the lab (Posner, 1980). Attention moved to a cued spot before the eyes did.

Think of looking for your blue bag at an airport. Your goal is "blue bag", so blue bags seem to **rise out of the crowd** of luggage. The other bags fade, even though they are just as close.

> **Science Says:**
>
> Looking for a red coat asks attention for **a quieter job** as well as the steering. It has to glue the colour and the shape into one whole object (Treisman & Gelade, 1980). The red and the coat become one thing you can find.

Steering by goals



Your goal tips the contest



Things that match it win



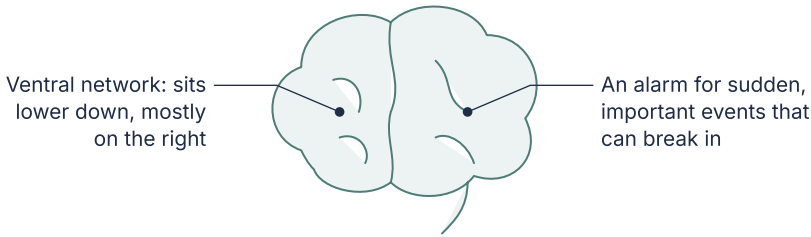
Glue the colour and the shape into one

The brain seems to keep the two kinds of pull partly apart. Brain scans suggest **two partly separate systems** (Corbetta & Shulman, 2002).

> **Key Concept:**
> The dorsal network. Dorsal means "on the back side". The dorsal network **runs along the top of the brain**. It handles attention driven by goals.

Ventral means "on the belly side", the opposite of the back, where a dolphin has its fin. The ventral network **sits lower down** and mostly on the right. It acts like an alarm for sudden, important events. It can break in on the dorsal network (Corbetta & Shulman, 2002; Corbetta et al., 2008).

Two partly separate systems



Brain scans suggest the brain keeps the two kinds of pull partly apart (Corbetta & Shulman, 2002).



One network steers attention by your goals. Another catches sudden, important events.

Picture yourself deep in a book, with the dorsal network steering. Someone behind you drops a plate. Before you decide anything, the ventral network **yanks your attention to the sound**. Only then do you choose whether to go back to the page.

The alarm breaks in

1. Deep in a book: the dorsal network steering
2. Someone behind you drops a plate
3. The ventral network yanks your attention to the sound
4. You choose whether to go back to the page

Any sudden sound can break into a task this way (Corbetta et al., 2008).

The alarm is useful. A falling plate or a shout may mean danger, and you need to notice it before you finish your page. The same alarm means **a sudden sound can pull you** off a page you care about.

What Captures Us Depends on Goals and History

The two systems **affect each other**. In tests, a sudden flash grabs attention more easily when it matches what people seek. That might be a colour, or something that suddenly appears.

> **Key Concept:**
>
> Contingent capture. Contingent means **"depending on something"** (Folk et al., 1992). In contingent capture, what grabs you depends on how your attention is set right now. Once you look for red, red things seem to leap out everywhere.

Contingent capture



What you look for decides what grabs you (Folk et al., 1992).

If you are thinking about buying a certain bike, you start to see that bike **on every street**. There are no more of them than before. Your attention is simply set to catch them. The doorkeeper lets in what fits the job it was given.



What grabs your attention depends on what you are looking for right now.

One team says the bottom-up and top-down split leaves out a third force (Awh et al., 2012). They call it **selection history**. Things that paid off in the past get picked up more easily. The same goes for things you have often paid attention to.

This holds even when they don't stand out and aren't your goal. Take the light switch in your own home. Your hand finds it in the dark **without any thought**, because it has found it so many times before.

Selection history, the third force



The light switch at home: your hand finds it in the dark



A once-rewarded colour still slowed people down



A phone that often brings good news gets past the doorkeeper

Three ways past rewards steer attention (Awh et al., 2012; Anderson et al., 2011).

> **Science Says:**
>
> Rewards teach attention. In one study, people first earned money for finding certain colours. Later, the money stopped, and those colours **had nothing to do with the task**. Yet a dull item in a once-rewarded colour still slowed people down as they searched for something else (Anderson et al., 2011).

The pull of the old reward kept going **after the rewards had stopped**. It worked even though the item did not stand out and was not what people were looking for (Anderson et al., 2011). The pull differed from person to person, along with their working memory and how impulsive they were, or quick to act without stopping to think.

A phone that often brings good news may get past the doorkeeper **more easily** for the same reason. It need not be loud or bright, and you need not be looking for it.



Three forces act on attention. What stands out pulls it, and goals steer it. What paid off before nudges it.

A child's classroom walls can pull at attention. In one study, kindergarten children had six science lessons in a lab classroom. Sometimes the walls were **covered in posters and decorations**, and sometimes they were bare (Fisher et al., 2014).

Busy classroom walls



A single study in a lab classroom.

> **Science Says:**
>
> With busy classroom walls, children **spent more time off task** and learned less from the lessons (Fisher et al., 2014). This was a single study in a lab classroom.

Change any of the three forces, and **you change what gets noticed**. Each of these steps works on one force.

- Set a clear goal before you start, so top-down control has something to steer by.
- Clear away things that stand out and don't help with your goal, such as pop-ups and clutter you can see.
- Expect rewarded habits, such as checking your phone, to pull at you. Plan around them.

> **Exercise:**
>
> Three-force check before you start.
>
> 1. Write your goal for the next 25 minutes in one short line.
> 2. Look around you and remove or cover one thing that stands out and has nothing to do with that goal.
> 3. Put your phone where you cannot see it, and note how often you think of reaching for it.
>
> The count in step 3 shows **the pull of selection history** on your own attention.

Table 1.5: What steers attention

Influence	What drives it	Example	What you can do
Bottom-up	Salience, meaning things that stand out from what is around them	A siren, a flashing notification	Remove or mute things that stand out and distract

Influence	What drives it	Example	What you can do
Top-down	Current goals held by the prefrontal cortex	Spotting a friend's red coat in a crowd	Set a clear goal before starting
Selection history	Past rewards and things you often paid attention to before	Glancing at a phone that often brings good news	Notice rewarded habits and plan around them

Key idea:

The brain picks what matters through salience, goals and selection history, and each of them is something you can work on.

Quick check:

1. What is the difference between bottom-up and top-down attention? Answer: Bottom-up attention is the world pulling at you through things that stand out. Top-down attention is your goals steering what you look for.
2. What is contingent capture? Answer: What grabs you depends on how your attention is set right now (Folk et al., 1992).
3. What third force does selection history add? Answer: Things that paid off in the past, or that you have often paid attention to, get picked up more easily (Awh et al., 2012).

1.3.2 Attention Networks and Brain Chemistry

To pay attention, the brain has three jobs. It must **wake up, then point, then choose**. How does it manage each one?

Each job has an everyday face. A runner **gets into a ready state** when the starter says “set”. That is alerting.

> **Key Concept:**
> Orienting and executive control. Turning toward the spot where a sound came from is orienting, **pointing attention at a place or thing**. Naming the ink colour of a word when the word itself says another colour is executive control, settling a clash between choices.

Wake up, point, choose

1. Alerting: a runner gets into a ready state on “set”
2. Orienting: turning toward the spot where a sound came from
3. Executive control: naming the ink colour of a word

One example for each of the three jobs.

Think of executive control as a referee. Two players both want the ball, and **the referee decides** who gets it. When the word says “blue” and the ink is red, two answers want to come out. Executive control is the referee that lets the right one through.



Attention leans on three networks that work as a team. Each has its own job and chemical messenger.

Michael Posner and Steven Petersen proposed that **separate brain networks** handle these three jobs (Posner & Petersen, 1990). They updated the model twenty years later (Petersen & Posner, 2012). The doorkeeper needs all three. It must stay awake, look the right way and pick who gets in.

What the doorkeeper needs



Stay awake: alerting



Look the right way: orienting



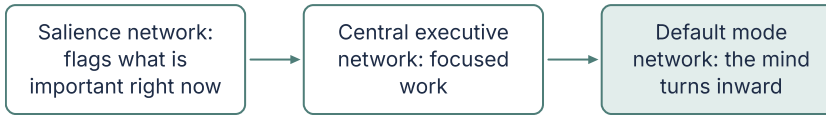
Pick who gets in: executive control

> **Science Says:**
>
> The Attention Network Test, or ANT, measures alerting, orienting and executive control in one short computer task (Fan et al., 2002). It is a research tool. Its alerting and orienting scores are **too shaky to judge one person**, and the three scores are not fully separate (MacLeod et al., 2010).

> **Key Concept:**
>
> The salience network. Brain scans taken while people simply rest show several large networks. The salience network is centred on a brain area called the insula. It **flags what is important right now** (Seeley et al., 2007).

The salience network works like a switch. It moves the brain between two other networks (Menon & Uddin, 2010). One is the central executive network, used for focused work. The other is **the default mode network**. It gets busy when the mind turns inward.

The salience network as a switch



The switch moves the brain between two other networks (Menon & Uddin, 2010).

Picture yourself writing an essay when your name is called from the kitchen. The salience network flags the call as important. It **can flip the brain** from the focused essay work toward the call.

Brain Chemistry, Arousal and Stress

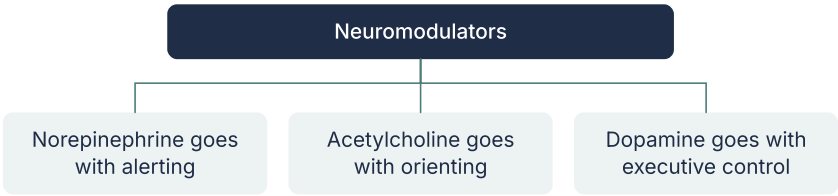
> **Key Concept:**
>
> Neuromodulators. Networks need messengers. Brain cells signal to one another with chemicals called neurotransmitters. Some of them, called neuromodulators, **act more broadly**. They change how busy wide parts of the brain are.

A text message goes to one phone. The weather **changes the whole town** at once. Neuromodulators work more like the weather, turning up or down the activity of large parts of the brain.

> **Science Says:**
>
> Three neuromodulators are central to attention. Norepinephrine, also called noradrenaline, **goes with alerting**. Acetylcholine goes with orienting, and dopamine with executive control (Petersen & Posner, 2012).

All three shape selective attention (Noudoost & Moore, 2011). Acetylcholine has a well-studied role in **spotting signals** (Sarter et al., 2005).

Three messengers, three jobs

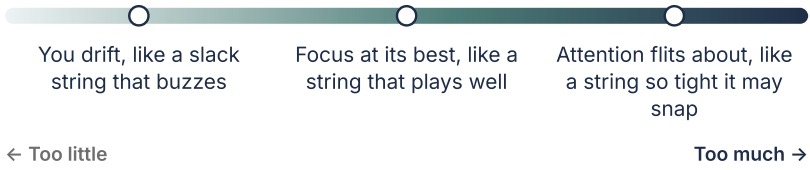


All three shape selective attention (Petersen & Posner, 2012; Noudoost & Moore, 2011).

> **Key Concept:**
>
> Arousal. Norepinephrine ties attention to arousal. Arousal is **how wound up your body and mind are**. The brainstem is the stalk at the base of the brain. A small area in it, the locus coeruleus, sends out norepinephrine.

Too little leaves you drifting, and too much makes attention flit about. **A medium level supports focus** (Aston-Jones & Cohen, 2005). Scientists call this rise-then-fall pattern an inverted U, a U turned upside down. The "right" level differs between people and tasks.

The inverted U of arousal



Think of a guitar string. Too slack, and it buzzes with no clear note. Too tight, and it may snap. **In between**, it plays well. Arousal works in a similar way, with focus at its best somewhere in the middle.

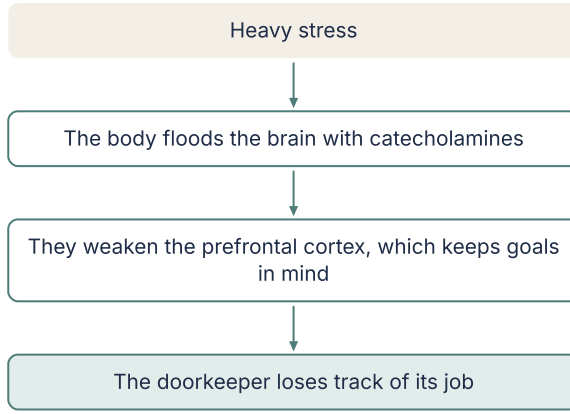


Focus works best when arousal is medium. Too little or too much makes it worse.

> 🗝 **Key Concept:**
>
> Catecholamines. Stress can push arousal too far. Under heavy stress, the body floods the brain with catecholamines, **a family of messengers** that includes norepinephrine and dopamine. At high levels, they weaken the prefrontal cortex, the front part of the brain that keeps goals in mind (Arnsten, 2009).

The prefrontal cortex is like a coach calling quiet instructions from the side of the pitch. Heavy stress is **a crowd roaring so loud** that the players can no longer hear the coach.

How heavy stress takes over



Each link makes the coach harder to hear (Arnsten, 2009).

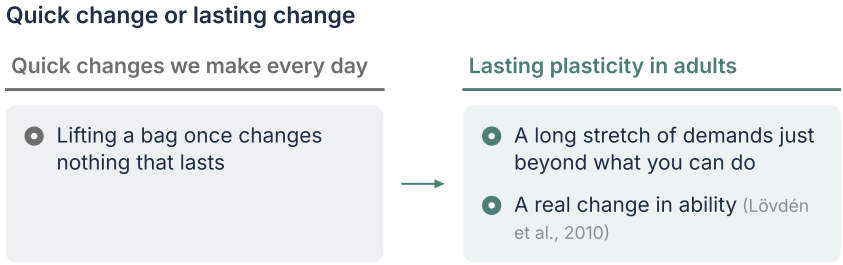
That is one reason **clear thinking can vanish** just when you need it most. Under that much stress, the doorkeeper loses track of the job it was given.

Can Training Change the Brain? Real but Specific

> **Key Concept:**
> Plasticity. The brain does change as you live and learn. Researchers call this plasticity. But changes from training are **usually specific** (Green & Bavelier, 2008). Practise a task, and you mostly get better at that one task.

> **Science Says:**
> Brain-training games make you **better at the games themselves**, less so at related tasks, with little evidence of improving everyday thinking (Simons et al., 2016).

Some training **may carry over more widely**. That kind gets harder or easier to fit you, keeps you keen and gives feedback.



Changes from training are usually specific (Green & Bavelier, 2008).

> **Science Says:**
> In one model, lasting plasticity in adults is a real change in ability. It comes from a long stretch of demands **just beyond what you can do** (Lövdén et al., 2010).

Take a muscle. Lifting a bag once changes nothing that lasts. Lifting a little more than is easy, week after week, **builds the muscle**. The model says lasting brain change needs a long stretch of that kind of stretch.

Small studies and reviews report **changes that came with training**. Some were in children's executive attention (Rueda et al., 2005). Others were in meditators (Tang et al., 2015).

> **Key Concept:**
> Meta-analysis. A meta-analysis is **a study that combines the results of many studies**. One meta-analysis found meditators' brains differed from non-meditators' in several areas (K. C. Fox et al., 2014).

One meta-analysis



A study that combines the results of many studies



Brains differed in several areas



Most of the data: one-time snapshots

> **Science Says:**
>
> In a meta-analysis of meditators' brains, the difference was moderate, which means **middle-sized** (d ≈ 0.46). The "d" is a number scientists use for how big a difference is. It works the same way for any test, so different studies can be compared. Most of the data are one-time snapshots, though. The authors warn of publication bias. This is when studies that found an effect get published more often (K. C. Fox et al., 2014).

With publication bias, it is as if only people who caught a fish post photos of their fishing trip. Looking at the photos, you would think **every trip catches a fish**. The empty trips are still out there. Nobody posted them.

Publication bias, like fishing photos

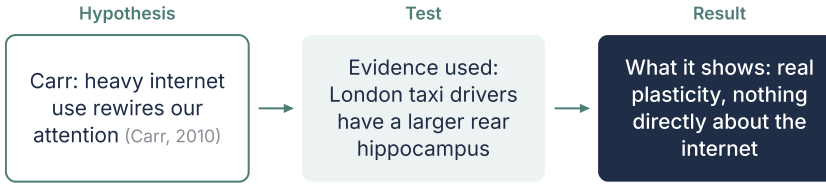
In science		Fishing trips
Publication bias	≈	Only people who caught a fish post photos
Studies nobody posted	≈	The empty trips are still out there

Each row links a part of publication bias with the fishing photos.

> **Science Says:**
> London taxi drivers have a larger rear part of the hippocampus, a memory structure. The bigger size went along with more years spent on the job (Maguire et al., 2000). That is **real plasticity**, in the kind of memory that tracks places.

It says nothing directly about the internet or attention. Nicholas Carr used it as evidence that heavy internet use rewires our attention (Carr, 2010). That **goes beyond the finding**.

The taxi drivers and the internet



The idea, the evidence used and how far that evidence goes (Maguire et al., 2000).

What This Means for Practitioners

No good evidence backs popular tips for "boosting" dopamine or noradrenaline. The tips promise to do it with foods, supplements or habits. Supplements are pills or powders sold to add something to what you eat.

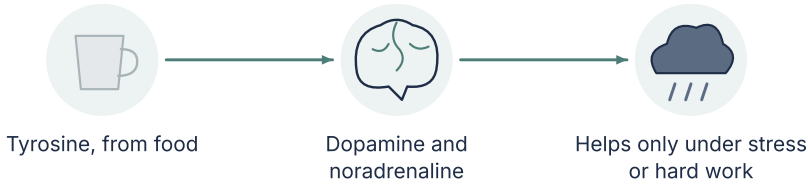
No good evidence for boosts

Dopamine: the same inverted U	**Tyrosine:** not a pill for daily focus

Dopamine's effects follow the same inverted-U shape. They depend on your starting level and the task (Cools & D'Esposito, 2011). More can help. It can also do nothing, or **even make things worse**.

> **Key Concept:**
>
> Tyrosine. The body builds dopamine and noradrenaline from tyrosine, a building block found in food. Taking tyrosine may help only when stress or hard work briefly lowers these messengers (Jongkees et al., 2015). It is **not a pill for daily focus**.

Tyrosine



> **Science Says:**
>
> Sleep has much better evidence. One study combined many studies of short-term total sleep loss, staying awake for up to two days. The largest effects were on simple and sustained attention, with **a large increase in lapses**, moments when attention drops out completely ($g \approx -0.78$, another number for the size of an effect) (Lim & Dinges, 2010). Sleep loss makes attention unstable (Lim & Dinges, 2008).

> **Science Says:**
>
> The evidence for caffeine is good. It improves vigilance, or watchfulness, and **reaction time** as well as attention (McLellan et al., 2016).

The "boosts" and better levers

No good evidence	Much better evidence
⊕ Foods, supplements or habits to "boost" dopamine or noradrenaline	⊖ Sleep: sleep loss hits sustained attention hard (Lim & Dinges, 2010)
⊕ More dopamine: it can help, do nothing or even make things worse	⊖ Caffeine: improves vigilance and reaction time (McLellan et al., 2016)
⊕ Tyrosine: not a pill for daily focus	

Popular boosts next to sleep and caffeine (Cools & D'Esposito, 2011).

I want you to pull on **a few better levers** in place of the "boosts".

- Keep arousal medium, so you are neither sluggish nor wound up.
- Protect sleep, because sleep loss hits sustained attention hard (Lim & Dinges, 2010).
- Manage stress, because high stress weakens control by the prefrontal cortex (Arnsten, 2009).
- Use caffeine on purpose. It reliably helps you stay watchful and improves attention and reaction time, even in people who are well rested (McLellan et al., 2016).

Caffeine on purpose



Exercise:

Find your middle.

1. Before your next focused task, rate how wound up you feel from 1 (sleepy) to 10 (jittery).
2. After the task, rate how well you stayed on it, from 1 to 10.
3. Do this for a week and look at which starting levels went with your best focus.

Your best level is **your own middle of the inverted U**. It may differ from a friend's, and it may differ between tasks.

Table 1.6: The three attention networks

Network	What it does	Main messenger	Everyday example	How the ANT measures it
Alerting	Reaching and keeping a ready state	Norepinephrine	Getting ready when a race starter says "set"	Alerting score (no cue compared with a double cue, which warns that a target is coming but not where)
Orienting	Aiming attention at a place or thing	Acetylcholine	Turning toward the spot where a sound came from	Orienting score (a cue at the spot compared with a cue in the centre)

Network	What it does	Main messenger	Everyday example	How the ANT measures it
Executive control	Settling a clash between choices that pull different ways	Dopamine	Naming ink colours when the words say other colours	Executive score (arrows beside the target that clash compared with arrows that match)

The chemical links in this table come from **animal and drug studies** (Fan et al., 2002). Each link is loose, with no exact one-to-one match.

The executive-control example is the Stroop task, used as an everyday case. The ANT itself uses **flanker arrows**, rows of arrows where the middle one is the target.

Flanker arrows

1. Rows of arrows
2. The middle one is the target

Table 1.7: Neuromodulators and attention

Neuromodulator	Role in attention	What to do
Norepinephrine	Alerting and arousal; follows an inverted U	Aim for medium arousal; manage stress; sleep
Acetylcholine	Orienting and spotting signals	Skip diet and supplement "boosts", since none is proven
Dopamine	Executive control and working memory; inverted-U effects	"More" is not always better; use caffeine on purpose

Key idea:

Posner and Petersen proposed that separate brain networks handle alerting, orienting and executive control. A medium level of arousal supports focus, and changes from training are usually specific.

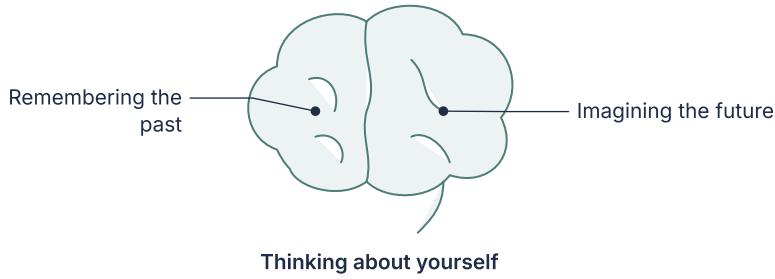
Quick check:

1. What are the three jobs of the attention networks? Answer: Alerting, orienting and executive control (Posner & Petersen, 1990).
2. What does the inverted U say about arousal? Answer: Too little leaves you drifting, too much makes attention flit about, and a medium level supports focus (Aston-Jones & Cohen, 2005).
3. Why do the taxi-driver findings not prove that the internet rewires attention? Answer: They show plasticity in memory for places and say nothing directly about the internet or attention (Maguire et al., 2000).

1.3.3 Mind-Wandering and the Default Mode Network

Where does your mind go when it has nothing in particular to do? Think of standing at a bus stop with no phone. Within a minute you may be replaying a talk from yesterday or planning the weekend. Scientists scanned the brains of **people resting quietly** to see what happens in moments like that.

What the brain is busy with: the default mode network



The kinds of thought that keep the network busy at rest (Raichle et al., 2001).

> **Key Concept:**
>
> The default mode network. A set of brain areas was **busier at rest** than during many focused tasks. Scientists called it the default mode network, the brain areas that get busy when your mind is left to itself (Raichle et al., 2001).

It is busy when you **think about yourself**. The same network gets busy when you remember the past or imagine the future (Buckner et al., 2008). For the doorkeeper, these are guests from the house, your own memories and plans. They come in when no guest from the street holds the room.

> **Definition:**
>
> **MIND-WANDERING:** thought that drifts away from the task at hand.

Science Says:

In one brain-scan study, the default network was busy **while people's minds wandered**. People who said their minds wandered a lot in daily life showed more activity in this network (Mason et al., 2007). It was a small study, as most brain-scan studies were at the time.

Key Concept:

Spontaneous thought. One model treats mind-wandering as **spontaneous thought**, the kind that pops up by itself (Christoff et al., 2016). Part of it you steer on purpose. Part comes from automatic pulls, such as worries.

Spontaneous thought



Thought that pops up by itself



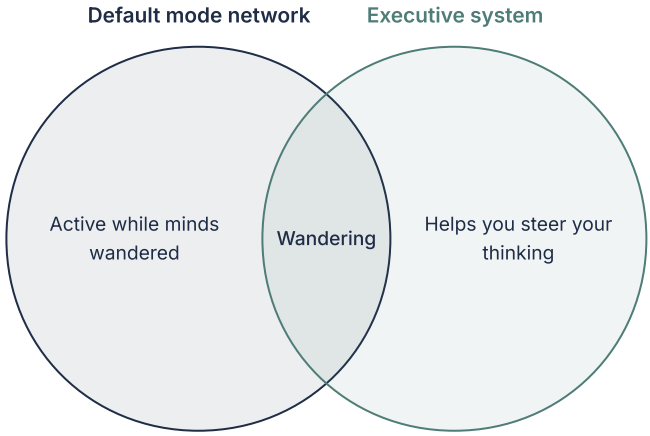
Part you steer on purpose



Part comes from automatic pulls, such as worries

People reported their thoughts during brain scans (Christoff et al., 2009). While their minds wandered, the default mode network was active. The brain's executive system, which helps you steer your thinking, **was busy at the same time**. Wandering is more than the default mode network working alone.

Wandering uses more than one network



People reported their thoughts during brain scans (Christoff et al., 2009).

Picture a school play. The actors make up the scenes, and **the stage crew keeps the lights and curtains working**. Both are busy at once. In a wandering mind, the default network is like the actors, and the executive system is like the crew.

How Often Minds Wander, and Its Costs

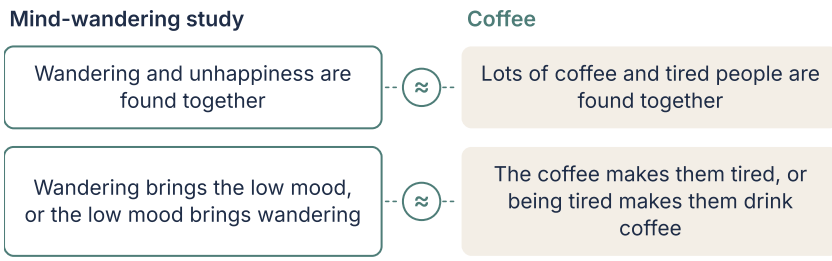
One large study measured how often the mind wanders off. It sent prompts to people's phones about what they were doing and thinking. Their minds were wandering in **about 47% of the samples** (Killingsworth & Gilbert, 2010). They were also less happy in the moment when it was.

> **Science Says:**
> Wandering is common. People in one large phone-prompt study were thinking about **something other than what they were doing** almost as often as about what they were doing (Killingsworth & Gilbert, 2010). Minds wandered in about 47% of the samples, an estimate from people who chose to use the app.

The study links wandering with unhappiness, **without showing which causes which**. Wandering might bring the low mood, or a low mood might send the mind wandering (Killingsworth & Gilbert, 2010).

Take tired people and coffee. People who drink lots of coffee are often tired. Maybe the coffee makes them tired, or maybe being tired **makes them drink coffee**. A study that only finds the two together cannot tell you.

Which causes which?



You reach the bottom of a page and realise you **took in nothing** (Smallwood & Schooler, 2015). The doorkeeper was busy with guests from the house, your own thoughts, so the page never got in.

> **Science Says:**
>
> Stories suffer in a special way. In one study, people read a detective story. When their minds wandered, they could still recall facts from it, yet **they lost the thread** of what was going on (Smallwood et al., 2008).

Wandering early in the story **did the most harm** (Smallwood et al., 2008). A missed clue at the start can spoil the whole mystery.

Wandering during a detective story



Facts from it: still recalled

What was going on: the thread lost

Wandering early: the most harm

Students watched a recorded lecture. As the lecture went on, their minds wandered more, and their memory for the lecture dropped. The more a student's mind wandered, **the less they remembered** (Risko et al., 2012).

People who are more easily pulled away by things around them that have nothing to do with the task **tend to mind-wander more** (Forster & Lavie, 2014). This link was for that one kind of distraction, and people rated their own wandering.



Wandering is common, and when it sneaks in mid-task, it costs you what you were reading or hearing.

> **Key Concept:**
>
> Experience sampling. Catching something as private as a wandering mind is hard. One way is to send phone prompts. This method is called **experience sampling**. It means asking people at random moments what they are thinking.

Catching a wandering mind



Experience sampling: phone prompts at random moments



Mind-Wandering Questionnaire: five items about yourself



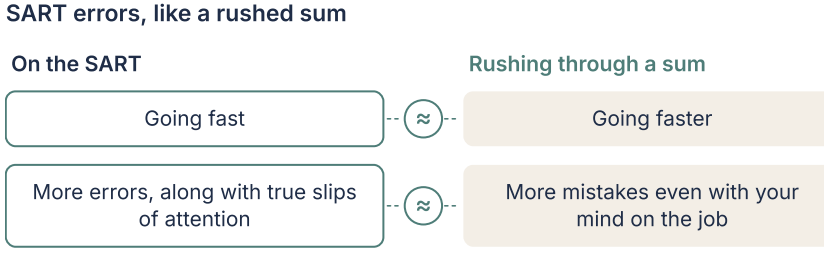
SART: press a key for every digit except one rare digit

Another way is a questionnaire, a short list of written questions **people answer about themselves**. One example is the five-item

Mind-Wandering Questionnaire, or MWQ (Mrazek, Phillips, et al., 2013).

> **Science Says:**
> Researchers can catch wandering with a dull task. In the Sustained Attention to Response Task, or SART, you press a key for every digit except one rare digit (Robertson et al., 1997). Slips on that rare digit go along with **everyday attention failures**.

The slips depend on how fast people choose to go. Errors on tasks like the SART **partly come from speed**, a trade between going fast and getting it right, along with true slips of attention (Seli et al., 2012; Seli, Jonker, et al., 2013). It is like rushing through a sum, where going faster brings more mistakes even with your mind on the job.



Part speed, part true slips (Seli et al., 2012; Seli, Jonker, et al., 2013).

Invited or Uninvited: Benefits and Coming Back

> **Key Concept:**
> Intentional mind-wandering. Letting your thoughts roam on a walk is **intentional mind-wandering**, the kind you choose. Wandering that sneaks in while you are in the middle of a task is unintentional. The two go along with different things (Seli et al., 2016).

Mind-wandering helps with **planning and with creative ideas** (Smallwood & Schooler, 2015). Guests from the house are welcome when you invite them in, on a walk or in the shower. They cost you when they push in during a task that needs the room.

Invited or uninvited

Intentional	Unintentional
⊕ Letting your thoughts roam on a walk	⊖ Sneaks in while you are in the middle of a task
⊕ Helps with planning and creative ideas	⊖ Costs you

The two go along with different things (Seli et al., 2016).



Chosen wandering can help with planning and new ideas. Wandering that sneaks in mid-task has costs.

The salience network can **bring you back to the task** (Menon & Uddin, 2010). It switches the brain back to the executive network.

Think of a friend in class who taps your shoulder when the teacher asks you a question. **You snap back** to the room. The salience network does a job like that tap (Menon & Uddin, 2010).

> **Science Says:**
>
> One small study found **lower default-mode activity** in skilled meditators while they meditated (Brewer et al., 2011). It compared people with years of practice to people who had never meditated, at one point in time.

The study shows a difference that **goes with meditation experience**. It cannot show that the training caused the difference (Brewer et al., 2011).

One small meditation study



Skilled meditators: lower default-mode activity



Looked at once, at one point in time



Cannot show the training caused it



When one network is busy, the other tends to quiet down.

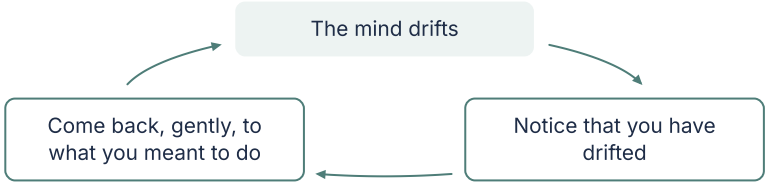
Short quizzes can bring minds back to a lesson. In two lab experiments, students watched online lectures. Some got **short quizzes between the parts** of the lecture (Szpunar et al., 2013).

> Science Says:
>
> Students who got short quizzes during online lectures **let their minds wander less**. They took more notes and learned more. They also felt less worried about the final test (Szpunar et al., 2013).

> Exercise:
>
> Quiz yourself.
>
> 1. Next time you watch a long video lesson, pause it every ten minutes or so.
> 2. Write down two things you just learned, without looking back.
> 3. Then press play again.
>
> The pause **gives your attention a reason** to stay with the lesson.

Coming back has two steps. First you **notice** that you have drifted. Then you come back, gently, to what you meant to do.

Noticing and returning



Each return is one more round of practice (Menon & Uddin, 2010).

Noticing and returning is **a skill you can practise**. In one randomised study, where people were split into groups by chance, a two-week mindfulness course made minds wander less during tests (Mrazek, Franklin, et al., 2013). It did not test how fast people notice and return. Choose when to wander, and come back fast when wandering sneaks in.

> Exercise:
>
> Catch and return.
>
> 1. Choose a reading or work task of about 15 minutes.
> 2. Each time you catch your mind wandering, make a small mark on paper, then return to the task.
> 3. Afterwards, look at the marks. Were they spread out, or bunched together when the task got dull?
> 4. Later in the day, give yourself five minutes of chosen wandering on a short walk.
>
> Every mark is **one moment you noticed** and came back.

Table 1.8: Mind-wandering

Kind	Costs	Benefits	What you can do
Unintentional (mid-task)	Missed information; errors; goes with lower mood in the moment	Few during hard tasks	Work on noticing and returning; measure with the Mind-Wandering Questionnaire (MWQ) or SART (Mrazek, Phillips, et al., 2013; Robertson et al., 1997)
Intentional (chosen)	Small if timed well	Planning, creativity, rest	Plan “free thinking” time, for example on walks
How often it happens	Common; one app study estimated about 47% of moments	Shows how common drifting is	Expect wandering, and put your effort into the return

Key idea:

Your mind wanders often, and wandering that sneaks in mid-task costs you what you were taking in. Coming back starts with noticing that you have drifted.

Quick check:

1. When is the default mode network busy? Answer: When you think about yourself, remember the past or imagine the future (Buckner et al., 2008).
2. How often were minds wandering in the phone-prompt study? Answer: In about 47% of the samples, an estimate from people who chose to use the app (Killingsworth & Gilbert, 2010).
3. What are the two steps of coming back? Answer: Notice that you have drifted, then return gently to the task.

1.3.4 Attention Disorders: ADHD and Beyond

When is trouble focusing just a bad week, and when does it **need a clinician**? We all lose our keys at times. Everyone's doorkeeper has an off day now and then.

Clinicians are doctors and other health experts. They look for three signs that set a lasting problem apart from a bad patch. It is the difference between **a rainy day and a rainy climate**.

> **Key Concept:**
>
> Three signs of a disorder. The problems **last a long time**. They start early. They cause trouble in many parts of life, such as school or work, home and friendships.
>
> One bad week has none of these signs. A pattern that has all three is **a reason to see a clinician**.

A bad week or a disorder?



A rainy day: one bad week



A rainy climate: a lasting problem



A reason to see a clinician

ADHD: What It Is, How Common It Is and What Helps

> **Definition:**
>
> **ADHD:** attention-deficit/hyperactivity disorder, a lasting pattern of trouble paying attention, or of being overactive and acting without thinking, or both.

> **Key Concept:**
>
> Disorder. A child with ADHD might **lose track of a task halfway through**, or find it very hard to wait for a turn. A disorder, here, means a problem that gets in the way of everyday life.

It starts in childhood and shows up in **more than one setting**. It gets in the way of daily life (American Psychiatric Association, 2022; National Institute of Mental Health [NIMH], n.d.).

What ADHD is



ADHD is well studied (Faraone et al., 2015; Centers for Disease Control and Prevention, 2026). Only **trained clinicians** can diagnose it.

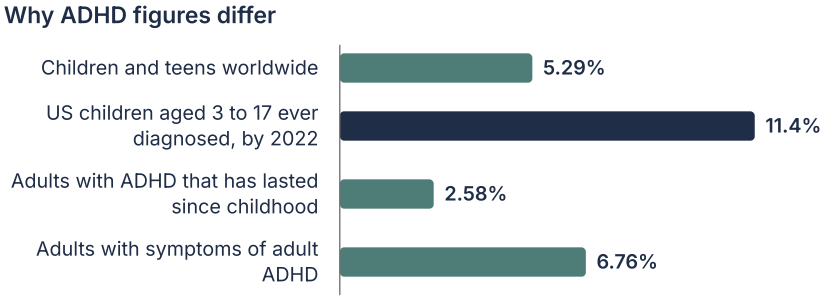
> **Science Says:**
> Worldwide, about 5.29% of children and teens have ADHD (Polanczyk et al., 2007). By 2022, about 11.4% of US children aged 3 to 17 had **ever been diagnosed** (Danielson et al., 2024).

Among adults, about 2.58% have **ADHD that has lasted since childhood** (Song et al., 2021). About 6.76% have symptoms of adult ADHD.

> **Key Concept:**
> Prevalence. The figures vary because each one **counts its own thing**, in its own way. Some count anyone "ever diagnosed". Others count who has it now, called current prevalence, where prevalence means how many people have something.

Think of counting people who have ever broken a bone, and then counting people who have a broken bone today. The first number is

much bigger, yet both counts are honest. ADHD figures differ in the same way.



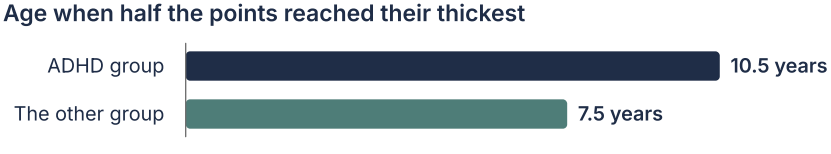
Four groups, four figures: each study counts a different group (Polanczyk et al., 2007; Danielson et al., 2024; Song et al., 2021).



ADHD figures vary because each number counts its own thing, with its own methods.

On average, brains in ADHD grow on **a different timetable**. One study scanned 223 children with ADHD and 223 without, many times as they grew. The outer layer of the brain reached its thickest point later in the ADHD group (Shaw et al., 2007).

> **Science Says:**
>
> In the ADHD group, half of the measured points on the brain's outer layer reached their thickest by about age 10.5. In the other group, it was about age 7.5 (Shaw et al., 2007). These are **group middles**. They do not mean any one child is three years behind, or that children simply grow out of ADHD.



Average age for each group of 223 children (Shaw et al., 2007).

A large analysis compared ADHD medicines across 133 trials (Cortese et al., 2018). It shows **which ones work best** for children and adults. It also shows which are best tolerated, meaning they cause the fewest problems.

A big trial split 579 children aged 7 to 9 into four groups by chance. After 14 months, all four groups had improved. Children given carefully managed medicine, alone or with behaviour therapy, **improved most** on most symptoms (MTA Cooperative Group, 1999).

> **Science Says:**
>
> Children from the 579-child trial were followed up years later. The trial's four groups got carefully managed medicine, medicine with behaviour therapy, intensive behaviour therapy or community care (MTA Cooperative Group, 1999). By 8 years on, in nearly every analysis, the four groups **no longer differed** (Molina et al., 2009). Medicine use had dropped by 62% after the trial ended, but allowing for that did not change the results.

Medicine helped while the trial ran. The early plan, on its own, **did not predict** how children were doing years later (Molina et al., 2009).

One big trial, two results



The World Federation of ADHD, a worldwide group of ADHD experts, agreed on a shared statement that sums up the research (Faraone et al., 2021). It is **the best single summary** of what is known.

Beyond Medication: Non-Drug Treatments, Genes and Environment

Researchers tested treatments without medicine (Sonuga-Barke et al., 2013). In some tests, the people rating symptoms likely did not know who got what. In those tests, three treatments **no longer clearly reduced core symptoms**.

> **Key Concept:**
> Neurofeedback and cognitive training. Three tested non-drug treatments are behavioural treatment, neurofeedback and cognitive training. Behavioural treatment teaches parents and children new routines and rewards. In neurofeedback, people watch their own brain signals on a screen and try to change them. Cognitive training means **computer tasks that drill memory and attention**.

> **Key Concept:**
> Blind ratings. A rater who does not know who got the treatment is called blind. **Blind ratings** are fairer, because hope cannot tilt the score. A parent who knows their child had a new treatment may see more progress than a stranger would.

Only two things still reduced symptoms. Supplements of certain fats, called free fatty acids, had **a small effect**. Removing artificial food colours helped in children often chosen for their sensitivity to them (Sonuga-Barke et al., 2013).

Non-drug treatments on blind ratings

No longer clearly reduced core symptoms	Still reduced symptoms
⊕ Behavioural treatment	⊖ Supplements of free fatty acids: a small effect
⊕ Neurofeedback	⊖ Removing artificial food colours, in children often chosen for their sensitivity
⊕ Cognitive training	

Which treatments still helped when the raters did not know who got what (Sonuga-Barke et al., 2013).

Two of the three still **help in other ways**. Behavioural programmes help parenting and cut conduct problems, which means behaviour problems such as fighting or breaking rules (Daley et al., 2014). Cognitive training boosts scores on lab tests of working memory (Cortese et al., 2015). Its effects on symptoms are small when raters don't know who got it.

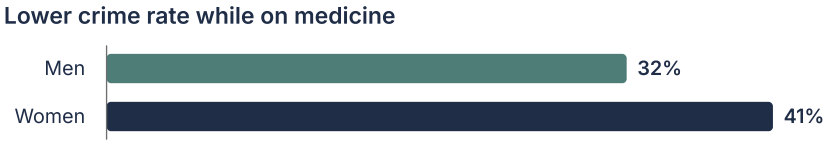
Science Says:

Adults on medicine had 12 sessions of cognitive behavioural therapy, or CBT, a talking therapy, added on top. It beat a comparison treatment on blind ratings, and the gains lasted 12 months. This was **one trial at a single site** (Safren et al., 2010).

Science Says:

In Sweden, researchers followed 25,656 people with ADHD to look at real-life results beyond symptoms. While on medicine, men had a 32% lower crime rate and women a 41% lower rate than **during their own times off medicine** (Lichtenstein et al., 2012).

This study watched what happened and **did not assign medicine by chance**. The authors say only that the results raise the possibility that medicine lowers the risk (Lichtenstein et al., 2012).



Compared with their own times off medicine, among 25,656 people with ADHD in Sweden (Lichtenstein et al., 2012).

Key Concept:

Heritability. Genes play a large part in ADHD. Scientists measure this with a number called heritability. Heritability describes **a whole group of people**. It says how much of the differences between people in that group come from differences in their genes (Visscher et al., 2008).

Twin studies give the number. They compare identical twins, who share all their genes, with non-identical twins, who share **on average half** of the genes that differ between people (Faraone & Larsson, 2019). The more alike identical twins are, compared with non-identical twins, the bigger the part genes play.

How twin studies give the number

	Genes shared
Identical twins	All their genes
Non-identical twins	On average half of the genes that differ between people

> **Science Says:**
> The average heritability across 37 twin studies of ADHD was **about 74%** (Faraone & Larsson, 2019). Studies in which adults rated themselves gave lower figures, around 30 to 40%. Because the figure is less than 100%, the environment must be involved too (Faraone & Larsson, 2019).

Picture a field of wheat where every plant gets the same water and soil. Then most of the differences in height come from the seeds. In a field where some plants get far more water, **the water explains more**. The heritability number belongs to one field at one time, never to one plant (Visscher et al., 2008).

What the twin figure says

74%

Average heritability across 37 twin studies of ADHD

> **Science Says:**
> No single "ADHD gene" has been found. A study of 20,183 people with ADHD and 35,191 without found **12 places in the genes** linked to ADHD (Demontis et al., 2019). The results suggest ADHD is the far end of a trait that varies across everyone, where a trait is a quality people have more or less of.

Johann Hari's book Stolen Focus gives **great weight to the environment** as a cause of ADHD (Hari, 2022). The twin evidence shows genes explain a large share of the differences between people (Faraone & Larsson, 2019). On that evidence, any account that pushes genes to the side goes too far.

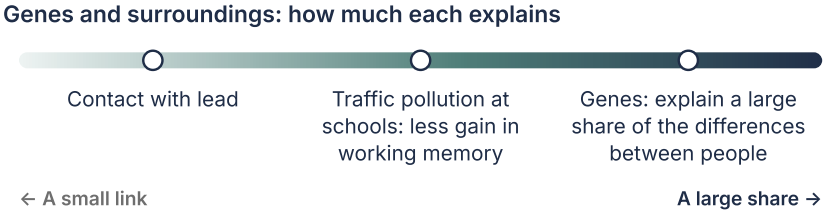
Links with a person's surroundings are real. They come from watching people, which **cannot prove cause**. Contact with lead goes along a little with inattention (r = .16; Goodlad et al., 2013). Lead goes along with lower IQ, a score on thinking tests (Lanphear et al., 2005).

Genes or environment?

Hari:	Twin evidence:
great weight to the environment	genes play a large part

> **Key Concept:**
> A small link. Contact with lead goes along a little with inattention (r = .16; Goodlad et al., 2013). An r of .16 is a small link. It means that, on average, more lead goes with a little more inattention, with **many exceptions** in both directions.

Children at schools with high traffic pollution **gained less in working memory** and in attentiveness over a year (Sunyer et al., 2015). Other things may explain part of this.



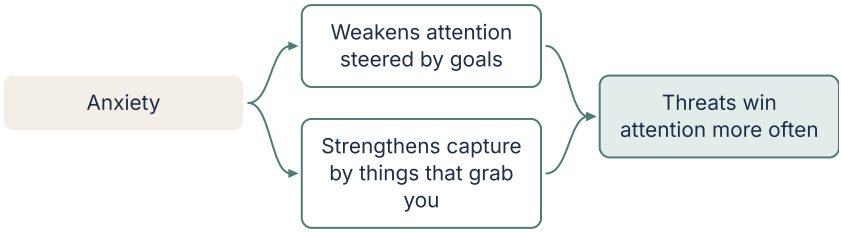
Links with surroundings are real, but they come from watching people and cannot prove cause.

Other Conditions That Affect Attention

> **Key Concept:**
> Attentional bias. Anxiety affects attention. Anxious people's attention reliably jumps to threats, a pull called attentional bias, where bias means **a lean in one direction**. The effect was middle-sized (d ≈ 0.45). People who are not anxious do not show it (Bar-Haim et al., 2007).

Attentional control theory gives **one possible reason** (Eysenck et al., 2007). Anxiety weakens attention steered by goals. It strengthens capture by things that grab you, so threats win attention more often. The doorkeeper lets threats in first.

Attentional control theory



Picture someone anxious about a test, trying to revise. Every worried thought about failing **gets in first**, and the notes wait outside.



In anxiety, worried thoughts and threats tend to win the race for attention.

Severe traumatic brain injury, an injury from a blow to the head, often harms attention and processing speed (Mathias & Wheaton, 2007). Processing speed means **how fast you take in and handle information**.

Other conditions, other effects



Anxiety: worry gets in first



Stroke: one side of space ignored



Depression: problems with memory and attention

> **Key Concept:**
>
> Spatial neglect. After some strokes, people ignore one side of space. This is called spatial neglect. It is best understood as **a problem in the brain networks that steer attention** (Corbetta & Shulman, 2011).

Imagine someone who eats only the food on the right half of the plate and never notices the left half. **Their attention no longer goes there.**

> **Science Says:**
>
> Depression brings moderate, or middle-sized, problems with memory and attention (Rock et al., 2014). It affects executive function, the skills that manage your thinking. Attention problems **can last even after mood gets better**.

Post-COVID-19 syndrome means symptoms 12 weeks or more after catching the virus. Among people with it, about 22% had problems with thinking, called cognitive impairment (Ceban et al., 2022). About 32% reported tiredness, or fatigue. These figures **varied hugely between studies**.

Post-COVID-19 syndrome and attention



How many people with lasting symptoms had each problem (Ceban et al., 2022).

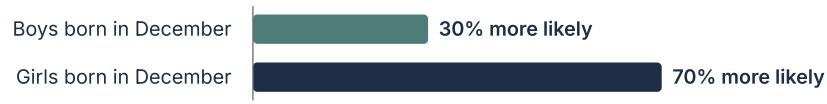
The Practitioner's Scope: Support, Don't Diagnose

A practitioner is anyone who teaches or coaches attention skills. If that is you, your job is to **notice warning signs** and send the person to a doctor.

> **Key Concept:**
>
> Screening scales. You **do not diagnose ADHD** or any other condition. Screening scales are short lists of questions that flag who may need a full check, and you do not use them to label anyone. One such scale is the Adult ADHD Self-Report Scale, or ASRS, a list of questions adults answer about themselves (Kessler et al., 2005).

A child's age in class can sway who gets a diagnosis. In British Columbia, researchers looked at 937,943 children. Boys born in December, the youngest in their school year, were **30% more likely to be diagnosed** with ADHD than boys born in January. For girls, it was 70% (Morrow et al., 2012).

More likely to be diagnosed: born in December



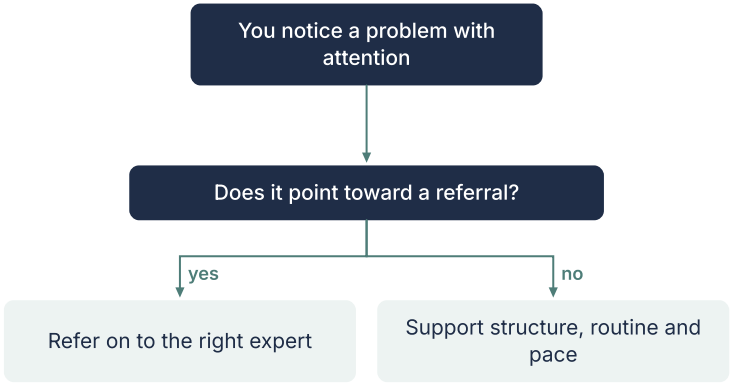
Each bar: children born in December compared with those born in January, boys with boys and girls with girls (Morrow et al., 2012).

> **Science Says:**
> In British Columbia, children born in December, the youngest in their school year, were more likely to be diagnosed with ADHD than those born in January. The worry with age in class is that being the youngest, and so **less grown up than classmates**, can be mistaken for ADHD. The British Columbia study only watched what happened, and the authors raised concerns about possible harm from too many diagnoses (Morrow et al., 2012).

You **refer on**, sending the person to the right expert. These signs point toward a referral.

- Inattention or restlessness that has lasted a long time and began in childhood.
- Problems that show up in several parts of life, such as work, home or relationships.
- Troubles that clearly harm daily life.
- Low mood or high anxiety that won't go away.
- Attention changes after a head injury or a stroke, or after an illness.

Support, do not diagnose





Practitioners notice the signs and refer on. They never diagnose or label anyone. They support structure and pace.

Each condition calls for **its own kind of support**. For ADHD, leave treatment to clinicians. Medicine is the best-tested choice, and you can support structure and routines. For anxiety, refer for care, and keep tasks clear and focused on goals.

Each condition, its own support



ADHD: leave treatment to clinicians



Anxiety: refer for care



Depression or brain injury: refer for assessment

For depression or brain injury, refer for **an assessment**, a full check by an expert. Do the same after a stroke or post-COVID-19. In each case, adjust the pace of any training.

Table 1.9: Conditions that affect attention

Condition	Main attention features	Care with good evidence	Practitioner's role
ADHD (children)	Lasting inattention and/or overactive behaviour and acting without thinking in more than one setting	Medicine (Cortese et al., 2018); behavioural programmes help parenting and conduct, while core symptoms did not clearly drop on blind ratings (Daley et al., 2014)	Refer; support routines; never diagnose
ADHD (adults)	Lasting symptoms that began in childhood	Medicine; CBT added to medicine (Safren et al., 2010)	Refer; support with structure
Anxiety and attention pulled to threat	Attention pulled toward threat; weaker control by goals	Clinical treatment (refer)	Refer; keep tasks focused on goals
Depression	Middle-sized attention and executive problems that can outlast low mood	Clinical treatment (refer)	Refer; adjust pace of training
Post-COVID-19 syndrome	Thinking problems in about a fifth; fatigue common; varies widely	Clinical assessment (refer)	Refer; pace sessions
Traumatic brain injury	Slower processing; attention problems	Clinical rehabilitation, therapy to win back lost skills (refer)	Refer; support under clinical guidance
Spatial neglect	Ignoring one side of space after a stroke	Clinical rehabilitation (refer)	Refer only

Key idea:

Many conditions can harm attention, and your part is to spot lasting warning signs and send the person to a clinician.

Quick check:

1. What three things do clinicians look for? Answer: Problems that last a long time, start early and cause trouble in many parts of life.
2. Why do ADHD figures differ? Answer: Each one counts its own thing in its own way, such as “ever diagnosed” or current prevalence.
3. Does a heritability of 74% mean 74% of one child’s ADHD comes from genes? Answer: No. Heritability describes differences across a group. It says nothing about one child (Visscher et al., 2008).



Module

2

How Attention Works with Memory, Intellect and Creativity

Attention never works alone. When you learn a name, solve a sum or look for a new idea, **attention is working with another ability** at the same moment. This module looks at those partnerships one at a time. It then shows how to choose the right kind of attention for each step of a real task.

In this book's terms, attention means **choosing what is important and staying with it**. Memory keeps what attention lets in. Intellect solves standard problems, the kind we already know how to approach, where the variables are identified. Creativity deals with new problems with no ready-made method, where the variables are not yet identified.

Attention and its three partners

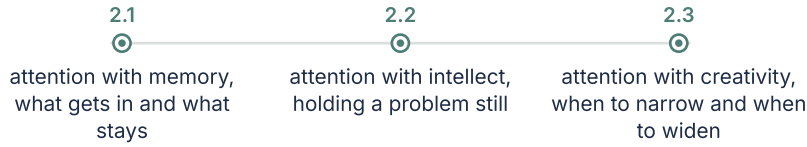


Attention: choosing what is important and staying with it	Memory keeps what attention lets in	Intellect: standard problems, variables identified	Creativity: new problems, variables not yet identified

The module has three chapters. **Chapter 2.1 pairs attention with memory**, and looks at what gets in and what stays. The Memory book calls this intake side extractivity, and here you see it from the attention side. Chapter 2.2 pairs attention with intellect, and shows how attention holds a problem still while you reason through it.

Chapter 2.3 pairs attention with creativity. It looks at **when to narrow and when to widen**, and at what side details and breaks can do for a stuck idea. Its last section brings the three partnerships together in one map that you can use on any task.

The three chapters of this module



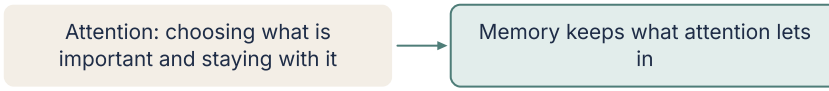
Each section ends with exercises at three levels, from a short starter to an advanced task for real work. **Bring one real task of your own** to the module, such as a report, a plan or a talk. Try each section's ideas on it as you go.

2.1.1 Attention Decides What You Remember

You meet a new neighbour at the garden gate while your phone buzzes in your pocket. She tells you her name, and you glance at the screen for a second. **By the time you reach your own door, the name is gone.** You heard it, yet it never stayed.

That small loss is where this module begins. In this book's terms, attention means **choosing what is important and staying with it**. Memory keeps what attention lets in, so the two work as a team at the start of everything you learn.

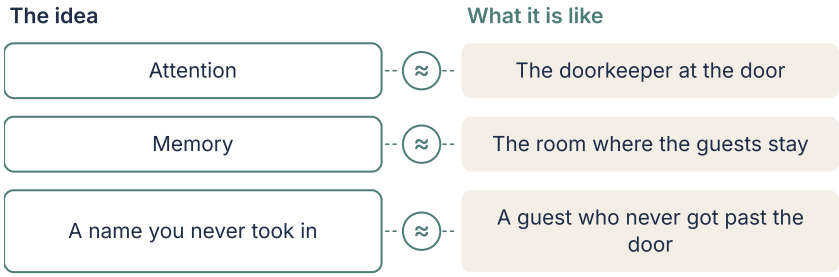
Attention and memory as a team



Picture the doorkeeper at the door of a small room. **Only the guests it lets in can be kept.** Memory is the room where they stay, and a guest

who never got past the door leaves no trace inside. A real mind is far messier than one door, so the picture only goes so far.

The doorkeeper and the room



Scientists have a name for that first step. In 1.2.1 you met it as **encoding**, a bit like pressing save on a note in your phone. Getting it back out later is called retrieval, like opening the note again.

Saving a note in your mind

Definition

Encoding

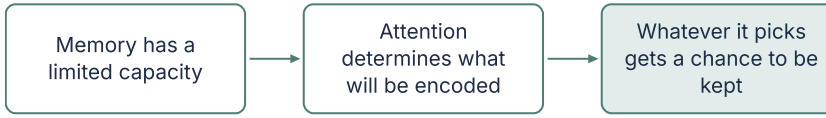
The first step, a bit like pressing save on a note in your phone. Retrieval is opening the note again.

Science Says:

One review of the research made the link very simple. The authors wrote that "Attention and memory cannot operate without each other" (Chun & Turk-Browne, 2007). They gave the reason too, that "memory has a limited capacity, and thus attention determines what will be encoded" (Chun & Turk-Browne, 2007). **Memory cannot save everything**, so attention picks what gets saved.

In this book's picture, **the doorkeeper does that picking**. It cannot wave every guest through, and it has to choose. Whatever it picks gets a chance to be kept, and the rest walks on down the street.

Why attention picks what gets saved



The Memory book has its own word for this intake side. It calls it **extractivity**, from "extract", which means to pull something out. This module looks at the same moment from the attention side. It is the moment when something new reaches you and you choose whether to take it in.

Two books, one moment

- The Memory book calls the intake side extractivity
- This module looks at the same moment from the attention side



A doorman in a long coat holding open the door of a small lamplit room, a single guest stepping inside from a busy street.

In 1.2.1 you met a study on splitting attention while learning (Craik et al., 1996). **Its main finding is told there.** The same study holds one more detail that is easy to miss, and it belongs in this module.

> **Science Says:**
>
> The team also timed a second task that people did at the same time. Splitting attention while taking material in brought only "small increases in RT" (Craik et al., 1996). RT means reaction time, how fast people answered on the second task. **The second task barely slowed** at the moment of intake.

What the timed second task showed

- Splitting attention while taking material in brought only small increases in RT
- RT means reaction time: the second task barely slowed

Think about what that means at the garden gate. While you heard the name and checked the phone, both jobs seemed to go fine. **The cost did not show up in the moment.** It showed up later, when you reached for the name and found nothing in the room.

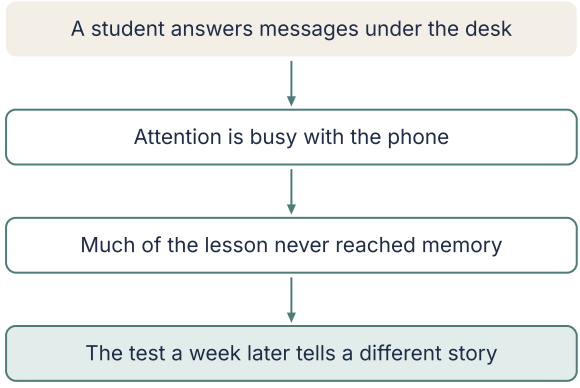
On this book's reading, that is why the split is so easy to fall for. You may feel you handled both things, because the second task kept up its pace. **Memory pays the bill afterwards**, and by then the moment of intake is over.

At the gate, and an hour later

Before	After
Both jobs seemed to go fine	You reach for the name and find nothing
The second task kept up its pace	Memory pays the bill afterwards

The same thing can happen in a lesson. A student answers messages under the desk and still nods along, and the lesson seems to make sense while it lasts. **The test a week later tells a different story**, because much of the lesson never reached memory. The student felt present, yet attention was busy with the phone.

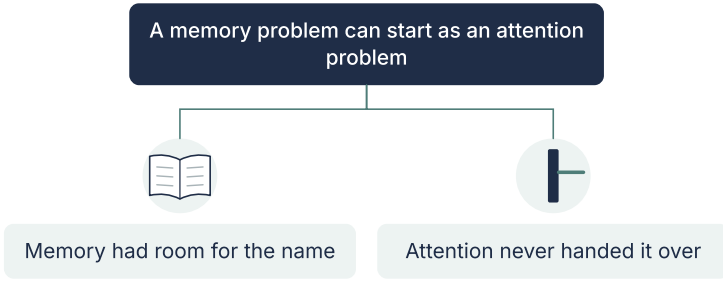
A lesson that never reached memory



> 🔑 **Key Concept:**
>
> Protect the moment of intake. It is **a rule for the first step of learning**, before any revising, testing or practice can help. A name, a lesson or an instruction often reaches you only once, so those are the seconds that count.

The team in that review said the two cannot work without each other, and the gate shows why. Memory had room for the name, and attention never handed it over. **A memory problem can start as an attention problem**, long before anything is forgotten.

Where a forgotten name starts



Most intake moments are short. A colleague reads out a phone number. A doctor explains how many tablets to take and when. **A few seconds of full attention** decide whether you will have that information an hour from now.

Look at the definition again with this in mind. Choosing what is important is **the doorkeeper picking the guest**, such as the neighbour's name out of all the sounds at the gate.

Staying with it is holding the door open long enough for the guest to come all the way in. Both halves are needed, because a name you chose and then left after half a second can still slip away.

Both halves of the definition at the gate

	Choosing what is important	Staying with it
At the gate	The doorkeeper picking the guest	Holding the door open
Here	The neighbour's name out of all the sounds	Long enough for the guest to come all the way in

Some intake moments come with a warning. A teacher says "this will be on the test", or a friend says "write this down". Others arrive without one, such as the name of a new colleague at a busy meeting. **The unannounced ones are the easiest to lose**, since nothing tells you to stop the second task.

Intake moments with and without a warning

With a warning	Without one
A teacher says "this will be on the test"	The name of a new colleague at a busy meeting
A friend says "write this down"	The unannounced ones are the easiest to lose

You cannot guard every second of the day, and you do not need to. Choosing what is important comes first, so **pick the intake moments that count** before they arrive. Good places to begin are the start of a meeting and the first lesson of a new course. The moment a child tells you about her day is another.

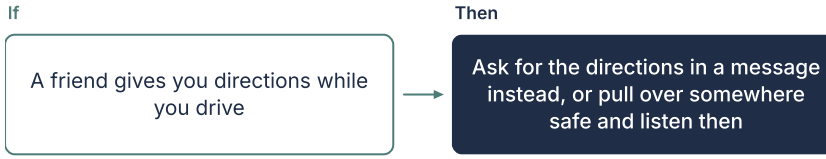
Intake moments that count

- [x] The start of a meeting
- [x] The first lesson of a new course
- [x] The moment a child tells you about her day

Some moments leave no way to stop the second task. If a friend gives you directions while you drive, **the road has to keep your attention**.

Ask for the directions in a message instead, or pull over somewhere safe and listen then. The rule is the same, because the intake gets your full attention once the road no longer needs it.

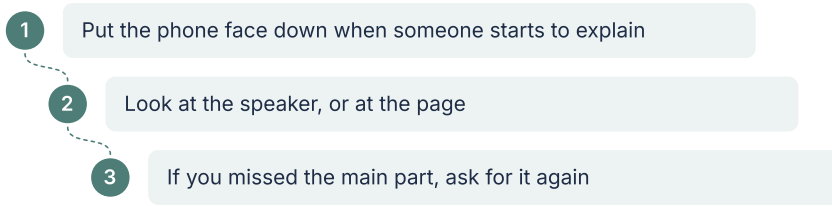
Directions while you drive



Protecting intake still leaves room for doing two things in a day. You **put the second task down for the few seconds** that count, and pick it up again straight after. The phone can wait for the end of a sentence. The email can wait until the instructions are finished.

A few habits make that easier. Put the phone face down when someone starts to explain something. Look at the speaker, or at the page, and let the other screen go dark. **If you missed the main part, ask for it again**, since a second chance at intake is often easy to get.

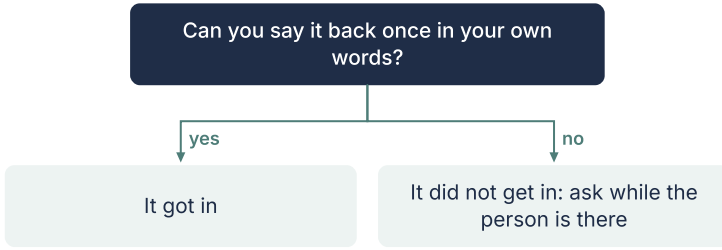
Habits that protect intake



You can also turn the doorkeeper's work into a short check. After a name or an instruction, **say it back once in your own words**.

If you cannot say it back, it did not get in, and you can still ask while the person is there. The whole check takes about as long as the name itself, and it turns a guess into something you know.

The say-it-back check



The exercises below rest on one study and on this book's own rule. The intake check borrows **its idea from the study above** (Craik et al., 1996).

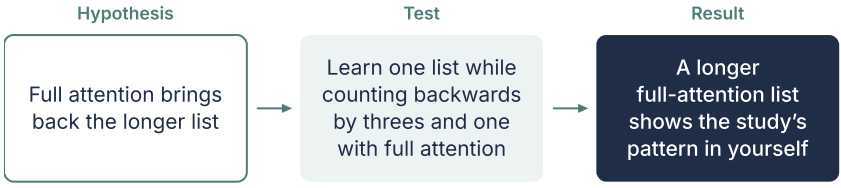
It is a study contrast used as practice, and no one has tested it as training. The encoding log and the Try it are practice too, so watch what each one shows you about your own memory.

How the exercises rest on the study

- The intake check borrows its idea from one study (Craik et al., 1996)
- No one has tested it as training, so it is practice

Read the middle level's result with care. A single try is a small test, so **run it twice** before you trust what it shows.

The intake check



If the full-attention list comes back longer, **you have seen the study's pattern in yourself**. If both lists come back the same, note what the second task was and try a harder one, such as counting backwards by sevens.

Exercise:

Try it. Next time someone tells you their name, stop what you are doing for those seconds. Look at them and say the name back once.

Exercise:

Guard the way in.

1. Starter. Before a short instruction, such as a recipe step or a message from your manager, put the second task down until the

instruction ends. Then say the instruction back in your own words.

2. Middle. Run an intake check. Learn a list of ten everyday words while you count backwards by threes out loud. Learn a second list of ten words with full attention. An hour later, write down both lists from memory and compare.
3. Advanced. Keep an encoding log for a week. Each evening, note three things you took in that day with full attention and three you took in while doing something else. **Next morning, check which ones you can still recall**, and look for the pattern.

Intake, kept



Key idea:

Attention decides what memory gets to keep, so **protect the moment of intake** with your full attention.

Quick check:

1. What did one review say about attention and memory? Answer: That they “cannot operate without each other” (Chun & Turk-Browne, 2007).
2. When people split their attention while taking material in, what happened to the second task? Answer: It slowed only a little, with “small increases in RT” (Craik et al., 1996).
3. What does the Memory book call the intake side? Answer: Extractivity.

2.1.2 Working Memory: The Small Desk That Attention Guards

You stand in a shop trying to remember the four things your partner asked for on the phone. Milk, lemons, rice and something for the cat. **While you pick the lemons, the cat food slips your mind.** You had all four a minute ago, and now you have three.

That slip happens on a small space in your mind. In 1.2.3 you met working memory as **a small desk** where you hold facts while you use them.

The shopping list on a small desk



Milk, lemons, rice and something for the cat



Working memory: a small desk where you hold facts while you use them

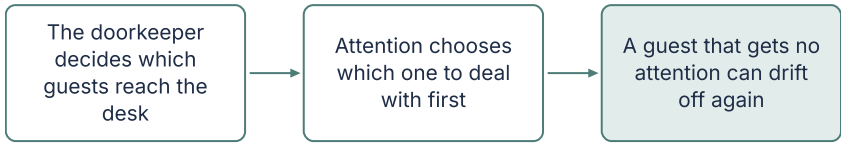


While you pick the lemons, the cat food slips your mind

That section also named a review of attention and working memory (Awh et al., 2006). **This section looks at how attention works on that desk**, both before things land there and while you use them.

The desk and the doorkeeper are a team. The doorkeeper decides **which guests reach the desk** at all. Once they are there, attention keeps working, since you still have to choose which one to deal with first. A guest who reaches the desk and then gets no attention can drift off again, like the cat food in the shop.

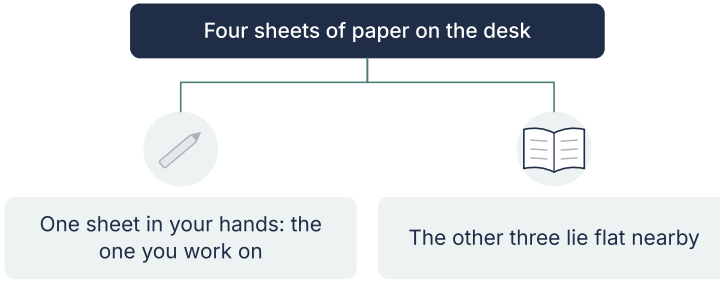
The doorkeeper and the desk



> **Science Says:**
>
> One review sums up where the field stands. It begins with the line "There is broad agreement that working memory is closely related to attention" (Oberauer, 2019). It then adds that "Within working memory contents, a single item is often selected into the focus of attention for processing" (Oberauer, 2019). **Out of the few things you hold, one gets worked on.** Processing simply means working on it, such as adding, comparing or deciding.

Picture the desk with four sheets of paper on it. **You hold one sheet in your hands** and read it, and the other three lie flat nearby. You can put the sheet down and pick up another, yet you work on only one at a time.

One sheet in your hands



The picture fits a lot of daily life. Adding up a bill in your head is one case. You hold the total so far on the desk and **work on one new**

number at a time. When you follow a recipe, the list of ingredients waits on the desk while your hands deal with one step.

The desk in daily life

Task	Waiting on the desk	In your hands
Adding up a bill in your head	The total so far	One new number
Following a recipe	The list of ingredients	One step

The definition of attention fits the desk well. **Choosing what is important** decides which sheets land on the desk and which one you pick up. Staying with it is keeping that sheet in your hands until the job on it is done, even when another sheet catches your eye.



A wooden desk with four sheets of paper on it, a pair of hands lifting one sheet towards the light from a window.

> **Key Concept:**
> The focus of attention. It is **the single item you are working on right now**, the sheet in your hands (Oberauer, 2019). You can tell what is in focus by asking which item your next step will change.

That picking has a cost when you forget to come back. In the shop, the lemons were in your hands, and the other items waited on the desk. **Waiting items need a glance now and then**, or they slide off the edge. This is one reason a list on paper helps, since the paper keeps them for you.

Why a list on paper helps



The link **starts before the desk**. Attention helps even while you are still seeing or hearing something, before you hold it at all. The same review looked at both moments (Awh et al., 2006).

> **Science Says:**
> The team wrote that "Attention facilitates target processing during both perceptual and postperceptual stages of processing" (Awh et al., 2006). Perceptual means **while you see or hear the thing**, and postperceptual means after it has gone, while you hold it in mind. Facilitates means makes easier.

In plain words, attention helps at two moments. It helps **while the thing is in front of you**, such as the list your partner reads out. It

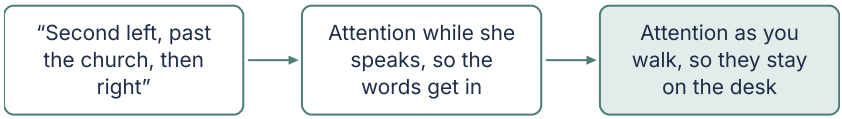
helps again after the call ends, while you keep the list on the desk and walk to the right aisle.

Two moments when attention helps



Spoken directions show both moments at work. A stranger tells you "second left, past the church, then right". **You need attention while she speaks**, so the words get in. You need it again as you walk, so they stay on the desk until the last turn.

Spoken directions, both moments



The same review found that **the link comes in more than one form**. In the authors' words, "although it is clear that these processes are closely intertwined, the nature of these interactions depends upon the specific variety of attention or working memory that is considered" (Awh et al., 2006).

There are different kinds of attention and different kinds of working memory, and **they work together in different ways**. The review gives no single rule that covers them all.

The link comes in more than one form

- Different kinds of attention and different kinds of working memory
- They work together in different ways, with no single rule for them all

Scientists still argue about **how best to describe the link** (Oberauer, 2019). One view treats attention as a limited supply of effort that working memory draws on, a little like a phone battery. Another treats attention as a way of picking which item gets worked on, like the hands that lift one sheet.

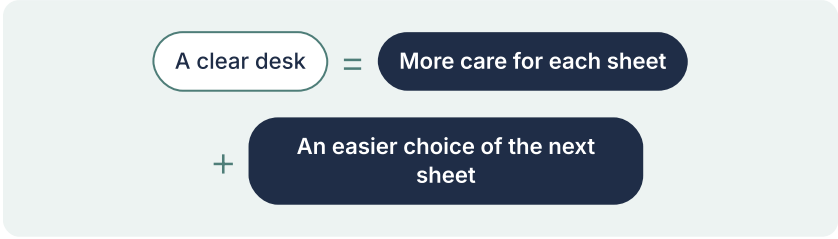
Two views of the link

	Attention as effort	Attention as picking
What it is	A limited supply of effort that working memory draws on	A way of picking which item gets worked on
Like	A phone battery	The hands that lift one sheet

Neither view changes how small the desk is. You still hold only a few things, and you still **work on one of them at a time**. The habits in this section fit either view.

For your own practice, the desk picture is enough. On this book's reading, **fewer things on the desk means each one gets more care**. A clear desk also makes it easier to see which sheet you should pick up next.

A clear desk



A busy morning shows how this plays out. You are writing a report while you also hold a reminder to call the dentist and the time of your next meeting. **Each extra item takes up space on the desk**, even when you are not looking at it. The report may get less of your attention than it seems.

Writing those extras down moves them off the desk. The dentist and the meeting go on a sticky note, and the report becomes the only sheet left. **The doorkeeper can then guard one job**, and fewer guests crowd the room while you work.

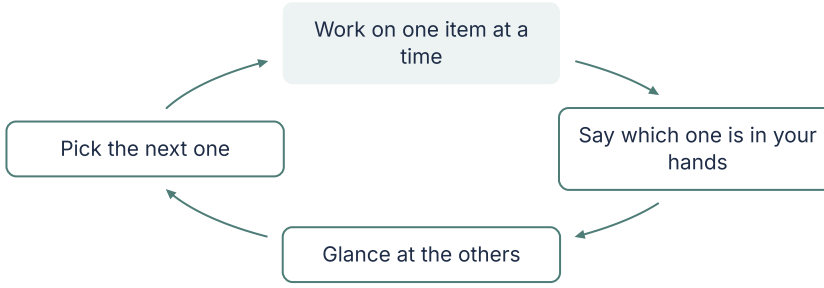
Writing the extras down

Before	After
The report, the dentist and the next meeting all on the desk	The dentist and the meeting on a sticky note
The report gets less attention	The report is the only sheet left

Interruptions knock the sheet out of your hands. You are halfway through the bill when a colleague asks what time the train leaves. **The running total is suddenly gone**, because a new item took the only free hands you had. Finishing the sum first, or writing the total down, keeps it safe.

The same idea helps with a long list you must keep in your head. Work on one item at a time and **say to yourself which one is in your hands**. Then glance at the others before you pick the next one, so none of them slides off.

Working through a list in your head



A parent packing school bags at eight in the morning knows this desk well. One child needs a swimming kit, the other needs a signed letter, and both are asking for breakfast. **Packing one bag at a time** keeps one sheet in the parent's hands. The letter and the kit wait their turn on a note by the door.

The desk also explains why a messy start can spoil a good plan. If you open a task with five worries on the desk, the first step gets only a share of your attention. **Clearing the desk first takes a minute**, and it gives the doorkeeper a quieter room to guard.

Clear the desk before you start

- [x] Pack one bag at a time
- [x] Let the letter and the kit wait on a note by the door
- [x] Clearing the desk first takes a minute

The exercises below come partly from the review on the focus of attention. Saying which item is in focus borrows that idea from one review (Oberauer, 2019), and **no training study has tested it**, so treat it as practice.

Clearing the desk before a complex task is practice too. **You can judge it by what it does** for your own work.

Practice to judge by its results

> - Saying which item is in focus borrows an idea from one review (Oberauer, 2019)
> - No training study has tested it, so judge it by what it does for your work

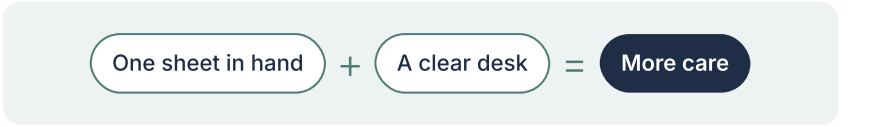
As you work through the levels, keep a short note of what you notice. You may find that saying the item out loud **makes it harder to lose your place**, or you may find it slows you down. Both are useful to know about your own desk.

> ✎ **Exercise:**
>
> Try it. Ask someone to read you five words. Hold them for one minute, and say out loud which word you are thinking about at each moment.

> ✎ **Exercise:**
>
> One sheet at a time.

1. Starter. Hold a short list of four errands in your head. Work through them one by one, and each time say which errand is “in focus” before you start it.
2. Middle. Add up a bill of six items in your head. Say the running total after each item, and notice that only one new number is in your hands at a time.
3. Advanced. Before a complex task, such as a report or a tax form, write down everything on your mind that the task does not need now. Then start the task, and **notice how the work changes** when the desk holds only the job in front of you.

Keep the desk clear



Key idea:

Attention picks the one item you work on from the few that working memory holds, so **keep the desk clear.**

Quick check:

1. What is the focus of attention? Answer: The single item from working memory that is "selected into the focus of attention for processing" (Oberauer, 2019).
2. At which two moments does attention help, according to Awh's team? Answer: While you see or hear something, and afterwards while you hold it in mind (Awh et al., 2006).
3. Why does writing extras down help? Answer: It moves them off the desk, so the job in front of you gets more care.

2.1.3 Memory Guides Attention: Knowing Where to Look

Two friends walk through the same woodland on a spring morning. One of them has watched birds for twenty years, and she stops every few steps to point at something in the branches. **The other sees leaves and nothing else.** They walked the same path, yet they did not see the same wood.

Same path, different wood

> - One friend stops every few steps to point at something in the branches
> - The other sees leaves and nothing else

Attention decides what memory gets to keep. **This section turns to memory's side of the link.** One review of attention and memory covers it (Chun & Turk-Browne, 2007), and 5.1.1 tells what it found.



Two women on a woodland path in spring, one pointing into the branches while the other looks the wrong way.

Think of the doorkeeper with a guest list, watching a crowded street. **Names on the list get spotted quickly** among the passers-by, and strangers are easier to overlook. The more you know about birds, the longer the list of bird guests the doorkeeper is ready for.

The doorkeeper with a guest list

The idea	What it is like
What you know	The guest list: names on it get spotted quickly
Knowing more about birds	A longer list of bird guests the doorkeeper is ready for

That is one plain way to see why the birdwatcher finds more. She knows the songs and the places where small birds sit. **Her memory points her eyes** at the right branch before she has even thought about it.

Two readers of one match report

	A football fan	Someone new to the sport
Reads	Straight to the moment the game turned	Every line with the same care

Reading works the same way. A football fan reading a match report goes **straight to the moment the game turned**. Someone new to the sport reads every line with the same care. The fan's memory has already marked which parts of a report are worth the most attention.

> **Science Says:**
>
> In 1.3.1 you met a third force that pulls attention, beside what stands out and what you are looking for (Awh et al., 2012). It was called **selection history**. Things that paid off in the past get picked up more easily, and the same goes for things you have often paid attention to. Paid off means it brought you something you wanted, such as a right answer or a good meal.

Paid off before, picked up now

Definition

Selection history

Things that paid off in the past, and things you have often paid attention to, get picked up more easily.

Here is what that looks like in a kitchen. A cook who has burnt garlic a few times **glances at the pan the moment it smells sharp**. A beginner keeps chopping and only looks up when the smoke rises.

You can feel selection history in your own hand. **Your thumb finds the apps you open most** before you have read a single icon. The sign of a favourite café jumps out from a busy street, because it paid off for you many times before.

Selection history in daily life



A cook glances at the pan the moment it smells sharp



Your thumb finds the apps you open most



The sign of a favourite café jumps out

The guest list also works indoors, among your own thoughts, where the choosing is internal attention (Chun et al., 2011). A worry you have had many times is quick to reach the door again.

Internal attention follows your history as well. Often **the answer you gave last time comes to mind first**, and it can crowd out a better one. A short pause to ask what else you know gives the other memories a turn.

The guest list among your own thoughts



A worry you have had many times reaches the door again



The answer you gave last time comes to mind first

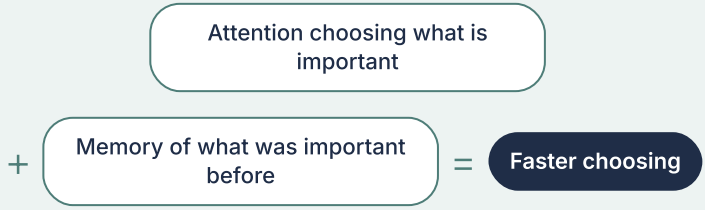


A short pause gives the other memories a turn

> 🗝 **Key Concept:**
>
> Memory guides attention. In this book's picture, **memory writes the guest list that attention works from**. A longer list helps you spot what you expect, and it can hide what is not on it.

In this book's terms, all of this is still attention **choosing what is important**. Memory simply tells it what has been important before. The choosing gets faster, because the doorkeeper no longer has to judge every guest from scratch.

Why the choosing gets faster



This helps a great deal at work. A nurse who has seen many patients may notice a change in someone's colour that a visitor would miss. A mechanic may hear one wrong rattle under the bonnet. **Knowledge turns noise into signals**, and the doorkeeper's guest list grows.

Knowledge turns noise into signals



A nurse notices a change in colour



A mechanic hears one wrong rattle



The doorkeeper's guest list grows

The same habit has a cost. A guest list helps you spot the expected guests, and it can make you **slow to notice a stranger**. If the birdwatcher only looks where birds usually sit, she might walk right past a fox at the edge of the path.

Most of the time the list is right, which is why it works so well. **The cost shows up when the world changes** and the list stays the same. A path or a job can change while your memory still expects the old version.

The guest list helps and costs

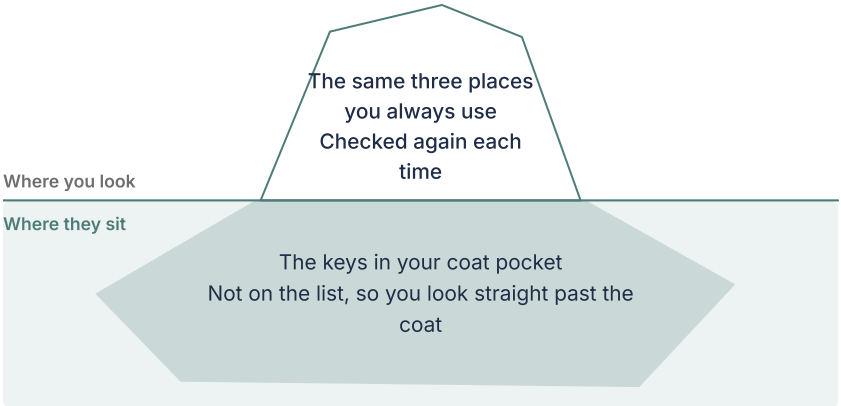
Helps	Costs
⊕ You spot the expected guests	⊖ You are slow to notice a stranger
⊕ Most of the time the list is right	⊖ The cost shows up when the world changes

On this book's reading, that is how knowing where to look can become **not looking anywhere else**. Selection history pulls attention towards what paid off before. A new problem may need you to look at the very spot your experience tells you to skip.

You can see the trap on an ordinary day. You search the kitchen for your keys, checking the same three places you always use. **The keys sit in**

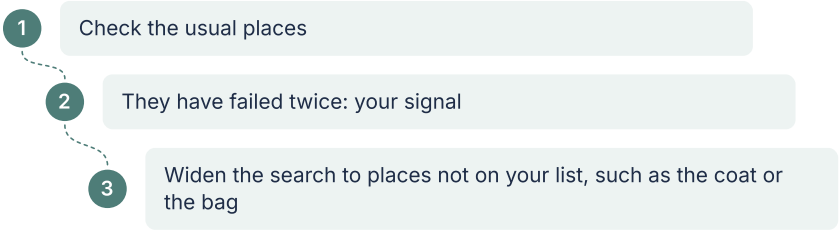
your coat pocket, and you look straight past the coat each time because it is not on the list.

Where the keys really are



The search for keys also shows when to change course. If the usual places have failed twice, **that is your signal to widen the search**. Look at the places that are not on your list, such as the coat or the bag you used yesterday.

When the usual search fails

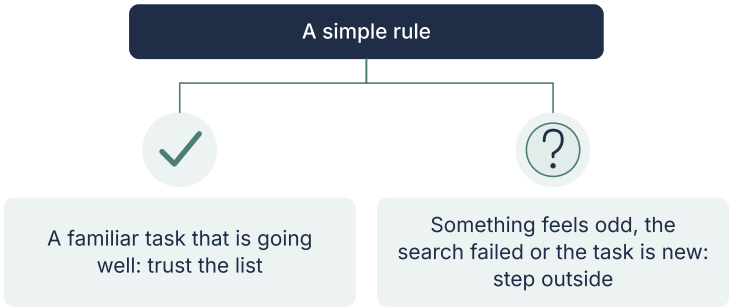


The Creativity book looks at a related trap, when what you remember gets in the way of new ideas. **For attention, the lesson is simpler.**

Memory gives you a fast list of where to look, and now and then you need to check outside it.

A simple rule helps you choose. On a familiar task that is going well, **trust the list** and let memory guide your eyes. Step outside the list when something feels odd or the usual search has failed. Do the same when the task is new to you, and look at everything for a moment.

Trust the list or step outside it



Beginners have one small advantage here. They have no list yet, so they look more evenly at everything. **A fresh eye can catch the odd detail** that the expert's list leaves out. That is one reason a new colleague's question can be so useful.

Travel shows the same thing. On your first day in a new city, **you notice the shape of the doors** and the colour of the buses. After a month there, the same streets feel ordinary. Your list has grown, and the familiar sights no longer stop you.

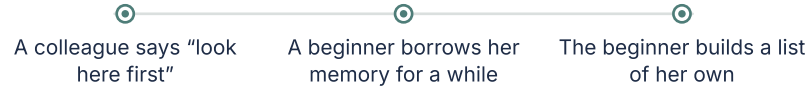
A new city, then a month later

Before	After
First day: you notice the shape of the doors and the colour of the buses	After a month: the same streets feel ordinary

You do not need to throw away your list to get some of that freshness back. You can **look on purpose at the parts you usually skip**. A short pause to scan the whole scene, before you go straight to the usual spot, gives the stranger a chance to be seen.

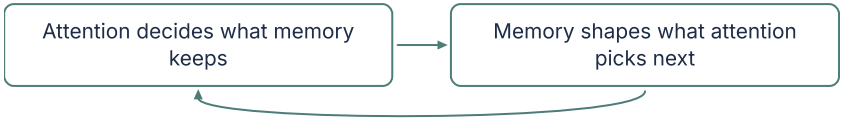
An expert can also share the list. When an experienced colleague says "look here first", **a beginner borrows her memory** for a while. Over time the beginner builds a list of her own, and the borrowed one is no longer needed.

Borrowing an expert's list



The two directions now fit together as one loop. Attention decides what memory keeps, and memory then shapes what attention picks next. **Good habits on both sides** keep the loop working for you. The Memory book looks at the same loop from its side, where what you know helps you take in more.

The attention and memory loop



The exercises below grow from this section's guest-list picture. **No study has tested them as training**, so they are practice ideas. The look-for list shows your own guest list at work, and the beginner's eyes exercise gives the strangers a turn.

Starting from what you expect is the heart of the Try it and the first two levels. Once your guess is said aloud or written down, you can check it against what is really there. The Advanced level turns this round and asks you to look at a familiar room the way a stranger would.

Start from what you expect

> - Say or write your guess first
> - Then check it against what is really there

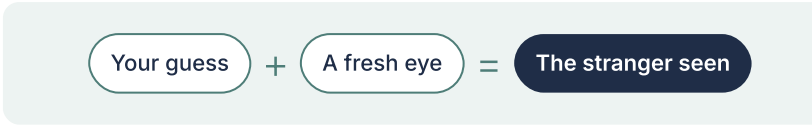
Keep your notes from each level for a few weeks. **The things you nearly missed** are the most useful part, because they show where your own list is short. Over time you may find you check outside it more often without being told.

> Exercise:
>
> Try it. Before you next open your fridge, say three things you expect to see. Then open it and notice one thing you had not named.

> Exercise:
>
> Outside the list.

1. Starter. Before a walk, write three things you expect to see on the way. Afterwards, write down what you saw that was not on the list.
2. Middle. Before a meeting, write three things you expect people to say or do. Afterwards, note what happened that was not on your list, and which of those you nearly missed.
3. Advanced. Choose a room you know very well, such as your kitchen or your office. Describe it in writing as if you were seeing it for the first time, and **list five details you had stopped noticing**.

Check outside your own list



Key idea:

Memory points attention at what it expects, so **let knowledge guide your eyes** and check outside your list now and then.

Quick check:

1. In this book's picture, who writes much of the guest list? Answer: Memory, from what you already know.
2. What is selection history? Answer: Things that paid off in the past, or that you have often paid attention to, get picked up more easily (Awh et al., 2012).
3. What is the cost of a long guest list? Answer: It can make you slow to notice what is not on it.

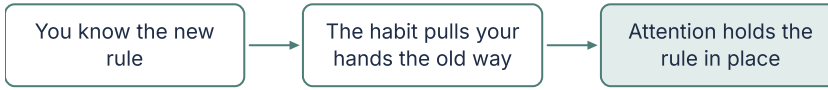
2.2 Attention and Intellect: Holding the Problem Steady

2.2.1 Attention Control: The Common Thread in Reasoning

YOU HIRE A CAR on holiday in a country that drives on the other side of the road. At the first roundabout, **your hands want to turn the old way**.

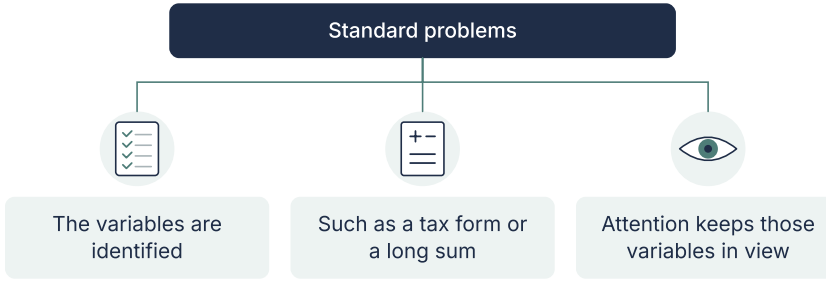
You know the new rule perfectly well, and still the habit pulls. Getting round safely takes **a kind of attention that holds the rule in place** while the habit pushes against it.

At the first roundabout



This chapter moves from memory to intellect. In this book's terms, intellect solves **standard problems**, the kind we already know how to approach, however hard they get. These are tasks where the variables are identified, such as a tax form or a long sum. Attention keeps those variables in view so intellect can work on them.

Intellect in this book



Picture the small desk from 2.1.2 again, where holding a few sheets is one skill. **Keeping the right sheet in your hands** is another, while a familiar but wrong sheet tries to slide on top. That second skill is the one this section is about. Scientists call it attention control.

Two skills at the desk

> - Holding a few sheets
> - Keeping the right sheet in your hands while a familiar but wrong sheet tries to slide on top

One researcher put working memory and attention very close together. He argued that working memory capacity, how much you can hold and use at once, "(b) is an important component of general fluid intelligence, and (c) represents a domain-free limitation in ability to control attention" (Engle, 2002). **He called it executive attention**, the part of attention that steers.

Fluid intelligence is the skill of **reasoning through new puzzles**, such as spotting the pattern in a row of shapes. Domain-free means the limit is the same whatever the subject, whether you are working with words or numbers. In plain words, the size of your desk seemed to depend on how well you could steer attention.

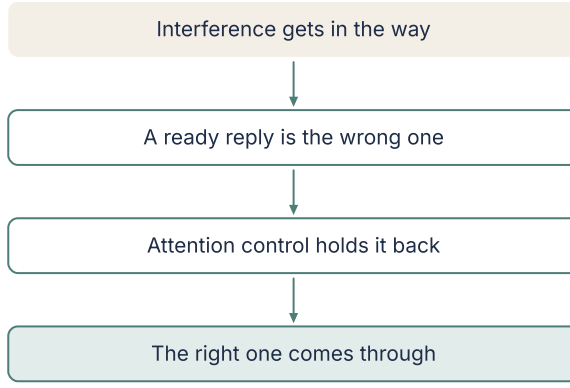
Words from Engle's paper

Term	Plain meaning
Working memory capacity	How much you can hold and use at once
Executive attention	The part of attention that steers
Fluid intelligence	Reasoning through new puzzles
Domain-free	The limit is the same whatever the subject

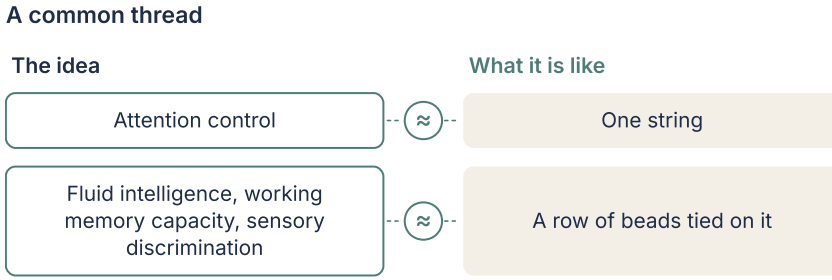
> **Science Says:**
>
> The same paper said when this steering counts most. “WM capacity, or executive attention, is most important under conditions in which interference leads to retrieval of response tendencies that conflict with the current task” (Engle, 2002). WM means working memory. **It matters most when an old habit fights the task**, such as turning the wrong way at the roundabout.

A response tendency is **a reply your mind is ready to give** before you choose it. Interference is anything that gets in the way. When a ready reply is the wrong one, attention control has to hold it back so the right one can come through.

When attention control counts most



Later work by the same lab went further. They wrote that “attention control provides a common thread among broad cognitive abilities, including fluid intelligence, working memory capacity, and sensory discrimination” (Burgoyne & Engle, 2020). **A common thread runs through several skills**, like one string tied through a row of beads.



Sensory discrimination means telling apart two things that are very alike, such as two shades of blue. The review draws mainly on the authors' own lab work, so **it is one team's view** of a wide field. Its point about goals is the part this section uses.

> **Science Says:**
> The same review said what attention control is for. "Attention control allows us to pursue our goals despite distractions and temptations, to deviate from the habitual" (Burgoyne & Engle, 2020). To deviate from the habitual means **to step off the usual path** when the usual path is wrong for the job.

The review names **distractions and temptations** as separate pulls. A distraction is something that grabs you from outside, such as a car alarm in the street. A temptation is something you want, such as a message you would love to read, and it pulls even when the room is quiet.

Two kinds of pull

	A distraction	A temptation
Comes from	Outside	Something you want
Example	A car alarm in the street	A message you would love to read



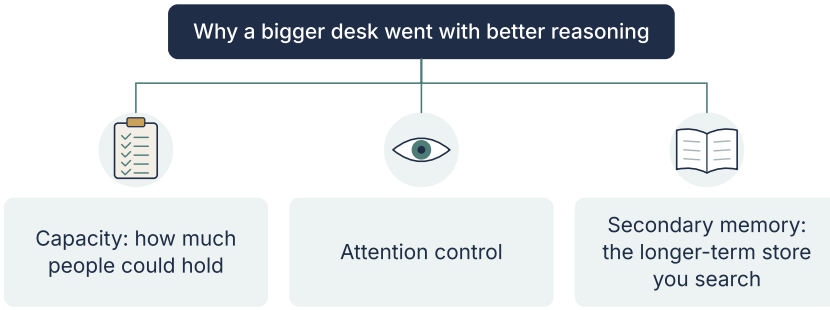
A string of wooden beads in different colours lying across an open notebook, a single red thread running through them all.

A separate study kept the picture honest. It found that "capacity, attention control, and secondary memory were uniquely related to WM storage, WM processing, and gF" (Unsworth et al., 2014). The team wrote that "the three factors completely accounted for the relation between WM (both processing and storage) and gF" (Unsworth et al., 2014).

That needs a plain reading. gF is short for fluid intelligence, and secondary memory is **the longer-term store you search** when you pull back something you learned earlier.

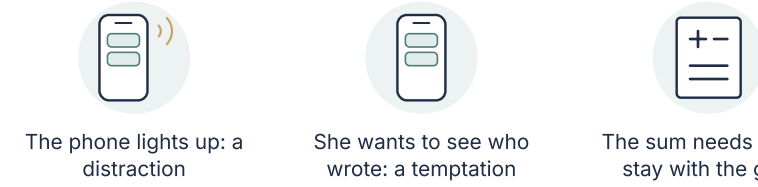
Three things together explained why people with a bigger desk tended to reason better. **Attention control was one of the three**, so it is part of the story and never the whole of it.

Three factors behind the link



A teenager doing maths homework with a phone on the desk meets both pulls. The phone lights up, which is a distraction, and **she wants to see who wrote**, which is a temptation. The sum on the page needs her to stay with the goal while both pull at once.

Maths homework with a phone on the desk

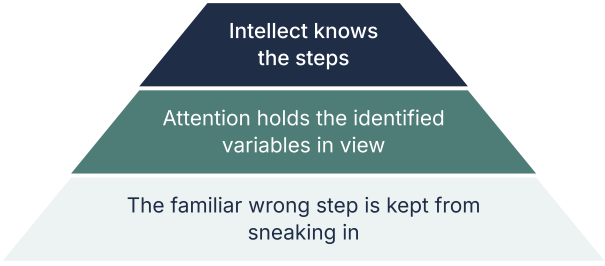


The three give you three places to look when your reasoning goes wrong. **You may have lost track** of what was on the desk. You may have been pulled off the plan, or you may have failed to find something you learned earlier. Each one calls for a different fix.

> **Key Concept:**
>
> Attention control. It is **the steering part of attention that keeps a chosen goal in charge** of what you do next (Burgoyne & Engle, 2020). You can see it working when the right reply comes out although the wrong one was ready first.

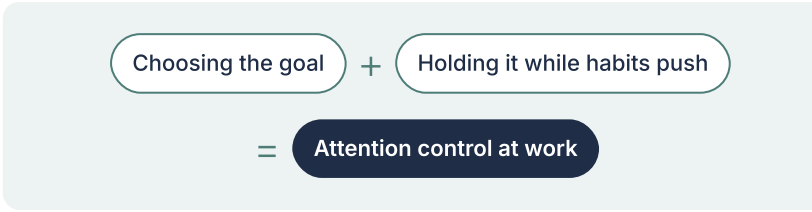
In this book's terms, attention meets intellect at this point. A standard problem has its variables identified, and intellect knows the steps. **Attention holds those variables in view** and keeps the familiar wrong step from sneaking in. The doorkeeper keeps the room for the guests the task needs.

Where attention meets intellect



Look at the definition again here. Choosing what is important is **choosing the goal** of the task, such as the right total on the form. Staying with it is holding that goal while habits and wishes push from every side.

The definition on a standard problem



Think of a recipe that you have to halve for a smaller dinner. You know how to halve numbers, and you know the recipe. **The trap is the habit of reading the old amounts** and pouring them in as you always do. Attention control is what makes you stop at each line and use the new number.

The same trap waits in a new password, a changed meeting time or a form that has moved one box. **Each one asks you to override something you already know.** These easy-looking spots are worth a second look, because a habit can carry you through them before you notice.

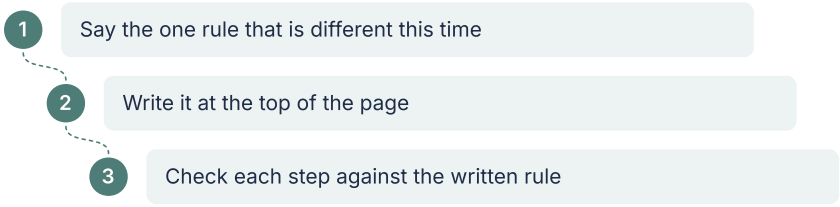
Spots that ask you to override a habit



You can make the habit's job harder. Before you start, **say the one rule that is different this time**, such as "half of every amount". Write it at the top of the page. A written rule gives the doorkeeper something to check each guest against.

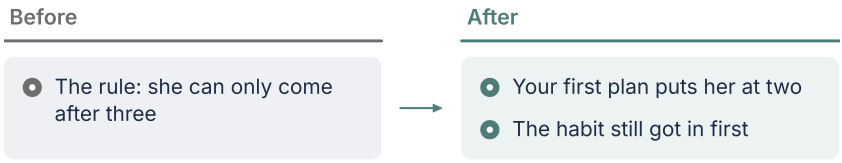
Saying the rule out loud puts it on the desk as its own sheet. **The habit then has something to bump into.** Without it, the old way of doing things simply carries on, and you only notice when the dish tastes wrong or the form comes back.

Give the habit something to bump into



A timetable puzzle shows the same pattern. You have to fit five meetings into one afternoon, and one person can only come after three. **Your first plan puts her at two**, because two is where she usually sits in your week. The rule was clear, and the habit still got in first.

The timetable puzzle



The exercises below lean on this section's studies with care. The starter uses a kind of lab task named in the research on attention control (Engle, 2002). **It shows you attention control at work**, and no study shows that it raises reasoning, so treat it as a demonstration. The interference audit is a practice idea.

The starter is a demonstration

- The starter shows you attention control at work
- No study shows that it raises reasoning

Look back at your tally after the advanced level. **The pulls that came most often** are the ones to plan for next time. You might move the phone out of the room, or write the changed rule at the top of the page.

> Exercise:
> Try it. Write RED in blue pen and BLUE in red pen. Name each ink colour out loud, and notice the pull to read the word. It is a two-word take on the Stroop task (Stroop, 1935).

> Exercise:
> Against the habit.
>
> 1. Starter. Write twenty colour words, each in an ink colour that does not match it. Name the ink colours as fast as you can, then read the words. Notice which one is harder, and where you slip. This is a paper version of the Stroop task (Stroop, 1935).
> 2. Middle. Ask a friend to stand in front of you and wiggle a finger beside one ear or the other. Each time, look to the opposite side, away from the movement, ten times in a row. Count how often your eyes go towards the finger first. I adapted this from the anti-saccade task, where you look away from a sudden target (Hallett, 1978).
> 3. Advanced. During one real reasoning task, such as a budget or a timetable, keep a tally of each pull away from your plan. Note

what pulled you, a habit, a distraction or a temptation, and **what you did to come back**.

Before you reason



Name the rule that is different this time

Hold the goal

The habit has something to bump into

Key idea:

Attention control holds the goal when a habit pulls the other way, so **name the rule that is different this time** before you reason.

Quick check:

1. When does executive attention count most, according to Engle? Answer: When interference brings up response tendencies that "conflict with the current task" (Engle, 2002).
2. Is attention control the whole reason a bigger working memory goes with better reasoning? Answer: No. It was one of three factors, along with how much people could hold and secondary memory (Unsworth et al., 2014).
3. What does attention do for intellect, in this book's terms? Answer: It keeps the identified variables in view so intellect can work on them.

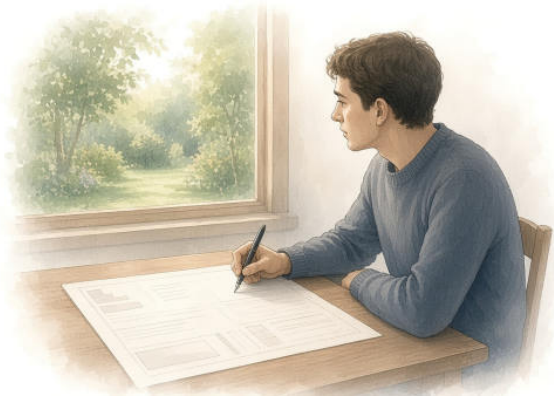
2.2.2 Lapses, Mind-Wandering and Problem Solving

You are filling in a long form for a new passport. Halfway down the second page, you realise you have been thinking about the holiday for the last few lines. **Your pen kept moving, and your mind went somewhere else.** Now you have to check every box you filled while you were away.

Gaps like this happen to everyone. For a single quick job, a lapse costs a second or two. **For a problem with many steps, it can cost much more**, because each step rests on the one before it. This section looks at lapses inside reasoning, and at how to catch them and get back on track.

One quick job and a long problem

A single quick job	A problem with many steps
A lapse costs a second or two	It can cost much more, because each step rests on the one before it



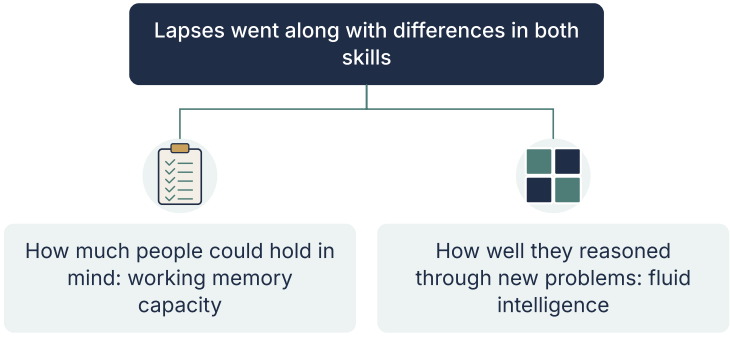
A man at a kitchen table with a half-finished passport form, pen in hand, gazing out of the window at a garden.

Some lapses are mind-wandering, which you met in 1.3.3, when attention drifts from the task to your own thoughts. **This section cares less about where a lapse comes from** and more about what it does to a problem with many steps.

One study of lapses is told in 3.3.1 (Unsworth & McMillan, 2014). **Here the interest is reasoning**, and the same study looked at that as well. In its words, the lapses it measured were "related to working memory capacity and fluid intelligence" (Unsworth & McMillan, 2014).

Lapses went along with differences in both skills, in how much people could hold in mind and in how well they reasoned through new problems. Each skill matters in a long problem, where you hold the earlier steps while you reason about the next.

Lapses and two thinking skills



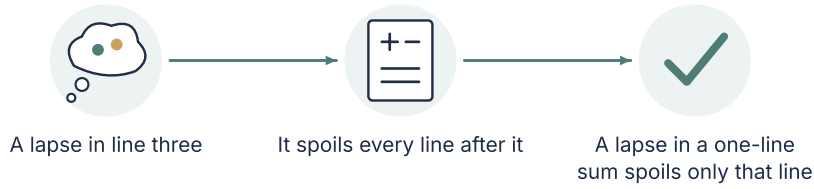
> **Science Says:**
>
> The team put the main link strongly. In their words, "lapses of attention are strongly related to cognitive abilities" (Unsworth & McMillan, 2014). Cognitive abilities are **thinking skills**, such as reasoning and holding things in mind. The study measured differences between people at one time, so it shows a link and leaves the cause open.

Reasoning is where a lapse hurts most. **A person who lapses** more often has more gaps to fill in the middle of a problem, and the gaps add up.

Think of a long sum on paper with many lines. **A lapse in line three spoils every line after it**, even if the rest of your working is perfect.

A lapse in a one-line sum only spoils that one line. This is why **a multi-step problem needs attention that stays with it**, and a quick plan to recover when it does not.

A long sum on paper



A lapse while you read the question is the costliest of all. **You may solve the wrong problem** from start to finish, with every step correct. Reading the question twice, once before you start and once before you finish, gives you two chances to catch it.

Two chances to catch a misread question

- [x] Read the question once before you start
- [x] Read it once more before you finish

A lapse also hides itself. You often notice a drift only after it has gone on for a while, like the lines on the passport form. **By the time you return, you may not know where you left off.** The doorkeeper has let a guest wander through the room, and the work on the desk has been sitting unattended.

There are signs that a lapse has happened. You read the same line twice and still cannot say what it said. **Your pen has moved and you cannot remember writing**, or a number on the page surprises you. Each sign tells you to stop and look back.

Signs that a lapse has happened



You read the same line twice and still cannot say what it said



Your pen has moved and you cannot remember writing



A number on the page surprises you

> **Key Concept:**
>
> Lapses of attention. A lapse is **a short gap when attention leaves the task** while the task goes on without it. The gap is often too short to feel while it happens, which is why the signs above matter.

The fix starts with expecting lapses. **Drifting is part of how attention works**, and a long task gives it more chances. The aim is to

make each lapse cheap, so that coming back takes seconds and costs you nothing you cannot find again.

Checkpoints make that possible. A checkpoint is **a short note of where you are** in the task, written every few steps. On a long sum, it might be the total so far. On a plan, it might be the last decision you made and the next one waiting.

A short note of where you are

> Definition
>
> ### Checkpoint
>
> A short note of where you are in the task, written every few steps, such as the total so far.

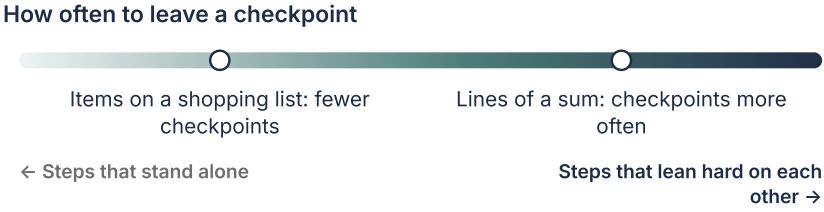
The doorkeeper cannot stop every guest, and checkpoints accept that. **A visit from a stray thought then costs very little**, because the work on the desk was saved a few steps ago. Writing a checkpoint takes seconds, and a lost page of working can take much longer to rebuild.

After a lapse, you go back to the last checkpoint and start again from there. **You lose a few steps and keep everything before them.** Without a checkpoint, you may have to start the whole problem again, or worse, carry on with an error you never saw.

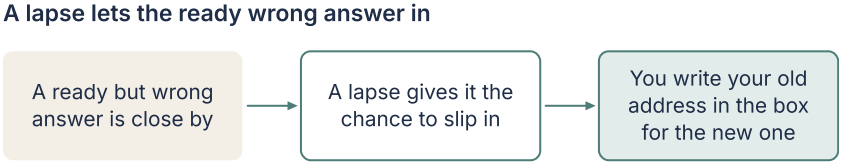
After a lapse, with and without a checkpoint



How often to leave a checkpoint depends on the task. **Steps that lean hard on each other** need checkpoints more often, such as the lines of a sum. Steps that stand alone, such as the items on a shopping list, need fewer.



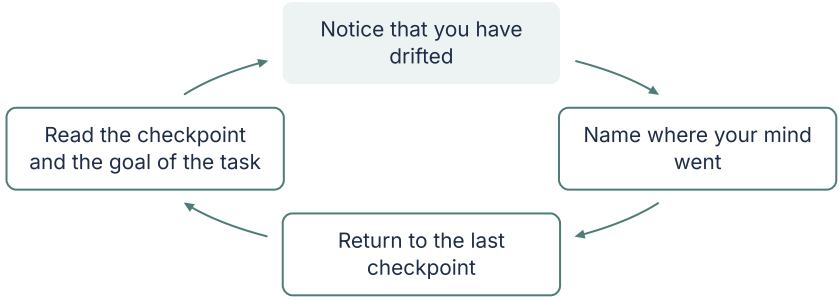
Interference adds a second risk. When a ready but wrong answer is close by, **a lapse gives it the chance to slip in** (Engle, 2002). You come back from the holiday thought and write your old address in the box for the new one, because the old one was waiting.



Catching a lapse is a skill you can practise. **Notice that you have drifted**, name where your mind went, and return to the last checkpoint. You do not need to scold yourself, since the aim is a quick return.

When you return, read the checkpoint and **the goal of the task** before you write anything new. The goal tells you what the work is for, and the checkpoint tells you where it stands. Together they put the right sheet back in your hands.

Back from a drift



On this book's reading, outer lapses can be easier to plan for than inner ones. You can close the window, put the phone in a drawer or work in a quiet room. **Inner lapses need a different plan**, because your own thoughts come with you wherever you sit.

One simple plan for inner lapses is a scrap of paper beside the task. When a thought about the holiday pushes in, **write it down in three or four words** and go back to the form. The thought has somewhere to wait, and you can give it your full attention later.

Outer and inner lapses

	Outer lapses	Inner lapses
Plan	Close the window or put the phone in a drawer	Write the thought down in three or four words on a scrap of paper

Group work has lapses too. In a long planning meeting, one person may drift while the others carry on, and **the plan moves past them**. A running list of decisions on a whiteboard is a shared checkpoint, so anyone who drifts can catch up in a few seconds.

A shared checkpoint in a meeting

> - A running list of decisions on a whiteboard
> - Anyone who drifts can catch up in a few seconds

A lapse tally shows you your own pattern. During one reasoning session, make a mark each time you notice a drift. **Note whether it came from outside or inside**, and what it was. Over a few sessions, you will see which kind visits you most.

Your tally may surprise you. Some people find that **most of their drifts come from inside**, even in a noisy room, and others find the reverse. Knowing which kind visits you most tells you whether to change the room or keep a scrap of paper for your thoughts.

Reading your lapse tally

Most drifts come from	Then
Inside	Keep a scrap of paper for your thoughts
Outside	Change the room

Keep the tally beside the finished work. **A mark is only useful when you know what it interrupted**, such as reading a question or checking a total. That tells you which part of your next task needs a checkpoint of its own.

The exercises below build on one study of lapses and reasoning (Unsworth & McMillan, 2014). That study found a link between people, and **it tested no exercise**, so checkpoints and the lapse tally are practice ideas. Watch what they do for your own long tasks.

A link between people, with no exercise tested

- The study found a link between people (Unsworth & McMillan, 2014)
- It tested no exercise, so checkpoints and the lapse tally are practice ideas

Exercise:

Try it. In your next long task, stop after every five steps and write one line saying where you are.

Exercise:

Catch and return.

1. Starter. Do a sum with at least six lines, such as adding up a month of shopping. After every two lines, write the total so far in the margin as a checkpoint.
2. Middle. During one reasoning session of about twenty minutes, such as planning a trip, keep a lapse tally. Mark each drift with an O for outside or an I for inside.
3. Advanced. In a real multi-step task at work or home, use checkpoints every few steps. Each time you lapse, **restart from the last checkpoint** and note how many steps you lost.

Make each lapse cheap



Key idea:

Lapses happen in every long task, so **leave checkpoints in long problems** and restart from the last one after a drift.

Quick check:

1. How did Unsworth and McMillan describe the link between lapses and thinking skills? Answer: “lapses of attention are strongly related to cognitive abilities” (Unsworth & McMillan, 2014).
2. Why does a lapse cost more in a long problem? Answer: Each step rests on the one before, so an error carries on through every later step.
3. What is a checkpoint? Answer: A short note of where you are in a task, written every few steps.

2.2.3 Related but Not the Same: Attention, Working Memory and Intelligence, and the Limits of Training

A FRIEND SAYS THAT A memory game has made her much better at solving problems. She can hold longer strings of numbers than she could last month. You are pleased for her, and you want to know **which problems have become easier**. The answer will tell you more than her best score in the game.

Attention, working memory and reasoning have appeared together throughout this chapter. They help each other, and the research finds links between them. **A link still leaves room for differences.** Knowing what each measure tells you helps you choose a useful goal for your own practice.

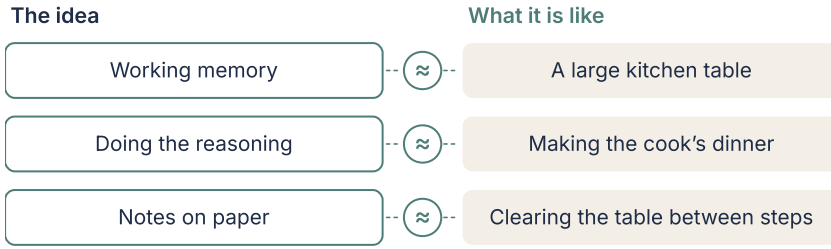
Linked, and still different

> - They help each other, and the research finds links between them
> - A link still leaves room for differences

A reasoning test asks you to work out an answer, often from a new pattern or problem. **The desk of working memory helps you do the work**, yet a desk and the work done on it are separate things.

A large kitchen table can help a cook spread out ingredients **without making the cook's dinner for her**. A cook with a small table can still cook well by clearing it between steps. A reasoner can do the same with notes on paper.

The desk and the kitchen table



That comparison stops at the edge of the table. Scientists measure each skill through tasks, and the tasks themselves can share parts. **How you measure the skills changes the link you find.** This is one reason the size of the link has been debated.

> **Science Says:**
> One review combined results from 86 samples. It found that "The average correlation between true-score estimates of WM and g is substantially less than unity" at .479 (Ackerman et al., 2005). A comment on that review gave a median of .72 for the underlying abilities and called them "strongly related constructs" (Kane et al., 2005). **The size was disputed**, and both accounts found skills that went together.

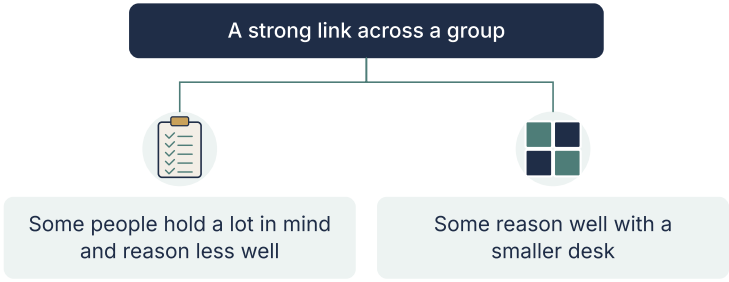
A sample is a group of people in a study. The letter g is short for general intelligence, the broad thinking ability measured across many kinds of test. The figures are **ways of measuring how closely two sets of scores move together**. Unity means one, a perfect match, and both figures leave room for people to differ.

Two accounts of one link

Ackerman et al., 2005	Kane et al., 2005
Combined results from 86 samples	The underlying abilities
Average correlation of .479	Median of .72
Substantially less than unity	Strongly related constructs

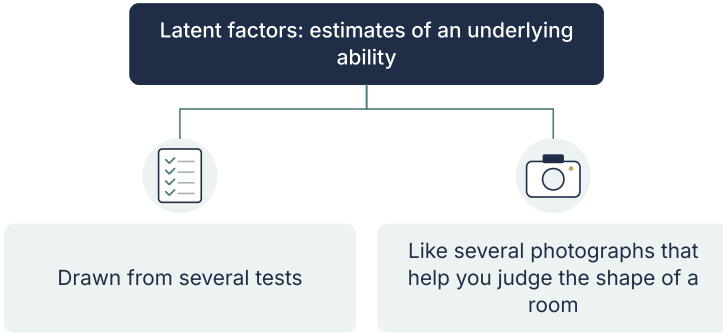
Even the higher figure is below one. **Some people hold a lot in mind and reason less well**, and some reason well with a smaller desk. A strong link across a group still leaves room for each person to differ.

Even the higher figure is below one



The second team used what scientists call latent factors. These are **estimates of an underlying ability** drawn from several tests, much as several photographs help you judge the shape of a room. The first team's average and the second team's median are different summaries. Placing them side by side shows the debate, without choosing a winner for your practice plan.

Several photographs of one room



The doorkeeper picture helps here. The doorkeeper decides which guests reach the room, and the desk holds the few that are being used. **Reasoning is what you do with them** once they are there. All three work together on any real problem.

Imagine two people taking a reasoning test. One loses track of the facts halfway through, while the other holds every fact and chooses the wrong rule. **Their wrong answers have different causes.** The first person needs help keeping track, and the second needs to check the approach.

Two wrong answers, two causes

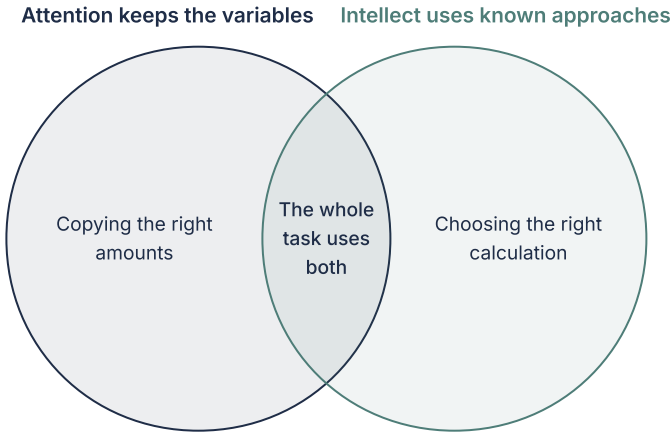
Person	What went wrong	What helps
The first	Loses track of the facts halfway through	Help keeping track
The second	Holds every fact and chooses the wrong rule	Check the approach

> **Key Concept:**
>
> Working memory and intelligence. They are **two skills whose test scores go together** (Ackerman et al., 2005; Kane et al., 2005), yet each can fail on its own in a real task. Ask which part went wrong before deciding what to practise.

Attention adds its own part to the picture. In one study of the desk and reasoning, attention control was **one of three factors** behind the link between the desk and reasoning (Unsworth et al., 2014). The other two were how much people could hold and how well they searched their longer-term memory.

In this book's terms, intellect uses known approaches on tasks where the variables are identified. Attention keeps those variables available for the work. **You can need one skill more at one step**, even though the whole task uses both. Copying the right amounts onto a tax form and choosing the right calculation are different jobs.

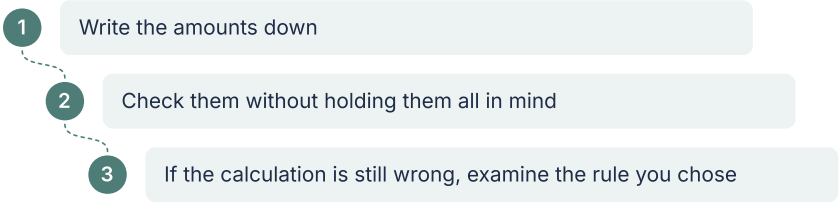
Two jobs on one tax form



A small desk can be helped by paper. Write the amounts down, and you can check them without holding them all in mind. **Paper gives you a place to keep the facts** while you reason about them. If the calculation is wrong after that, the next thing to examine is the rule you chose.

A tidy room also helps the doorkeeper. With the facts on paper, **fewer guests need to stay in mind at once**, and attention is free to watch the steps.

Paper for a small desk



This gives you a simple way to look at a mistake. First check the information you used against the original question, then check the steps against the rule. **The first wrong step tells you where practice belongs.** A correct answer at the end gives you less detail about how you reached it.

Look at a mistake in order

- [x] Check the information against the original question
- [x] Check the steps against the rule
- [x] The first wrong step tells you where practice belongs

Training adds another question. A skill that helps on a task can still fail to improve through a particular drill. **Finding a link and testing a training plan are separate jobs.** A study of people at one time tells

you how their scores differ, while a training study asks whether practice changes later performance.

Finding a link and testing a plan

Finding a link	Testing a training plan
A study of people at one time	A training study
How their scores differ	Whether practice changes later performance

Section 6.1.2 sets out what working memory training does and does not change (Melby-Lervåg et al., 2016), and 7.2.2 looks at brain-training apps. **This section keeps to one point**, that linked skills are still separate skills. The Intellect book looks closely at what brain training can establish.

That leaves useful goals within reach. You can practise checking a bill, keeping your place in a long plan or catching the moment your attention drifts. **Each goal names work you want to do better.** You can test the same kind of work again and see whether the change helps.

Useful goals within reach



Checking a bill



Keeping your place in a long plan



Catching the moment your attention drifts

A game score can be useful for a game. If you enjoy the game and want to improve at it, the score tells you how you are doing. **A claim about everyday reasoning needs an everyday check**, such as whether your budgets have fewer errors or your plans leave fewer steps out.

An everyday check

> - A game score can be useful for a game
> - A claim about everyday reasoning needs an everyday check, such as fewer errors in your budgets

Suppose you want to stop losing your place when you plan a family trip. Start with the work itself. Write the dates and costs on paper, and leave a checkpoint after each booking choice. **Count the errors in the plan you finish**, then try the same kind of planning again with those aids in place.

You might find fewer errors, or you might find that the cost calculation is still wrong. In the second case, **practise the calculation with a worked example** beside you.

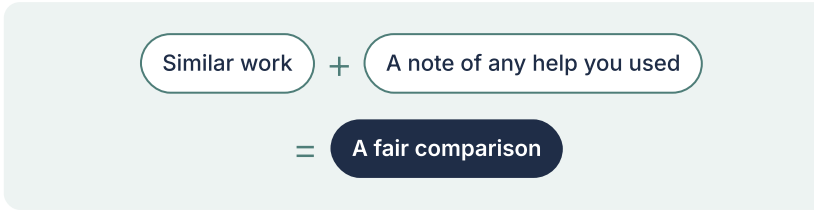
Practice on a family trip plan

- Write the dates and costs on paper
- Leave a checkpoint after each booking choice
- Count the errors in the plan you finish
- Try the same kind of planning again with those aids

Let the result choose the next exercise, so your practice follows the problem you actually have. Repeating a drill just because its score rises can keep you busy while the original problem stays.

A fair comparison needs similar work. Comparing an easy shopping list with a complex holiday plan tells you little about a change in attention. **Keep the task close enough to compare**, and note any help you used. The record is for you, so write the awkward parts as plainly as the successes.

A fair comparison





A woman at a dining table comparing two written travel plans, with train timetables and a small calculator spread beside them.

The practice below uses the task-first approach of this section, and it is this book's own idea. **No study has tested these exercises as a programme**, and the links between abilities give no promise about them. Use the record to find a helpful habit in one task you care about.

> **Exercise:**
>
> Try it. Choose one reasoning task that gave you trouble this week. Write the exact step where you lost track or made the first error.

A useful note is concrete. “I am bad at numbers” tells you little, while “I copied the wrong price into the total” names something you can check next time. **Write what happened on the page**, and keep broad judgements about yourself out of the record.

A useful note is concrete

Names something to check	Tells you little
⊕ “I copied the wrong price into the total”	⊖ “I am bad at numbers”

> Exercise:
>
> Practise the work you need.
>
> 1. Starter. In the Try it task, circle the facts you had to hold. Copy them onto a new sheet and try that step again.
> 2. Middle. Choose a similar task and decide how you will check it. Record the first wrong step, any lost facts and the help you used. Compare it with the earlier task.
> 3. Advanced. Make a short plan for one real reasoning task you do often. Say where attention is needed and how you will keep the facts available. Use it on several similar tasks and **judge the finished work** by the same check each time.

What a practice plan needs



Key idea:

Working memory and reasoning go together, and a practice plan still needs **a clear goal in real work** and a check that fits that goal.

Quick check:

1. Why are the two figures in the Science Says box different? Answer: The accounts used different ways to estimate and summarise the link.
2. What does a rising game score tell you first? Answer: That you are getting better at the game.
3. What should guide your next exercise? Answer: The first wrong step in the real task you want to do better.

2.3 Attention and Creativity: Narrowing, Widening and Letting Go

2.3.1 Focused and Open Attention: Two Modes for Two Kinds of Task

On Monday morning you have two jobs before lunch. One is to find a mistake in a spreadsheet, and the other is to name your team's new project. **Both need attention, and they need it in different shapes.** If you bring the same kind of attention to both, one of them will probably go badly.

This chapter turns to creativity. In this book's terms, creativity deals with **new problems with no ready-made method**, tasks where the variables are not yet identified. The spreadsheet belongs to intellect, since its variables are all on the page. The project name belongs to creativity, since nobody knows yet what it should look like.

The spreadsheet and the project name

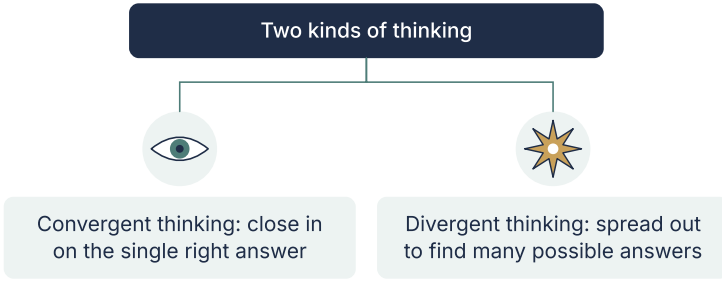
The spreadsheet	The project name
Belongs to intellect	Belongs to creativity
Its variables are all on the page	Nobody knows yet what it should look like

In 1.1.1 you met two ways the doorkeeper can work, focused and open, as two kinds of meditation. **This section takes the same two modes to everyday tasks**, such as the spreadsheet and the project name.

This section asks a different question, which is **when to use each mode**. The spreadsheet is a one-answer problem. Scientists call the thinking it needs convergent thinking, where you close in on the single right answer.

The project name is a many-answers problem. **The thinking it needs is called divergent thinking**, where you spread out to find many possible answers. A team naming a product or a family planning a holiday faces the same kind of task.

One answer or many answers



> **Science Says:**
>
> One small study compared the two kinds of meditation before thinking tasks. The authors reported that "OM meditation induces a control state that promotes divergent thinking" (Colzato et al., 2012). OM means open monitoring, the open mode. **The open mode went with more varied ideas**, and the study had only 19 adults who already practised both kinds.

The same study found less for the focused mode. In the authors' words, "FA meditation does not sustain convergent thinking" (Colzato et al., 2012). FA means focused attention. **The focused sit did not help the one-answer task**, so the study gives no support for a focused sit before a puzzle.

What one small meditation study found

- The open mode went with more varied ideas
- The focused sit did not help the one-answer task
- Only 19 adults who already practised both kinds

The authors also suggested that **a better mood after meditating** may have played a part. With one small group of experienced meditators, the result is a hint worth testing on yourself and no more. It is a reason to think about modes, and it gives no proof that a short sit works for beginners.

A wide door can still let in noise. For practice, you might try **noticing guests that are about the task**, such as words and pictures that belong to your project. A busy café full of chatter can fill the room with guests that have nothing to do with the name you need.

What a wide door lets in

Helps	Gets in the way
⊕ Guests that are about the task, such as words and pictures for your project	⊖ A busy café full of chatter that has nothing to do with the name

Open attention is only half the creative story. Another team looked at what happens while people make up new ideas. They described idea generation as “a state of focused internally-directed attention involving controlled semantic retrieval” (Benedek, Jauk, Fink, et al., 2014). **Making ideas is focused too**, aimed inward at what you know.

That quote needs a plain reading. Internally directed means **pointed inward**, at your own thoughts and memories. Semantic retrieval means

pulling up meanings and facts you already know, and controlled means you steer the search. When you hunt for a project name, you close the door to the street and search the house on purpose.

Searching the house on purpose

Definition

Controlled semantic retrieval

Pulling up meanings and facts you already know, with attention pointed inward and the search steered.

> **Key Concept:**
> Two modes of attention. **Focused attention closes in on one thing**, and open attention lets many things come and go. The skill is choosing the mode on purpose for each part of a task.

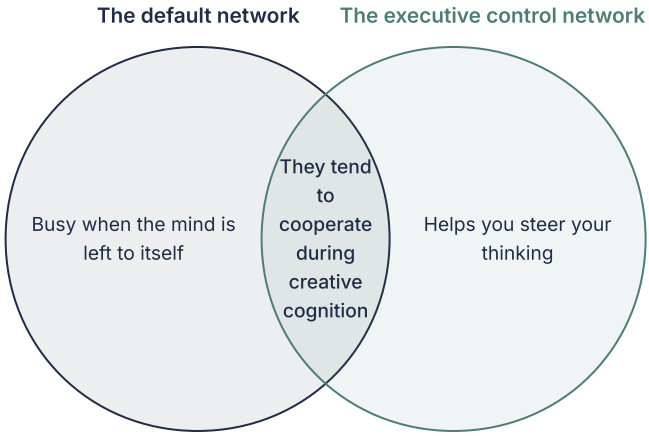
The brain seems to mix the modes during creative work. A review found that two brain systems "tend to cooperate during creative cognition and artistic performance" (Beaty et al., 2016). One is the default network, which gets busy when the mind is left to itself. The other is the executive control network, which helps you steer your thinking.



Two rowers in one long boat on a calm river at dawn, their oars dipping into the water at the same moment.

These two systems can pull against each other in other tasks. In creative work, **they tend to work as a pair** (Beaty et al., 2016). For your own practice, the brain detail matters less than the lesson it points to, that open and focused can take turns inside one task.

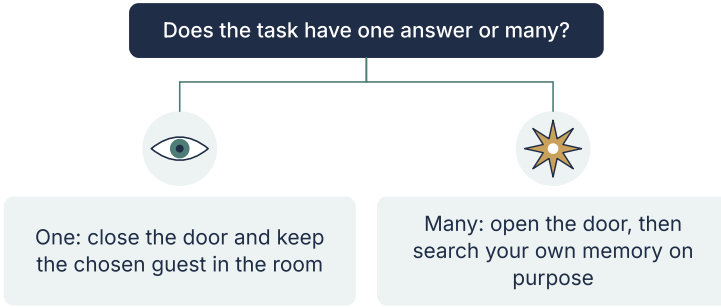
Two brain systems in creative work



You do not need to become a different kind of person for each task. **Modes are choices you can make within one sitting**, and a quiet person can open up just as a talkative person can close in. The choice is about the job on the desk, with no judgement about who you are.

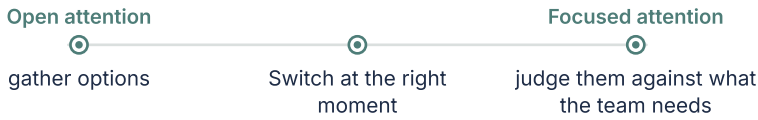
This gives you a simple check before each task. **Ask whether the task has one answer or many.** If it has one, close the door and keep the chosen guest in the room. If it has many, open the door and notice what comes in, then search your own memory on purpose.

The check before each task



Many real tasks have both kinds of step. Naming the project needs open attention to gather options, then focused attention to judge them against what the team needs. **Switching at the right moment** is part of the skill. You open first, gather, and then close the door to choose and check.

Naming the project, in two modes



Watch the doorkeeper at each switch. When you open, **the doorkeeper lets odd guests in** and does not judge them yet, such as a silly name that might lead somewhere. When you close, the doorkeeper checks each guest against what the task needs and sends most of them away.

A switch can go wrong in two ways. You can stay open too long, and the list of names grows without anyone choosing. **You can also close too early**, picking the first name that comes to mind before any better ones have arrived. Naming the mode out loud at each switch helps you notice which mistake you tend to make.

Two ways a switch goes wrong

Mistake	What happens
Staying open too long	The list of names grows without anyone choosing
Closing too early	Picking the first name before better ones have arrived

Signs can tell you it is time to switch. If the list of ideas has stopped growing, or the same few keep coming back, **the open step has done its work**. If you find faults in every idea before it is finished, you have closed too early. Open the door again for a while.

Signs it is time to switch

- [x] The list of ideas has stopped growing
- [x] The same few keep coming back
- [x] You find faults in every idea before it is finished: open the door again

The spreadsheet has its own trap. If you treat it as a many-answers task, you may drift into wondering about the layout or the colours. **The one-answer task asks for the door to stay almost shut** until the total is right. Afterwards, you can open it again for the next job.

A day can be planned around modes too. Some people put one-answer tasks, such as accounts or forms, in a block of their own. **Many-answers tasks get a separate block**, such as planning or writing first drafts. Two blocks mean fewer switches, and each switch you do make is one you chose.

A day planned around modes



A block for one-answer tasks, such as accounts or forms



A block for many-answers tasks, such as first drafts

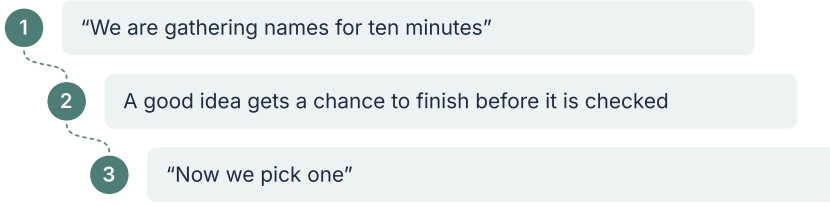


Fewer switches, and each one chosen

At a meeting, **naming the mode can help the whole group**. Say "we are gathering names for ten minutes" before anyone starts to judge them.

The group then knows which step it is in, and a good idea gets a chance to finish before it is checked. Later, say "now we pick one" so everyone knows the judging has started. The Creativity book explores this work of making and judging ideas.

Naming the mode at a meeting



The exercises below use this section's studies with care. The open-mode result comes from **one small study of experienced meditators** (Colzato et al., 2012).

The switching plan is this book's own idea, so **treat every level as practice**. For how to sit in each mode, use the methods in 3.2.1, and keep this section's exercises for choosing when.

How far the evidence goes

- The open-mode result: one small study of experienced meditators
- The switching plan is this book's own idea

Exercise:

Try it. Before your next task, say out loud whether it has one answer or many. Then name the mode you will use.

Exercise:

Choose the mode.

1. Starter. List five tasks for tomorrow. Mark each one as one answer or many answers, and write the mode beside it.
2. Middle. Pick one task that has both kinds of step, such as planning a meal for guests. Write where you will open up to gather ideas and where you will close in to choose.
3. Advanced. In one real project, switch modes on purpose at least twice. At each switch, **write one line naming the mode you are entering** and why. Note afterwards whether the switch came too early or too late.

Keep the notes from the advanced level for your next project. **A late switch and an early switch feel different** when you look back at the

work, and the notes make the difference easier to see. Use them as your own record of the work.

Key idea:

Focused attention suits one-answer tasks and open attention suits many-answers tasks, so **choose the mode on purpose** and switch when the step changes.

Two modes, one task



One answer: focused attention



Many answers: open attention



Switch when the step changes

Quick check:

1. What did Colzato's team report about open-monitoring meditation? Answer: It "induces a control state that promotes divergent thinking" (Colzato et al., 2012).
2. Is making new ideas a purely open state? Answer: No. Idea generation was described as "focused internally-directed attention" (Benedek, Jauk, Fink, et al., 2014).
3. What check helps you choose the mode? Answer: Ask whether the task has one answer or many.

2.3.2 Noticing What Others Overlook: Selective and Leaky Attention

You finish a report and close the file. A colleague asks whether you heard the argument in the next room, and you have no idea what she means. **The report had all your attention.** Later, when you need an idea for its title, a phrase from that argument might have been useful, if you had heard it.

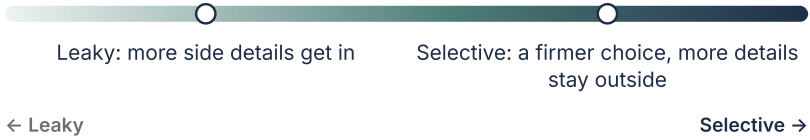
Choosing what to ignore helps you finish work. Choosing what to let in can feed new work. **The choice changes with the step**, and keeping everything out for the whole day can leave you short of things to think with. This section looks at when side details deserve a turn.

Ignoring and letting in

Choosing what to ignore	Choosing what to let in
⊕ Helps you finish work	⊖ Can feed new work

Picture the doorkeeper allowing some guests through around the edge of the queue. **Leaky attention lets more side details in**, even while something else has the room. Selective attention keeps a firmer choice, so more of those details stay outside. Flexible attention can change that choice when it stops being useful.

From leaky to selective attention



The words describe different patterns of attention. Leaky can sound like a fault, as if something needs mending. **In the research here, it is a description**, about how much gets through. Whether a side detail helps depends on what you are doing with it.

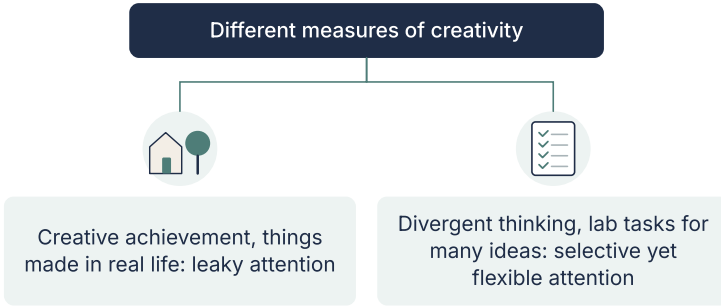
Leaky is a description

It can sound like	In the research here
A fault that needs mending	A description of how much gets through

> **Science Says:**
>
> One team distinguished two kinds of creativity. They wrote that "creative achievers may have leaky attention, as suggested by previous literature, whereas divergent thinkers have selective yet flexible attention" (Zabelina et al., 2016). **Different measures of creativity went with different attention patterns.** Creative achievement meant things people had made in real life, while divergent thinking was measured through lab tasks that ask for many ideas.

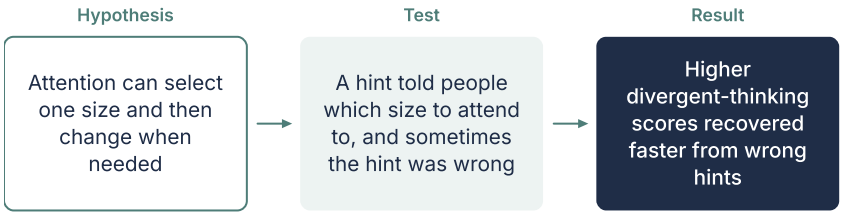
The team's point is that **real achievements and lab idea scores tell different stories** (Zabelina et al., 2016). You cannot take the attention pattern from one measure and assume it fits every kind of creative work. Each label needs the name of the measure beside it.

Two measures, two attention patterns



One task in the study used a large letter built from tiny letters. A hint told people which size to attend to, and sometimes the hint was wrong. **People with higher divergent-thinking scores recovered faster from wrong hints** (Zabelina et al., 2016). Their attention could select one size and then change when the selection needed correcting.

The large letter built from tiny letters



Imagine a shop sign made from flowers. From across the road you read the word; up close you look at the flowers. **Both views are available**, and the useful one depends on what you came to find. A wrong hint is like someone telling you to count petals when you need to read the shop's name.

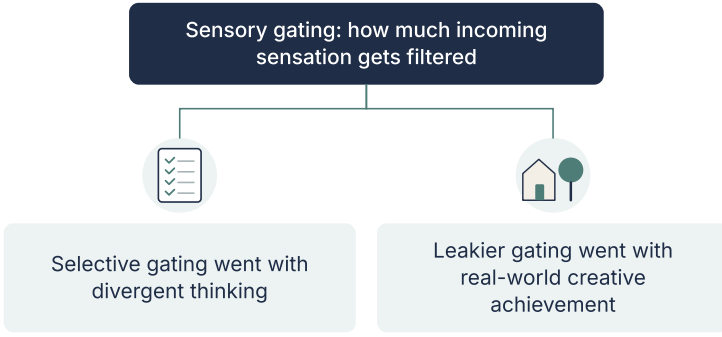
A shop sign made from flowers

The idea	What it is like
The large letter	Reading the word from across the road
The tiny letters	Looking at the flowers up close
A wrong hint	Being told to count petals when you need the shop's name

> **Key Concept:**
>
> Selective yet flexible attention. **Choose what the step needs**, and be ready to change that choice when it sends you the wrong way. A wrong hint or a dead end is the cue to look again and choose afresh.

An earlier study of 84 people measured sensory gating. It found selective gating with divergent thinking and leakier gating with real-world creative achievement (Zabelina et al., 2015). Sensory gating means **how much incoming sensation gets filtered**. This was a measured difference between people, with no instruction to become leakier.

Gating in a study of 84 people



The two studies used different tasks, and their distinction helps explain an everyday puzzle. **A person may be good at a quick ideas test** and have a different attention pattern from someone who has spent years making things. The kind of creativity has to be named before the attention pattern means much.

A separate study examined latent inhibition. This means **tuning out something that has been useless before**, such as the hum of an old fridge. In young, high-IQ samples, people with higher creative achievement tuned out less (Carson et al., 2003). IQ is a score from an intelligence test, and that sample limit belongs with the finding.

Tuning out the old fridge

- Latent inhibition: tuning out something that has been useless before
- In young, high-IQ samples, higher creative achievement went with tuning out less



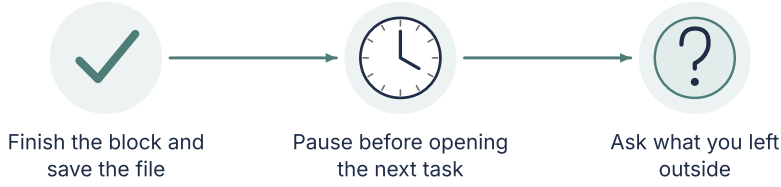
An old fridge in a kitchen corner, with a woman at the table looking up from a page of writing as its motor starts.

That finding gives another view of side details. A sound you ignored yesterday might still reach you today. **A detail that once seemed useless can become useful** when the task changes. The study found differences between people; it did not test whether leaving the fridge humming improves an idea.

For this book's practice, the useful question is when to review what you filtered out. **A focused block has a purpose**, such as finishing the report. After it ends, there may be room to look again at the parts of the scene that had no place in that block.

You can use a short review without letting the whole room interrupt the report. Finish the block, save the file, and pause before opening the next task. **Ask what you left outside** while you were working. A note you dismissed, an odd phrase or a question from a colleague may now deserve a look.

A short review after a focused block



This review is this book's own idea. It keeps the timing clear, so **the side detail gets its turn after the focused work**. During the report, the doorkeeper keeps the needed guests in the room. At the end, you can choose to let a few others in.

Suppose the report is about visitors to a library. While checking the figures, you ignore a colleague's remark that children cannot see the signs. When you turn to ideas for the entrance, **the remark becomes**

worth examining. The detail changed its value because the step changed.

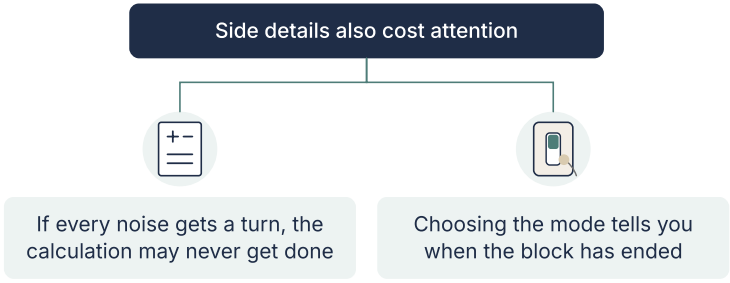
The library remark changes its value

Step	The colleague's remark
Checking the figures	Ignored
Ideas for the entrance	Worth examining

The same detail can lead nowhere. You may inspect the signs and find that they are already easy to read, or the figures may show a different problem. **Letting a detail in is a chance to examine it**, with no promise that it will improve the plan. Choosing comes after noticing.

Side details also cost attention. If every noise gets a turn during a calculation, the calculation may never get done. **Keep the focused block intact** when the answer depends on holding the steps in order. Choosing the mode on purpose tells you when that block has ended.

Keep the focused block intact



The findings give no reason to label yourself as one kind of person for life. They report patterns across people on particular measures. **For your own work, watch the choice you can make now**, such as whether the next step needs checking figures or gathering a fresh clue.

A review can be brief. Choose one detail you filtered out and ask whether it bears on the task now. **One useful detail is enough to test**, and a long list can become another way to put off the next step. If none fits, carry on with the work.

A brief review of what you filtered out

- [x] Choose one detail you filtered out
- [x] Ask whether it bears on the task now
- [x] If none fits, carry on with the work

The Creativity book looks more closely at observing and at the relation between these attention patterns and creative work. **This section keeps to timing**, the point where checking a task gives way to looking for another clue.

When you use the review with others, explain its purpose first. Ask each person for one detail that had been set aside while the main task was being done. **A shared pause can expose different choices**, since one person may have attended to a remark that another never heard. Treat each remark as something to check.

A beginner's side detail may deserve the same hearing as an experienced person's. The detail still needs to fit the task, whoever noticed it. **Write down the detail before judging its source**, then check what it says about the work in front of you.

A shared pause in a group



Ask each person for one detail that was set aside



Write it down before judging its source



Check what it says about the work in front of you

The exercises below are practice ideas built around these findings. **No study has tested the review as training**, and none shows that trying to become leakier raises creative achievement. Use the record to see whether a detail you set aside becomes useful after a focused block.

What no study has tested

- No study has tested the review as training
- None shows that trying to become leakier raises creative achievement

> Exercise:
>
> Try it. After your next focused task, write one thing you filtered out while you worked. Say whether it has any use for the next step.

A record can include an empty result. “The sound outside had nothing to do with the report” is a fair entry. **Keep the useless details in the record too**, so you can judge the review by what actually helped, with the failures beside the successes.

> Exercise:
>
> What I filtered out.
>
> 1. Starter. Finish one short focused block, then name one side detail you ignored. Write why it had no place in the block you just finished.
> 2. Middle. Review that detail against the next step of the task. Decide whether to use it, check it or leave it aside, and write your reason.

3. Advanced. Repeat the review across several real tasks. For each one, record the step you had finished and what the side detail did for the next step. **Keep the focused work separate from the review**, so you can see which part helped.

When side details get a turn



Finish the focused block | Let one side detail in | Check what it contributes to the work

Key idea:

Different creative measures go with different attention patterns, so **choose when side details get a turn** and check what they contribute to the work.

Quick check:

1. Which attention pattern went with divergent thinking in the 2016 study? Answer: Selective yet flexible attention (Zabelina et al., 2016).
2. What does latent inhibition mean? Answer: Tuning out things that were useless before.
3. Does the review exercise have a tested training benefit? Answer: No. It is a practice idea for deciding when to examine a side detail.

2.3.3 Mind-Wandering and Breaks: What They Do and Do Not Do for Ideas

You have spent an hour trying to think of a theme for your daughter's birthday party. **Every idea feels flat**, so you put the kettle on and stand by the window while it boils.

Ten minutes later, back at the table, two new ideas arrive in quick succession. It is tempting to say your wandering mind found them while you watched the garden.

The kettle and the party theme



An hour of work: every idea feels flat

The kettle and the window

Back at the table: two new ideas

This section looks at what studies of breaks found about that moment. **A break can help a stuck idea**, and that evidence comes from a study that combined many studies. The popular story about why it helps is weaker, and the attention side of the break is what you can plan.



A woman standing by a kitchen window waiting for a kettle to boil, a notepad of crossed-out party ideas on the table behind her.

Scientists call the break incubation. It works **a little like leaving bread dough to rise** before you shape it. The dough needs the earlier kneading, and the waiting time works only because of it. The picture stops there, since the mind is no ball of dough.

Incubation, like rising dough

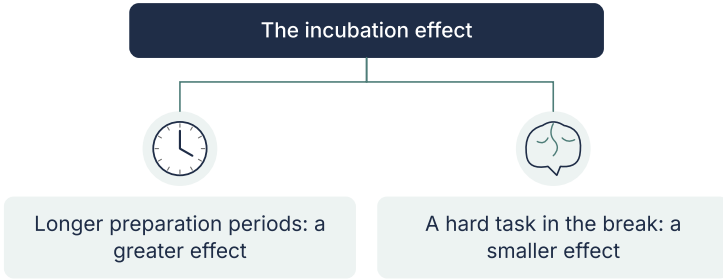
Bread dough	A stuck problem
The earlier kneading	Working on the problem first
Leaving it to rise	The break

> **Science Says:**
>
> A study that combined many incubation studies found "a positive incubation effect, with divergent thinking tasks benefiting more than linguistic and visual insight tasks from incubation" (Sio & Ormerod, 2009). Divergent thinking tasks ask for many answers, such as party themes. **Many-answers tasks gained the most from a break.** Insight tasks are word or picture puzzles with one hidden answer.

The same review found **two details about timing**. They wrote that "Longer preparation periods gave a greater incubation effect, whereas filling an incubation period with high cognitive demand tasks gave a smaller incubation effect" (Sio & Ormerod, 2009).

A hard task in the break shrank the gain. In plain words, work properly on the problem first, then fill the break with something light.

Two details about timing



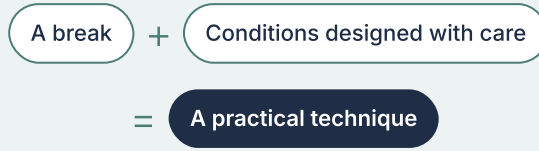
One more detail comes with a limit. For word puzzles with a hidden answer, **a light task during the break did better than simple rest** (Sio & Ormerod, 2009). That result held for that kind of puzzle only, so it says little about party themes.

A limit on light tasks

- For word puzzles with a hidden answer, a light task did better than simple rest
- The result held for that kind of puzzle only

The authors also wrote that "the conditions under which incubation can be used as a practical technique for enhancing problem solving must be designed with care" (Sio & Ormerod, 2009). **A break is a tool with conditions**, and the conditions decide how well it works. The rest of this section is about the conditions attention can control.

A tool with conditions



The popular story says your wandering mind does the work during the break. In 1.3.3 you met the view that mind-wandering can help with planning and creative ideas. **One claim about breaks has been tested more strictly.**

> **Science Says:**
> A team tried to repeat an earlier lab result about mind-wandering during a break. Across two studies with 443 people, they "found no evidence for the claim that mind wandering during a creative-incubation interval facilitates a form of creativity associated with divergent thinking" (Murray et al., 2024). Facilitates means helps. **Wandering during the break did not explain the gain.**

That result leaves the break itself in place. The review still found that breaks help, especially for many-answers tasks (Sio & Ormerod, 2009). **What failed was one explanation of why**, the idea that drifting thoughts during the pause did the work. The studies here do not settle why breaks help.

Breaks and the wandering mind

What failed	What still stands
The idea that drifting thoughts during the pause did the work	Breaks help, especially for many-answers tasks

For your own planning, this is good news. You do not have to make your mind wander during a break, or worry when it does not. **The parts you can plan are the work before and the return after.** Those are both jobs for attention.

On this book's reading, the kettle scene fits the review well. **You had worked on the theme for an hour**, so the room was full when you stood up. The kettle and the window were a light filler, and the ideas came soon after you sat down again.

The parts of a break you can plan



> **Key Concept:**
>
> Incubation. It means **setting a problem aside for a while and then coming back to it**. In this book's terms, it is a planned gap in attention with a planned return.

Look at the work before the break first. Preparation is when the doorkeeper lets in all the parts of the problem. **A break after five**

minutes of work has little to come back to, while a break after a real effort has a full room waiting.

Now look at what fills the break. A hard task, such as answering difficult emails, puts new guests in the room. **A light task leaves the room free**, such as making tea or folding washing. The review's finding about hard fillers points this way.

What fills the break

A hard filler	A light filler
Answering difficult emails	Making tea or folding washing
Puts new guests in the room	Leaves the room free

Phones need a careful look here. On this book's reading, **a screen full of messages is closer to a hard filler** than a light one. Each message brings new guests into the room. A break spent scrolling may leave less space for the problem when you come back.

Scrolling in a break

> - A screen full of messages is closer to a hard filler
> - Each message brings new guests into the room

The return is where many breaks go wrong. You come back to the table, and the problem has gone cold. **You spend the first ten minutes remembering where you were**, and sometimes you never get back at all because a message pulls you away.

A return note solves part of this. Before the break, write one or two lines saying what you are trying to do and where you stopped. **The**

note brings the problem back to the desk the moment you sit down. It is a small checkpoint, like the ones in long reasoning tasks.

What a return note holds



What you are trying to do



Where you stopped



It brings the problem back to the desk

The note also protects the break. With the problem written down, you do not need to keep it on the desk while you make tea. **You can let the room go quiet** and trust that the note will hand the problem back later.

Some problems need more than one break. If the second return brings nothing new, **the problem may need more preparation**. Fresh facts or a talk with someone who knows the subject can help. A break helps most when there is real work for it to follow.

Timing matters for the return too. A break that runs for hours can turn into a different afternoon, and the problem may never come back. **Decide when you will return** before you leave, such as after the kettle, after the walk or after lunch.

Before you leave the problem

- [ ] Write the return note
- [ ] Decide when you will return, such as after the kettle, after the walk or after lunch

Breaks for rest and restoration, such as time in nature, are covered in 8.2.2. **This section keeps to breaks for ideas**, and the habits here sit

alongside those. A walk in the park can be both, as long as the return note waits on the table.

When you come back, give the problem a few minutes before you judge your ideas. **Read the note, look at what you had**, and add whatever arrives. Judging can wait until the new ideas have had a chance to land, and then you can close the door to choose.

When you come back

Try this now

1. Read the note
2. Look at what you had
3. Add whatever arrives
4. Judge once the new ideas have had a chance to land

Breaks work in groups too. A team stuck on a plan can stop for ten minutes and come back with **one person reading out the return note**. Everyone starts from the same place, and nobody spends the first part of the meeting asking where they were.

The attention lesson sits here. Stay with the problem long enough to load the room. **Then let go on purpose**, fill the gap with something light, and come back with a note ready. The doorkeeper does its best work at the start and at the return.

The attention lesson of a break



The exercises below rest on the review of many incubation studies (Sio & Ormerod, 2009). The return note and the timed return are this book's own ideas, so **treat them as practice**. Nothing in them asks your mind to wander, since the stricter test found no gain from that.

Keep the counts from the middle level honest. Count every new idea, including the odd ones, and write the count before you judge them. **A fair count makes the two breaks easier to compare.**

What each break tests



> **Exercise:**
> Try it. Before your next break from a stuck problem, write one line saying where you stopped and what you are trying to find.

> **Exercise:**
> Leave and return.
>
> 1. Starter. Work on a many-answers problem, such as gift ideas, for at least twenty minutes. Write a return note, take a ten-minute break doing something light, then come back and read the note first.
> 2. Middle. Try two breaks on two similar problems. Fill one with something light and one with a hard task, such as difficult emails. Count the new ideas in the ten minutes after each return.

3. Advanced. For one real project over a week, plan each break in advance. Note the length of work before it, what filled it and when you returned. **Look for the pattern** in which breaks gave you most.

A break that helps a stuck idea



Load the problem first | Something light in the break | Come back with a note

Key idea:

Breaks help stuck ideas most after real work, so **load the problem first**, fill the break with something light and come back with a note.

Quick check:

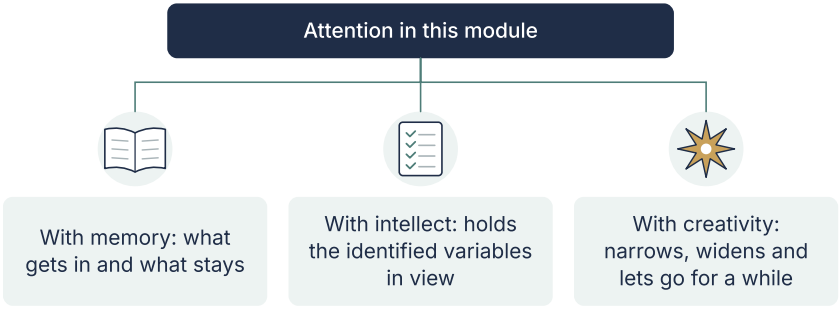
1. Which tasks gained most from incubation? Answer: Divergent thinking tasks, the many-answers kind (Sio & Ormerod, 2009).
2. Did mind-wandering during the break explain the gain? Answer: No. Two studies with 443 people found no evidence for that claim (Murray et al., 2024).
3. What goes in a return note? Answer: Where you stopped and what you are trying to find.

2.3.4 When You Need Which: Choosing the Right Kind of Attention for Each Step

YOUR GRANDMOTHER TURNS NINETY next month, and the family has asked you to give a short talk at her party. You have five minutes, a room full of relatives and a lifetime of stories to choose from. **The talk is one task, and it asks for several kinds of attention.** This section walks through it step by step.

The module has shown attention working with three partners. With memory, it decides **what gets in and what stays**. With intellect, it holds the identified variables in view while you work through them. With creativity, it narrows and widens, and lets go for a while when an idea is stuck.

Three partners, three jobs





An elderly woman in a cardigan laughing at a long family table, a birthday cake with many candles in front of her.

A real task rarely needs only one of these. It moves from step to step, and **each step has its own kind of job**. The skill is noticing which job is in front of you and giving it the attention it needs.

> **Science Says:**
>
> One study looked at three thinking skills that steer attention and the desk. It found that "fluid intelligence was strongly predicted by updating, but not by shifting or inhibition. Creativity was predicted by updating and inhibition, but not by shifting" (Benedek, Jauk, Sommer, et al., 2014). **Updating went with both reasoning and creativity.**

Those three skills need plain names. Updating means **keeping the desk current**, swapping old items for new ones as a task moves on. Shifting usually means moving from one task to another, and the study's short summary gives no detail of the test. Inhibition means holding back a ready response, like the habit at the roundabout.

Three thinking skills

Skill	Plain meaning	Predicted
Updating	Keeping the desk current	Fluid intelligence and creativity
Shifting	Moving from one task to another	Neither
Inhibition	Holding back a ready response	Creativity

The same study found that "updating ... was found to explain a relevant part of the shared variance between intelligence and creativity" (Benedek, Jauk, Sommer, et al., 2014). Shared variance means **what the two have in common**. Part of the overlap between reasoning and creativity came from keeping the desk up to date.

What reasoning and creativity share

> - Shared variance: what the two have in common
> - Part of the overlap came from keeping the desk up to date

Shifting in that study did not predict either score. **The mode switching in this module is this book's own practice**, and no study has tested it as a skill. The study's result on shifting says nothing either way about it.

A brain study adds one more piece. People with high creative ability showed links across **three large brain systems** that tend to work in opposition (Beaty et al., 2018). The authors described highly creative people as able to engage these systems at the same time.

The default and executive networks appeared in 2.3.1. The salience network notices what stands out. **They worked together in more creative people**, and the study measured a link, with no recipe for

training it. It also gives no support for labels like left-brained or right-brained people.

Three large brain systems



The default network



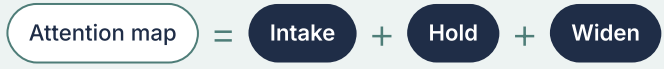
The executive network



The salience network notices what stands out

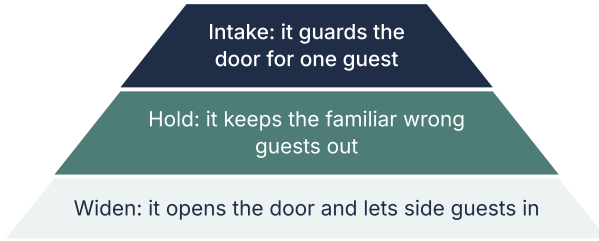
> **Key Concept:**
>
> The attention map. **Attention map = Intake + Hold + Widen.** Intake is what you must take in fully, for memory. Hold is which known variables must stay in view, for intellect. Widen is where you need side detail or a break, for creativity. The map is this book's own tool, built from the studies in this module.

The attention map



The doorkeeper does a different job in each part of the map. At intake, **it guards the door for one guest**, such as the story your aunt is telling. In the hold step, it keeps the familiar wrong guests out of the room. In the widen step, it opens the door and lets side guests in for a while.

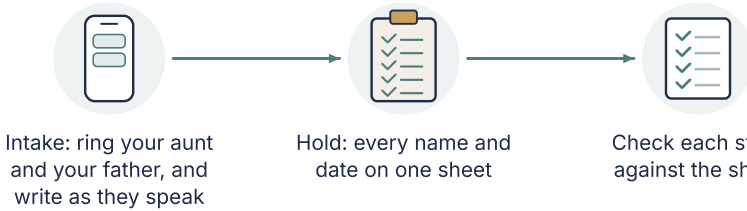
The doorkeeper in each part of the map



Start the talk with intake. You ring your aunt and your father, and each tells you two or three stories about your grandmother. **This is the moment to protect**, as 2.1.1 set out. Put the phone on speaker, close the laptop and write as they speak.

Next comes the hold step. You have five minutes, and every name and date must be right. **These variables are identified**, so this step belongs to intellect. Write them on one sheet, keep it in view, and check each story against it as you draft.

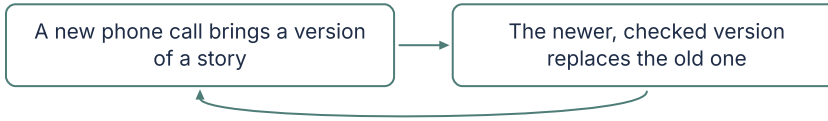
Intake and hold for the talk



The hold step has its own traps. Your father tells the wedding story differently from your aunt, and the familiar version keeps sliding back into your draft. **Attention control earns its keep here** (Engle, 2002). Name the rule that is different this time, such as “use the date the aunt checked”, and write it at the top.

Updating runs through these first steps. Each new phone call brings a version of a story. **The desk has to be kept current**, with the newer, checked version replacing the old one. That is the skill that went with both reasoning and creativity in the study (Benedek, Jauk, Sommer, et al., 2014).

Keeping the desk current



Then comes the widen step. You need an opening line that will make the room smile, and nobody knows what it is yet. **This step has no ready-made method**, so it belongs to creativity. Open the door, look over the stories for an odd detail and let the side remarks back in (Zabelina et al., 2016).

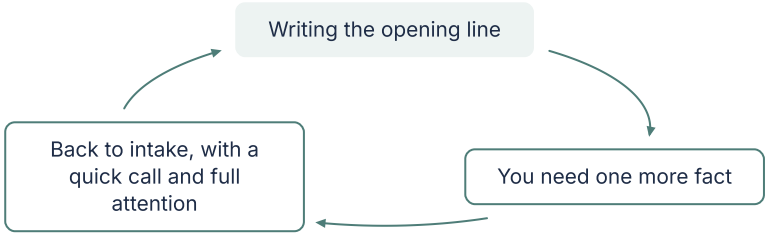
If the opening line still will not come, take a break with a return note. **Write where you stopped** and what you are looking for, and go and do something light. When you come back, read the note first, then let new lines arrive before you judge them.

The widen step



Steps can also loop back. While you write the opening line, you may need one more fact. It might be the name of the village where your grandmother grew up. **That sends you back to intake**, with a quick call and full attention while your father answers.

Steps can loop back



The last step is a check. You read the talk aloud and time it, and you check every name against the sheet. **The door closes again**, and focused attention looks for the one right version. Intellect leads, and attention keeps the check from drifting.

Seen as a whole, the talk moved through all three parts of the map, and some parts more than once. **No step needed every kind of attention at once**, and every step needed one kind more than the others. Naming that kind before you start is a good place to begin.

The talk, step by step

Step	Kind of attention	Partner
Stories from the family	Intake	Memory
Names and dates	Hold	Intellect
The opening line	Widen	Creativity
Read it aloud and check every name	Focused check	Intellect

Inhibition has a place in the talk as well. The first funny line that comes to mind may be one the family has heard many times. **Holding it back for a moment** gives a fresher line a chance, and the study found that inhibition went with creativity (Benedek, Jauk, Sommer, et al., 2014).

Holding back the first funny line

> - The first funny line may be one the family has heard many times
> - Holding it back gives a fresher line a chance

The map also tells you where a task is likely to go wrong. If the stories came out muddled, look at intake. If a name was wrong, look at the hold step. **If the talk felt flat, look at the widen step**, and ask whether you opened the door at all.

Where a task went wrong

- [x] The stories came out muddled: look at intake
- [x] A name was wrong: look at the hold step
- [x] The talk felt flat: look at the widen step

The map works for small daily tasks too. A long email from your manager needs intake first, so read it once with the doorkeeper guarding the door. **Hold the facts it asks for** on one sheet while you answer. If it asks for a new idea, widen for a few minutes before you write the reply.

A long email from your manager



Intake: read it once, the doorkeeper guarding the door



Hold: the facts it asks for on one sheet



Widen: a few minutes for a new idea

The Creativity book asks the same question for the four abilities, which one should lead each step. **This module asks it for attention**, which kind of attention each step needs. The two questions fit together, and you can ask both about the same task.

The exercise below uses the attention map, which is this book's own tool. It draws on findings from this module, such as protecting intake (Craik et al., 1996), and **no study has tested the map itself**, so treat it as practice. Use it on real tasks and keep notes on what it changes.

You can share the map with others. Before a team task, say which step you are in, such as "this is intake, so phones down" or "this is widen, so no judging yet". **Naming the step helps everyone bring the same kind of attention** to it at the same time.

Name the step together

> - "This is intake, so phones down"
> - "This is widen, so no judging yet"

> **Exercise:**
>
> Try it. Pick one task for tomorrow. Write one word for its main step, intake, hold or widen.

> **Exercise:**
>
> Draw the attention map.
>
> 1. Starter. Take one small task, such as a birthday card. List its steps and mark each one intake, hold or widen.
> 2. Middle. Take one larger task, such as planning a weekend away. For each step, write what you will do with your attention, such as phone away, sheet in view or a break with a note.
> 3. Advanced. Use the map on one real project at work or at home. After each step, note whether the kind of attention fitted. When a step went wrong, **name the part of the map** where it went wrong and plan the fix.

Map the steps before you begin



Intake: what you must take in fully



Hold: the known variables in view



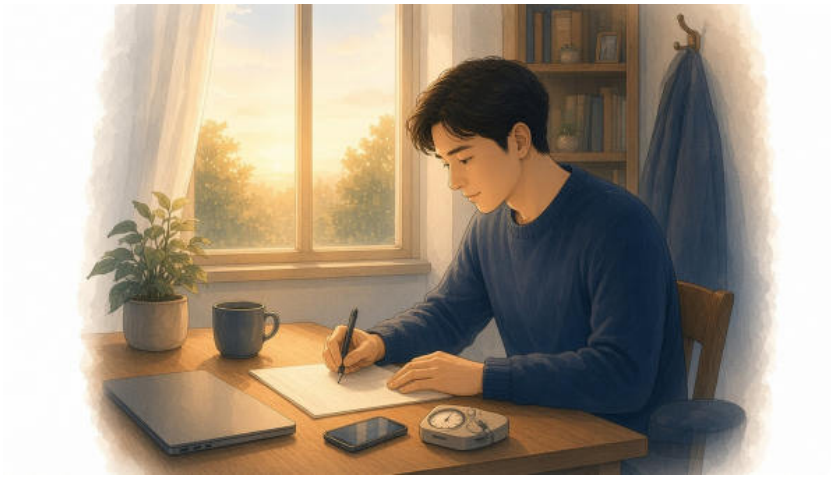
Widen: side detail or a break

Key idea:

Each step of a task needs its own kind of attention, so **map the steps as intake, hold or widen** before you begin.

Quick check:

1. Which skill went with both reasoning and creativity in Benedek's study? Answer: Updating, keeping the desk current (Benedek, Jauk, Sommer, et al., 2014).
2. What are the three parts of the attention map? Answer: Intake, hold and widen.
3. Which part of the map leads when a step has no ready-made method? Answer: Widen, the creativity part.



Module

3

Core Techniques for Training Attention

3.1 Directing and Holding Focus

3.1.1 Single-Tasking and Clear Intentions

GRAB A PEN, BECAUSE this section starts with **a one-minute test**.

A one-minute test



Grab a pen



One minute



A test

> Exercise:
>
> The A-1 test.
>
> 1. Write the letters A to Z as fast as you can.
> 2. Write the numbers 1 to 26 as fast as you can.
> 3. Now **mix the two lists**, as in A, 1, B, 2, C, 3, and keep going to the end. This mixing test goes back to Jersild (1927).
>
> Notice how the third line feels next to the first two.

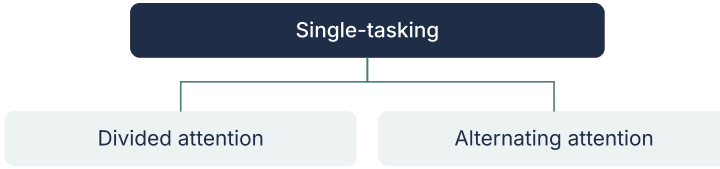
Most people **slow down and stumble** on the mixed line. If you are doing two things at once, are you really doing either one well? You already know both lists by heart. The trouble comes from the changing between them, because at every step the doorkeeper has to swap one guest for another.



Two easy lists make one hard mix. You know both lists, so the slowdown comes from changing between them.

Single-tasking means doing one mentally demanding task at a time. You give it your attention until you finish it or choose to stop. It answers two limits you met in 1.2.2, divided attention and alternating attention.

Two limits, one answer

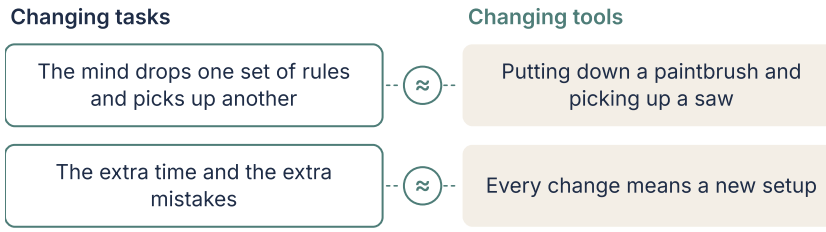


The Cost of Switching

> **Key Concept:**
>
> Switch cost. A switch cost is **the extra time and the extra mistakes** that come from changing from one task to another. With each change, the mind drops one set of rules and picks up another.

The stumble in the A-1 test is a switch cost. It is like **putting down a paintbrush and picking up a saw**. Each tool is easy to use, but every change means a new setup.

A switch is a new setup

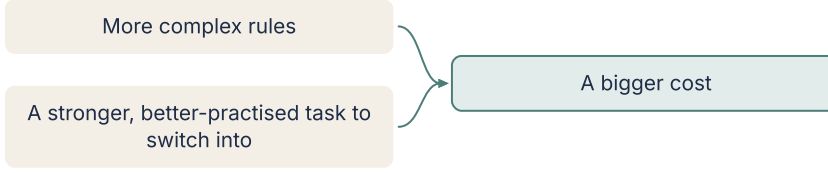


Both tools are easy; the cost is in the change.

Switch costs show up across **a wide range of tasks** (Monsell, 2003; Kiesel et al., 2010). The more complex the rules, the bigger the cost (Rubinstein et al., 2001).

How well you know a task counts, though **not in a simple way**. Switching into a task you don't know can take longer (Rubinstein et al., 2001). Yet switching into a stronger, better-practised task can bring the larger cost (Monsell, 2003).

What makes the cost bigger

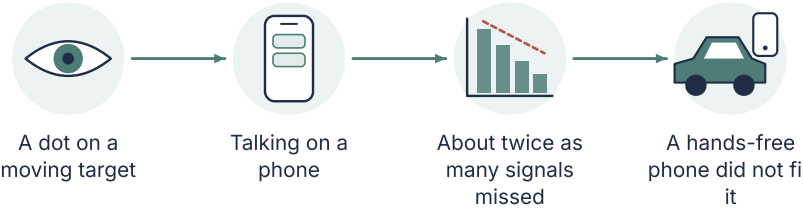


Two things that bring the larger cost (Rubinstein et al., 2001; Monsell, 2003).

> **Science Says:**
>
> In one study, people did **a joystick tracking task on a computer** that stood in for driving. They kept a dot on a moving target and reacted to traffic signals on the screen. While talking on a phone, they missed about twice as many signals and reacted more slowly to the ones they caught. A hands-free phone did not fix it (Strayer & Johnston, 2001).

The joystick study shows that **the cost lies in attention**, and your hands have little to do with it. The talk still pulled the doorkeeper away from the task.

The joystick study



The hands stayed free, yet the talk still cost attention (Strayer & Johnston, 2001).

You might expect heavy multitaskers to be the best at switching. One study found **roughly the opposite** (Sanbonmatsu et al., 2013). People who multitasked most tended to be worse at it. They also thought they were better than they were.

> **Key Concept:**
>
> Media multitasker. A media multitasker is a person who **uses many streams of media at the same time**, such as a show, a chat and a web page.

One claim says heavy media multitaskers have **worse control over their attention** (Ophir et al., 2009). It is still debated. Other researchers tried to repeat it, and a meta-analysis found the link was weak (Wiradhany & Nieuwenstein, 2017). Small studies often show bigger effects than large ones, and once the researchers corrected for that, the link no longer held up.

A coin shows why **small studies can mislead**. Toss it four times, and three heads happens quite often. Toss it four hundred times, and the heads land close to half. A small study is like the four tosses, where a few lucky results can make an effect look bigger.

Four tosses and four hundred

	Four tosses	Four hundred tosses
Three heads	Happens quite often	
Heads	A few lucky results	Land close to half

Small studies are like the short run.

> **Science Says:**
> A later study of 80 young adults found that heavier media multitaskers had **more attention lapses**, short moments when attention slips. A lapse just before trying to remember something went with forgetting it (Madore et al., 2020). The study measured a link at one time, so it cannot show cause.

The original lab's own later review calls the findings **mixed, with open questions** (Uncapher & Wagner, 2018). Nicholas Carr's The Shallows leans on the same finding (Carr, 2010). His use of it goes further than the evidence now does.

How the multitasking claim has held up



Still debated by the original lab.

> **Science Says:**
> "Multitasking costs 40% of your productive time" is **a number nobody measured**. It comes from a remark credited to the psychologist David Meyer, on an American Psychological Association page written for general readers. The figure was an illustration (American Psychological Association, 2006). Switch costs themselves are real and well measured (Rubinstein et al., 2001).

Stolen Focus claims students did 20% worse on a test when texts interrupted them (Hari, 2022). That claim **goes too far**. The test was described in a newspaper opinion piece. It was not a peer-reviewed paper, checked by other scientists.

The interruptions were lab instant messages, with no phones involved. In a second test, **the gap shrank to 14%**. A group told to expect interruptions that never came improved by 43% (Sullivan & Thompson, 2013). Hari's corrections page defends the claim (Hari, 2024).

The texting test



The gap shrank in the second test (Sullivan & Thompson, 2013).

Clear Intentions: Goals and If–Then Plans

Staying with one task is easier when you know **what that task is**. Specific, challenging goals direct attention and effort better than vague ones (Locke & Latham, 2002). "Draft the first two pages of the report" is specific, and "work on the report" is vague.

A vague goal is like telling a taxi driver **"somewhere in town"**. The car moves, but it wanders. A clear address lets every turn point the same way.

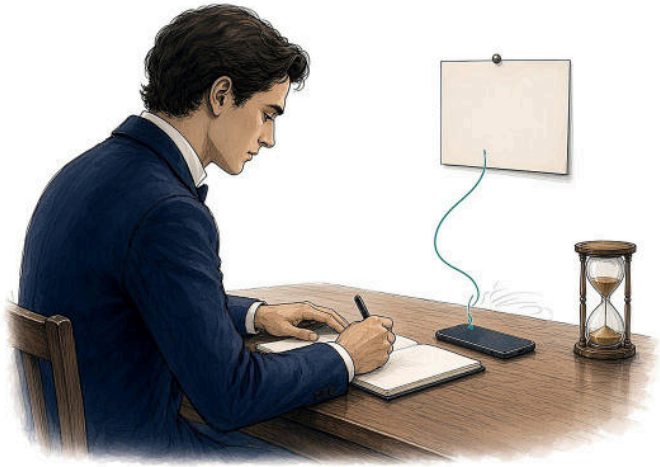
Vague and specific goals



A specific goal points every step the same way (Locke & Latham, 2002).

> **Key Concept:**
>
> Implementation intention. An implementation intention is **an if-then plan** made in advance. It takes the form "If X happens, then I will do Y" (Gollwitzer, 1999).

Try “If my phone buzzes, then it stays face down until the timer ends.” You make **the decision before temptation arrives**, so the doorkeeper’s answer to that guest is set in advance.

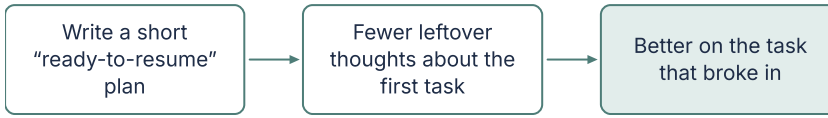


Decide before temptation arrives. An if-then plan links a likely trigger to a response you have already chosen.

Across many studies, if-then plans **helped people reach their goals** (Gollwitzer & Sheeran, 2006). The studies measured reaching goals in general, and that result does not speak to attention in particular.

A plan can help at the moment you stop. In four studies, people who wrote **a short “ready-to-resume” plan** before switching had fewer leftover thoughts about the first task. They did better on the task that broke in (Leroy & Glomb, 2018). You will meet this “park it” habit again in 3.1.2.

Park it before you switch



Four studies, one small habit (Leroy & Glomb, 2018).

> **Exercise:**
>
> Single-task setup.
>
> 1. Name the one task you are doing now, either out loud or on paper.
> 2. Write a specific goal for this session.
> 3. Form one if-then plan for the interruption you are most likely to face.
> 4. Close windows and tabs that have nothing to do with the task.
> 5. Before you switch, finish the task or **"park" it with a next-step note** (see 3.1.2).

Table 3.1 gives each technique **a grade for its evidence**. The grades run from strong, with many good studies behind it, down to weak, with only a few small or indirect ones. A grade drops a step when the studies did not test the technique itself.

Table 3.1: Single-tasking techniques

Technique	How to Do It	Evidence and How Strong It Is
Single-tasking	Work on one demanding task at a time, and close unrelated windows	Weak. Many controlled tests show switch costs (Monsell, 2003; Kiesel et al., 2010), and the costs grow as the rules get harder (Rubinstein et al., 2001). One step lower because single-tasking itself was not tested

Technique	How to Do It	Evidence and How Strong It Is
Goal setting	Write a specific, hard goal for the session	Moderate. A review of many controlled studies found that specific goals direct attention and effort (Locke & Latham, 2002)
Implementation intentions	Plan "If X, then I will Y" for the likeliest interruption	Strong. A meta-analysis found that if-then plans helped people reach goals (Gollwitzer & Sheeran, 2006)
Task parking	Before switching, write where you stopped and the next step	Weak. Several lab tests with small groups and few repeats by other teams. Leftover thoughts about unfinished tasks hurt the next task (Leroy, 2009)

Key idea:

Every switch has a setup cost, so pick one task, give it a specific goal and decide in advance with an if-then plan what you will do when interruptions come.

3.1.2 Deep Work: Protecting Long Blocks of Concentration

You are sorting a tall stack of papers when **someone knocks at the door**. You chat for ten seconds. When you sit back down, you have lost your place, and you have to recheck the pile you had already sorted.

The knock was short, but **its cost lasted much longer**. Why does a "quick" interruption seem to cost far more than its few seconds?

One answer to the knock is to **protect long stretches of time**. The writer Cal Newport calls such work deep work (Newport, 2016). It is the kind of work that pushes your thinking skills right to their limit.

Deep work



Protect long stretches of time



Distraction-free concentration



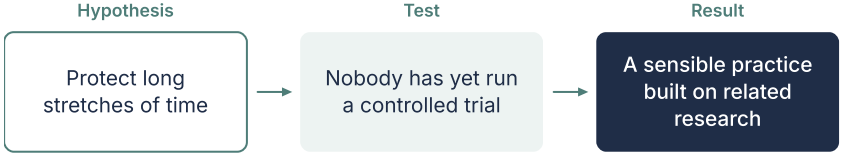
Thinking skills right to their limit

Work that needs long, protected blocks (Newport, 2016).

> **Key Concept:**
>
> Deep work. Deep work is **work done in "a state of distraction-free concentration"**, the phrase Cal Newport uses for it (Newport, 2016). Time-blocking means setting aside fixed blocks in your calendar for that kind of work.

Newport made **time-blocking** popular (Newport, 2016). His book is mostly argument and stories. Nobody has yet run a controlled trial of deep-work scheduling itself. It is a sensible practice built on related research.

Deep-work scheduling



Newport made it popular; nobody has tested it in a trial.

Why Interruptions Cost So Much

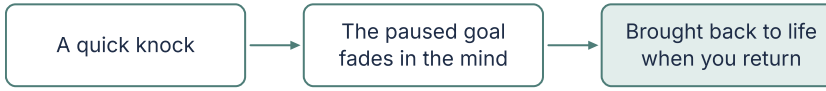
The first point is **how often the knock comes**. Researchers sat with information workers, people whose job is mostly reading, writing and

handling messages. They found the work cut into short pieces by interruptions and switches (Mark et al., 2005).

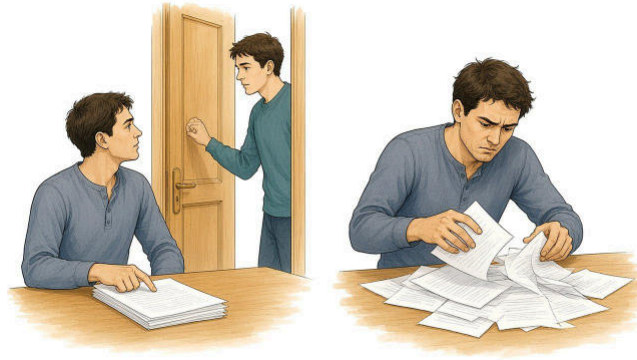
> **Science Says:**
>
> Even very short interruptions cause trouble. In one test, people worked through **a step-by-step task**. Interruptions of only a few seconds made their errors go up by a lot (Altmann et al., 2014). It is the lab version of losing your place in a stack of papers.

A quick knock turns **the doorkeeper away** from the guest inside. When the doorkeeper turns back, the guest has to be found again. One theory says a paused goal fades in the mind and has to be brought back to life when you return (Altmann & Trafton, 2002).

A paused goal fades



Every return costs a search (Altmann & Trafton, 2002).



The ten-second knock makes you lose your place. Its cost outlasts the knock itself.

Longer, harder interruptions make it **slower to pick up** where you left off (Monk et al., 2008). People try to make up for an interruption by speeding up their work. In one lab study, interrupted people kept up the quality of their work (Mark et al., 2008). They paid for it with **more stress, frustration and effort**.

Making up for an interruption



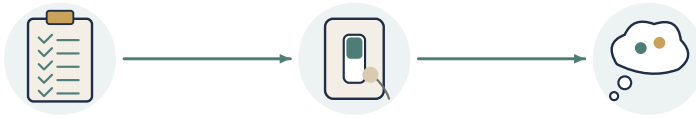
They paid for the quality (Mark et al., 2008).

Something stays behind when you jump from an unfinished task straight into a new one.

> 🗝 **Key Concept:**
>
> Attention residue. Attention residue is **the leftover thinking about an unfinished task** that stays with you after you switch to a new one, and it lowers your work on the new task (Leroy, 2009).

The doorkeeper waves a new guest in, but **the old one is still there**. The findings come from lab tests with modest samples, so they are promising, though not yet settled. They are the main reason to finish or deliberately "park" a task before switching.

Attention residue

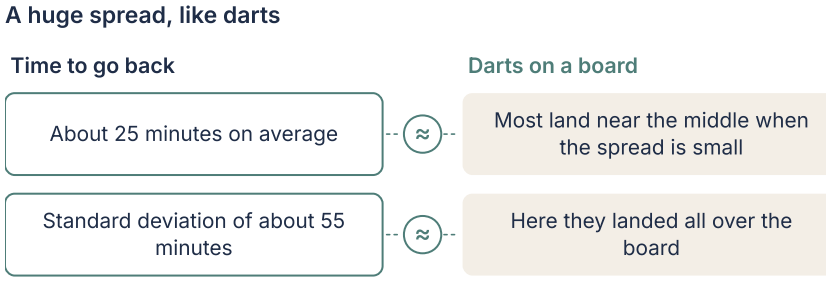


Promising lab findings, not yet settled (Leroy, 2009).

Parking can be tiny. In four studies, **a short "ready-to-resume" plan**, written just before switching, cut attention residue and protected work on the new task (Leroy & Glomb, 2018).

> **Science Says:**
> "It takes 23 minutes to refocus after an interruption" is **a figure the study never measured**. In the original study, people went back to interrupted work later the same day. On average, that took 25 minutes 26 seconds (Mark et al., 2005). People usually worked on about two other tasks in between. The "23 minutes 15 seconds" version comes from a 2006 magazine interview (Robison, 2006).

The spread in those times was huge, with **a standard deviation of about 55 minutes**. That measure shows how far the times strayed from the average. Picture darts on a board. If most land near the middle, the spread is small, and here they landed all over the board.



The times strayed far from the average.

Neither figure measures **how long it takes to regain focus**. Both measure how long until people went back to the task. The often-cited 2008 paper does not contain the figure (Mark et al., 2008). Interruptions can throw you off for longer than they last, yet nobody has an exact "refocus" time to quote.



Neither figure is a refocus time.

Protected Focus Time and Deep Practice

A workplace can try to **guard the focus** of the people who work there. At one software company, engineers got protected "quiet time" blocks (Perlow, 1999). They said they got more work done.

> **Science Says:**
>
> In one study, 13 workers went **without email for five days** (Mark et al., 2012). They switched windows less often and stayed longer on each one. The study was small, and it was not randomised. Like the quiet-time study, it hints at a benefit without proving it.

Five days without email



Only 13 workers, and not randomised (Mark et al., 2012).

Focused effort builds skill over time. The classic account links expert performance to **years of deliberate practice** (Ericsson et al., 1993).

> **Key Concept:**
>
> Deliberate practice. Deliberate practice is **hard, focused practice** designed to improve one part of a skill. It aims at the parts you cannot do yet.

Think of the difference between **playing your favourite song again** and slowly working on the two bars you keep getting wrong. Only the second one is deliberate practice. It needs your whole attention, which is why it belongs in a deep-work block.

Your favourite song or the two hard bars

Playing again	Deliberate practice
Playing your favourite song again	Slowly working on the two bars you keep getting wrong Needs your whole attention

Only the hard bars need a protected block.

Popular books spread a "10,000-hour rule", starting with Gladwell's Outliers (2008). Many read it to mean that **enough practice makes almost anyone an expert**. Ericsson himself rejected that reading (Ericsson & Pool, 2016).

The "10,000-hour rule"



A classic account, a popular reading, then Ericsson's answer.

> **Science Says:**
>
> A meta-analysis measured **how much deliberate practice explains** about the differences between people (Macnamara et al., 2014; corrected figures, Macnamara et al., 2018). Practice explained more of the differences in games, music and sports. It explained much less in education and professions.

Practice counts, but **its share depends heavily on the field**. Before you plan hours of drills, ask how much drills can do in your own field.



How much practice explains depends heavily on the field.

None of the steps below has been tested on its own, so treat **this plan as a starting point** you adjust.

> ✎ **Exercise:**
>
> Plan one deep-work block.
>
> 1. Put the block in your calendar as you would a meeting.
> 2. Write **one outcome** for the block.
> 3. First answer urgent messages, and tell colleagues when you will be free.
> 4. When you stop, leave a short "next step" note to park the task (Leroy, 2009; see also Masicampo & Baumeister, 2011, in 3.3.3).
> 5. Afterwards, write down what worked and what broke your focus.

Table 3.2 grades each strategy by **how firm its evidence is**. A study that only watches people, without changing anything, is weaker than an

experiment. A study whose results vary a lot from field to field is graded down a step.

Table 3.2: Deep-work strategies

Strategy	What It Protects Against	Evidence and How Strong It Is
Scheduled focus blocks	Broken-up work and frequent switching	Weak. One study that watched engineers at a single company (Perlow, 1999). Newport's book is argument (Newport, 2016). No controlled trial
Fewer email checks during a block	Window switching	Weak. A small study of 13 workers that was not randomised (Mark et al., 2012)
Handling interruptions beforehand	Brief interruptions that knock you off a sequence of steps	Moderate. Controlled lab experiments (Altmann et al., 2014). The length and difficulty of the interruption count (Monk et al., 2008)
"Next step" note when stopping	Attention residue	Weak. Several controlled lab studies, two steps lower for small samples and few repeats by other teams (Leroy, 2009; Masicampo & Baumeister, 2011)
Deliberate practice on hard skills	Shallow, unfocused practice	Moderate. A meta-analysis of studies that measured links, one step lower because results varied a lot by field (Macnamara et al., 2014, 2018). It shows a link, and it cannot show cause

Key idea:

A short interruption costs more than its length, because you lose your place and leave part of your mind on the old task, so protect blocks of time for demanding work.

3.2.1 Focused-Attention and Open-Monitoring Meditation

SITTING AND WATCHING YOUR breath can look like doing nothing. It is closer to teaching **a puppy to stay on a mat**. It wanders off, and you bring it back, kindly. It wanders off again, and you bring it back again.

Nobody gets angry with a puppy for being a puppy. Nobody expects it to stay put on day one, either. Breath practice works much the same way, and **the bringing back is the exercise**.

The puppy on the mat



The breath is the mat in FA practice.

Two Ways to Meditate: Focused Attention and Open Monitoring

You met **two families of meditation** in 1.1.1. Scientists sort them by what you do with your attention while you sit (Lutz et al., 2008).

> **Key Concept:**
> Focused-attention (FA) meditation. In focused-attention meditation, you **hold attention on one object**, such as the breath. You come back to it each time you notice you have drifted (Lutz et al., 2008).

The puppy and the mat are **FA practice**. The mat is the breath, and every return is one more lesson for the puppy.

> **Key Concept:**
> Open-monitoring (OM) meditation. In open-monitoring meditation, you **don't hold on to any one object**. You notice whatever comes up, such as sounds, feelings in the body or thoughts, without reacting to it or getting carried off by it (Lutz et al., 2008; Dahl et al., 2015).

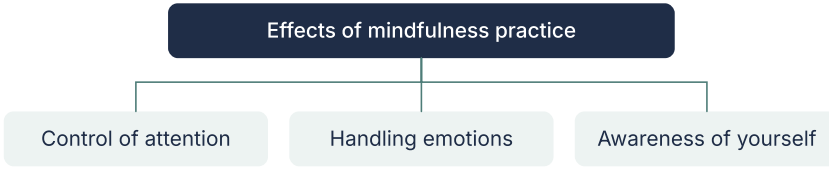
OM is like **sitting on a riverbank** and watching boats go by without jumping on. Thoughts are harder than boats, because they often feel like you. That is why staying on the bank takes practice.



Focused attention holds one object and brings attention back. Open monitoring notices what passes without jumping aboard.

A major review sorts the effects of mindfulness practice into **three groups** (Tang et al., 2015). They are control of attention, handling emotions and awareness of yourself. For this book, control of attention is the one that counts most.

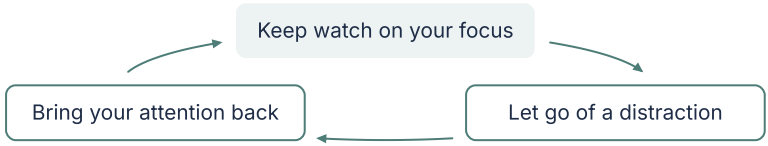
Three groups of effects



Attention is the group this book follows (Tang et al., 2015).

FA practice works three small skills again and again (Lutz et al., 2008). You **keep watch on your focus**, let go of a distraction when it pulls and bring your attention back. The doorkeeper keeps one chosen guest in view and fetches it back when it slips away.

Three small skills of FA



FA practice works these again and again (Lutz et al., 2008).

In OM, **the doorkeeper watches guests** come and go without following any of them.

What the Evidence Shows

Meditation seems to work **somewhat for some things**, and less well than the headlines say. An early meta-analysis of 163 studies found

roughly medium effects on attention tests (Sedlmeier et al., 2012). Effects on emotional outcomes were larger.

> **Science Says:**
>
> In one randomised trial, people went into **a retreat group or a waiting list**. The retreat group spent three months in an intensive retreat. It improved their sustained attention, the skill of staying with a dull task for a long time. It also improved telling apart small differences in what they saw, called perceptual discrimination (MacLean et al., 2010).



Three months of intensive practice, tested with random groups (MacLean et al., 2010).

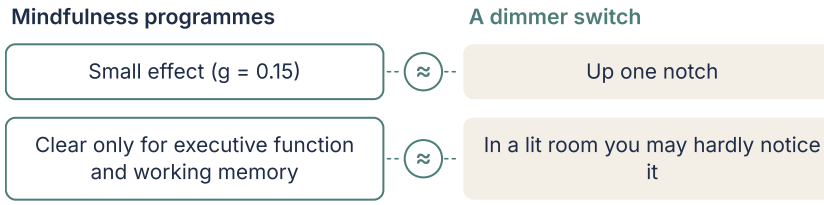
Smaller studies found that mindfulness training affected **separate parts of the attention system** (Jha et al., 2007). Five days of a specific body-mind training improved executive attention, the part that settles conflicts between competing responses, more than relaxation training did (Tang et al., 2007). Both were small, and the first was not randomised.

A later, more careful meta-analysis **softens the picture** (Whitfield et al., 2022). It covered 56 randomised studies of mindfulness programmes, with 45 in the pooled analysis.

Across those studies, the overall effect of mindfulness programmes on thinking was **small (g = 0.15)**. Here g is an effect size like d (see 1.3.2), used for small samples. The effect was clear only for executive function, the brain's planning and self-control skills, and for working memory, the mind's notepad (Whitfield et al., 2022).

A small effect is like **turning a dimmer switch up one notch**. You can measure the change, but in a lit room you may hardly notice it.

A small effect, like a dimmer



You can measure it, yet hardly notice it (Whitfield et al., 2022).

The programmes beat doing nothing. They did not beat **active comparisons**, such as other training that kept people just as busy. There was no reliable effect on attention as a separate area.

What the programmes beat

	Beat it?
Doing nothing	Yes
Active comparisons	No
Attention as a separate area	No reliable effect

Doing nothing is a weak comparison.

What the Evidence Does Not Show

What the research has not found counts just as much. A large review for the journal JAMA Internal Medicine looked at meditation programmes (Goyal et al., 2014). It found moderate evidence that they help with anxiety, depression and pain. For attention, the evidence was only low or not enough, and meditation did not beat other active treatments.

> **Science Says:**
> In one trial, 8,376 pupils aged 11 to 14 in 84 schools took part in **a test of school mindfulness lessons**. After a year, the mindfulness training was no better than usual teaching (Kuyken et al., 2022).

Hype in this field worries **a group of researchers** (Van Dam et al., 2018). They point to loose definitions, weak study designs and the media overstating results. Their warnings echo earlier ones about defining practices, choosing fair groups to compare with and relying on what people say about themselves (Davidson & Kaszniak, 2015).



Echoes of earlier warnings (Van Dam et al., 2018).

If you want to check a new claim yourself, the U.S. National Institutes of Health keeps **a plain-language page** on what meditation research

does and does not support (National Center for Complementary and Integrative Health, 2022).

Think of practising **musical scales**. Scales clearly train finger control. Whether they make you better at all else in life is a much bigger claim. The evidence for that kind of broad payoff from meditation is modest and mixed.



Like scales for the fingers, meditation trains narrow skills. Evidence for broad gains in attention is modest and mixed.

Practising Safely: Core Practices and How Long to Practise

Meditation is **not free of risk**. A systematic review, one that searches for every study on a question, found adverse events, meaning unwanted effects, in about 8% of people taking part (Farias et al., 2020). The rate was about 4% in trials. It was higher in observational studies, which watch what happens without assigning anyone to a group.

> **Science Says:**
>
> Across the studies in one review of unwanted effects from meditation, **the types reported most often** were anxiety (in 33% of the studies), depression (27%) and cognitive anomalies, meaning odd changes in thinking (25%) (Farias et al., 2020).

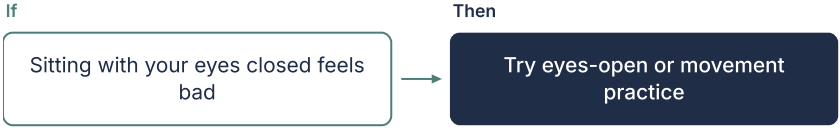
Unwanted effects reported most often



How often each type was reported, in one review (Farias et al., 2020).

The safety advice in this book **has not been tested in a study**. Before you start, think honestly about your mental health. Keep sessions short at first. If sitting with your eyes closed feels bad, try eyes-open or movement practice, and if distress appears, stop and get help from a professional.

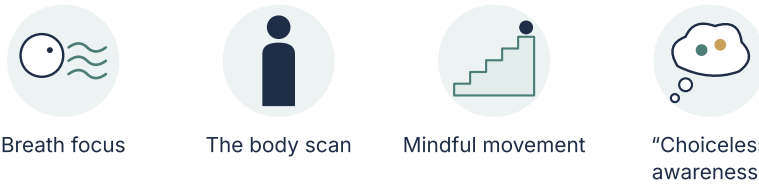
If practice feels bad



Advice from this book, not from a study.

Four practices form **the core of this unit**. Three of them come from the non-religious Mindfulness-Based Stress Reduction programme, or MBSR (Kabat-Zinn, 1990; Santorelli et al., 2017). They are breath focus, the body scan and mindful movement.

Four core practices

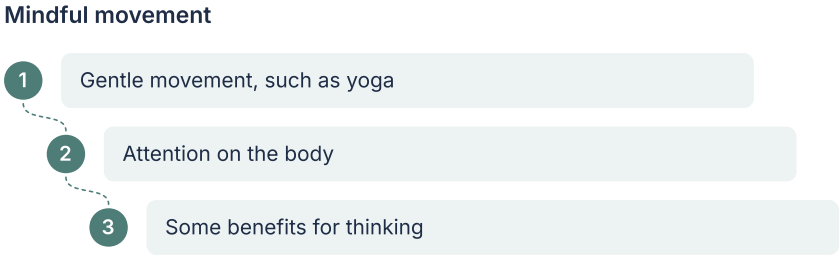


Three of the four come from MBSR.

The OM practice comes from MBSR's **"choiceless awareness"**, which means letting attention rest on whatever is there without picking one thing. The soft-labelling "noting" method comes from Burmese insight meditation (Mahasi Sayadaw, 1971).

> Exercise:
>
> The four core practices.
>
> 1. **Breath-focused FA.** Sit up straight but comfortably. Rest attention on the feeling of breathing, at the nose or belly. When you notice you have drifted, note where you went and return to the breath.
> 2. **Body scan.** Move attention slowly through the body, one part at a time. Notice what you feel without trying to change it.
> 3. **OM "noting".** Let attention rest on whatever stands out most. Give it a soft label, such as "hearing", "thinking" or "feeling", and let it pass.
> 4. **Mindful movement.** Practise gentle movement, such as yoga, with attention on the body.

For mindful movement, a meta-analysis of yoga trials found **some benefits for thinking** (Gothe & McAuley, 2015). The studies were small and varied.



Yoga trials so far are small and varied in design.

You may hear that you should practise **"12 minutes a day"**. That figure is the programme advice in Amishi Jha's book Peak Mind (Jha, 2021). It comes from the length of the guided recordings used in her lab's studies.

One study followed college football players during pre-season (Rooks et al., 2017). The groups did not clearly differ. Players who practised more were **better protected from a drop in attention**. That link is correlational, meaning the two simply went together, so it cannot show cause.



A link with practice time (Rooks et al., 2017).

Related studies with military groups **pointed the same way** (Jha et al., 2015, 2017). They were small and not randomised. In another small trial, 13 minutes a day of guided meditation improved attention and

memory after eight weeks, with no clear change at four weeks (Basso et al., 2019).

No study has tested **a minimum dose**. There is no evidence-based minimum, so pick a length you can keep up and treat consistency as the goal.

Four weeks and eight weeks



From one small trial of 13 minutes a day; no minimum dose has been tested.

Side by side, the two practices differ in **what you hold, what you train and where you get stuck** (Lutz et al., 2008).

Table 3.3: Focused attention and open monitoring compared

	Focused Attention (FA)	Open Monitoring (OM)
Object of attention	One chosen object, such as the breath	Whatever comes up, moment to moment
Skill trained	Watching the focus, letting go of distractions, coming back	Noticing without reacting or getting carried away
Typical instruction	"Rest attention on the breath, and when you notice you've wandered, come back"	"Notice what is here, label it softly and let it pass"
Common difficulty	Frustration at constant drifting	Getting lost in a thought instead of noticing it

Key idea:

Focused attention trains you to hold one thing and come back when you drift, and open monitoring trains you to notice what comes up without getting carried off, yet broad gains in attention have only modest, mixed support.

Once the four core practices feel familiar, the short drills below **add variety**. Pick one a week.

Exercise Table 1: Meditation practice exercises

Exercise	What to Do
Breath anchor	For 3 minutes, rest on the breath, or count out-breaths to 10 and start again
Sound anchor	Rest on the sounds around you without naming them
Label and return	When you drift, silently say "wandering" and come back
Open sit	Sit for 5 minutes with no chosen object, noticing what comes up
Longer sessions	Add one minute to your usual session each week

3.2.2 Noticing and Returning: Working with a Wandering Mind

You are reading a report when you reach the bottom of the page and realise **you have no idea what it said**. You have read the same paragraph three times on autopilot. Then comes the little jolt of "wait, where was I?" as you look up from the page.

That jolt is **the skill to train** in this section. How long does it take you to notice your mind has wandered, and what do you do when you notice? Both answers can change with practice.

The skill to train



How long it takes you to notice



What you do when you notice



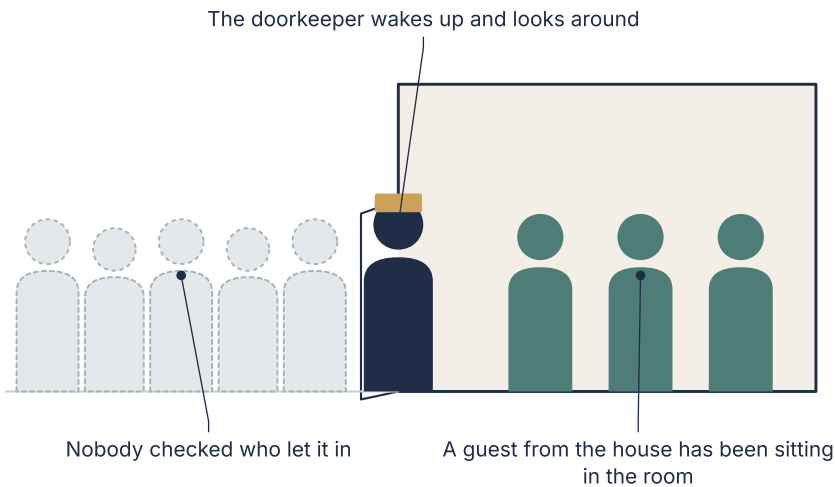
Both answers can change with practice

Noticing sooner is what practice trains.

> **Key Concept:**
>
> Meta-awareness. Meta-awareness is **noticing what your own mind is up to** at any given moment. While you think, you know that you are thinking.

Meta-awareness is the moment **the doorkeeper wakes up** and looks around. Until then, a guest from the house has been sitting in the room, and nobody checked who let it in.

The doorkeeper wakes up



Meta-awareness is that moment of looking around.

> 🗝 **Key Concept:**
>
> Perceptual decoupling. In perceptual decoupling, **attention comes loose from what is in front of you** while the mind wanders. The eyes keep moving across the page, but nothing goes in (Reichle et al., 2010; Schooler et al., 2011).

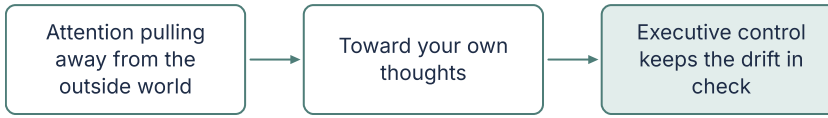
Decoupling is like **a TV left on in an empty room**. The picture keeps playing, but nobody is watching. The wandering often goes on for a while before meta-awareness catches it (Reichle et al., 2010; Schooler et al., 2011).



In perceptual decoupling, the eyes keep reading but nothing goes in. It lasts until meta-awareness catches it.

The drift has a known shape. One review describes it as attention **pulling away from the outside world** toward your own thoughts. Executive control, the brain's system for steering attention toward goals, keeps that drift in check (Smallwood & Schooler, 2015).

The shape of the drift



The known shape, from one review (Smallwood & Schooler, 2015).

Wandering has a cost and a payoff. One review found **costs to reading**, to staying with a dull task and to scores on aptitude tests, tests of how well people learn and reason. It found possible benefits for planning your own life and for creative problem solving (Mooneyham & Schooler, 2013).

Costs and payoffs of wandering

Costs	Possible benefits
⊕ Reading	⊖ Planning your own life
⊕ Staying with a dull task	⊖ Creative problem solving
⊕ Scores on aptitude tests	

Both come from one review (Mooneyham & Schooler, 2013).

Another team places mind-wandering in **a family of free-flowing thought**, along with creative thinking and dreaming (Christoff et al., 2016). That is a theory, with no new data behind it.

The Four-Phase Cycle

The catch itself can be studied. One brain-scan study asked experienced meditators to focus on their breath. They **pressed a button** whenever they noticed their mind had wandered (Hasenkamp et al., 2012).

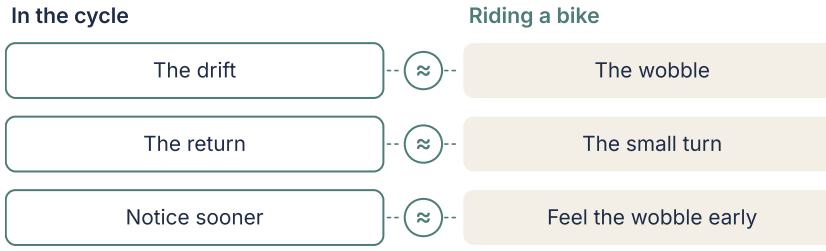
> **Science Says:**
>
> The researchers mapped **a repeating cycle of four phases**. First, the mind wanders. Then the person becomes aware that it has wandered. Next, attention shifts back, and then it stays focused for a while before it drifts again (Hasenkamp et al., 2012).



Focus runs in a loop. The skill is noticing and returning sooner.

The loop works like **riding a bike in a straight line**. Nobody rides without wobbling. Good riders feel the wobble early and correct it with a small turn, while beginners notice late and swerve. In the cycle, the wobble is the drift, and the small turn is the return.

The cycle, like riding a bike



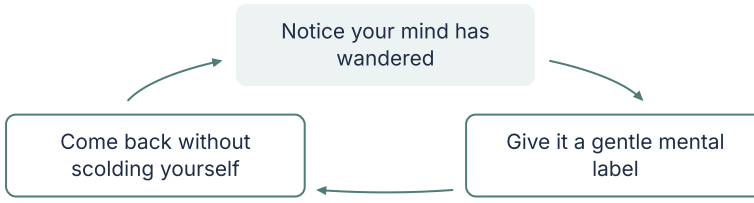
Wobbling is normal; good riders correct it early.

The sample was small and made up of experienced meditators. Still, the cycle gives anyone who practises **a useful map** of what happens. Practice aims at two changes, and they make a simple formula.

Better practice = **sooner notice + smoother return**.

None of the habits below has been tested on its own. They come straight from the four phases of the cycle (Hasenkamp et al., 2012), and the sooner the doorkeeper notices, the sooner **the chosen guest comes back**.

Catch and return



Each catch counts as a success.

> **Exercise:**
>
> Catch and return.

1. When you notice your mind has wandered, give it a gentle mental label, such as “wandering”.
2. Come back **without scolding yourself**. Noticing the drift counts as the success.
3. Now and then, ask yourself where your attention is right now.
4. Allow intentional mind-wandering, such as planning on a walk. Chosen wandering differs from the kind that sneaks in (Seli et al., 2016).

Does Training Reduce Mind-Wandering, and Where Does the Skill Apply?

Some evidence suggests that **practice can make the cycle run better**, with limits (Mrazek et al., 2012). People who score higher on mindfulness tend to mind-wander less. In the same work, a short session of mindful breathing cut mind-wandering in a task that came after it.

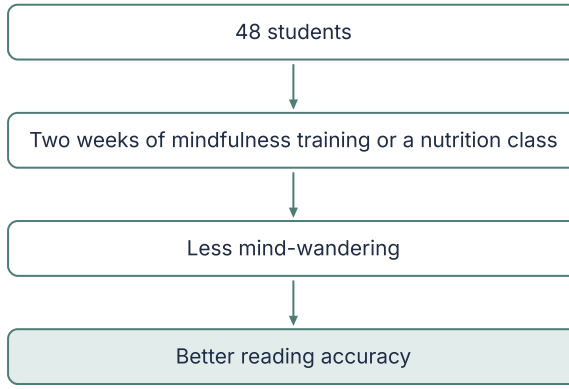
A short session of mindful breathing



Some evidence, from one short session (Mrazek et al., 2012).

> **Science Says:**
>
> A small randomised trial put 48 students **into two groups** (Mrazek, Franklin, et al., 2013). One had two weeks of mindfulness training, and the other took a nutrition class. Compared with the nutrition class, mindfulness training reduced mind-wandering. It improved reading accuracy on a shortened version of the GRE reading test, an entrance test for graduate school.

Mindfulness or a nutrition class



A small trial, repeated only a little (Mrazek, Franklin, et al., 2013).

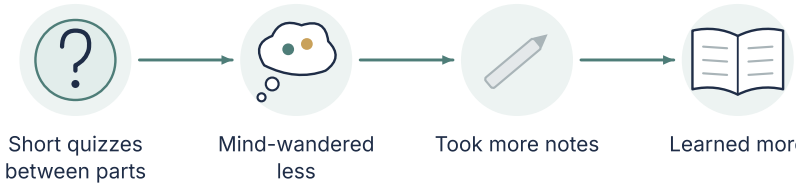
The result is hopeful, but it has been **repeated only a little**. One small trial cannot tell you how much a reader like you would gain.

Experienced meditators show lower activity in **the default mode network** while they practise (Brewer et al., 2011; see 1.3.3). The default mode network is a set of brain areas that get busy when the mind drifts. This finding comes from a small comparison of two groups at one point in time, so it cannot show that the training caused the difference.

Short quizzes are another way to **pull a wandering mind back**. In two experiments, people watched online lectures with short quizzes slipped

in between parts. They mind-wandered less, took more notes, learned more and felt less worried about the final test (Szpunar et al., 2013).

Quizzes in online lectures

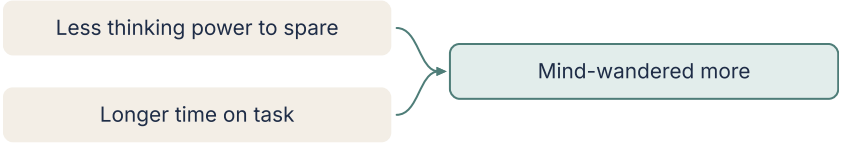


Two experiments (Szpunar et al., 2013).

> **Key Concept:**
> Time on task. Time on task is **how long you have been working** on the same task without a break.

Across 88 results, people with **less thinking power to spare** mind-wandered more. Longer time on task made that link stronger (Randall et al., 2014). These were links between measures, so they show what goes together without showing cause.

Less to spare, more wandering



Links between measures across 88 results (Randall et al., 2014).

Put those two findings next to each other, and they suggest **one plan for long study sessions**. Break a long lecture or chapter into parts, and test yourself between them.

The same notice-and-return skill works **whenever attention counts**. You might be rereading a textbook page you drifted through (see 5.1.1). You might catch yourself checking messages in a meeting (see 5.2.1), or realise you stopped listening to a friend (see 5.3.1).

One skill, three places



Rereading a textbook page



Checking messages in a meeting



Stopped listening to a friend

The return is the same move each time.

One study used a phone app to ask people at random moments what they were thinking about. They were **thinking about something other than what they were doing** in about 47% of those moments (Killingsworth & Gilbert, 2010; see 1.3.3).

How often minds wander



A phone app asked at random moments

Thinking about something other than what they were doing

In about 47% of those moments

People chose the app, so the estimate is rough.

The people chose to use the app, so the figure is **a rough estimate**. Either way, you will get plenty of chances to practise the return.

Table 3.4: The four-phase cycle

Phase	What Happens	What to Say to Yourself	Common Trap
Mind-wandering	Attention drifts to thoughts that have nothing to do with the task	Nothing yet, because drifting is normal	Believing drifting means you are "bad at it"
Awareness of wandering	You notice you have drifted	"Where is my attention now?"	Getting caught up in judging the drift
Shifting attention	You bring attention back to the task or anchor	A soft label ("wandering"), then return	Coming back harshly, with self-criticism
Sustained focus	Attention stays on the task for a while	Rest on the anchor with no need to force it	Straining or forcing attention to stay put

Key idea:

Your mind will wander, and that is normal, so the skill is noticing sooner that it has wandered and coming back without a fuss, a loop you can practise until the return gets quicker and easier.

Quick check:

1. What is meta-awareness? Answer: Noticing what your own mind is up to at any given moment.
2. What are the four phases of the cycle? Answer: The mind wanders, you become aware of it, you shift attention back, and you stay focused for a while (Hasenkamp et al., 2012).
3. What helped students wander less during online lectures? Answer: Short quizzes slipped in between parts of the lecture (Szpunar et al., 2013).

3.3.1 External and Internal Distractions

A colleague at the next desk takes **a loud phone call**. That distraction comes from outside. An unpaid bill keeps popping into your mind, even in a silent room. That one comes from inside.

Both pull you off task, but they **call for different fixes**. Earplugs do nothing for the bill, and a to-do list does nothing for the phone call. These are the doorkeeper's two kinds of guests, from the street and from the house.

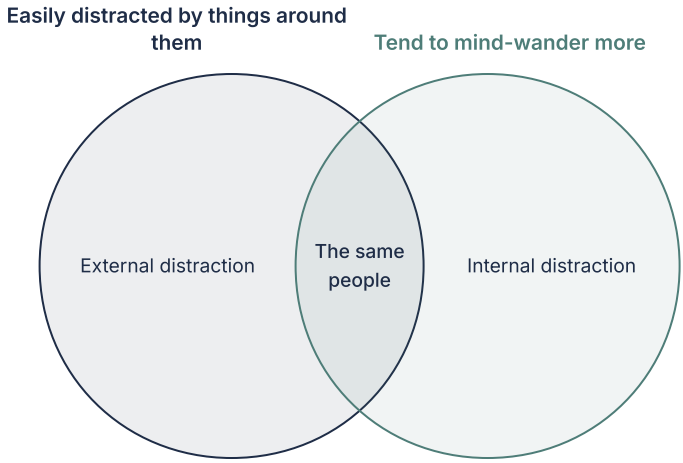


Some distractions come from the room and some from your head. Each kind needs its own fix.

Researchers make **the same split**. In external distraction, something around you grabs attention. Internal distraction is mainly mind-wandering, which you met in 1.3.3. The two are related, yet they can be told apart as sources of attention lapses (Unsworth & McMillan, 2014).

The two kinds **go together in people** (Forster & Lavie, 2014). Those more easily distracted by things around them tend to mind-wander more. The study measured a link between the two, and it did not test whether working on one helps the other.

The two kinds go together



A link in people, with no test of whether fixing one helps the other.

External Distractions: Sound, Sights and Devices

Background speech is **especially hard to tune out**. Even speech you aren't trying to hear harms short-term memory, the memory that holds a phone number while you dial it (Banbury et al., 2001).

> 🗝 **Key Concept:**
>
> The irrelevant-sound effect. The irrelevant-sound effect is **the harm to short-term memory** from sound you are not trying to listen to, such as nearby speech (Banbury et al., 2001).

Speech gets in because **your brain treats words as words**, whether you asked for them or not. A colleague's call drops words into the same mental space you use to hold the words of your report. Two streams of words then compete for one small notepad.

Two streams of words, one notepad

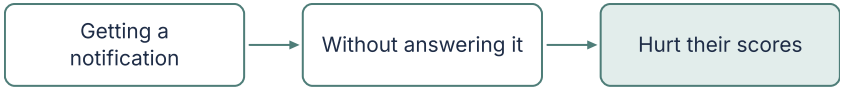


Speech gets in because words are treated as words.

> **Science Says:**
> In one test, people did an attention task while their phone was nearby. Simply **getting a notification**, without answering it, hurt their scores. The harm was about as large as when people actually used the phone (Stothart et al., 2015).

Even a buzz in your pocket that you never check can **pull you off task**. The doorkeeper turns to look at the knock, even if it never opens the door.

A buzz you never check



A buzz you never check still costs attention (Stothart et al., 2015).

Alerts have been tested in daily life, outside the lab. In one study, 221 adults spent one week with **alerts on and the phone nearby**, and another week with alerts off and the phone away. With alerts on, they

said they had more trouble paying attention, and that went with getting less done (Kushlev et al., 2016).

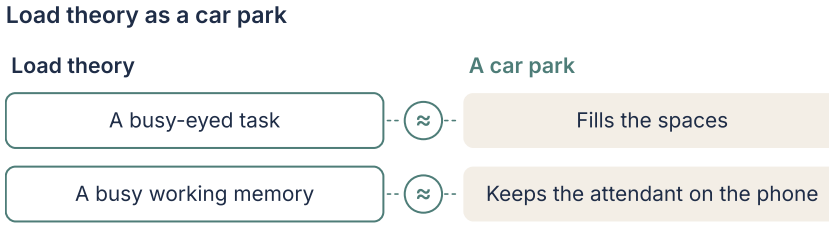


221 adults, one week of each (Kushlev et al., 2016).

> **Key Concept:**
> Load theory. Load theory is **an idea about when distractions get in**. It splits the load on your mind into two kinds, the load on your senses and the load on your working memory (Lavie, 2005).

Load theory, which you met in 1.2.3, explains a puzzle. A task that keeps your eyes very busy **leaves little spare room** for distractions. A busy working memory works the other way and leaves you more open to them (Lavie, 2005). Working memory is the mind's notepad, where you hold what you are using right now.

Think of a car park with an attendant. If every space is full, a stray car has **nowhere to park**. If there is room but the attendant is busy on the phone, stray cars slip in. A busy-eyed task fills the spaces, and a busy working memory keeps the attendant on the phone.



Full spaces keep stray cars out; a busy attendant does not (Lavie, 2005).

A later review sums up the same pattern. **Focus improves** when a task loads the senses and gets worse when a task loads your control of thought, such as working memory. The review traces this into daily life and into health problems (Lavie, 2010).

When attention is locked tightly on one thing, **other things can go unseen** altogether.

> **Science Says:**
>
> In one study, people watched a short video of basketball players and counted the passes made by one team. Partway through, **a person in a gorilla suit** walked through the scene, and many of the counters never saw it (Simons & Chabris, 1999).

The phone that just sits on your desk is **a harder case**. One study linked the mere presence of your own smartphone to lower scores (Ward et al., 2017). The scores were for working memory and reasoning, and the effect was called “brain drain”. That claim is in doubt.

The brain-drain claim



The unused-phone question is still open.

> **Science Says:**
>
> A direct repeat of the brain-drain study found that **phone location made no difference** (Ruiz Pardo & Minda, 2022). A meta-analysis did find an overall harm to thinking from phone presence or use (Böttger et al., 2023). Even so, the studies were few, and the results varied a great deal.

We don't know whether **a silent, unused phone** affects attention. Putting it in another room is still a cheap precaution. It costs nothing, and it removes the buzz that does have evidence behind it.



The phone on the desk is an open question. Putting it away is a cheap precaution, though nobody has proven it works.

Internal Distractions: Thoughts, Worries and Emotions

Inside distractions **cost you memory**. In a study of 80 young adults, attention lapses just before people tried to remember something went with forgetting it (Madore et al., 2020). It found a link, so it cannot show cause.

Worries are **a special kind** of internal distraction. Anxious people's attention is reliably drawn toward possible threats (Bar-Haim et al., 2007).

Attentional control theory is an idea about **how anxiety changes attention** (Eysenck et al., 2007). It says anxiety weakens attention steered by your goals. It strengthens the pull of whatever seems alarming.

That is why the doorkeeper **keeps letting the unpaid bill back in**. The bill carries a sense of threat that the report on your screen doesn't.

Anxiety and the doorkeeper



Worry takes over the doorkeeper (Eysenck et al., 2007).

The fix starts with **finding out which kind** is pulling at you. A short record for one working session is enough to start.

> **Exercise:**
>
> The distraction audit.
>
> 1. For one working session, jot down every time your attention is pulled away.
> 2. Mark each one as external (sound, sight, device) or internal (thought, worry, feeling).
> 3. Pick **one fix for your most common external distraction**. Pick another for your most common internal one.
> 4. Try them for a week, and then repeat the audit.

Table 3.5 sets the main kinds side by side, with **a first fix for each**. The last column names the studies behind each one.

Table 3.5: Types of distraction

Distraction Type	Examples	How It Gets in the Way	What to Try First	Source
Background speech	Nearby phone calls, conversations	Speech you are not listening to harms short-term memory	Move, close the door or use ear protection	Banbury et al. (2001)
Device notifications	Buzzes, pings, pop-ups	Even unanswered notifications hurt scores on attention tasks	Silence notifications during focus blocks	Stothart et al. (2015)
Phone presence	A silent phone on the desk	Unsettled, because the studies disagree	Put it away as a cheap precaution	Ward et al. (2017); Ruiz Pardo & Minda (2022); Böttger et al. (2023)
Mind-wandering	Daydreams, planning, replaying conversations	Attention comes loose from the task	Notice and return (3.2.2)	Unsworth & McMillan (2014)
Worry and threat	Unpaid bills, health fears	Anxiety pulls attention toward threats	Write the worry down (3.3.3), and get help if anxiety is severe	Bar-Haim et al. (2007); Eysenck et al. (2007)

Key idea:

Distractions come from outside and from inside, and people prone to one tend to be prone to the other, so find out which kind is pulling at you and fix that kind first.

Quick check:

1. What is the irrelevant-sound effect? Answer: The harm to short-term memory from sound you are not trying to listen to, such as nearby speech (Banbury et al., 2001).
2. According to load theory, which kind of busy task leaves you more open to distraction? Answer: A task that keeps your working memory busy (Lavie, 2005).
3. Is a silent phone on the desk proven to hurt attention? Answer: No. A direct repeat of the study found no effect (Ruiz Pardo & Minda, 2022).

3.3.2 Designing a Focus-Friendly Environment

KEEP **a biscuit tin on the counter**, and you fight the urge to snack every time you walk past. Put it in a high cupboard, and most of the fight disappears.

The same idea works for attention. **Set up the space so the easy choice is the focused one**, and you have fewer distractions to fight.

The biscuit tin



Clear the View, Control the Noise

Every object in view **competes for a place** in your visual system. Brain scans show that clutter competes to be represented in the brain (McMains & Kastner, 2011). Top-down attention, the kind you steer on purpose, has to work to push it back. Each object is one more guest asking the doorkeeper for attention.

A cluttered desk



Clutter competes in the brain (McMains & Kastner, 2011).

> **Science Says:**
> In one study, kindergarten children in a classroom full of decorations were **more off-task** and learned less than in a sparse classroom (Fisher et al., 2014). It was a small study of young children, so take care applying it to adults.

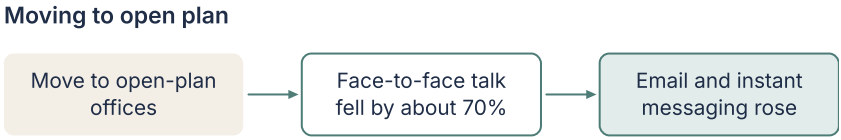
The classroom study **fits the brain research**, even though it tested children. A clear desk leaves less competing for your eyes, and the doorkeeper has fewer guests to turn away.

Noise, especially speech, is **the big trigger** in shared spaces. In a lab test, open-plan office noise harmed memory more than quiet did, and it raised fatigue (Jahncke et al., 2011). That was a small sample.

In another study, people whose jobs demanded high concentration **did better in private offices** (Seddigh et al., 2014). Their health and

performance scores were higher than those of people in open-plan offices.

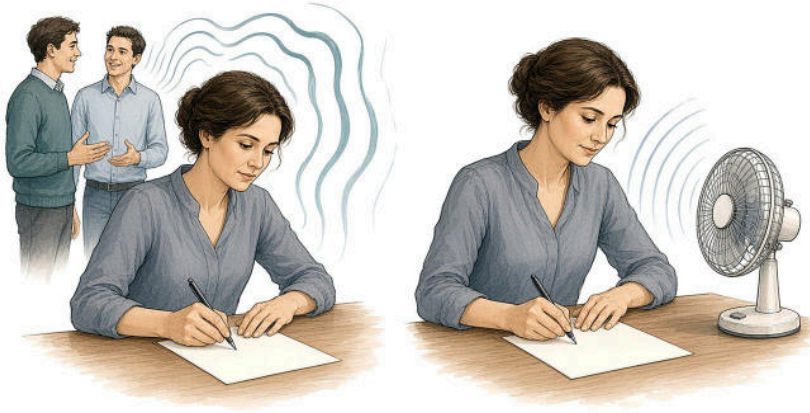
> **Science Says:**
>
> Researchers ran two field studies at the headquarters of two large companies as they moved to open-plan offices (Bernstein & Turban, 2018). In both, face-to-face talk fell by about 70%. Email and instant messaging rose, so open plans did not deliver **the conversation they promised**.



Two field studies, two headquarters (Bernstein & Turban, 2018).

Speech nearby is the classic example of the irrelevant-sound effect (Banbury et al., 2001). The effect was first described as **unattended speech** disrupting short-term memory (Salamé & Baddeley, 1982). Sound that keeps changing, like speech, disrupts it far more than unchanging sound (Jones et al., 1992; Jones & Macken, 1993; Banbury et al., 2001).

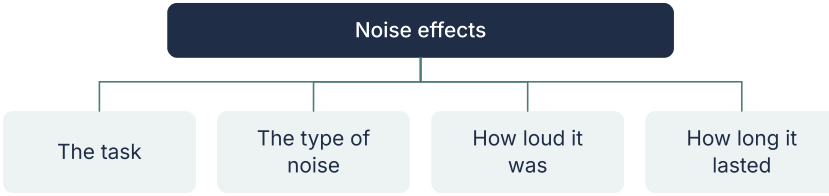
That is why **a talk-radio chat** is likely harder to work through than a constant hum. Each new word and change of pitch gives the doorkeeper something fresh to check. A hum offers nothing new after the first few seconds.



A voice that rises, falls and changes words breaks into short-term memory. A hum that never changes does much less harm.

Noise effects **depend on the details**. A meta-analysis of 242 studies found that the harm varied with the task, the type of noise, how loud it was and how long it lasted (Szalma & Hancock, 2011).

What the harm from noise depends on



The harm from noise varied (Szalma & Hancock, 2011).

Music, Noise and Sound: A Personal Choice

> **Science Says:**
> On average, background music **neither helps nor hurts much**. A meta-analysis found a near-zero overall effect on adults (Kämpfe et al., 2011). It did find slight harm to reading and memory.

If you are reading something demanding, **silence may serve you better**.

In one small lab study, office noise harmed people's memory for lists of words. **A constant noise** played over it reduced that harm, while music did not (Schlittmeier & Hellbrück, 2009). Most people still preferred the music.

That result shows **liking a sound and working well with it** are two separate things. Your own taste is a poor guide to what helps your memory.

Liking a sound and working well with it

	Memory for word lists	Preferred
A constant noise	Reduced the harm	
Music	Did not reduce it	Most people

Liking a sound did not help memory (Schlittmeier & Hellbrück, 2009).

A separate study found that moderate background noise, at about 70 decibels, **boosted creative thinking** (Mehta et al., 2012). It did better than low or high noise. That finding is about creative work, so it gives no reason to seek out noise for concentration.

Sound for the task



Demanding reading: silence



Background music: near-zero overall effect



Creative thinking: moderate noise, about 70 decibels

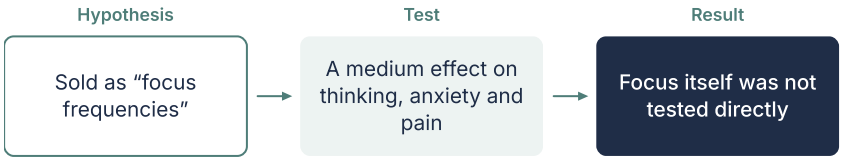
Creative work and concentration differ in what sound helps.

> **Key Concept:**
>
> Binaural beats. Binaural beats are **two tones, one slightly different in each ear**. The listener hears a "beat" at the difference between them. They are often sold as "focus frequencies".

One meta-analysis reported **a medium effect** on thinking, anxiety and pain (Garcia-Argibay et al., 2019). A later systematic review found inconsistent evidence that the beats change brain rhythms as claimed (Ingendoh et al., 2023). Study methods varied a lot.

There is moderate evidence that the beats affect some outcomes. **Focus itself was not tested directly**, so treat "focus frequency" claims as unproven.

Binaural beats



Treat the focus claim as unproven.

> **Science Says:**
>
> The idea that **Mozart makes you smarter** or more focused traces to a short 1993 letter. It reported a brief gain on a spatial task after people listened to Mozart (Rauscher et al., 1993). A later meta-analysis found little evidence for any special Mozart effect (Pietschnig et al., 2010).

The Mozart effect



From a short letter to a meta-analysis.

Choose sound by **what helps you work**. For demanding reading, quiet is a safe default.

> **Exercise:**
>
> Set up a space for focus.
>
> 1. Audit your space. Sit at your desk and list everything that catches your eye or ear.
> 2. Reduce visible clutter. Clear the surface and keep **only what the current task needs**.
> 3. Control speech noise. Find a quiet room or close the door. Use ear protection at a shared desk.
> 4. Remove device triggers. Silence notifications and move the phone out of sight (see 7.2.1).

5. Test one change for a week, and then review whether it helped (see 9.3.2).

These five moves **look different in different places**.

- At a home study desk, keep a clear surface and the phone in another room. Close the door, and use silence or quiet music without words for reading.
- In a shared office, book a quiet room or private office for high-concentration work. Use ear protection at a shared desk, and turn notifications off during focus blocks.
- In a classroom, set up a sparse corner with few decorations, facing away from busy displays. Use it for tasks that need long stretches of attention.

Table 3.6 grades each finding. **Strong** means a meta-analysis points the same way. **Moderate** means a review of controlled tests, or a meta-analysis that did not test focus. **Weak** means one small study, a survey, or a study of something other than focus.

Table 3.6: Environmental factors

Factor	What the Studies Found	What to Do	Strength of Evidence
Visual clutter	Clutter competes for space in the brain, and a decorated classroom made children more off-task (McMains & Kastner, 2011; Fisher et al., 2014)	Keep the work area clear	Weak, from one small study of young children plus brain-scan work
Background speech	Changing sound such as speech harms short-term memory (Jones et al., 1992; Jones & Macken, 1993; Banbury et al., 2001)	Use quiet rooms, closed doors or ear protection	Moderate, from a review of controlled tests

Factor	What the Studies Found	What to Do	Strength of Evidence
Open-plan offices	Noise harmed memory and raised fatigue, and private offices were better for high-concentration work (Jahncke et al., 2011; Seddigh et al., 2014)	Find quiet spaces for focused work	Weak, from a small lab study plus a survey
Background music	Near-zero effect overall, with slight harm to reading and memory (Kämpfe et al., 2011)	Your choice, but prefer quiet for hard reading	Strong, from a meta-analysis showing a near-zero effect
Moderate background noise	Helped creative thinking only (Mehta et al., 2012)	Don't use it to help you focus	Weak for focus, because the tests measured creativity and never focus (Mehta et al., 2012)
Binaural beats	A medium effect on some outcomes, with mixed evidence on how they work (Garcia-Argibay et al., 2019; Ingendoh et al., 2023)	Don't rely on them for focus	Moderate, from a meta-analysis that never tested focus directly (Garcia-Argibay et al., 2019)

Key idea:

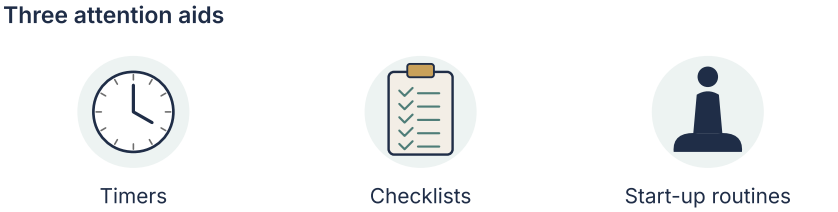
It is easier to arrange a space with fewer distractions than to resist them all day, so clear what you can see, cut speech noise, put devices out of reach and let music be your own choice.

3.3.3 Attention Aids: Timers, Checklists and Rituals

WHY DO PILOTS AND surgeons, among the most highly trained people alive, **still use checklists**? Memory and attention are limited, even in experts.

A checklist **takes over the job of remembering**, and that frees attention for the task itself. A shopping list does the same, so you can hunt for the cheapest tomatoes instead of juggling items in your head.

With the list doing the remembering, the doorkeeper can **keep its eyes on the task**. Timers, checklists and start-up routines each take a different job off your mind.



Three aids, three jobs your memory can drop.

Timers and Interval Work (the Pomodoro Technique)

> **Key Concept:**
>
> The Pomodoro Technique. The Pomodoro Technique is a way of working in **25-minute blocks with short breaks** in between (Cirillo, 2018).

A timer **marks off one block of work**. Results are mixed on whether a fixed timer beats taking breaks when you feel like it.

> **Science Says:**
>
> One study compared fixed and self-chosen breaks for students (Biwer et al., 2023). Some had a Pomodoro-style 24/6 schedule, some a shorter 12/3 one, and a third group chose its own breaks. Students with fixed breaks **reported less fatigue and distraction**, and more concentration and motivation. They did not get more done or put in more effort.

The Pomodoro-style group did no better than the shorter-break group. **The feeling improved**, while the output stayed the same.

Fixed and self-chosen breaks

	How it felt	Work done
Fixed breaks	Less fatigue and distraction	Not more
Pomodoro-style group	No better than the shorter-break group	The same

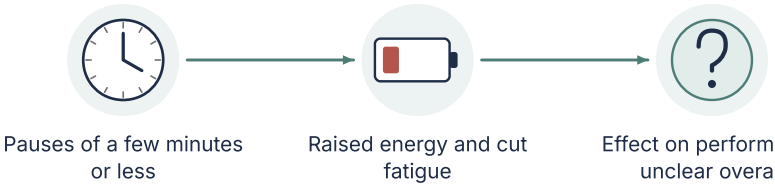
The feeling changed; the output did not (Biwer et al., 2023).

In a second controlled study, 94 students had a two-hour study session (Smits et al., 2025). Each used Pomodoro (25 minutes on, 5 off), self-chosen breaks or a third break method. **Productivity and task completion did not differ.** Neither did flow, the sense of being fully absorbed, or overall motivation. Fatigue rose faster with Pomodoro.

Both were single, online study sessions with students. Fixed breaks may make a session feel better. Neither study shows that **Pomodoro gets more work done** than self-paced breaks.

A meta-analysis of 22 samples, with 2,335 people in all, found that micro-breaks **raised energy and cut fatigue** (Albulescu et al., 2022). Micro-breaks are pauses of up to 10 minutes. Their effect on performance was unclear overall. It was clear only for less demanding tasks, and longer breaks helped performance more.

Micro-breaks



22 samples, 2,335 people (Albulescu et al., 2022).

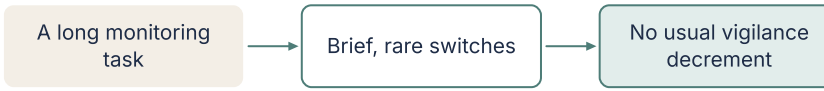


Fixed breaks made study feel better in both Pomodoro studies, yet the amount of work stayed the same.

> **Key Concept:**
>
> Vigilance decrement. Vigilance decrement is **the drop in attention** that comes with watching for rare signals over a long time.

A small lab study built **brief, rare switches** into a long monitoring task (Ariga & Lleras, 2011). These switches prevented the usual vigilance decrement. Short, planned pauses may help keep attention fresh during long tasks.

Short, planned pauses



A small lab result about short breaks (Ariga & Lleras, 2011).

> **Exercise:**
>
> The Focus Timer.
>
> 1. Set a timer for a block of **single-task work**, and then take a short break.
> 2. Try different lengths, because the evidence does not favour 25 minutes over self-chosen breaks.

The drills below **vary the timer**, so you can find a rhythm that suits your work.

Exercise Table 2: Timer drills

Drill	What to Do
10-minute sprint	Work on one task only for 10 minutes
Compare schedules	Try 25/5 blocks one day and self-chosen breaks the next, and note how each felt
Quiet breaks	Stand, stretch or look away from screens instead of checking messages
Micro-pause	In a long task, pause for 30 seconds every 15 to 20 minutes
Stop note	When the timer ends, write where you stopped and the next step

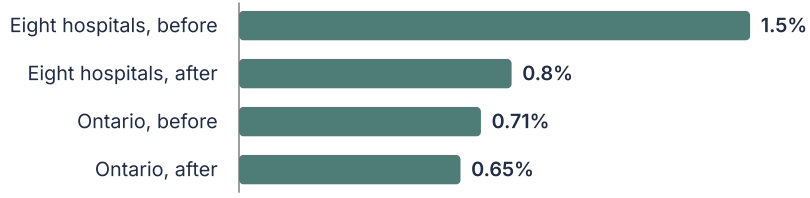
Checklists and Capture Plans

Checklists are designed to **support attention and reduce omissions**, the steps people forget when busy or tired. Human-factors research, the study of how people work with tools and machines, shows how cockpit checklists support pilots' attention (Degani & Wiener, 1993).

> **Science Says:**
>
> In eight hospitals, surgical teams began using the World Health Organization's Surgical Safety Checklist (Haynes et al., 2009). **Deaths then fell from 1.5% to 0.8%.** That study compared before and after and was not randomised, so other changes may have played a part.

When **101 hospitals in Ontario** had to adopt the checklist, deaths across about 215,000 operations went from 0.71% to 0.65%, a fall so small it may have been chance (Urbach et al., 2014).

Deaths before and after the checklist



In Ontario the fall may have been chance (Urbach et al., 2014).

Atul Gawande tells the wider story in The Checklist Manifesto (Gawande, 2009). This evidence comes from surgery and aviation, and **nobody has tested personal to-do checklists** in the same way. Using them for everyday focus is a reasonable extension, though not a research finding.

Unfinished work calls for **a close cousin of the checklist**. In small lab studies, people made a specific plan for an unfinished goal (Masicampo & Baumeister, 2011). The plan ended unwanted thoughts about that goal and its pull on other tasks.

Jotting down a plan **"parks" the task** so it stops nagging. A parked task stops knocking for the doorkeeper. Before you leave a task, a short note on where you are and what comes next helps you switch cleanly (Leroy & Glomb, 2018).



A written plan for a half-done job lets you put it down and turn back to the work in front of you.

> **Science Says:**
>
> You may have read that people remember interrupted tasks better than finished ones, which is called the Zeigarnik effect. **A meta-analysis found no reliable memory advantage** for unfinished tasks (Ghibellini & Meier, 2025). What held up was the tendency to go back and finish them (Ghibellini & Meier, 2025).

> **Key Concept:**
>
> The Ovsiankina effect. The Ovsiankina effect is **the pull to finish** an interrupted task (Ghibellini & Meier, 2025).

Unfinished tasks: what held up

	What the meta-analysis found
Better memory for unfinished tasks	No reliable memory advantage
The pull to go back and finish	Held up

Zeigarnik out, Ovsiankina in (Ghibellini & Meier, 2025).

An unfinished task pulls you back toward it, so **park it with a clear plan**, and don't count on remembering it.

> **Exercise:**
>
> The Focus Checklist.
>
> 1. List your steps for **before, during and after** focused work.
> 2. Tick them off, and cut any you never use.

A checklist stays useful only while it is **short and in sight**. Pick one or two of these drills to start.

Exercise Table 3: Checklist and capture drills

Drill	What to Do
Setup list	List 3 to 5 steps to prepare, such as clearing the desk and silencing the phone, and keep it where you start work
Shutdown list	End the day by writing down open tasks and tomorrow's first task

Drill	What to Do
Capture and plan	When a stray to-do or worry pops up, write it down with one next step, then return to the task
One top task	Each morning, write your most important task at the top of your list
Interruption log	Note each interruption in a session and where it came from

Rituals and Pre-Task Routines

Many people start work with **the same small sequence**. They might clear the desk and make a drink before opening the document. Such routines are useful habits with no proven effect on performance.

The same start sequence works like **a habit cue**, because habits are triggered by context (Wood & Neal, 2007). The sequence can include an if-then plan (Gollwitzer, 1999).

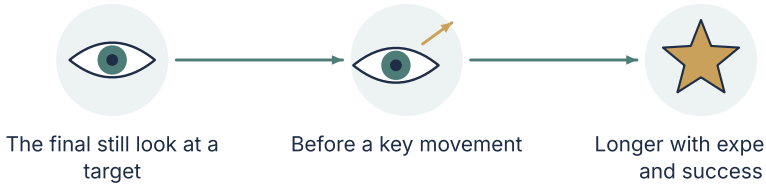


A routine you repeat each day can tell your mind that work is starting, though it has no proven effect on how well you do.

Athletes offer a related example. The quiet eye is **the final still look at a target** before a key movement (Vickers, 2016). Longer quiet-eye

periods go with expertise and success, and quiet-eye training has improved performance (Lebeau et al., 2016; see 4.2.2).

The quiet eye



The same idea shows up in athletes (Vickers, 2016).

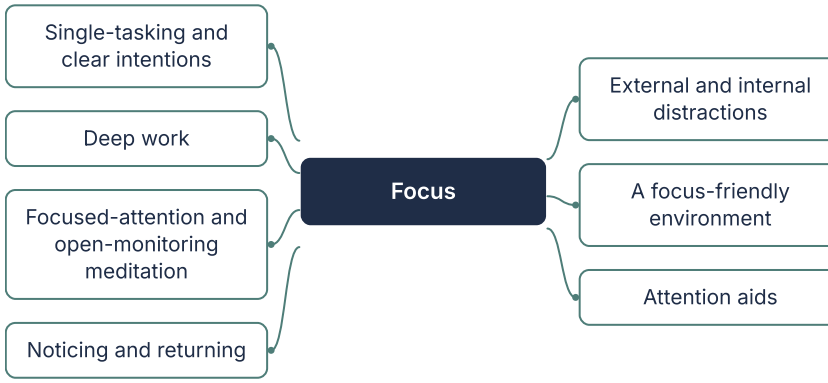
One broad review proposes that rituals help people **manage emotions, goals and social connection** (Hobson et al., 2018). The review builds theory, and much of the experimental work behind it is small.

> Exercise:
>
> The Start-Up Routine.
>
> 1. Use **the same short sequence** to begin focused work, and keep it under five minutes.
> 2. Clear the desk, close tabs you don't need and put your phone in a drawer.
> 3. Write an if-then start, such as "When I sit down at my desk after lunch, I will open the report first."
> 4. Take three slow breaths, then name the one result you want from the session.
> 5. Begin with the smallest next step from yesterday's note, and after two weeks drop any step that does not help.

Whichever aid you pick, **keep it simple**, with one aid per problem. Put it where you will see it, such as the timer on the desk or the checklist by

the screen. Fit it to your own work, and after a week or two, adjust it or drop it.

Focus and distraction in one picture



In Table 3.7, **weak** means the studies are few, small or not randomised. **Not rated** means nobody has tested the aid itself.

Table 3.7: Attention aids

Aid	Purpose	How to Use	Evidence and Limits
Timer (Pomodoro or similar)	Fence off a block of single-task work	Set a block length, then take a short break	Weak, from two small randomised studies of students in single online sessions, and neither showed more work done (Biwer et al., 2023; Smits et al., 2025)
Planned micro-pauses	Keep attention fresh during long tasks	Take brief, rare pauses from monitoring work	Weak, from one small lab study (Ariga & Lleras, 2011)
Checklist	Reduce omissions and free attention	List key steps and tick them off	Weak, from a large before-and-after study that was not randomised, plus a study of cockpit checklist design (Haynes et al., 2009; Degani & Wiener, 1993), and untested for personal work

Aid	Purpose	How to Use	Evidence and Limits
Capture and plan	Stop unfinished tasks from breaking in	Write when, where and how you'll do the task	Weak, from several controlled lab studies with small samples (Masicampo & Baumeister, 2011)
Start-up routine	Cue the shift into focused work	Use the same short sequence each time	Not rated, because the routine itself is untested and rests on habit research (Wood & Neal, 2007) and theory (Hobson et al., 2018)

Key idea:

Attention aids work by taking jobs off your mind, so pick one simple aid per problem, keep it in sight and check whether it helps, knowing that checklists have encouraging but non-randomised support while Pomodoro and rituals have not been shown to get more done.



Module

4

Practical Attention Exercises

4.1 Daily Attention Practice

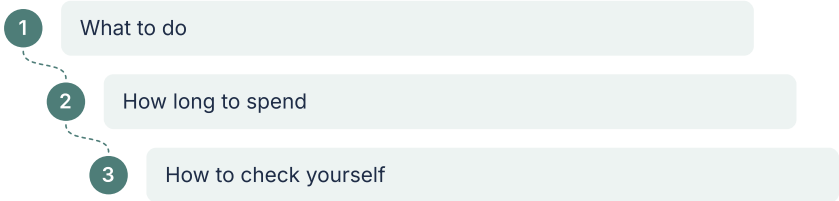
4.1.1 Short Exercises for Every Day

TEN MINUTES A DAY sounds tiny. A basketball player at the free-throw line shows what tiny can do. She takes the same shot over and over, and **each shot rehearses one move on purpose**. Nobody claims that free-throw practice alone will transform her whole game.

The exercises here work the same way. Each one **rehearses one attention move**, such as holding focus on one thing or noticing when you have drifted. They are worth doing. Still, no large trial shows broad attention gains from short daily exercises in the general population, and nothing here promises that.

Each exercise says what to do, **how long to spend and how to check yourself**, plus any safety points. The lengths are suggestions, and none has been tested as a dose.

How each exercise is set out

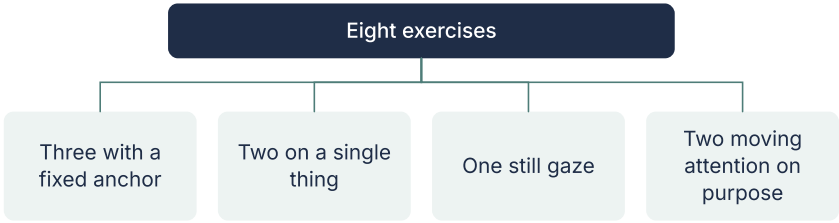


Plus any safety points, with each length only a suggestion.

Anchoring on the Breath or a Guide

The first three exercises give attention **a fixed anchor**, either the breath or a recorded guide. The simplest anchor is your own breathing. The first exercise turns it into a count you can lose and restart.

The eight exercises, grouped



The order this section follows.

> **Exercise:**
>
> Breath counting.
>
> 1. Sit comfortably.
> 2. Silently count each out-breath from 1 to 9, and then start again at 1.
> 3. If you lose count or go past 9, simply **start again at 1**.
> 4. Begin with a few minutes, and build up as it feels manageable.
>
> If focusing on the breath makes you anxious, count sounds or steps instead.

Losing count is **built-in feedback**, a small mirror held up to your wandering mind. Researchers have shown that breath counting can measure mindfulness from what people do, instead of what they say about themselves (Levinson et al., 2014).

An independent team **repeated and extended that work** on how well it measures (Wong et al., 2018). You can note how often you lose count as a rough self-check (see 9.3.2).



Count to nine and begin again. Each lost count is a sign of where the mind went.

The second exercise keeps the breath as the anchor but **changes the job**. Instead of counting, you slow the breath down and feel it move under your hand. The diaphragm does the work here. It is the dome-shaped muscle beneath the lungs (Ma et al., 2017).

> **Exercise:**
>
> Slow diaphragmatic breathing.
>
> 1. Place one hand on your belly.
> 2. Breathe in slowly so **the hand rises**.
> 3. Breathe out slowly so it falls.

4. Keep going for a few minutes a day, and notice whether your attention settles on your hand.

Stop if you feel dizzy, and return to normal breathing.

Only **a single small study** backs this exercise.

> **Science Says:**
>
> Forty adults were put into two groups of 20 by alternating the order in which they signed up (Ma et al., 2017). One group had eight weeks of coached diaphragmatic-breathing training, and the other had none. The trained group **improved on a sustained-attention test**, and its cortisol, a stress hormone measured in spit, fell.

The untrained group showed no such change. Still, the study had **no active control group**. A control group is the comparison group in a study. An active one does some other task, so both groups get the same time and attention. Treat the result as promising.

What the breathing study did not test

	Trained group	Untrained group
Eight sessions of breathing	Yes	No
Change afterwards	Yes	No such change

With no active control group, the cause stays open.



A hand on the belly shows the breath. It lifts with each slow in-breath and sinks as you let the air go.

The third exercise keeps an anchor. This time, **a recorded guide leads you back** each time you drift.

> **Exercise:**
>
> A ten-minute guided focus session.
>
> 1. Play a 10-minute guided meditation.
> 2. Follow the instructions.
> 3. Each time you drift, **return to the guide's anchor**.
> 4. At the end, note roughly how often you drifted and how quickly you came back.
>
> Read the safety advice near the end of this section before you start.

Even one session can show up in the lab, though the studies are small. **The effect varies from person to person.**

> Science Says:
>
> A single 10-minute guided meditation **improved novices' performance** on an attention task (Norris et al., 2018). The studies were small, and the effect depended on personality.

In another study, four brief sessions **improved working memory and executive function**, the brain's planning and self-control skills, compared with listening to an audiobook (Zeidan et al., 2010). In a small trial, eight weeks of brief daily meditation improved attention, while four weeks did not (Basso et al., 2019). If there is a lesson, it is "keep going".

Brief guided sessions



Small studies, so treat it as a first sign.

One Object, One Sound

The next two exercises rest attention on **a single thing**, either an object or the sounds around you. The plainest uses one object, and you come back to it each time you drift.

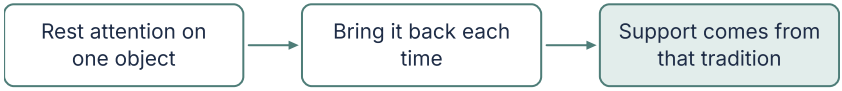
> Exercise:
>
> Single-object focus.
>
> 1. Choose one object, such as a ticking clock or a mark on the wall.

2. Rest attention on it for a few minutes.
3. When attention drifts, **return to the object**.
4. Notice how long you stay before drifting.

Here the doorkeeper **keeps one guest in the room** and brings it back each time. This is a focused-attention practice idea (Lutz et al., 2008). It comes from the traditional one-pointed concentration described in 1.1.1, where the mind rests on one point (Bryant, 2009).

Its support comes from that tradition. Nobody has yet put this drill, under its own name, to a test.

Single-object focus



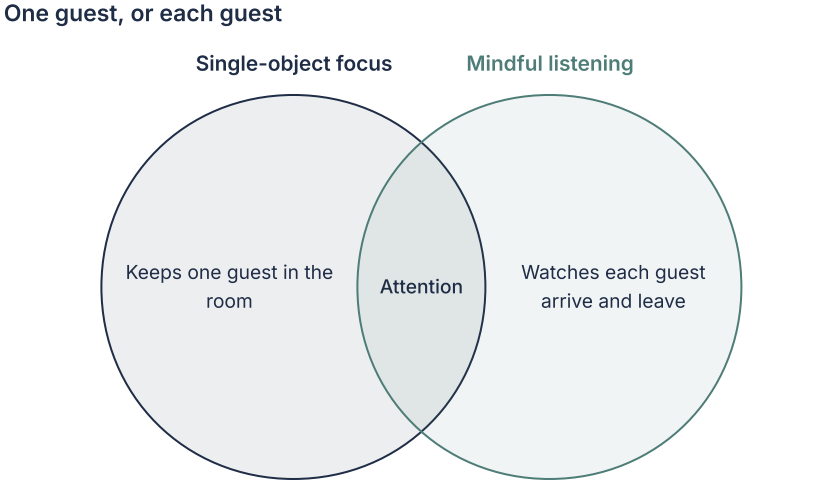
Backed by tradition, not by its own trial.

In the next exercise, **things come and go**. You notice each sound as it arrives and then let it pass.

> **Exercise:**
>
> Mindful listening.
>
> 1. Sit still, with your eyes closed if that is comfortable.
> 2. Let sounds arrive, such as traffic, a fan or your breath.
> 3. Notice each one, and then **let it go**.
> 4. If a sound pulls you into a story, come back to just hearing.

5. After a few minutes, ask whether you could hear a sound without labelling it.

In listening, the doorkeeper **watches each guest arrive and leave** without following it. This is an open-monitoring practice idea (Lutz et al., 2008). It is modelled on the "sounds" meditation in MBSR and in MBCT, a related course built on MBSR (Santorelli et al., 2017; Williams et al., 2024).



A focused-attention idea and an open-monitoring idea.

Those courses were tested as whole packages, and **the listening drill on its own** has no study behind it.

A Still Gaze Before You Act

Shortest of all is the next exercise. It **narrows attention to one spot**, just before you act. In sport this is the quiet eye, a brief steady look at the target (see 3.3.3).

How long it lasts **depends on the task** (Vickers, 2016). In fast tasks such as hitting a moving ball, it lasts about 200 to 500 milliseconds, well under a second. On a short golf putt it runs to about 2.5 seconds, and on a long putt about 3 seconds.



In fast tasks, it lasts well under a second.

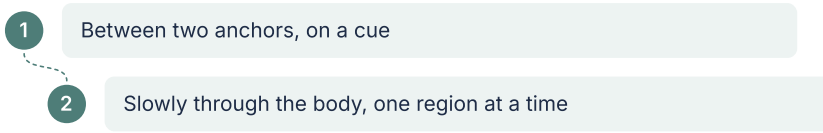
> **Exercise:**
>
> A still gaze before a task.
>
> 1. Get ready to take a shot or start a precise movement.
> 2. Rest your eyes on **one spot of the target** for a second or two.
> 3. Then begin.
> 4. Afterwards, ask whether your eyes were still or darting when you started.

The exercise is borrowed from sport (see 4.2.2). Quiet-eye training **improved sport performance** (Lebeau et al., 2016). In a small study, it helped players keep control of their attention under pressure (Vine & Wilson, 2011). Those are sport findings, and the gaze is untested as an everyday focus drill.

Moving Attention on Purpose

The last two exercises **move attention deliberately**. One moves it between two anchors on a cue. The other moves it slowly through the body.

Moving attention on purpose



The last two exercises in this section.

> **Exercise:**
>
> Deliberate switching.
>
> 1. Rest attention on your breath.
> 2. Every fifth out-breath, **move it to a sound**.
> 3. On the next cue, move it back.
> 4. After a few minutes, ask whether you switched on the cue or drifted before it.

Preparing for a switch **reduces its cost** but does not remove it (Monsell, 2003; see 3.1.1). That lab finding explains why a set cue might help. Whether the drill itself trains switching is still an open question.

Why the drill uses a set cue



Why a cue is built into this drill.

Meditation seems to affect switching less than **a different attention skill**, called inhibition.

> **Key Concept:**
> Inhibition. Inhibition is **the ability to hold back an automatic response**, such as glancing at a buzzing phone.

The final drill moves attention slowly in one direction. It goes from your feet to your head, **one region at a time**.

Body scan



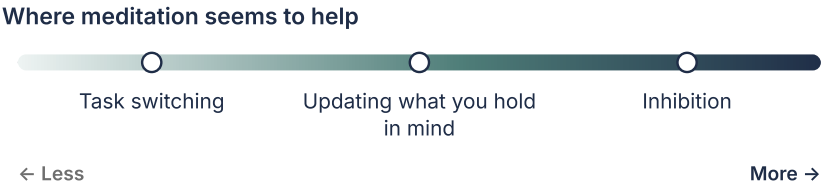
Feet first, head last.

> **Exercise:**
> Body scan.
>
> 1. Lie down or sit.
> 2. Move attention slowly from your feet to your head.
> 3. Notice sensations in each region **without trying to change them**.
> 4. Spend 5 to 10 minutes, and notice where attention tends to jump ahead or wander off.

The body scan follows **the format of the Mindfulness-Based Stress Reduction programme** (Kabat-Zinn, 1990).

What Brief Practice Can and Cannot Do

With eight exercises to choose from, **be clear about the payoff**. Meditation seems to affect inhibition more than task switching or updating what you hold in mind (Gallant, 2016).



Of the three, inhibition comes out ahead.

The pooled evidence is modest. Mindfulness programmes had only a small effect on thinking, g = 0.15 (see 3.2.1), and no dependable effect on attention as its own area (Whitfield et al., 2022).

One app trial pointed the same way, though **other app studies are more mixed** (see 7.2.2).

> **Science Says:**
> People did 30 sessions with the Headspace meditation app (Noone & Hogan, 2018). On executive function, they **did no better than with a sham meditation**. A sham is a look-alike practice that leaves out the part thought to work.

Pupils fared no better. In the 84-school trial with pupils aged 11 to 14 (see 3.2.1), a year of mindfulness lessons **brought no gain over usual teaching** (Kuyken et al., 2022).

Two more trials

	App trial	School trial
Who	People doing 30 sessions	84 schools, pupils aged 11 to 14
Result	Did no better on executive function	After a year, no better

Both point the same way as the pooled evidence.

The college football study in 3.2.1 showed no clear group difference, and its link between more practice and **steadier attention** cannot show cause (Rooks et al., 2017). No large trial shows that short daily exercises improve attention in the general population.

Safety comes before payoff. Unwanted effects are reported by **about 8% of people who meditate** in studies, and about 4% in trials (Farias et al., 2020; see 3.2.1). Anxiety, depression and odd changes in thinking were the types studies reported most often.

How often unwanted effects are reported



Trials sit at the low end (Farias et al., 2020).

Check in with your mental health first. Start short, and stop and seek other help if you feel distressed.

If you feel distressed

If	Then
You feel distressed	Stop and seek other help

Start short; your mental health comes first.

A 10-minute daily menu could be 3 minutes of breath counting, 5 minutes of a guided session and 2 minutes of single-object focus. **The split is only a suggestion**, because no study has tested a daily dose.



Ten minutes in three short pieces. Change the mix to suit you.

Key idea:

Short daily exercises rehearse specific attention moves, such as holding focus, noticing drift and coming back, so practise them for the skill while keeping your expectations honest.

4.1.2 Building Attention Habits into Daily Routine

You never forget to brush your teeth, yet the focus practice you promised yourself keeps slipping away. Tooth-brushing is **tied to a cue**, such as after breakfast or before bed.

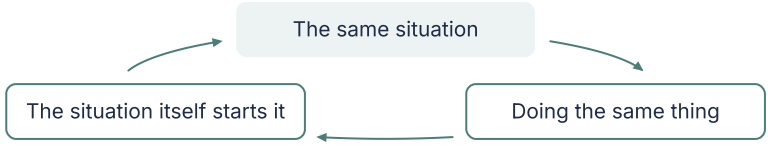
You don't decide to do it each time. The moment itself reminds you, so **the doorkeeper has nothing to weigh up**. Attention practice can work the same way. "After I pour my morning coffee, I'll do three minutes of breath counting."

How Habits Form, and How Long They Take

Habits grow out of **one simple pattern**, and it starts with where you are.

> **Key Concept:**
> Context-dependent repetition. Context-dependent repetition is **doing the same thing in the same situation** until the situation itself starts the behaviour (Gardner et al., 2012).

Context-dependent repetition



Repetition in the same setting builds the cue.

You may have heard that this takes “21 days”. **There is no evidence for that number.** The real timeline is longer, and it varies a lot from person to person.

> **Science Says:**
>
> In a real-world study, a new behaviour started to feel automatic **at very different times** (Lally et al., 2010). For some people it was 18 days in, and for others 254. Missing one day did not derail the process.



Not 21 days. In one study, a new habit took anywhere from 18 to 254 days to feel automatic.

A later meta-analysis **backs this up** (Singh et al., 2024). Health habits can begin to form within about two months, varying widely between people.

Researchers followed 111 new gym members for 12 weeks (Kaushal & Rhodes, 2015). To build an exercise habit, the members needed **at least four sessions a week for six weeks**. Doing it consistently predicted

the habit, and so did keeping it simple, having a helpful setting and enjoying it.

Building an exercise habit



111 new gym members over 12 weeks.

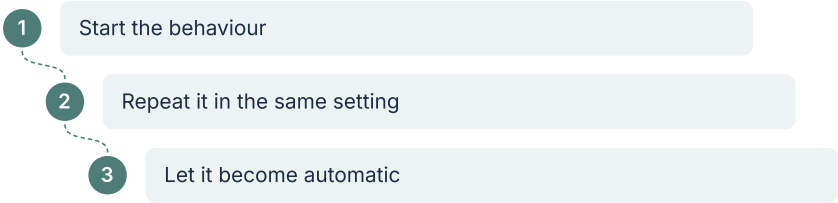
Expect weeks to months, then, and **don't give up after a missed day**.

Hooking Practice onto Daily Routines

If context is what starts a habit, **choose the context on purpose**. Habits are triggered by context and work alongside our goals (Wood & Neal, 2007). Repetition in a stable context is what builds them (Wood & Rünger, 2016).

A review of ways to build habits points to **three steps** (Lally & Gardner, 2013). Start the behaviour, repeat it in the same setting, and let it become automatic. To break an old habit, the same review looks at changing the setting that triggers it.

Three steps to a habit

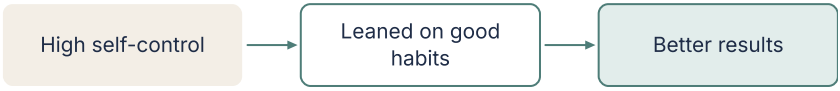


Breaking an old habit starts with its setting.

Good habits may be **what self-control looks like in real life**, with less fighting of temptation along the way.

> **Science Says:**
>
> In six studies with 2,274 people, those with high self-control **leaned on good habits**, such as regular exercise, sleep and study (Galla & Duckworth, 2015). Those habits helped explain their better results. The studies were correlational, so they show a link.

Self-control and good habits



A link across six studies (Galla & Duckworth, 2015).

Start by hooking practice onto **something you already do every day**. Each hook below pairs a daily moment with one short exercise.

> **Exercise:**
>
> Three daily hooks.
>
> 1. After pouring your morning coffee, do three minutes of breath counting.
> 2. On the commute, do a body scan or single-object focus, but never while driving.
> 3. Before opening email, do **one minute of slow breathing**.

Turn each hook into an if-then plan from 3.1.1 (Gollwitzer, 1999). One plan might be **"If I sit down at my desk, then I'll do one minute of breathing before opening email."**



Hook it onto something you already do. An existing routine becomes the cue for one short practice, written as an if-then plan.

Logs, Reminders and Other People

Keeping track helps. A meta-analysis pooled studies on monitoring progress toward a goal (Harkin et al., 2016).

> **Science Says:**
>
> Across 138 studies, monitoring progress toward a goal had **a small-to-moderate effect** on reaching it ($d \approx 0.40$). It worked better when progress was physically recorded, and when it was made public (Harkin et al., 2016).

An effect of that size is like **a light tailwind on a bike ride**. You still do the pedalling, but you get there a little more easily.

A light tailwind

Monitoring progress		A bike ride
A small-to-moderate effect	≈	You still do the pedalling
Across 138 studies	≈	You get there a little more easily

Keeping track helps; you still do the work.

A simple log on paper or in an app fits **the cycle of planning, doing and reflecting**. That cycle underlies self-regulated learning, where learners steer their own learning (Zimmerman, 2002).

Planning, doing and reflecting



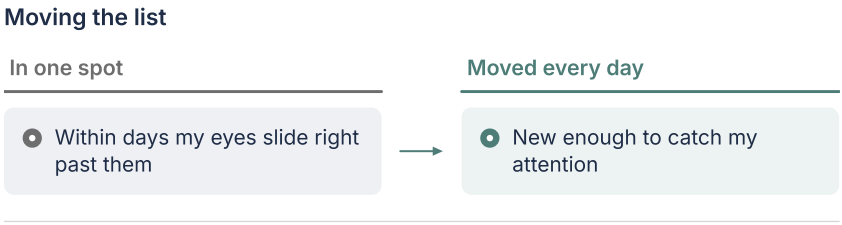
A simple log fits each step.

Phone reminders can be the cue until the habit takes over. Each reminder is **a knock that turns the doorkeeper back** to the practice.

Even a written list can stop working. I keep my goals, my self-development strategies and the methods I want to use every day pinned up where I can see them. Every day, **I move them to a new place**. If I leave them in one spot, within days my eyes slide right past them.

> **Key Concept:**
> Habituation. Habituation is **the brain no longer noticing** something that never changes.

Moving the list keeps it **new enough to catch my attention**, so what matters most stays in view.



Habituation explains the daily move.

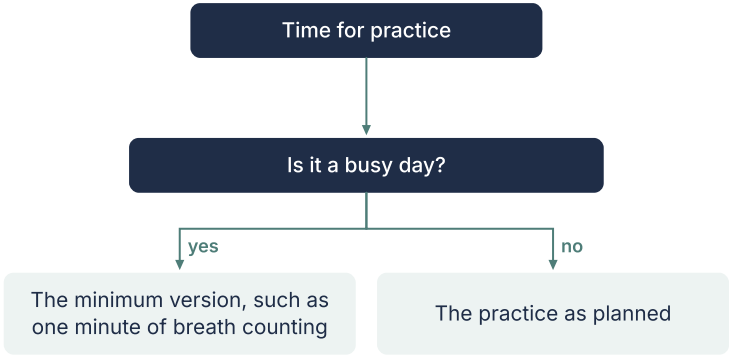
Gaps are normal, and the research on home practice shows **how normal they are**.

> **Science Says:**
> In mindfulness courses, people did **about two-thirds** of their assigned home practice (Parsons et al., 2017). More practice was modestly linked to better outcomes.

Doing most of it, on most days, **is a normal result**. Nobody in those courses did everything.

Plan for imperfect weeks. Agree a minimum version of the practice for busy days, such as one minute of breath counting. That way, the cue still gets its response and the habit keeps building.

A busy day



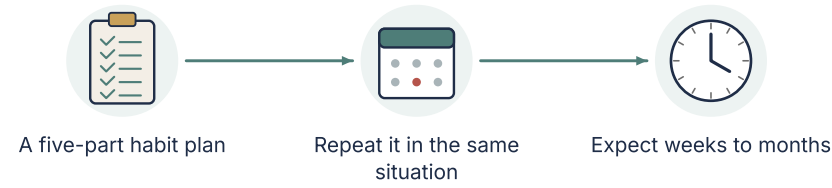
On busy days, the habit keeps building.

The minimum version fits Lally's finding that **one missed day did no harm**. The idea itself has not been put to a test, so try it and see whether it holds for you.

A written plan **pulls all of this together**.

> Exercise:
>
> A five-part habit plan.
>
> 1. Pick the cue, an existing daily routine, and write "After I...".
> 2. Pick the practice, one exercise from 4.1.1, and write "I will...".
> 3. Set the duration as "For... minutes".
> 4. Choose how you will log it, such as paper, an app or a calendar, and write "I will record it in...".
> 5. Set **a weekly review** with "Each... I'll check my log and adjust."

From plan to habit



Habits take weeks to months.



Habit plan template. Pick a cue, a practice and a duration. Log it, and review each week to adjust.

Key idea:

Attention practice sticks when you tie it to something you already do every day, repeat it in the same situation and keep a simple log, and it takes weeks to months to become a habit.

4.2.1 Entering and Sustaining Flow

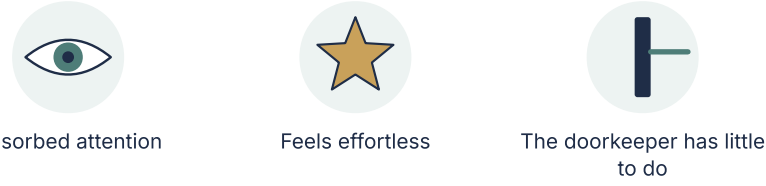
Have you ever looked up from something and found that two hours had vanished? A musician practising a piece just at the edge of their ability **knows that feeling well**.

If the piece were too easy, they would get bored and their mind would wander. If it were far too hard, they would get anxious and stop. In between is **a sweet spot where attention seems to hold itself**.

> **Key Concept:**
>
> Flow. Flow is **a state of absorbed attention that feels effortless** (Csikszentmihalyi, 1990; Nakamura & Csikszentmihalyi, 2009; see 1.1.1). It usually comes with clear goals, immediate feedback and a task matched to your skill.

In flow, **the doorkeeper has little to do**. Nothing else is knocking hard enough to get in.

What flow feels like



Two hours can vanish this way.

What Makes Flow More Likely, and What It Does

The match between challenge and skill is **the classic ingredient**.

> **Science Says:**
>
> A meta-analysis found **a moderate relationship** between flow and the balance between how hard a task is and how skilled you are (Fong et al., 2015). The balance was a reliable contributor, alongside clear goals and a sense of control. The review questioned whether the balance is the main cause.

The balance is, then, **one ingredient among several**. Three studies by another team point the same way (Engeser & Rheinberg, 2008). The idea that flow depends on the balance could only be partially supported.

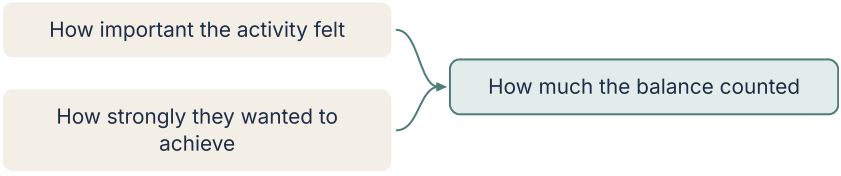
One ingredient among several



The balance was reliable, but it may not be the main cause.

How much the balance counted depended on **how important the activity felt** to people and how strongly they wanted to achieve (Engeser & Rheinberg, 2008). In two of the three studies, flow predicted performance.

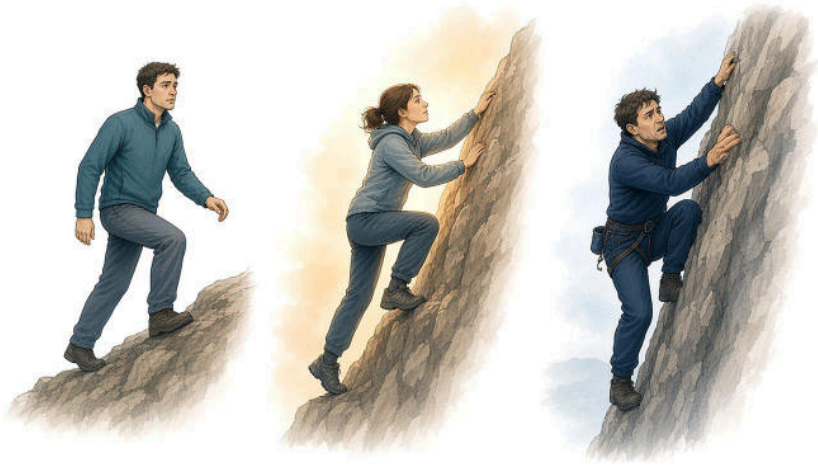
What the balance depended on



How much it mattered to people counted too.

In music students, a good balance went with **more flow and less performance anxiety** (Fullagar et al., 2013).

Lab experiments have gone a step further (Keller & Bless, 2008; Ulrich et al., 2014). In these, task difficulty was adjusted to match each person's skill. People then **reported more flow** than when the task was too easy or too hard. With the task matched, fewer stray thoughts knock at the doorkeeper's door.



The sweet spot. A task matched to your skill goes with more reported flow, as one ingredient among several.

Both studies were small. They show what causes flow **within a task someone is already doing**.

People in flow tend to perform better. A meta-analysis found **a moderate positive relationship** (Harris et al., 2023). Still, it isn't clear which way the arrow points. Flow might improve performance, performing well might make flow more likely, or both.



An arrow with two heads. Flow and performance are linked. Flow may help performance, performing well may make flow likelier, or both.

Flow even **shows up in the body**. Professional pianists played the same piece five times (de Manzano et al., 2010). Their flow ratings were linked to measures of their heartbeat, blood pressure, breathing depth and the activity of the smiling muscles in the face.

Flow in the body



Professional pianists, one piece played five times.

The pianist study was small. Still, it suggests that **flow leaves a trace you can measure**, beyond what people say about it.

Setting Up Conditions for Flow

Setting up flow is like **laying a fire**. You can prepare the dry wood, the kindling and the airflow. You can't order the flame to catch, though.

The four steps below come from flow theory and the studies above. **They raise the odds** without guaranteeing entry, and nobody has tested them as a set.

> Exercise:
>
> Four steps to set up flow.
>
> 1. Set a clear goal for the session (Csikszentmihalyi, 1990).
> 2. Arrange immediate feedback, so you can tell how you are doing as you go (Csikszentmihalyi, 1990; Fong et al., 2015).
> 3. Pick **a task just a little beyond your current skill** (Csikszentmihalyi, 1990; Fong et al., 2015).
> 4. Remove interruptions (see 3.1.2).

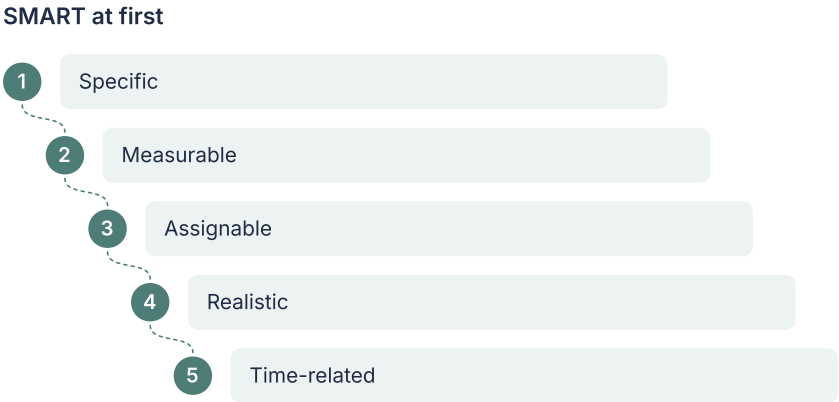


Laying the fire. Prepare the conditions, and leave the flame to catch in its own time.

A short study of people at work suggests that **a small nudge can help**.

> **Science Says:**
> In one five-day experiment, 65 full-time workers were recruited online (Weintraub et al., 2021). A brief "SMART" goal-setting nudge **increased the flow and engagement** they reported each day.

SMART first stood for **specific, measurable, assignable, realistic and time-related** (Doran, 1981). Later versions vary.



What SMART first stood for (Doran, 1981).

A small trial tried to bring on flow in a clinic (Yoshida et al., 2018). Twenty patients with attention problems after a brain injury were randomised to **a flow-inducing video game** or a plain one for four weeks.

Both groups improved, and the flow group **tended to improve more** (Yoshida et al., 2018). The more flow people felt, the more their attention improved. It was a pilot study, so the result is a hint.

The clinic pilot

	Flow-inducing video game	Plain video game
Four weeks of play	Yes	Yes
Attention	Tended to improve more	Improved

Twenty patients, so read it as a hint.

Those are single studies, though. The wider evidence on bringing on flow is **much less encouraging**.

> Science Says:
>
> A review looked at 29 flow interventions in sport and exercise (Goddard et al., 2023). **None gave firm evidence** that it brings on flow.

Most flow research is correlational, showing links only (Peifer et al., 2022).

What the flow evidence shows



Links, so far, more than causes.

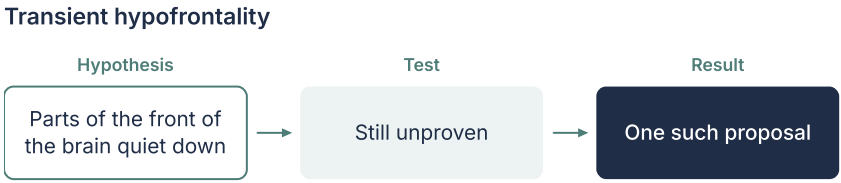
Effortful practice is **part of the picture**, as the deliberate-practice research suggests (Ericsson et al., 1993). That comes with the caveat from 3.1.2 that its contribution varies widely by field.

Intensive training can strengthen sustained attention. A three-month meditation retreat **did so in a randomised study** (MacLean et al., 2010).

What Happens in the Brain, and How to Measure Flow

Brain activity during flow is **still a matter of untested ideas**, or hypotheses. Researchers have proposed several brain mechanisms (Harris et al., 2017). These involve attention, effortless control and reward.

Transient hypofrontality is **one such proposal**, and it is still unproven.



An untested idea about flow in the brain.

> **Key Concept:**
> Transient hypofrontality. Transient hypofrontality is **the idea that parts of the front of the brain quiet down** for a while during flow (Dietrich, 2004).

Measuring flow is on firmer ground. If you want to track flow, two well-tested questionnaires exist. Both were developed for physical activity (Jackson & Eklund, 2002; see 9.3.2).

The first is the Flow State Scale-2. It asks about **a specific event** you just took part in.

The second is the Dispositional Flow Scale-2. It asks **how often you tend to experience flow** in a chosen activity.

Two flow questionnaires

	Flow State Scale-2	Dispositional Flow Scale-2
Asks about	A specific event you just took part in	How often you tend to experience flow

One asks about an event, the other about how often.

Key idea:

Flow is absorbed, effortless-feeling attention that tends to appear when goals are clear, feedback is quick and the task matches your skill, so set up those conditions and let it come.

4.2.2 Concentration under Pressure and Fatigue

A BASKETBALL PLAYER STANDS AT the free-throw line with the game at stake. Normally **the shot is automatic**. Under pressure, the player starts thinking through each part of the motion, and misses.

Attention has moved **from the target to the mechanics**. The mechanics are the small body movements that make up the shot.



Target or mechanics? Under pressure, attention moves from the target to the mechanics.

Why Pressure Disrupts Focus

What happened at the line is **a familiar pattern in research**.

> 🗝 **Key Concept:**
>
> Choking under pressure. Choking under pressure is **performing worse than you normally would** because the stakes feel high (Beilock & Carr, 2001).

Pressure seems to cause choking **by more than one route**. One route runs through well-learned skills. In one set of studies, people choked under pressure on a golf putt they had practised until it ran smoothly (Beilock & Carr, 2001). They did not choke on a letter-and-number puzzle.

The results fit the idea that pressure makes people **watch their own movements step by step** (Beilock & Carr, 2001). That upsets skills that normally run on their own.

The skill route

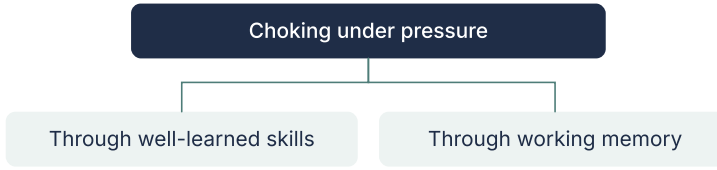


Watching a skill can upset it.

The other route runs through working memory, **the mind's small workspace**. Maths problems showed this route clearly.

> **Science Says:**
> Under pressure, people did worse only on unpractised maths problems that made **heavy demands on working memory** (Beilock et al., 2004). Once they had practised those problems until the answers came straight from memory, the choking went away.

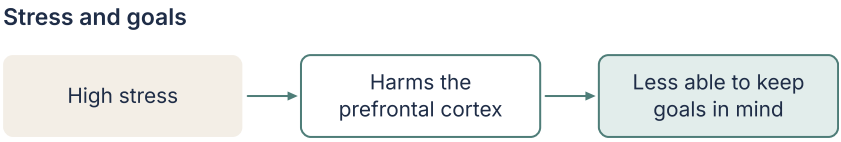
Two routes to choking



Two routes, so more than one fix.

Pressure changes attention itself. Anxiety weakens goal-directed attention, the kind you aim on purpose (Eysenck et al., 2007). It makes it easier for threats to capture attention. **The doorkeeper lets a threat in** ahead of the guest you chose.

High stress harms **the prefrontal cortex**, the front part of the brain that keeps goals in mind (Arnsten, 2009; see 1.3.2).



Stress harms the goal-keeping part of the brain (Arnsten, 2009).

The same pattern shows up in education. Test anxiety is linked to **lower test scores and grades**, with small to moderate effects (von der Embse et al., 2018). High stakes raise it.

Tools under Pressure: Quiet Eye, Reappraisal and Mindfulness

The first tool that can help **works through the eyes**. It is the quiet eye, the steady look an athlete holds on the target (Vickers, 2016; see 3.3.3). It lasts from well under a second in fast ball sports to about 3 seconds on a long golf putt.

Experts tend to hold it longer, and training it **has lifted sport performance** (Lebeau et al., 2016). During the quiet eye, the doorkeeper lets in only the target.



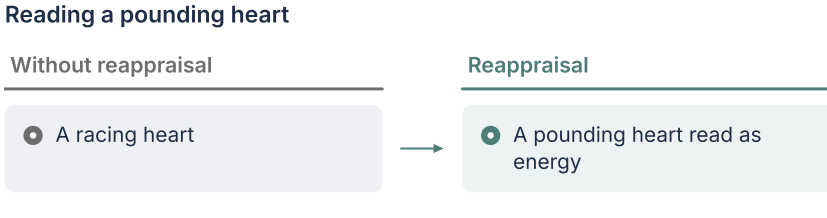
The quiet eye. One still look at one spot on the target, held just before the key movement.

In basketball free throws, anxiety disrupted players' gaze control and accuracy (Wilson et al., 2009). In one small study, training the quiet eye kept **their gaze and their shooting steadier** under pressure (Vine & Wilson, 2011).

Across 47 studies of ways to stop choking in sport, three methods were most often reported to work (Gröpel & Mesagno, 2019). They were **routines before performing**, quiet-eye training and practising under pressure.

The second tool works through **how you read your own body**. A racing heart is part of arousal (see 1.3.2).

> **Key Concept:**
>
> Reappraisal. Reappraisal is **interpreting the same body signals differently**, such as reading a pounding heart as energy instead of danger.



Same body signals, a different reading.

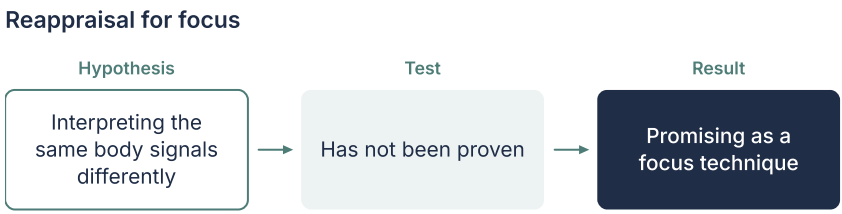
In one study, people told that stress arousal can help them showed **a healthier heart and blood-vessel response** to stress. Their attention was pulled less toward threats (Jamieson et al., 2012).

> **Science Says:**
> Students told that stress arousal can help them **scored higher on GRE maths** (Jamieson et al., 2010). The GRE is a graduate-school entrance test. The gain came in practice and on the real test one to three months later.

Saying "I am excited" before singing, speaking or doing maths **beat trying to calm down** (Brooks, 2014). Few other studies have repeated it, though.

Five double-blind trials tested a roughly 30-minute online "synergistic mindsets" module (Yeager et al., 2022). In a double-blind trial, neither the people taking part nor the researchers working with them know who got which version. The module **improved teenagers' stress responses**.

The module targets stress, though, and does not address attention. **Reappraisal is promising as a focus technique** but has not been proven.



Promising for stress, not proven for focus.

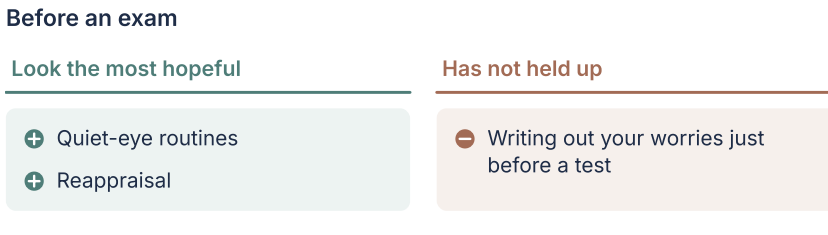
The third tool is **mindfulness practice**. Amishi Jha's lab has studied military groups (Jha, 2021). Before deployment, those who practised more mindfulness showed better-protected working memory under high stress (Jha et al., 2010).

In later groups, eight hours of training-focused mindfulness **kept attention stable** (Jha et al., 2015). It protected working memory (Jha et al., 2017). The groups were small and not randomised, so these results point the way without proving it.

Writing out your worries just before a test **has not held up** as an exam tip.

> **Science Says:**
>
> In a classroom study, anxious students who wrote about their worries before a test **did better** (Ramirez & Beilock, 2011). A large project then repeated 21 well-known experiments, each preregistered, meaning run to a plan fixed in advance, and only 13 held up (Camerer et al., 2018). A recent meta-analysis found no clear effect on anxiety or scores (O'Meara & Lovett, 2026).

For now, **no pre-exam focus technique has been proven**. Quiet-eye routines and reappraisal look the most hopeful, and neither has been tested on attention directly.



None of these has been proven for focus.

Mental Fatigue: What It Really Is

Pressure is one threat to focus, and time on task is another. Long tasks **wear down goal-directed attention** and increase distractibility,

meaning how easily you get pulled off task (Boksem et al., 2005). Watching for rare events is hard, stressful work (Warm et al., 2008).

Fatigue may work like **the doorkeeper weighing the guest you chose** against everyone else waiting outside. One proposal is that mental fatigue reflects a running cost-benefit check (Boksem & Tops, 2008). When the effort a task costs seems to outweigh its expected rewards, motivation to keep going drops.



Effort on one side of the scale, reward on the other.

The opportunity-cost model goes further (Kurzban et al., 2013). It treats **fatigue as a signal**, with the feeling of effort reflecting the value of the other things you could be doing.

The old idea of willpower as a fuel tank **has not survived testing**. Early studies suggested self-control draws on a resource that gets used up (Baumeister et al., 1998).

Two models of fatigue

	Fuel tank	Opportunity cost
Fatigue is	A resource that gets used up	A signal

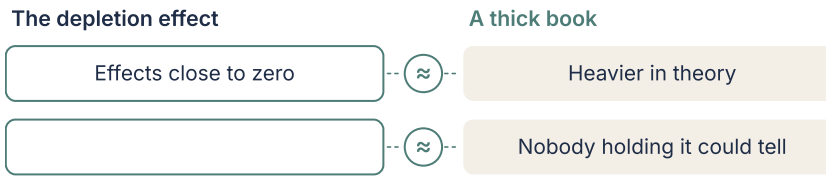
The model that has held up better.

> **Key Concept:**
> The depletion effect. The depletion effect is **the idea that using self-control** leaves less of it for the next task.

Large replications run across many labs, to a plan fixed in advance, found effects of self-control "running out" **close to zero** (Hagger et al., 2016; Vohs et al., 2021). The effect was d = 0.04 in 23 labs and d = 0.06 across 36 sites.

Effects that size are like **one extra page in a thick book**. The book is heavier in theory, but nobody holding it could tell.

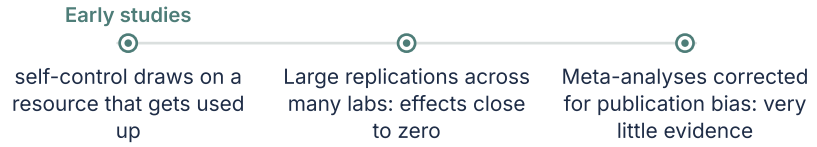
One extra page



Too small to feel.

Meta-analyses corrected for publication bias found **very little evidence** that the depletion effect is real (Carter et al., 2015).

The depletion effect



The fuel-tank idea has not survived testing.

When fatigue builds, **change the task's value, variety or breaks**. Trying to "save willpower" will not help.

Breaks help with how you feel. A meta-analysis found that micro-breaks of 10 minutes or less **raised energy and reduced fatigue** (Albulescu et al., 2022). The gains in performance were smaller and depended on the task.

Practice, habits and focus



The tips below borrow from the studies in this section. **Each has a reason behind it**, but none has been tested as a tip on its own.

> **Exercise:**
>
> Five tips for pressure and fatigue.
>
> 1. Before a key action, take a still final look at the target (quiet eye).
> 2. Say a reappraisal statement, such as "This energy can help me".

3. During long monitoring work, take brief planned breaks (Ariga & Lleras, 2011, a small study; see 3.3.3).
4. Rotate tasks where you can.
5. **Protect your sleep** (see 8.1).

Key idea:

Pressure pulls attention onto the mechanics or onto threats, and mental fatigue is your mind asking whether the task is still worth it, so a still gaze, reappraising arousal and well-timed breaks are promising tools, though none has been proven to protect attention directly.

When fatigue builds, change



The task's value



Variety



Breaks



Module

5

Attention in Context

5.1 Attention in Learning

5.1.1 How Attention Shapes Learning and Memory

YOU PUT YOUR KEYS down while thinking about a phone call, and later they seem to have vanished. Often the memory of where they went was **never formed at all**.

Nothing got written in. **Your doorkeeper was dealing with the call**, so the keys never got in. Memory can only keep what attention lets in.

Attention as the Gateway to Memory

As 1.2.1 showed, split attention does **most of its damage on the way in** (Craik et al., 1996).

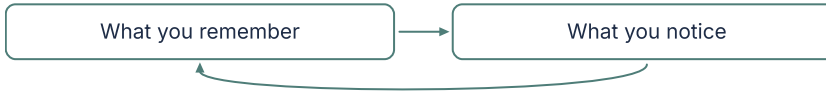
The way in is **encoding** (see 1.2.1), and it is far more fragile than recall.



Divided attention hits the way in. Memory suffers most when attention is split during learning, and little when it is split during recall.

The traffic runs both ways (Chun & Turk-Browne, 2007). **What you remember guides what you notice**, and what you notice shapes what you remember.

Remembering and noticing



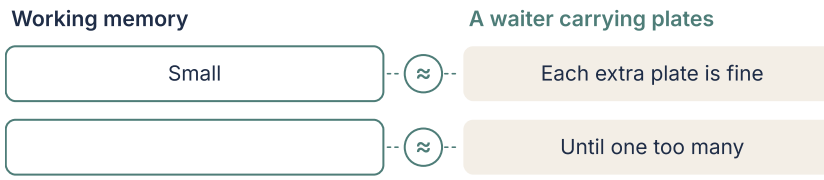
Each one shapes the other.

Attention guards a second space, **working memory**, the small mental workspace (see 1.2.3). In effect, the doorkeeper helps decide what enters it (Awh et al., 2006).

Cognitive Load and Split Attention

Think of a waiter carrying plates. Each extra plate is fine **until one too many**, and then something drops. Working memory is small in the same way.

Plates and working memory



Overload drops something.

> **Key Concept:**
>
> Cognitive load theory. The idea that **learning slows when working memory is overloaded**, so teaching should cut load that does not help learning (Sweller, 1988).

Unlike plates, though, **some load is useful**. The mental effort of making sense of the material is what produces learning. That effort includes linking words and pictures and connecting them to what you know. Good design cuts only the wasted effort (Mayer & Moreno, 2003).

Some difficulties help learning, as long as the learner can meet them. **Spacing out study and testing yourself** are two examples. If the learner can't meet these difficulties, they just get in the way (Bjork & Bjork, 2011).

One common source of wasted load comes from **layout**. Picture text placed far from the part of the picture it describes. The learner's eyes and mind keep searching back and forth.

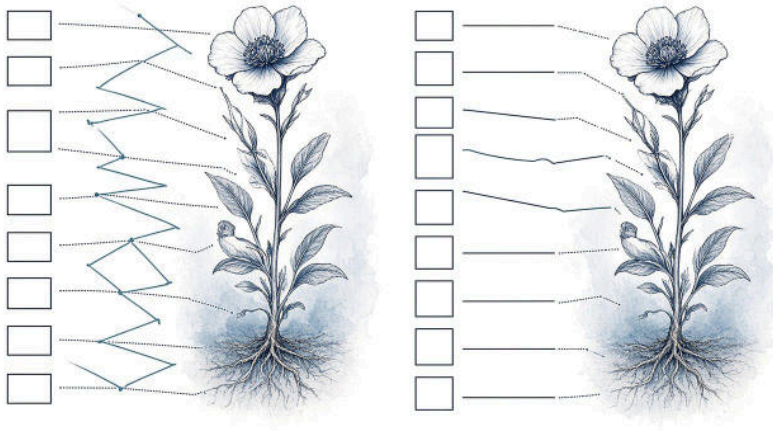
Useful and wasted load

	Useful load	Wasted load
Example	Making sense of the material	Searching back and forth
Good design	Keeps it	Cuts it

Cut only one of them.

> 🗝 **Key Concept:**
> Split attention. The extra load of **searching back and forth** between words and the part of a picture they describe.

Mayer and Moreno (2003) proposed **nine ways to reduce load**, based on one research group's experiments. Two of them are placing words next to the part of the picture they describe and cutting interesting but irrelevant extras.



Labels on the picture. When each word sits beside the thing it names, the eyes stop hunting.

Wandering Minds, Study Techniques and Screens

Load is one obstacle to learning. **Wandering minds are another** (see 1.3.3). The longer a lecture runs, the more minds drift and the less of it sticks (Risko et al., 2012).

Long lectures



A second obstacle besides load.

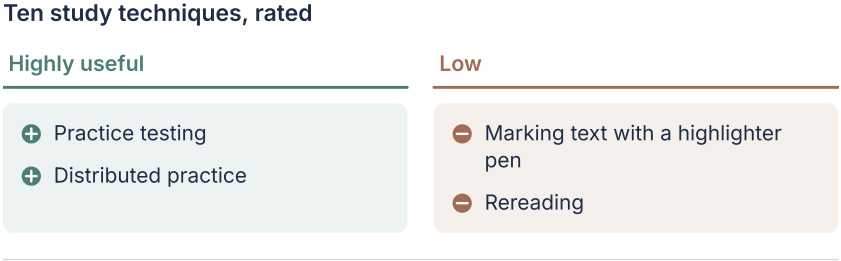
For reading, the costs are clear. A meta-analysis of 25 texts and 73 correlations found that **more mind-wandering went with poorer reading comprehension** (Bonifacci et al., 2022). The link was r = −0.21, a modest one (see 1.3.4).

Picture a crowd of readers. **Drifters tend to score lower**, with plenty of exceptions either way. The link was stronger in older readers, and it

vanished when mind-wandering was measured by a general questionnaire.

Quizzes slotted into online lectures help pull minds back (Szpunar et al., 2013; see 1.3.3).

> **Science Says:**
>
> A major review rated ten study techniques (Dunlosky et al., 2013). Quizzing yourself, called practice testing, and spreading study over time, called distributed practice, came out **highly useful**. Marking text with a highlighter pen and rereading came out low.



Quizzing and spacing come out on top.

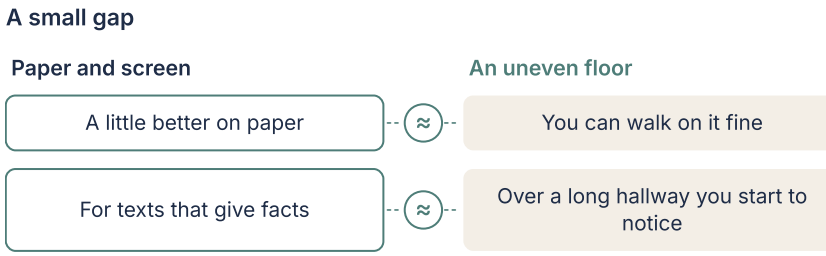
A meta-analysis found that **testing beats restudying** for later memory (Rowland, 2014). Tests where you recall the answer gave bigger benefits than tests where you only recognise it. Another meta-analysis confirms that spacing helps you remember for longer (Cepeda et al., 2006).

In one small trial, **two weeks of mindfulness training** cut mind-wandering (Mrazek, Franklin, et al., 2013; see 3.2.2). Few studies have repeated it so far.

Nicholas Carr argued that **screens make our reading shallower** (Carr, 2010; see 3.1.1). His claims hold up to different degrees.

> **Science Says:**
> Comprehension is **a little better on paper** for texts that give facts, especially under time limits, with no real gap for stories (Delgado et al., 2018, g = −0.21, 54 studies; Clinton, 2019, g = −0.25, 33 studies). Readers judged their own understanding less accurately on screens (Clinton, 2019).

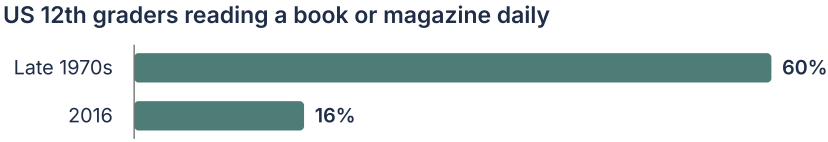
The g figure measures the size of the gap (see 3.2.1). A gap that size feels like **a slightly uneven floor**. You can walk on it fine, but over a long hallway you start to notice.



Real, though small for any one text.

The claim that links harm comprehension is **overstated and dated**. Links do add mental load, but the effect depends on working memory and on what the reader already knows. The studies are of early hypertext, the first linked text on computers (DeStefano & LeFevre, 2007).

As a daily habit, **deep reading has declined**, so that claim holds up as behaviour. The measure was US 12th graders reading a book or magazine daily. That share fell from 60% in the late 1970s to 16% in 2016 (Twenge et al., 2019). This is a change in habits. It does not prove that people can pay less attention than before.



Habits fell; attention was not measured.

Many people believe students learn best when teaching matches their "style", such as visual or auditory. **A major review found no adequate evidence** for matching instruction to learning styles (Pashler et al., 2008).

Match the method to the material instead. Use techniques with good evidence, such as practice testing and spacing.

Table 5.1 rates **the strength of support** for each technique. Strong means meta-analyses or a major review agree. Moderate means controlled experiments in one setting. Weak means experiments from a single research group. Only the lecture-quiz studies measured attention, through mind-wandering.

Table 5.1: Learning techniques and attention

Technique	How It Engages Attention	Evidence Strength
Practice testing	Retrieving answers keeps attention on the material	Strong for learning and remembering, from meta-analyses and a major review (Adesope et al., 2017; Rowland, 2014; Dunlosky et al., 2013)
Spaced practice	Short, spaced sessions instead of one long one	Strong for remembering over time, from a major review and a meta-analysis (Dunlosky et al., 2013; Cepeda et al., 2006)
Quizzes during lectures	Brief questions keep minds on the lecture	Moderate, from controlled experiments on online lectures that cut mind-wandering and improved learning (Szpunar et al., 2013)
Words beside the picture	Labels placed next to the part they explain	Weak, from one controlled experiment by a single research group (Mayer & Moreno, 2003)

Technique	How It Engages Attention	Evidence Strength
Cutting extras	Removing decoration and side detail	Weak, from several experiments by a single research group (Mayer & Moreno, 2003)

Key idea:

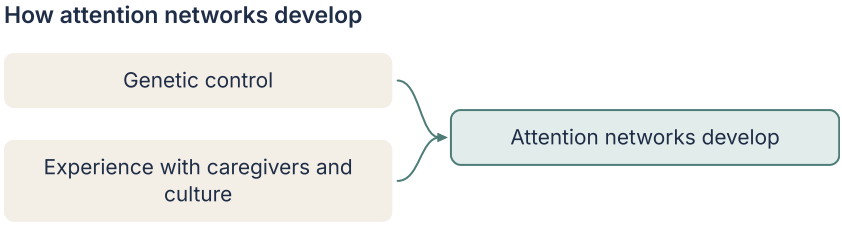
You can only remember what attention lets in, and splitting attention while learning costs the most. Keep the load light, build in questions that pull wandering minds back, and study by quizzing yourself and spacing it out.

5.1.2 Helping Children and Students Focus

TEACHERS OFTEN HEAR THAT students switch off after ten minutes, so lessons should come in **ten-minute chunks**. The real picture is messier, and more useful.

How Children's Attention Develops

Children's **control of attention grows through childhood** (see 6.2.1 for the full story). It builds on the attention networks described in 1.3.2 (Posner & Rothbart, 2007b). These networks develop partly under genetic control and partly through experience with caregivers and culture.



Genetic control and experience each play a part.

Researchers have tried to help that growth along. In a small study, 4- and 6-year-olds did **five days of attention training** (Rueda et al., 2005). Their executive attention (see 1.3.2) improved compared with children who did not train. Whether such gains last or carry over to schoolwork is not established.

One review looked at programmes for children aged 4 to 12 (Diamond & Lee, 2011). It identified **several approaches that improved executive functions**, the skills that steer your thinking (see 1.3.4).

No Fixed Ten-Minute Limit

No fixed limit turned up in reviews of lecture research (Wilson & Korn, 2007; Bradbury, 2016; see 1.2.3). The teacher counts for more.

> **Science Says:**
> One clicker study ran in three chemistry courses (Bunce et al., 2010). Students used clickers to report their own lapses. The lapses were **short, mostly a minute or less**, and they came and went all through the lecture.

There was **no single collapse** at any fixed minute. The doorkeeper drifted off for a moment, then came back.



Lapses all through the lecture. Brief drifts appear early, middle and late, with no cliff edge.

Clicker questions and demonstrations **cut the reported lapses** (Bunce et al., 2010). The drop came during the activity and in the lecture just after.

The lapses were self-reported, and attention itself was not measured. Attention, then, **drifts in and out**, and short active moments pull it back. Each active moment calls the doorkeeper back.

Drift and come back



Active moments spread through a lesson.

> **Science Says:**
>
> In a later experiment, 195 undergraduates watched a video statistics lecture (Welhaf et al., 2022). **Questions slotted into the lecture cut thoughts unrelated to the task**, repeating an earlier finding in a new setting.

Devices in the Classroom

Devices are **a newer pull** on students' attention. Some students were allowed devices for non-academic use in lectures. Their later exam scores fell (Glass & Kang, 2019).

In one study, **laptop use was logged directly** (Ravizza et al., 2017). Non-academic internet use went with lower exam scores. This was true whatever the students' motivation, interest or intelligence.

The cost spreads. Laptop multitasking **hurt the comprehension of nearby students** who could see the screen (Sana et al., 2013).

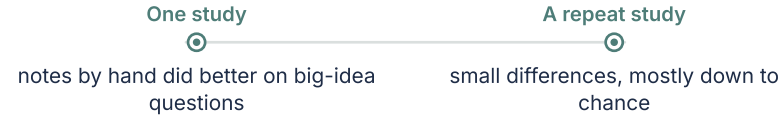


The screen next door. One student's browsing can cost the people sitting behind.

Handwritten notes are another debate. In one study, people who wrote notes by hand **did better on big-idea questions** (Mueller & Oppenheimer, 2014).

A repeat study found **small differences that could mostly be down to chance** (Morehead et al., 2019). Don't teach "pen beats laptop" as a rule. The risk with laptops is off-task use (Glass & Kang, 2019).

Pen versus laptop



Teach off-task use as the risk.

Phones, Mindfulness, Movement and the Classroom

Schools have tried several fixes, starting with **phone bans**.

One observational study linked phone bans in English schools to **better exam results** (Beland & Murphy, 2016).

A study like this shows **a link across many pupils**, and it cannot prove that the bans caused the gains.

What one observational study can show

Shows	Cannot prove
⊕ A link across many pupils	⊖ It cannot prove that the bans caused the gains

Better exam results in one study.

Later research looked at English secondary schools (Goodyear et al., 2025). Pupils at schools with strict phone rules showed **no difference**

in wellbeing or in overall phone use. Their phone use was lower only during school hours.

Strict phone rules

	Pupils at strict schools
Wellbeing	No difference
Overall phone use	No difference
Phone use in school hours	Lower

Measured once, so cause is not shown.

> **Key Concept:**
> Cross-sectional study. A study that **looks at people once**, at a single moment, so it shows links without showing cause.

The Goodyear study was cross-sectional, so it **cannot prove bans have no effect**. UNESCO's global review covers device distraction and phone policies (UNESCO, 2023).

> **Science Says:**
> A rapid review pooled five studies of school smartphone bans (Böttger & Zierer, 2024). The overall effect was **modest (d = 0.162; see 1.3.2)**, larger for social well-being than for school performance.

Phone-ban studies



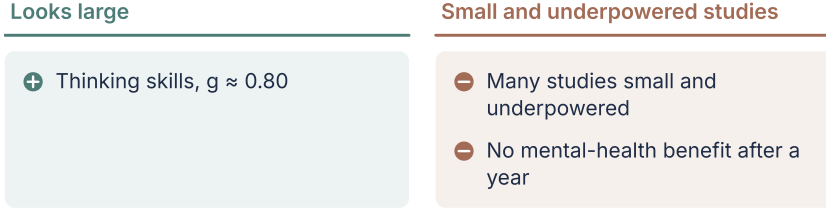
Results differ by study.

The ban effect is like **a pinch of salt in a large pot of soup**, there if you taste carefully.

A second fix is **mindfulness**. One meta-analysis pooled studies on school mindfulness programmes (Zenner et al., 2014). The largest effects were on thinking skills (g ≈ 0.80; see 3.2.1). On paper that is a large step, but many studies were small and underpowered, too small to give firm answers.

MYRIAD, the large school trial met in 3.2.1, found no mental-health benefit from mindfulness lessons after a year (Kuyken et al., 2022). Offer it as an option, and **don't sell it as a promise**.

School mindfulness



Large on paper, less firm in the trials.

Movement has firmer support. In one randomised trial, a 9-month after-school physical-activity programme improved children's inhibition (see 4.1.1) and their cognitive flexibility, the ability to switch between rules (Hillman et al., 2014).

After-school activity



One randomised trial, in children.

> **Science Says:**
> A meta-analysis of 44 studies linked **physical activity to better thinking in children** (Sibley & Etnier, 2003). The overall effect size was 0.32.

An effect of 0.32 counts as small to moderate, like **a gentle slope** on a bike ride.

Classroom walls play a part. **Heavily decorated rooms** pulled kindergarteners off task in one small study (Fisher et al., 2014; see 1.3.1).

Food claims need care. Eating breakfast instead of skipping it **helps on-task behaviour and same-morning thinking**, mainly in children who don't get enough food (Adolphus et al., 2013, 2016).

Omega-3 has not been shown to **improve attention in healthy children** (Stonehouse, 2014). For ADHD, the newest Cochrane review, a careful summary of all the trials, found no clear effect (Gillies et al., 2023; see 8.3.1).

Food and attention

Helps	Not shown
⊕ Eating breakfast instead of skipping it	⊖ Omega-3 for attention in healthy children ⊖ Omega-3 for ADHD

Breakfast counts most for children short of food.

Exercise:

A focus plan for one week of lessons.

1. Drop the ten-minute rule and plan **short active moments** all through each lesson (Bunce et al., 2010).
2. Insert short questions into recorded or online lectures. In live ones this is likely, but not proven, to help (Szpunar et al., 2013; see 1.3.3).
3. Set clear rules for non-academic device use, and seat laptop users so screens don't distract others (Glass & Kang, 2019; Sana et al., 2013).
4. Keep wall displays purposeful (Fisher et al., 2014).
5. Build in physical activity, and set self-testing and spacing for homework (Hillman et al., 2014; Dunlosky et al., 2013).

Table 5.2 sorts the strategies by **the weight of the evidence**. Moderate means at least one well-run controlled trial. Weak means small,

observational or conflicting studies. A grade drops when samples are small or results vary a lot between studies.

Table 5.2: Strategies for helping students focus

Strategy	Age Group	Evidence	Strength (Strong / Moderate / Weak)
Active moments and questions during lectures	Students in lectures	Fewer lapses and less mind-wandering (Bunce et al., 2010; Szpunar et al., 2013; Welhaf et al., 2022)	Moderate, from controlled experiments on online and video lectures (Szpunar et al., 2013; Welhaf et al., 2022), with the self-report clicker study as context (Bunce et al., 2010)
Rules on non-academic device use	Students in lectures	Off-task use lowers exam scores (Glass & Kang, 2019; Ravizza et al., 2017)	Weak, from one classroom study and one observational study (Glass & Kang, 2019; Ravizza et al., 2017)
School phone bans	Secondary school	Small or modest gains in some studies, and in another no difference in wellbeing or overall phone use (Beland & Murphy, 2016; Böttger & Zierer, 2024; Goodyear et al., 2025)	Weak, from few and conflicting studies
School mindfulness programmes	School-age	Promising small studies, and a large trial with no mental-health benefit (Zenner et al., 2014; Kuyken et al., 2022)	Moderate for no mental-health benefit, from one large trial across many schools (Kuyken et al., 2022), and Weak for thinking gains, because samples were small and results varied (Zenner et al., 2014)
Physical-activity programmes	Children (after school)	Improved attentional inhibition in one trial (Hillman et al., 2014)	Moderate, from a single randomised trial (Hillman et al., 2014)
Sparse classroom displays	Kindergarten	Less off-task behaviour in a small study (Fisher et al., 2014)	Weak, from a single small study (Fisher et al., 2014)

Key idea:

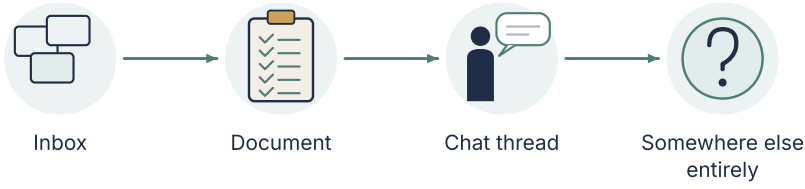
Students don't switch off at minute ten. Their attention drifts in and out all lesson, and short active moments bring it back. Off-task devices hurt the user and their neighbours, and phone bans, school mindfulness and pen-versus-laptop all have mixed evidence.

5.2.1 Focus in the Modern Workplace: Meetings, Messages and Multitasking

You open your inbox for a quick look, and one message **links to a document**. The document reminds you of a chat thread. Soon you are somewhere else entirely.

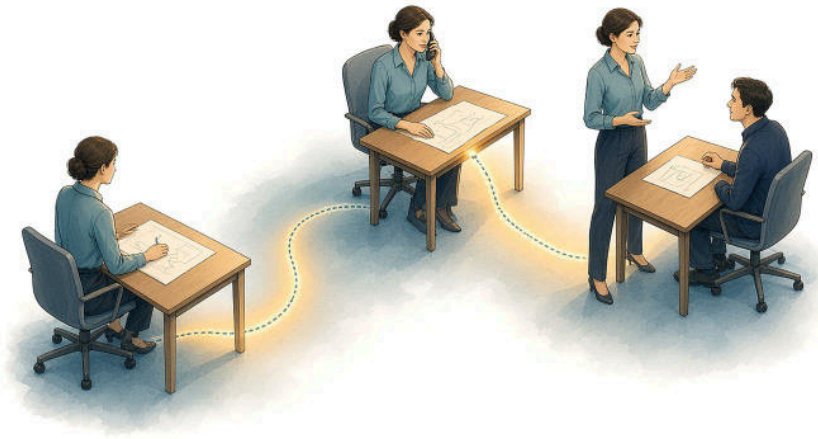
Detours like this are **how modern work tends to go**, and the research on it is surprisingly detailed.

A quick look at the inbox



Fragmented Work

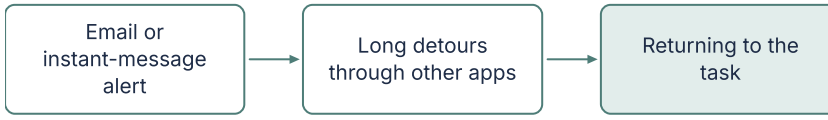
Office work comes **in short, broken pieces**, and a task resumed the same day can wait close to half an hour first (Mark et al., 2005; see 1.2.3).



The long way back. Every detour adds distance to the return trip.

Alerts cause detours of their own. After email or instant-message alerts, workers often **took long detours through other apps** before returning (Iqbal & Horvitz, 2007). Each alert is a knock, and the doorkeeper turns to look.

An alert



Each alert can mean a long detour.

Thoughts about an unfinished task **stay with you after you switch**. That leftover pull is attention residue (see 3.1.2), and it drags down the next task (Leroy, 2009).

Email and Messaging

Email is **both a real source of overload and a symbol of it** (Barley et al., 2011). Mobile email gives professionals a feeling of freedom. It pulls them into being always available at the same time.



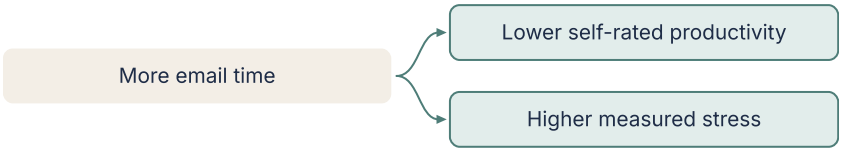
Mobile email gives both at once.

> **Key Concept:**
>
> Autonomy paradox. The pattern where mobile email **feels like freedom but ties people to constant availability** (Mazmanian et al., 2013).

The studies on checking less **seem to disagree**. One was a field experiment, run in people's real lives (Kushlev & Dunn, 2015). Checking email less often **lowered stress**.

A second study tracked email use with **computer logs and body sensors** (Mark, Iqbal, Czerwinski, Johns, Sano, & Lutchyn, 2016). More email time went with lower self-rated productivity and higher measured stress. Batching did not reliably reduce stress.

Email time and stress



From logs and sensors, not from a diary.

A notification experiment **helps make sense of the two results** (Fitz et al., 2019). Its 237 people had their phone notifications handled in different ways, assigned at random.

> **Science Says:**
>
> Batching notifications **can improve well-being** (Fitz et al., 2019). People who got no notifications at all reported more anxiety and more worry about missing out on what others are doing.

No notifications at all



The cost of a total cut-off.

A small study looked at a day without push notifications (Pielot & Rello, 2017). People were more productive, but some were more anxious. Early evidence suggests you should **batch predictably**, since a total cut-off may backfire.

People differ, and the content of the messages counts. In a small exploratory study, 32 workers used software to **block online**

distractions for a week (Mark et al., 2018). They rated their focus and productivity higher.

The biggest gains went to people who **felt less in control of their work**. That feeling was linked to lower conscientiousness and less perseverance (Mark et al., 2018).

A survey of 365 sales professionals and a diary study of 212 looked at email interruptions (Addas & Pinsonneault, 2018). **Irrelevant emails hurt performance** by adding to workload. Relevant ones helped, by keeping people more mindful of their work.

Irrelevant and relevant emails

	Irrelevant emails	Relevant emails
Effect on performance	Hurt	Helped
How	Adding to workload	Keeping people more mindful of their work

Content counts as well as number.

Personal skill helps. A meta-analysis found that time management is **moderately related to job performance**, and more strongly to well-being (Aeon et al., 2021).



Set times, steady habits. A few planned check-ins beat both a constant trickle and a total blackout.

Meetings, Open Offices and Work Where Lapses Hurt

Heavy meeting loads go with lower well-being (Rogelberg et al., 2006). The strength of the link depends on whether meetings are good and really needed.

Microsoft commissioned a **vendor survey of 31,000 workers** in 31 markets (Microsoft, 2023). It was the Work Trend Index 2023, run by Edelman Data x Intelligence. In it, 68% said they lacked enough uninterrupted focus time in the workday.

People ranked **badly run meetings** as the number-one thing hurting their productivity. Microsoft's own app data looked at the average employee's Microsoft 365 time. Of that time, 57% went to communicating in meetings, email and chat.

Both figures are **vendor figures** from a company that sells workplace software, and neither has been peer-reviewed.

Microsoft survey and app data



Vendor data, not peer-reviewed.

A Microsoft study that recorded brain waves with EEG (see 1.1.1) during back-to-back video meetings is **an example only** (Microsoft WorkLab, 2021). It had 14 people and was not peer-reviewed.

Office layout plays its own part. Open-plan moves at two company headquarters **cut face-to-face talk by about 70%** and pushed people onto email and chat (Bernstein & Turban, 2018; see 3.3.2).

> **Science Says:**
>
> A review of five studies with 13,277 people linked open-plan offices to **more sick-leave days** (Mauss et al., 2022). The odds of sick leave were about a quarter higher.

By contrast, one software team given **protected quiet time** got more done, in a single-site study (Perlow, 1999; see 3.1.2).

Office layout

	Open-plan	Protected quiet time
Result	Less face-to-face talk	Got more done
Evidence	Two headquarters; a review of five studies	A single-site study

Office layout plays its part.

In some jobs, divided attention is **a safety matter**. In a joystick task standing in for driving, phone talk cost attention whether the phone was handheld or hands-free (Strayer & Johnston, 2001; see 1.2.2). The doorkeeper is busy with the call, so the signal gets missed.

Phone talk in a driving task



Hands-free costs attention too.

> **Exercise:**
>
> A one-week focus reset at work.
>
> 1. **Batch email and notifications** at set, predictable times.
> 2. Agree team quiet hours.
> 3. Write down where you stopped before switching tasks.
> 4. Cut or shorten low-value meetings.
> 5. Keep phone calls out of driving and any work where a lapse can hurt someone.

Table 5.3 marks how much **weight each finding can bear**. Moderate means a randomised experiment in real life. Weak means a single field

study, a correlation, a vendor survey or small lab work. A grade drops when attention was only self-rated or samples were modest.

Table 5.3: What competes for attention at work

Competing Demand	Effect on Attention	What to Do	Evidence
Alerts	Long detours before going back to the task	Turn off alerts you don't need, and batch the rest	Weak, from one field study (Iqbal & Horvitz, 2007)
Email	More email time linked to lower self-rated productivity and higher stress	Check email less often, at set times (Kushlev & Dunn, 2015)	Moderate, from one field experiment (Kushlev & Dunn, 2015), though a logging study found batching did not reliably reduce stress (Mark, Iqbal, Czerwinski, Johns, Sano, & Lutchyn, 2016) and notification batching was tested on well-being (Fitz et al., 2019)
Meetings	Heavy load linked to lower well-being	Fewer, better meetings	Weak, from a correlational study (Rogelberg et al., 2006) and a vendor survey (Microsoft, 2023)
Open-plan noise and visibility	Less face-to-face talk, more messaging, more sick leave	Quiet zones and protected time	Weak, from field studies (Bernstein & Turban, 2018; Perlow, 1999, single site) and a small review (Mauss et al., 2022)
Task switching	Leftover thoughts lower performance on the next task	Finish or "park" a task before switching	Weak, from several lab experiments with modest samples and little direct repetition (Leroy, 2009)

Key idea:

Modern work is chopped up by pings, and each one costs more time than it takes. Early evidence suggests that checking messages at a few predictable times may work better than either constant checking or cutting yourself off completely.

5.2.2 Attentive Leadership and Decision-Making

Herbert Simon's warning that information **uses up attention** (Simon, 1971; see 1.2.1) reads today like a job description for leaders.

Every report, dashboard and message draws on **the same limited attention**. A flood of information therefore leaves less attention for each item (Simon, 1971). Attention has to be shared out on purpose. Each item knocks, and the doorkeeper can't let them all in.

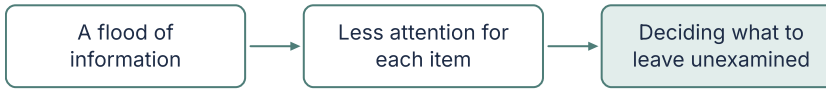


Too many knocks. Reports and messages queue up for one small supply.

> **Key Concept:**
>
> Attention-based view. The idea that **what a company does depends on where its leaders point their attention** (Ocasio, 1997).

A leader's job is partly **deciding what to leave unexamined**. That is the doorkeeper's choice, made on purpose.

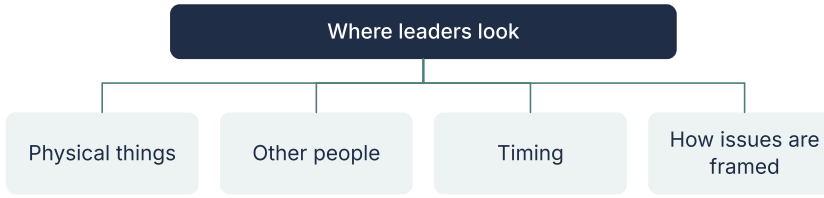
Sharing out attention



The leader's part of the job.

A review of 173 articles on this view proposed the idea of **situated attention** (Brielmaier & Friesl, 2022). Where leaders look is shaped by physical things, by other people, by timing and by how issues are framed. For a leader, **the room, the people and the calendar** all steer what gets noticed.

Situated attention



Framing and timing count as well.

Picture skilled driving. You see brake lights ahead, understand that traffic is stopping and **predict that the driver behind you will need room**.

> **Key Concept:**
> Situation awareness. Perceiving what is happening, understanding what it means and **projecting what comes next** (Endsley, 1995).

Leaders can use **the same three steps** when the situation keeps changing.



Perceive, understand, project. A good driver reads the road three moves deep.

> **Science Says:**
>
> Pooling 243 studies, a meta-analysis compared two tests that **check what a person really knows** about what is going on around them, instead of asking how aware they feel (Endsley, 2019). Both predicted performance equally well. One picked up differences more often, in 94% of studies against 64%.

Think of two smoke alarms. **Both ring for a real fire**, but one notices faint smoke far more often. Situation awareness can be measured, and measured well.

Studies where each test picked up differences



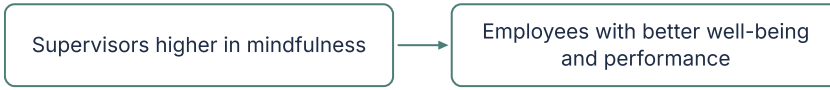
Both predicted well; one notices more.

Mindful Leadership: What We Know

A major review places attention **at the centre of how mindfulness might affect work** (Good et al., 2016). Daniel Goleman's framework covers inner, other and outer focus (Goleman, 2013).

Two studies paired supervisors with their own employees (Reb et al., 2014). Supervisors higher in mindfulness **had employees with better well-being and performance**. Findings like these show that two things went together, and they cannot show cause.

Mindful supervisors



Linked in two studies; cause not shown.

> **Key Concept:**
>
> Sunk-cost bias. Letting **past costs that can't be recovered** drive a current decision, such as funding a failing project because so much is already spent.

> **Science Says:**
>
> Across four studies, one correlational and three experiments, a brief mindfulness exercise **reduced the sunk-cost bias** (Hafenbrack et al., 2014). Two of the experiments were run in the lab.

An online programme raised well-being and emotional intelligence, **the skill of noticing and handling emotions** (Nadler et al., 2020). It was a small trial, with a waiting-list group for comparison and no attention measure.

A short, light programme for leaders raised **authentic leadership as rated by their followers**, meaning leadership seen as genuine and open (Nübold et al., 2020).

Two leader programmes



Small trials, with no attention measure.

> **Science Says:**
>
> Across 56 workplace trials, mindfulness programmes **reduced stress and burnout** and improved well-being (Vonderlin et al., 2020). Evidence on productivity was limited.

In a trial outside leadership, mindfulness training improved **self-reported attentional control** (Chin et al., 2021). It did not improve performance on an attention task.

A systematic review of 19 studies on managers found **some encouraging signs** for leaders' own well-being and skills (Donaldson-Feilder et al., 2018). Study quality varied a great deal. There was no evidence of benefits for the people they managed.

Reviews of leader mindfulness

19 studies on managers	52 articles
some encouraging signs	less stress and better self-regulation

Solid tests are still lacking.

A later review of 52 articles linked mindfulness training for leaders to **less stress and better self-regulation** (Tenschert et al., 2024). It found that solid tests of whether the training works are still lacking.

None of these studies measured leaders' attention. **No study yet shows** that mindfulness improves leaders' attention or decisions.

Mindfulness for leaders

Shown	Not yet shown
⊕ Less stress and burnout	⊖ Better leaders' attention
⊕ Better well-being	⊖ Better decisions

What the trials did and did not measure.

> Exercise:
>
> Four habits for an attentive leader.
>
> 1. **Protect the team's focus time** (Perlow, 1999; see 3.1.2).
> 2. Define clearly what deserves attention (Ocasio, 1997).
> 3. Run short check-ins on perceive, understand and project (Endsley, 1995).
> 4. Reduce meeting load (Rogelberg et al., 2006).

Hungry judges are often cited as proof of decision fatigue, the idea that a long run of decisions leaves people mentally drained (Glöckner, 2016).

> Science Says:
>
> One study looked at decisions on whether to release prisoners early, made within court sessions (Danziger et al., 2011). The share of releases **fell from about 65% to near zero**, then reset after food breaks.

The order of cases and other factors **may explain much of the drop** (Weinshall-Margel & Shapard, 2011). Computer simulations suggest the pattern can arise without any tiredness at all (Glöckner, 2016).

Design **good decision processes and schedules**, and don't rely on a "decision fatigue" story.

Hungry judges

	Decision fatigue story	Other factors
What the drop shows	Tired, hungry judges	The order of cases and other factors

Rely on good processes.

Table 5.4: Situation awareness for leaders

Endsley's Level	Leadership Question	Practice
1. Perceive	What is happening right now?	Check the few signals that count most
2. Understand	What does it mean for our goals?	Discuss what the data mean for the team

Endsley's Level	Leadership Question	Practice
3. Project	What is likely to happen next?	Ask "If this continues, then what?" and plan for it

The three levels come from Endsley (1995), and **the leadership questions and practices are the author's own adaptation**, untested in leadership research.

Key idea:

A flood of information leaves less attention for each item, so good leaders choose what to look at and protect their team's focus. Mindfulness at work helps stress and well-being, but no study has yet shown it sharpens leaders' attention.

5.3 Attention in Relationships

5.3.1 Listening and Being Present with Others

A FRIEND KEEPS GLANCING AT their phone while you talk. They may hear every word, and **you still feel unheard**. Your friend's doorkeeper keeps turning toward the phone. Attention is **something other people notice**, and something they feel.

What High-Quality Listening Is

> 🔑 Key Concept:
>
> High-quality listening. Listening with **attention, understanding and no judgement**, while showing the speaker you are following.

Listening isn't passive. The listener **signals through questions and reflections** that they are following the speaker's thoughts.

High-quality listening



Attention



Understanding



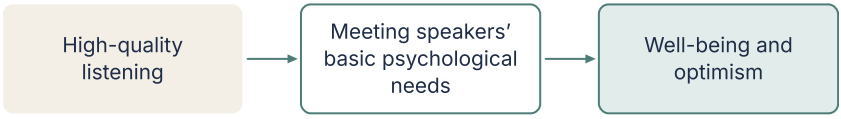
No judgement

Shown to the speaker.

> **Science Says:**
>
> A review of research on listening at work found that **attentive, non-judgemental listening benefits both speakers and relationships** (Kluger & Itzchakov, 2022). In experiments, speakers who were listened to well became less defensive and more reflective (Itzchakov et al., 2017).

Newer work tested listening **during disagreements** (Saluk et al., 2026). Across five studies with 1,624 people, three of them preregistered, high-quality listening raised speakers' well-being and optimism in the moment. It worked even when the two sides disagreed, and it seemed to work by **meeting speakers' basic psychological needs**.

Listening in disagreements



It worked even across a disagreement.

A registered report is a study whose plan is **reviewed before any data come in**. One such study trained listeners in a school-wide project, where pairs talked about their character strengths (Moin et al., 2024). Trained listening raised the shared positive feeling between the pair. It did not change how authentic or anxious people felt.

The same idea reaches into the workplace, **as we saw with mindful supervisors in 5.2.2**.



The listener's half of the talk. Nods and paraphrases tell the speaker the message landed.

Phones and Presence

For time together, the clearest evidence about phones concerns **actually using one**.

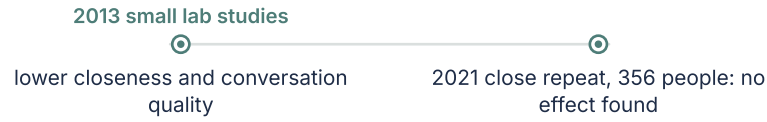
> Science Says:
>
> In a field experiment, some friends had their phones out during a meal (Dwyer et al., 2018). They **enjoyed it less and felt more distracted**.

An observational study looked at **pairs of people in conversation** (Misra et al., 2016). Conversations held with a mobile device present were rated as lower in quality.

A phone just lying on the table is **a harder case**. Small lab studies linked its mere presence, the phone simply being in sight, to lower closeness and conversation quality (Przybylski & Weinstein, 2013).

A close repeat of those studies, with 356 people in 136 groups, failed to find the effect (Linares & Sellier, 2021). A failed repeat leaves the effect possible but unproven. Treat the mere-presence effect on relationships as **uncertain**.

The phone on the table



One repeat failed, so treat it as uncertain.

Whether a phone in sight **drains your own thinking** is a separate question, and a disputed one (Ward et al., 2017; see 3.3.1).



Phones and time together, ranked by certainty. Scrolling at the table has the firmest evidence, and a phone merely lying there remains an open case.

> **Key Concept:**
> Phubbing. Snubbing someone **by turning to your phone** in their company.

In couples, phubbing went with **lower relationship satisfaction** (Roberts & David, 2016). That survey can't tell us which causes which.

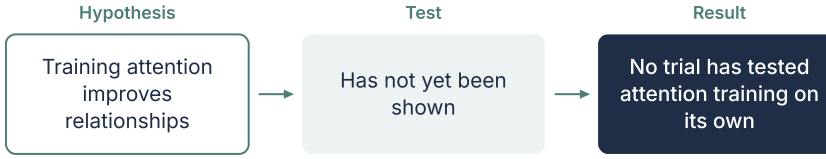
Does Training Attention Improve Relationships?

A review concluded that claims about mindfulness **improving romantic relationships** run ahead of the evidence (Karremans et al., 2017).

One couples trial of a mindfulness programme reported **better relationship satisfaction** for couples who were not in distress (Carson et al., 2004). It is a single small study.

No trial has tested attention training on its own with relationship outcomes, so its benefit **has not yet been shown**. Offer listening skills as good practice for conversations. They are no proven way to repair a relationship.

Training attention for relationships



Listening skills remain good practice.

A review of listening research described **signals of good and poor listening** (Kluger & Itzchakov, 2022). The steps below draw on those signals.

Exercise:

Five listening steps for your next real conversation.

1. Give the speaker **your full attention**, and put your phone away.
2. Let them finish. Short signals like a nod or "mm-hm" show you're following without interrupting. A brief pause after they stop helps.
3. Reflect back what you heard, by paraphrasing or naming the feeling.
4. Ask open questions before adding your view, and hold back advice nobody asked for. Steps 3 and 4 follow the active listening that Rogers and Farson (1957) described.
5. Notice when you're preparing your reply instead of listening. Your doorkeeper has turned to your own thoughts. Come back to what they are saying.

Step 5 is a practice suggestion that goes beyond the review's signals.

Key idea:

People can feel whether you are really listening, and attentive, non-judgemental listening helps them think more openly. Using a phone during time together appears to lower its quality, and whether training attention improves relationships hasn't been tested yet.

5.3.2 Shared Attention in Families and Teams

A PARENT AND TODDLER CROUCH together, watching a ladybird crawl across a leaf. The toddler **stays with it far longer** than when alone.

Where shared focus shows up



Parent and toddler



Families



Teams

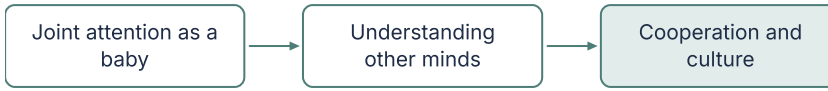
Attention is **partly social**. What one person looks at pulls in the people beside them, from the nursery to the meeting room.

Joint Attention: Where Shared Focus Begins

> **Key Concept:**
> Joint attention. Two people **coordinating their attention on the same thing**, each aware that they share it (Mundy & Newell, 2007; Tomasello et al., 2005).

Practice with joint attention as a baby is thought to **help children understand other minds** (Mundy & Newell, 2007). Shared attention and intentions are seen as a base for human cooperation and culture (Tomasello et al., 2005).

Joint attention as a base



Practice as a baby, then cooperation later.

A meta-analysis of 71 reports linked joint attention to **language** in children, both in typical development and in autism (Bottema-Beutel, 2016). The link was stronger in autism, and stronger for responding to another person's lead.

> **Science Says:**
> One-year-olds **kept their attention on a toy longer** when a parent attended to it at the same moment (Yu & Smith, 2016).



Two pairs of eyes, one ladybird. Shared looking stretches a small child's focus.

Adults feel the pull in their own way. Attending to something with others makes its mental and emotional effect **stronger** (Shteynberg, 2015).

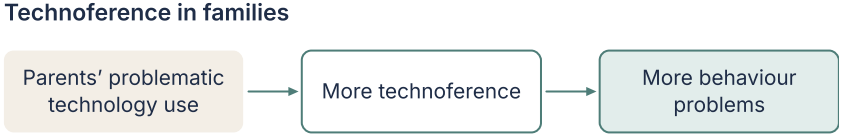
> **Key Concept:**
> We-mode. Holding a shared task in mind **as a group**, from the point of view of "we" (Gallotti & Frith, 2013).

Technoference in Families

Picture the reverse. A child tugs a parent's sleeve again and again while the parent scrolls. **The parent's doorkeeper is busy with the screen.**

> **Key Concept:**
> Technoference. **Technology interrupting time together**, such as a phone breaking into a meal or a conversation.

> **Science Says:**
> In a study of 170 families, parents' problematic technology use, a measure of how much their device habits cause trouble, went with more technoference (McDaniel & Radesky, 2018). More technoference went with **more behaviour problems** in the children. Which causes which is unclear.



Associations in 170 families.

In a small observational study, 55 caregivers were watched at restaurant meals (Radesky et al., 2014). When adults were absorbed in phones, some children **made bigger and bigger bids for attention**. Each bid was another knock for a busy doorkeeper.

A scoping review, one that maps what a field has studied, gathered 64 studies of parental technoference (Komanchuk et al., 2023). It set out **which outcomes, definitions and study designs** researchers have used so far.

A useful tool is the American Academy of Pediatrics' family media plan (American Academy of Pediatrics, n.d.; Moreno et al., 2024). It helps families **set device-free times and zones**. The plan gives rules, with no tested effects on attention.

A family media plan



Device-free times



Device-free zones



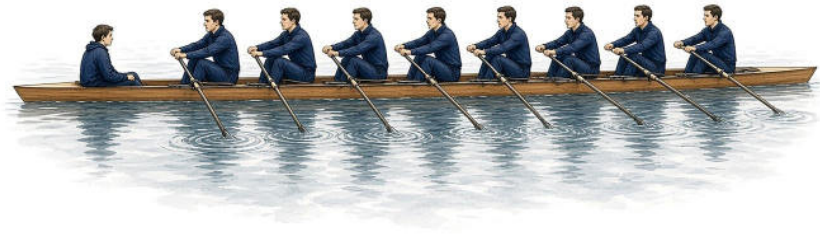
A plan for the family

Rules for families, not tested on attention.

Mindfulness programmes for parents brought **slightly less parenting stress** and small gains for children (Burgdorf et al., 2019). Most studies had no control group, and the risk of bias was serious.

Shared Attention in Teams

Shared focus counts beyond the family. Good teams **watch each other's work** and share a common picture of the task (Salas et al., 2005).



One stroke rhythm. A rowing crew pulling as one is a team version of joint attention.

In acute hospital care, a review applied situation awareness (see 5.2.2) to **the whole team** (Weller et al., 2024). Members perceive, understand and predict together, keeping one shared picture of the patient's situation.

Good teams



Shared focus beyond the family.

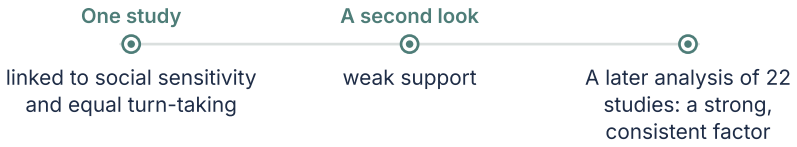
> **Key Concept:**
>
> Collective intelligence. A group's **general ability to do well** across many kinds of tasks.

One study linked collective intelligence to members' social sensitivity, **how well they read each other**, and to equal turn-taking (Woolley et al., 2010). A second look at the data found weak support for a single collective-intelligence factor (Credé & Howardson, 2017).

> **Science Says:**
>
> A later analysis of 22 studies, with 5,279 people in 1,356 groups, **found a strong, consistent collective-intelligence factor** (Riedl et al., 2021). Social perceptiveness and the share of women in the group predicted it.

The debate is **still open**. Equal turn-taking costs little, so it is a sensible habit while the evidence settles.

Collective intelligence



In the later analysis, social perceptiveness counted.

In field studies, team mindfulness **weakened the slide** from task disagreements into personal conflict (Yu & Zellmer-Bruhn, 2018). These findings show links only. No training trial was run.

Attention at school, at work and at home



Table 5.5 labels each practice by **how much the research can carry**. Weak means a single study, a correlation or an observation, or a finding

still in dispute. Not rated means a tool or framework with no data on attention.

Table 5.5: Shared-attention practices

Setting	Shared-Attention Practice	Source	Evidence Note
Family	Join a young child's focus on an object	Yu & Smith (2016)	Weak, from a single study in which infants looked longer during shared attention
Family	Set device-free times and zones with a family media plan	American Academy of Pediatrics (n.d.); Moreno et al. (2024)	Not rated, a family tool with no attention data
Family	Cut phone use around children	McDaniel & Radesky (2018); Radesky et al. (2014)	Weak, from correlational and observational studies
Family	Mindfulness programmes for parents	Burgdorf et al. (2019)	Weak, from a meta-analysis of mostly uncontrolled studies, with only 6 randomised trials and serious risk of bias
Team	Watch each other's work and share the task picture	Salas et al. (2005); Weller et al. (2024)	Not rated, a framework and a narrative review
Team	Encourage equal turn-taking	Woolley et al. (2010); Credé & Howardson (2017); Riedl et al. (2021)	Weak, from correlational group studies whose main factor is disputed
Team	Build team mindfulness	Yu & Zellmer-Bruhn (2018)	Weak, from correlational field data

Key idea:

Attention is partly social. Shared focus helps children stay with things longer and helps teams coordinate. Parents' phone use is linked to children's behaviour, and team mindfulness to less conflict, but these are associations, and none proves that training attention fixes them.



Module

6

Overcoming Attention Challenges

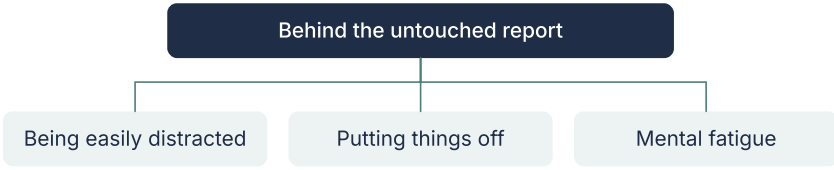
6.1 Common Attention Problems

6.1.1 Distractibility, Procrastination and Mental Fatigue

You sit down to write the report. Ten minutes later **the kitchen is spotless** and the report is untouched.

Most of us know the pattern. Three common attention problems can sit behind it. They are **being easily distracted, putting things off and mental fatigue**, and each has a different cause.

Three common attention problems



Each one has its own section below.

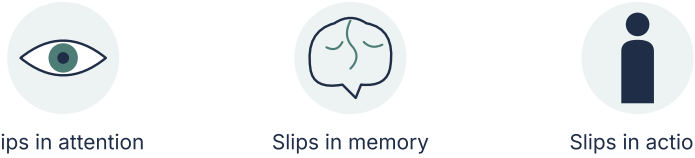
Chronic Distractibility and Everyday Lapses

We all walk into a room and forget why, or read a page and take nothing in. **Everyday slips like these can be measured.**

> **Key Concept:**
>
> Cognitive Failures Questionnaire. A questionnaire asking **how often you make small slips** in attention, memory and action (Broadbent et al., 1982).

A person's score **stays fairly steady** over long periods (Broadbent et al., 1982). It holds about as firmly as other measures of lasting traits, so it describes your usual tendency more than one bad week.

Small slips the questionnaire asks about



A score that stays fairly steady.

Distractibility may be one tendency with two sides. People more easily pulled off task by their surroundings **are more prone to mind-wandering** (Forster & Lavie, 2014; see 3.3.1). The link held for distractions unrelated to the task.

For such people **the doorkeeper hears knocks from both sides**, from the road outside and from the rooms within.



Noise outside, chatter inside. Two sources of interruption meet at one door.

Procrastination

The second problem is the one in the kitchen. Procrastination usually **comes from how a task feels**.

> **Science Says:**
> A large meta-analysis (see 1.3.2) looked at what goes with procrastination (Steel, 2007). The strongest and most consistent links were **how unpleasant the task feels**, how far away its rewards and deadlines are, low confidence in your ability, distractibility and impulsiveness, meaning acting on the urge of the moment.

What goes with procrastination



The strongest links in a large meta-analysis.

One account puts feelings at the centre. **Putting a task off feels good now**, and the bill arrives later.

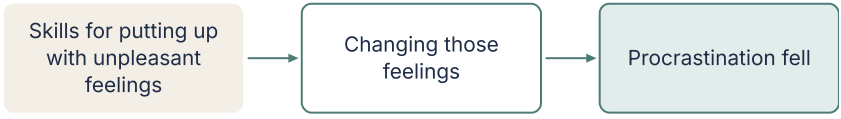
> **Key Concept:**
> Mood repair. Delaying a task **to ease a bad feeling now**, while your future self pays the cost (Sirois & Pychyl, 2013).

Seen that way, **the spotless kitchen** is effort spent on feeling better at the report's expense. The cleaning was real work, aimed at the wrong target.

> **Science Says:**
>
> Three studies looked at skills for **putting up with unpleasant feelings and changing them** (Eckert et al., 2016). Two were surveys, one taken once and one repeated over time. The third, a randomised trial, taught people the skills, and procrastination fell in the trained group.

If the feeling drives the delay, **working on the feeling** is a sensible place to begin. Section 6.1.2 turns to the planning tools that help next.

Working on the feeling



Three studies, one a randomised trial.

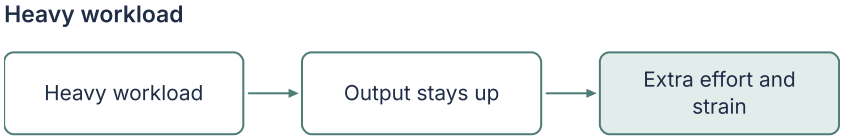


Relief today, cost tomorrow. Avoidance pays out first and charges later.

Mental Fatigue

The third problem **builds up over time**. After hours on a spreadsheet, the small itch to check the news grows louder, and each knock gets harder for the doorkeeper to ignore.

People under heavy workload often **keep their output up** for a while (Hockey, 1997). They pay for it in extra effort and strain, so steady results can hide a rising cost.



The cost is strain.

Long effort weakens goal-directed attention, the focus you steer by choice. In a three-hour task, people became **more easily pulled by whatever was around** them (Boksem et al., 2005; see 4.2.2).

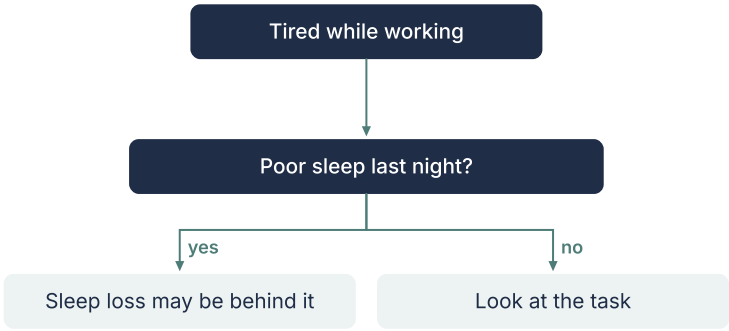
Section 4.2.2 described fatigue as **a running check of effort against reward** (Boksem & Tops, 2008; Kurzban et al., 2013). When the task starts to seem worth less, everything else starts to look more tempting.

The popular idea that willpower simply runs out **has not held up** in a large test across many labs (Hagger et al., 2016; see 4.2.2).

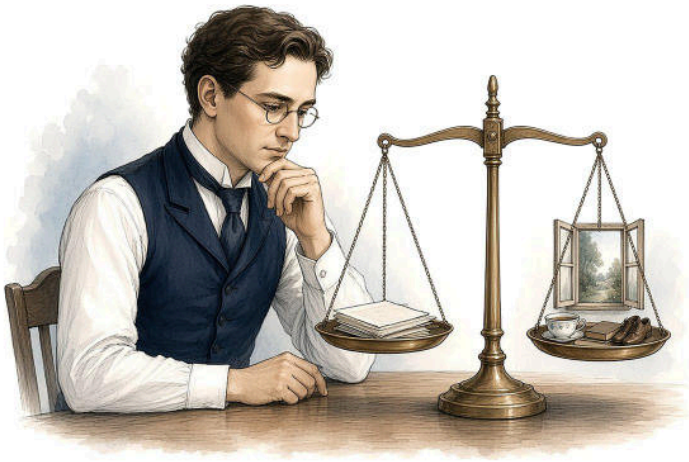
> **Science Says:**
>
> Pooling 19 studies with 1,932 people, a meta-analysis found that sleep loss **strongly impairs functioning**, with mood hit hardest (Pilcher & Huffcutt, 1996). Partial loss, sleeping less than you need, did more harm than total loss. Section 1.3.2 covers sleep and attention.

Tiredness from poor sleep and tiredness from a long task **feel alike** from the inside. Checking last night's sleep is a quick first step before you blame the task.

Which tiredness is it?



Tiredness first.



The value check. As the job loses appeal, the other options gain it.

Telling the Problems Apart

The four signs below are **this book's summary** of the research above. They point you toward a likely problem, and they cannot diagnose anything.

Which problem is it?



Frequent small slips: distractibility



Avoiding an unpleasant task: procrastination



The task seems worth less: mental fatigue

Exercise:

Which problem is it?

1. Notice **frequent small slips**, with outside noise and your own thoughts both pulling you away. That points to distractibility.
2. Notice whether you avoid one task, especially an unpleasant one, and feel relief doing something else. That points to procrastination.
3. Notice whether, after long effort, the task feels harder and other things feel more tempting. That points to mental fatigue.
4. Notice whether your accuracy slips as a dull, repetitive task goes on. That points to lapses during long tasks.

5. If problems last and affect daily life, **see a doctor or psychologist**.

Key idea:

Distractibility is a general pull from the world and from your own thoughts, procrastination mostly dodges a bad feeling now, and mental fatigue signals that the task has started to seem worth less than the alternatives.

6.1.2 Strategies for Regaining Focus

Focus has slipped, and the report still needs finishing. **Feeling refreshed and getting more done** turn out to be two separate results, and the research on getting focus back keeps them apart.

Structured Breaks

Micro-breaks, pauses up to 10 minutes long, **lift how you feel** (Albulescu et al., 2022; see 3.3.3). The pooled data covered 22 samples and 2,335 people. Vigour, meaning feeling energetic, rose a little (d = 0.36), and fatigue fell a little (d = 0.35).

Effects that size are **easy to feel and modest in size**. Picture two queues of workers, one that took micro-breaks and one that did not. At d = 0.35, about 64 in 100 break-takers would feel fresher than the typical worker in the other queue, against 50 by chance alone.



Output is **a different story**. Performance overall did not clearly improve (d = 0.16), except on less demanding tasks. At that size, only about 56 in 100 break-takers would beat the typical non-taker. Longer breaks gave a bigger lift to performance.



Refreshed, and only slightly quicker. Mood gains outpaced output gains.

Timing and content matter. In a study that tracked workers' breaks day by day, breaks taken earlier in the day and filled with activities people preferred **restored more** (Hunter & Wu, 2016).

Breaks that restored more



Tracked day by day at work.

Key Concept:

Recovery experiences. Four ways of recharging after work. They are switching off mentally, relaxing, learning something new and **choosing for yourself** (Sonnentag & Fritz, 2007).

Each of the four is **moderately linked to well-being** (Sonnentag & Fritz, 2007). Any of them can fill an evening or a weekend.

Four recovery experiences



Any of the four can fill an evening.

Science Says:

A review of 14 studies of short nature exposures, from 10 to 90 minutes, found that **12 restored directed attention** in students and young people (Mason et al., 2022). Directed attention is the deliberate focus that tires with long use.

For long watching tasks, **a brief change of task** can help. Turning away now and then to recall a few digits kept watchfulness from sliding in one lab study (Ariga & Lleras, 2011; see 3.3.3).

The Pomodoro technique (see 3.3.3) has **two small student trials** behind it. In one, scheduled breaks beat self-chosen ones on how students felt. They felt less tired and distracted, and more focused and motivated (Biwer et al., 2023). Both groups completed a similar amount of work.

In the other trial, **fatigue climbed faster** under Pomodoro (Smits et al., 2025). A timer can lift how a session feels, and it does not guarantee more work.

Two Pomodoro trials

	One trial	The other trial
How students felt	Less tired and distracted	Fatigue climbed faster
Work done	A similar amount in both groups	Not more

A timer helps how it feels.

Planning and Restarting

Getting back into a task is **its own step**. Before you stop, write the very next action on a sticky note (see 3.3.3), so the restart takes seconds instead of a search.

An if-then plan (see 3.1.1) **links a situation to an action**, as in "If I finish lunch, then I will open the report" (Gollwitzer, 1999). Such plans helped people reach goals across many studies, goals threatened by distraction among them (Gollwitzer & Sheeran, 2006).

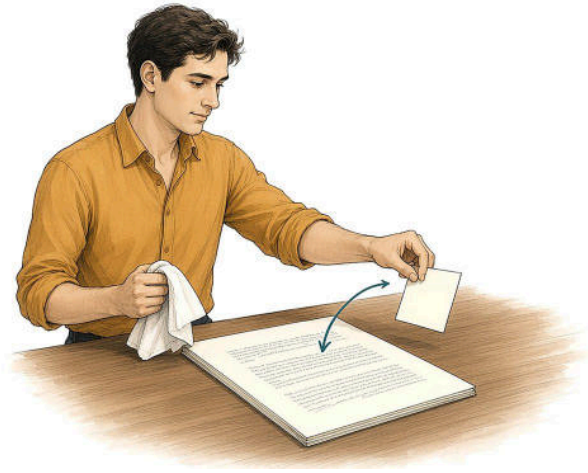
An if-then plan



The answer is settled before the knock.

The plan **settles the doorkeeper's answer** to a knock before the knock arrives.

> **Exercise:**
>
> A restart plan.
>
> 1. Before you stop, write **the very next action** on a note.
> 2. Name the interruption most likely to pull you away, such as a message alert.
> 3. Write an if-then plan for it, such as "If my phone buzzes, then I will leave it until my break."
> 4. Put the note where you will see it when you sit back down.



A note and a rule. Two small tools for coming back.

An unfinished goal can keep **nagging in the background**. Making a specific plan for it quietened unwanted thoughts about it in small lab studies (Masicampo & Baumeister, 2011; see 3.3.3). The goal stops knocking at the doorkeeper's door so often.

Planning for an unfinished goal



The goal knocks less often.

For procrastination itself, treatments have **moderate effects overall** (van Eerde & Klingsieck, 2018). Cognitive-behavioural approaches (see 1.3.4), which work on how you think and act, did best, in line with the emotion-training result in 6.1.1.

Mental Training, Lifestyle and Stress

The practices in Modules 3 and 4 are **the place to start**. Commercial brain games mostly train the game, with smaller gains on related tasks and little sign of better everyday thinking (Simons et al., 2016; see 1.3.2).

> **Key Concept:**
> Transfer. When practice on one task **improves a different task**. Near transfer reaches similar tasks, and far transfer reaches very different ones.

Near and far transfer

	Near transfer	Far transfer
Reaches	Similar tasks	Very different ones
Working-memory training	Short-lived, narrow gains	Did not appear

Learning stays with the trained task.

Working-memory training gives **short-lived, narrow gains** (Melby-Lervåg & Hulme, 2013; Melby-Lervåg et al., 2016). Far transfer, to intelligence or other distant skills, did not appear. Learning tends to stay with what was trained (Green & Bavelier, 2008; see 1.3.2).



Practise the game, master the game. Everyday focus needs its own practice.

> **Science Says:**
> In 2016, Lumosity agreed to pay **$2 million** to settle US Federal Trade Commission charges (Federal Trade Commission, 2016). The charges said its claims about better work and school performance were not backed by evidence.

Microsoft's brain-wave study of breaks between meetings, which we met in 5.2.1, **was run by the company itself** (Microsoft WorkLab, 2021). It suggested the breaks stop stress building up. With 14 people and no peer review (see 3.1.1), it can only illustrate the idea.

Lumosity and the Federal Trade Commission

2$ million

Agreed in 2016 to settle US Federal Trade Commission charges

Claims not backed by evidence.

Daily habits **shape attention**. Sleep loss strongly impairs functioning (Pilcher & Huffcutt, 1996; see 6.1.1). In a pooled analysis of each person's raw data across studies, a single bout of aerobic exercise improved thinking in general, most of all for people who started lower (Ishihara et al., 2021). Module 8 covers sleep, movement and food, and 4.2.2 covers stress.

Put together, the evidence points to **a handful of habits**.

- Take longer breaks when you can, and earlier in the day.
- Write the next action down before you stop.
- Make an if-then plan for your most likely interruption.
- Practise the skill you want to improve, and skip brain games.

Table 6.1 pairs each problem with a strategy and **grades the support** behind it.

Table 6.1: Common problems and strategies

Problem	Strategy	How to Apply	Evidence Strength
Distractibility	Cut outside pulls and notice inner ones	Clear your space and bring attention back when it drifts (see 3.3)	Weak, from one study linking two kinds of distraction, with the strategy itself untested (Forster & Lavie, 2014)
Procrastination	Structured help, especially cognitive-behavioural	Name the feeling, set an if-then plan and break the task down	Strong, from a meta-analysis (van Eerde & Klingsieck, 2018)
Mental fatigue	Breaks, especially longer ones you enjoy	Step away earlier in the day and choose a break you like	Strong for well-being and weak for performance (Albulescu et al., 2022), with timing from one day-by-day study of workers (Hunter & Wu, 2016)
Lapses during long tasks	Brief, occasional switches away from the task	In long, dull watching or checking work, switch briefly to a different small task now and then	Weak, from one lab study (Ariga & Lleras, 2011)

Key idea:

Breaks make you feel better without reliably making you faster, and the best restarts come from a written next step and a simple if-then plan. Brain games train the game, so practise the real skill you want.

6.2 Attention Across the Lifespan

6.2.1 How Attention Develops and Changes with Age

Attention **gets both better and worse** across a lifetime. Which way it moves depends on the part of attention and the stage of life.

Childhood and Adolescence

The three attention networks you met in 1.3.2, alerting, orienting and executive control, **develop at different rates** through childhood (Rueda et al., 2004). In plain terms, they handle getting ready, aiming attention and settling conflicts between responses.

Prefrontal control networks (see 1.3.1), at the front of the brain, **keep maturing well into adolescence** (Casey et al., 2005). A teenager's skill at holding back an impulse is still under construction, and experience helps shape it.

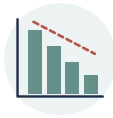


Three networks, three timetables. Readiness, aim and conflict control mature on separate schedules.

> **Science Says:**
>
> Brain-wave recordings (see 1.1.1) compared selective attention in four age groups, from 9-year-olds to adults of 63 to 74 (Müller et al., 2008). The brain's attention markers differed in **strength, timing and where on the scalp** they appeared. The sample was small.

Selective attention (see 1.2.2) **keeps changing shape** across the whole lifespan, and those recordings show the change at the level of the brain.

Attention markers differed in



Strength



Timing



Where on the scalp

Four age groups, a small sample.

Large projects now **follow young brains as they grow**. The ABCD study built a battery of thinking tests for tracking adolescents over many years, and it reported early data on 2,299 young people (Luciana et al., 2018).

Attention **can be shaped early**, as Module 5 showed. Attention training in 4- and 6-year-olds improved executive attention in small studies (Rueda et al., 2005; see 5.1.2). Infants kept looking at a toy for longer while a parent was looking at that same toy (Yu & Smith, 2016; see 5.3.2).

Posner and Rothbart wrote **a book on these networks** in children (Posner & Rothbart, 2007a). It sets out how they develop and can be trained.

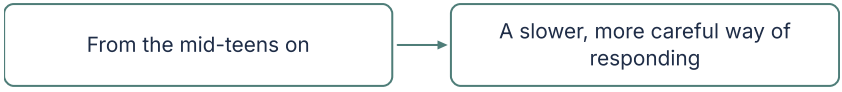
Adulthood: Peaks and Slowing

Adulthood is **no long plateau** either. Different thinking abilities peak at very different ages (Hartshorne & Germine, 2015), some in the teens and others decades later.

> **Science Says:**
> In a study of 10,430 people, the ability to **sustain attention peaked in the early 40s** and then declined gradually (Fortenbaugh et al., 2015).

Sustained attention means **staying with one task** across a long stretch (see 1.2.2). The same study found that from the mid-teens on, people chose a slower, more careful way of responding with age (Fortenbaugh et al., 2015). Part of the slowing is a choice of style.

A choice of style



A careful style, chosen with age.



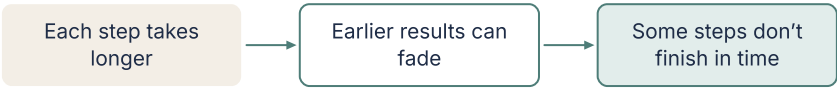
A long climb and a gentle slope. Watchfulness tops out in midlife.

> **Key Concept:**
> General slowing. The idea that **mental processing slows across the board** with age (Salthouse, 1996).

General slowing accounts for **much of the age-related drop** in fluid thinking (Salthouse, 1996). Fluid thinking is on-the-spot reasoning with new problems, and it includes working memory (see 1.2.3).

When each step takes longer, **some steps don't finish in time**. Earlier results can fade before later steps need them, so a slow start costs more than time.

How slowing costs more than time



Behind much of the drop in fluid thinking.

Changes in Filtering, Dividing and Switching

Ageing changes **how well we filter out distractions**. A chatty radio may be harder to tune out while reading, because it keeps knocking at the doorkeeper's door.

One theory says ageing **weakens inhibition** (Hasher & Zacks, 1988), the ability to block out what doesn't matter (see 4.1.1).

> **Science Says:**
> In a small brain-imaging study, older adults **had trouble blocking out what didn't matter** (Gazzaley et al., 2005). Their boost for what did matter held up.

The doorkeeper still welcomes the chosen guest in later life. Keeping the others out takes more work.

Filtering in later life

	What did matter	What didn't matter
In older adults	The boost held up	Trouble blocking it out

The chosen guest still gets in.

Older minds may **wander less**, all the same. Older adults reported less mind-wandering than younger ones despite poorer inhibition, and eye tracking backed up their reports (Frank et al., 2015). Mood and motivation partly explained the gap.

A review that combined several meta-analyses (see 1.3.2) found that **general slowing explained** most age effects on selective attention (Verhaeghen & Cerella, 2002). Switching itself, the step from one task to the next, carried no extra age cost.

Specific age costs **did appear in two places** (Verhaeghen & Cerella, 2002). One was doing two tasks at once. The other was keeping two tasks ready during the same stretch of work.



Where age bites. Two jobs at once cost older adults the most.

Table 6.2 sums up the main change at each stage, with **the study behind each row**.

Table 6.2: Attention across the lifespan

Life Stage	Typical Attention Changes	Key Source
Childhood	Alerting, orienting and executive control develop at different rates	Rueda et al. (2004)
Adolescence	Prefrontal control networks are still maturing	Casey et al. (2005)
Early to middle adulthood	Sustained attention peaks in the early 40s	Fortenbaugh et al. (2015)
Later adulthood	Slower processing, harder filtering of distractions, specific costs for doing two tasks at once and for keeping two tasks ready, and a more cautious strategy	Salthouse (1996), Gazzaley et al. (2005), Verhaeghen & Cerella (2002), Fortenbaugh et al. (2015)

Key idea:

Attention control builds slowly through childhood and adolescence, peaks for sustained focus around the early 40s and then slows gradually. The clearest age costs come from doing two things at once and keeping two tasks ready, while older adults tend to respond more slowly and carefully.

6.2.2 Keeping Attention Sharp in Later Life

Older adults hear **many promises** about keeping the doorkeeper sharp. Some have solid support, and others deserve doubt.

Many later-life studies measured cognition, meaning **thinking skills in general**. Few measured attention on its own, so most results here speak to thinking as a whole.

Cognitive Training

Training mostly **improves what you train**, with little transfer (see 6.1.2) to daily life. The biggest trial shows the pattern.

> **Science Says:**
> The ACTIVE trial trained 2,832 older adults in memory, reasoning or processing speed (Ball et al., 2002). **The trained abilities improved.** Everyday function showed no effect at 2 years.

Gains in reasoning and speed **lasted 10 years** on the trained abilities, and trained groups reported less difficulty with daily activities (Rebok et al., 2014).



Practice pays off on the practised task. Daily life gained far less.

A later look at the same data linked speed training to **lower 10-year dementia risk** (Edwards et al., 2017). Dementia is a lasting decline in memory and thinking that disrupts daily life.

The Edwards result came from a secondary analysis, **a question the trial wasn't designed to answer**. It sat close to the line for ruling out chance, so it does not show that brain training prevents dementia.



The dementia link is not proof.

> **Science Says:**
>
> Across 52 randomised trials with 4,885 healthy older adults, computer-based training had **a small overall effect** on thinking (g = 0.22; Lampit et al., 2014). It showed no clear effect on executive functions or attention.

A g of 0.22 (see 3.2.1) is **a small step**. Picture a hall of trainees and a hall of non-trainees. About 59 in 100 trainees would score above the typical non-trainee, against 50 by chance.



A small step for brain training.

A small video-game study **looked promising** (Anguera et al., 2013). Large reviews have not found such spread to other skills (Simons et al., 2016; see 1.3.2).

Physical Activity

Regular aerobic activity, such as brisk walking, has **the most consistent support** of any lifestyle step. The benefits are smaller than often claimed.



A walk a day. Movement leads the lifestyle field, by a modest margin.

An early study of ageing and fitness linked aerobic fitness in older adults to **better executive control** (Kramer et al., 1999; see 1.3.2).

> **Science Says:**
>
> Across 18 trials, a meta-analysis found **the largest exercise gains in executive control** (Colcombe & Kramer, 2003).

For healthy people in general, a recent review found that the benefits **shrink to almost nothing** once publication bias (see 1.3.2) is accounted for (Ciria et al., 2023; see 8.2.1).

Exercise and thinking

Support	Doubt
⊕ Walking improved executive control ⊕ Largest gains in executive control	⊖ Benefits shrink to almost nothing once publication bias is accounted for

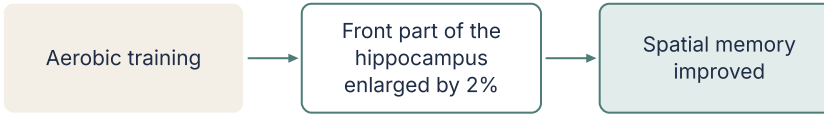
Smaller benefits than often claimed.

In adults over 50, sessions of **45 to 60 minutes** at moderate or higher intensity were linked to cognitive benefit (Northey et al., 2018).

> **Science Says:**
> In a randomised trial with 120 older adults, aerobic training **enlarged the front part of the hippocampus by 2%** (Erickson et al., 2011). The hippocampus is a memory structure (see 1.3.2). Spatial memory improved, and attention was not tested.

The hippocampus result shows **exercise can change the ageing brain**. Its payoff was in memory, which makes it a reason to move more and no proof of sharper attention.

Exercise and the hippocampus



A memory result, in older adults.

Social Engagement and Hearing

Hearing loss and social isolation are among **14 risk factors for dementia** that can be changed (Livingston et al., 2024).

> **Science Says:**
>
> In a large trial, treating hearing loss **did not slow overall decline** in thinking (Lin et al., 2023). A planned look at one subgroup within the trial hinted at benefit for people at higher risk.

Data from watching people **point the other way**. Among 2,040 older Americans followed over time, memory for events declined more slowly after people started using hearing aids (Maharani et al., 2018). The study was observational (see 3.2.1).

People who chose hearing aids **may differ in other ways**, such as health or income. The trial avoids that problem, so its null result carries more weight.

Hearing aids and thinking

	Large trial	Observational study
Result	Did not slow overall decline	Memory declined more slowly
Weight	More	Less

People who get hearing aids may differ.

Social activity, networks and support **go with overall thinking** and some executive functions, and the evidence shows no link to attention (Kelly et al., 2017). Most of it is observational.

Stay social **for its own rewards**. Company does not count as attention training.

Diet, Multidomain Programmes and Keeping Up Practice

> **Key Concept:**
> Multidomain programme. A programme that **combines several steps at once**, such as diet and exercise together.

> **Science Says:**
> A 2-year programme combined diet, exercise, cognitive training and health checks for older adults at risk of decline (Ngandu et al., 2015). **Thinking improved modestly.**

Diet alone has **a weaker record**. The MIND diet, built to protect the brain, did no better than a control diet for overall thinking over 3 years (Barnes et al., 2023).

A Mediterranean diet with extra olive oil, tested in older adults at high heart risk, brought **small gains** on some memory tests and on tests of attention and planning (Valls-Pedret et al., 2015). Those gains came from a secondary analysis with borderline results.

Two diets tested

	MIND diet	Mediterranean diet with extra olive oil
Result	No better than a control diet	Small gains on some tests
Note	Over 3 years	From a secondary analysis

Specific diets: mixed evidence.

Official guidance is cautious. WHO says a Mediterranean-like diet may be recommended to reduce the risk of decline in thinking, and that

everyone should eat a healthy, balanced diet (World Health Organization, 2019).

The US National Institute on Aging calls the evidence on specific diets **mixed and inconclusive** (National Institute on Aging, 2024).

A US National Academies report reviewed **what is known** about preventing cognitive decline and dementia (National Academies of Sciences, Engineering, and Medicine, 2017). It found that the evidence base had been limited.



A thin evidence base. Firmer proof is still needed.

Keeping up practice **may matter**. Among people who had attended an intensive meditation retreat, those who kept practising showed less age-related decline in how steady their reaction times were (Zanesco et al., 2018).

Keeping up practice

Kept practising after a retreat → Less decline in steady reaction times

A hint, from a study that was not randomised.

Their doorkeeper **stayed more even** from moment to moment. The study was not randomised (see 1.3.3), so it can only suggest that practice helps.

Problems, strategies and age



Exercise:

A later-life plan.

1. Build in **regular aerobic activity**, such as brisk walks, at moderate intensity or above.
2. If you train, pick the skill you want, and expect gains mainly there.
3. Get your hearing checked, and treat hearing loss for its own sake.
4. Eat well and stay social for general brain health.

Table 6.3 grades each approach. A grade **drops a level** where WHO rates the evidence low, where publication bias shrinks the effect or where a result rests on a secondary analysis.

Table 6.3: Keeping attention sharp in later life

Approach	What the Evidence Shows	Recommendation	Strength
Cognitive training	Gains on trained abilities, little everyday transfer and unproven dementia claims	Train specific skills, and don't expect broad effects	Weak, from one large randomised trial, lowered because WHO rates the evidence very low to low (Ball et al., 2002; Rebok et al., 2014; Simons et al., 2016; World Health Organization, 2019)

Approach	What the Evidence Shows	Recommendation	Strength
Aerobic exercise	Better thinking, especially executive control	Regular sessions at moderate intensity or more, with aerobic and strength exercise both counting	Moderate, from meta-analyses, lowered for publication bias that leaves small effects in healthy adults (Colcombe & Kramer, 2003; Northey et al., 2018; Ciria et al., 2023)
Social engagement	Linked to overall thinking and not to attention	Stay social for general brain health	Weak, from a systematic review of mostly observational studies with only 3 randomised trials (Kelly et al., 2017)
Hearing care	No overall slowing of decline in thinking	Get hearing checked and treat hearing loss for its own sake, since a benefit for higher-risk adults is unconfirmed (World Health Organization, 2019; National Institute on Aging, 2024)	Moderate evidence of no overall benefit, from one randomised trial (Lin et al., 2023)
Diet and multidomain programmes	Modest gains from a multidomain programme, none from the MIND diet and small secondary gains from a Mediterranean diet	Eat well for general health, since no “attention diet” exists	Moderate, from one randomised trial each (Ngandu et al., 2015; Barnes et al., 2023), and Weak for the Mediterranean diet, lowered for a secondary analysis with borderline results (Valls-Pedret et al., 2015)
Continued meditation practice	Less decline in reaction-time steadiness	Keep practising if you already do	Weak, from a follow-up that was not randomised (Zanesco et al., 2018)

Key idea:

In later life, exercise has the most consistent support for keeping thinking sharp, though the benefits are smaller than often claimed, and brain training mainly improves what you train. Diet, hearing care and social life support general brain health without being shown to train attention.



Module

7

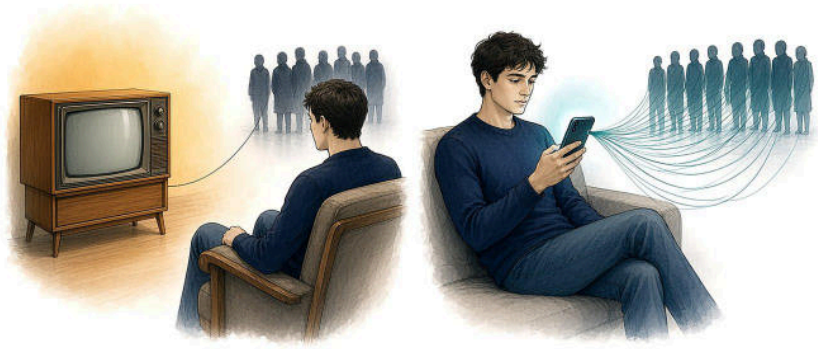
Technology and the Attention Economy

7.1 The Attention Economy

7.1.1 How Apps and Platforms Compete for Attention

Free apps carry a hidden price. **You pay with your attention**, and the whole business runs on it.

A free app earns money by **selling your time and focus** to advertisers (Wu, 2016). It can measure what holds you and keep adjusting (Williams, 2018).

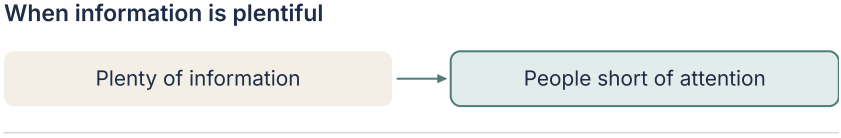


The price tag you never see. Minutes of focus, sold on.

Origins and the Business of Capturing Attention

Herbert Simon's 1971 warning, met in 1.2.1 and 5.2.2, **still sets the scene**. Plenty of information, he argued, leaves people short of attention (Simon, 1971).

When information is plentiful, **attention becomes the scarce thing**. There is only one doorkeeper, and every message wants its eye.



Attention becomes what is scarce.

> **Key Concept:**
>
> The attention economy. A market in which **attention is what gets traded**, a label later writers gave the internet as a whole (Goldhaber, 1997).

Selling attention **has a long history**, running from advertising-funded newspapers to social media (Wu, 2016).

What has changed is **how precisely design can work** against users' own goals (Williams, 2018). Each knock can now be aimed at the doorkeeper with great care. Features built to steer behaviour this way are called persuasive design.

Ethicists argue that designing platforms to encourage compulsive use, **repeated use that people struggle to stop**, raises real moral problems (Bhargava & Velasquez, 2021).

> **Exercise:**
>
> An attention audit.
>
> 1. For one day, note **which apps reach you first**, before you have chosen them.

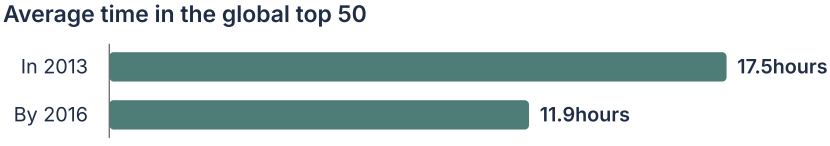
2. Next to each, write how it earns from your time, such as ads or subscriptions.
3. Keep the ones that serve your goals, and move the rest off your home screen.

Faster Collective Attention

> **Key Concept:**
> Collective attention. The attention **a whole population gives a topic**, measured by how long the topic stays popular.

> **Science Says:**
> In 2013, hashtags stayed in Twitter's global top 50 for **17.5 hours** on average. By 2016, that had dropped to 11.9 hours (Lorenz-Spreen et al., 2019).

The same study drew on large-scale data, records of activity from very many people, and found that **topics burn out sooner** as the volume of content rises (Lorenz-Spreen et al., 2019; see 1.2.3).



Topics now drop faster.



Trending, then gone. A crowd's interest runs out sooner than it used to.

Johann Hari's book Stolen Focus **retells the hashtag finding** (Hari, 2022; see 1.2.3). One of the study's authors said Hari kept the crowd and the single person apart (Lehmann, 2022).

The result describes **how fast a society moves between topics**. Whether one person's attention span is shrinking is a separate question, and the study does not answer it.

What the hashtag study answers

	Answered by the study?
How fast a society moves between topics	Yes
Whether one person's attention span is shrinking	No

Population, not person.

The Open Debate About Social Media

For individual minds, **the argument is still open**. Some of the strongest designs point to harm.

> **Science Says:**
> In a large randomised trial, people who deactivated Facebook for four weeks **spent more time offline** and reported better well-being (Allcott et al., 2020).

A natural experiment uses a change that happened in the world, compared across the groups it reached at different times. Facebook arrived at US colleges in stages, and its arrival **harmed students' mental health**, possibly through unfavourable comparisons with others (Braghieri et al., 2022).

Two Facebook studies

	Randomised trial	Natural experiment
What happened	People deactivated Facebook for four weeks	Facebook arrived at US colleges in stages
Result	More time offline, better well-being	Harmed students' mental health

Both point the same way, for these groups.

The U.S. Surgeon General's advisory said there is **not yet enough evidence** to judge social media safe enough for young people (Office of the U.S. Surgeon General, 2023). Read it as precautionary, a better-safe-than-sorry warning.

> **Science Says:**
> In data on about 355,000 adolescents, technology use explained **at most 0.4% of the differences** in well-being between them (Orben & Przybylski, 2019).

Picture the differences in teenagers' well-being as a 100-piece puzzle. Technology use would account for **less than half of one piece**.

Technology use and teen well-being

0.4%

Of well-being differences in about 355,000 adolescents

Less than one puzzle piece in 100.

Reviews of the wider field **reach a cautious verdict**. Most research is correlational (see 3.2.1), with small, conflicting links in both directions. The most careful preregistered studies (see 4.2.2) find links so small they hardly matter in practice (Odgers & Jensen, 2020).

An expert commentary **disputes that social media caused** the rise in teen mental illness (Odgers, 2024).



Two sides of the scale. Trials and surveys still pull different ways.

A balanced review concluded that the internet can produce **short-term and possibly lasting changes** in attention, memory and social cognition, meaning how we think about other people (Firth et al., 2019). Long-term effects remain unknown.

What the internet can change



Short-term changes, long run unknown.

None of this proves **every app harms you**. The evidence shows a business built to hold attention, with mixed findings on what that does to each person.

Popular Claims Checked

Popular books on the internet make bolder claims than the studies support, and **four of them** have been checked against the research.

- "The internet makes us permanently shallower thinkers." This popular claim is linked to the book The Shallows (Carr, 2010). It is unsupported, and no long-term evidence exists.
- "Five days of Googling rewired the brain." This claim is overstated. The study scanned 24 adults aged 55 to 76 at one point in time, and the paper reports no five-day follow-up. More brain activation, extra activity seen on a scan, is no evidence of harm (Small et al., 2009).
- "Google makes us forget facts." This claim is less settled than it sounds. Four studies found lower recall when people expected to look facts up later (Sparrow et al., 2011). Only 13 of 21 well-known

social-science experiments held up when repeated, so single findings need checking (Camerer et al., 2018).

- "Adults sleep far less than they used to." Stolen Focus makes this claim (Hari, 2022). It is unsupported (see 8.1.1).

Table 7.1 sums up **how the attention business works**, with the source behind each part.

Table 7.1: The attention business model

Element of the Attention Business Model	How It Works	Source
Attention as the product	Users' time and focus are sold to advertisers	Wu (2016)
Information abundance	More information makes attention scarcer	Simon (1971); Goldhaber (1997)
Persuasive design	Features are tuned to hold users, sometimes against their own goals	Williams (2018); Bhargava & Velasquez (2021)
Faster topic turnover	Rising content volume shortens how long topics hold public attention	Lorenz-Spreen et al. (2019)

Key idea:

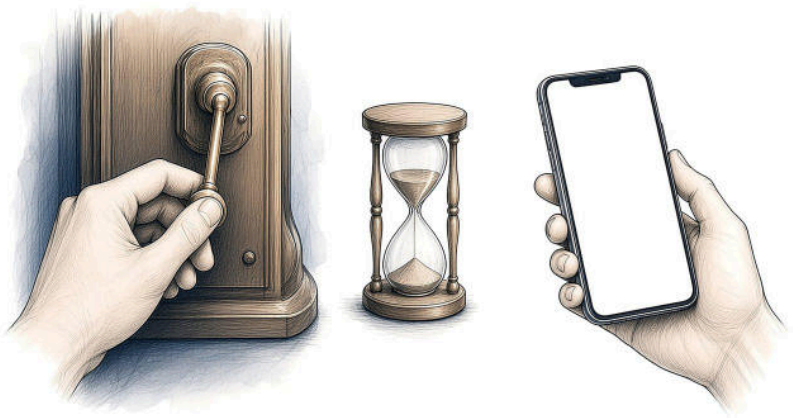
Free apps are paid for with your attention, which is why they are designed to hold it. Society's attention moves between topics faster than before, while whether social media and the internet harm individual minds in the long run is still debated.

7.1.2 Notifications, Infinite Feeds and Habit Loops

Stopping a scroll is **harder than starting one**, and the design is built that way.

> 🗝 **Key Concept:**
> Variable rewards. Rewards that **arrive unpredictably**, so you never know whether the next try will pay off.

Pull-to-refresh and endless feeds **run on variable rewards** (Eyal, 2014). Each pull might bring something new, and the only price is your time.



One more pull. The next refresh might be the good one.

The Habit Loop by Design

> **Key Concept:**
>
> The habit loop. A repeating cycle in which **a trigger leads to an action and a reward**, from a popular guide on building habit-forming products (Eyal, 2014).

The guide is written for designers and **presents no research**.



Round and round. Each turn sets up the next.

A review that works from existing theories, without new data, **lists design features** that may keep people on apps for longer (Montag et al., 2019). It draws on psychology and economics. The effect of any single feature is hard to establish.

> **Science Says:**
>
> A large-scale analysis of people's posts found that **posting follows reward learning**, with likes acting as rewards (Lindström et al., 2021). Reward learning means repeating what has paid off before.

Checking Habits, and Why We Say "Problematic Use"

The loop shows up in **everyday checking**. Much smartphone use takes the form of brief, repeated checks, kept going by quick rewards of new information (Oulasvirta et al., 2012).

Checking often **runs on habit**. The doorkeeper turns to the phone before you have chosen to look. Users describe checking as more of an annoyance than an addiction (Oulasvirta et al., 2012).

What keeps checking going

Quick rewards of new information → Brief, repeated checks

Much smartphone use looks like this.



A pause before the reach. One extra step can break the chain.

Small changes to **the moments around a check** may help. They have not been tested together.

Exercise:

Reshaping a checking habit.

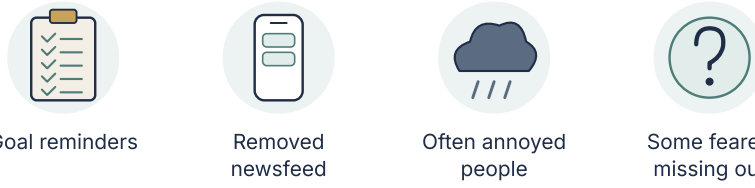
1. For a day, notice **what comes just before you check**, such as boredom, a pause or a buzz.
2. Put a small step between cue and check, such as moving apps off your home screen.
3. Treat checking as a habit you can reshape. It says nothing bad about your character.
4. If one feed pulls you most, hide it for a week and note what changes.

Design changes to the apps themselves **have been tested**, in a study of one platform.

Science Says:

For 6 weeks, 58 students tried changes to Facebook's design (Lyngs et al., 2020). Goal reminders and a removed newsfeed **both helped them stay on task**. The reminders often annoyed people, and some feared missing out without the feed.

Two changes to Facebook



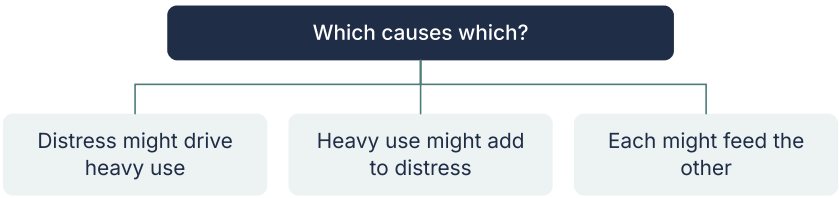
Both helped people stay on task.

A change that works **can still grate**. Pick one you can live with for weeks, since a tool you switch off helps nobody.

A critical review argues that "smartphone addiction" **lacks the evidence** to count as a true addiction (Panova & Carbonell, 2018). We use "problematic use" instead, so ordinary habits are not labelled a clinical condition, meaning a medical disorder.

> **Science Says:**
>
> Problematic use still **goes with distress**. A review of 23 papers linked it consistently to depression, with at least medium-sized links, and to anxiety, with small ones (Elhai et al., 2017). All the studies were correlational (see 3.2.1), so which causes which is unknown.

Distress and heavy use



Each direction remains possible.

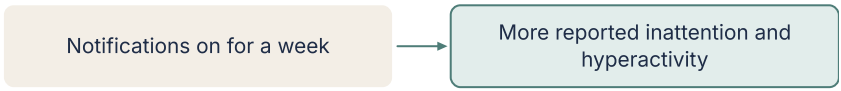
Distress might drive heavy use, heavy use might add to distress, or each might feed the other. **Every direction** remains possible.

The Cost of Notifications

Many checks begin with a notification, and **notifications cost attention** even when ignored. Just receiving one, without answering, disrupted an attention task about as much as using the phone (Stothart

et al., 2015; see 3.3.1). Even an unanswered buzz turns the doorkeeper's head.

A week with notifications on



Self-reported, in 221 adults.

In a field experiment (see 5.2.1) with 221 adults, a week with notifications on **raised reported inattention and hyperactivity** compared with a week with them off (Kushlev et al., 2016; see 3.3.1). Those are the restless, easily distracted signs seen in ADHD (see 1.3.4).

A day without push notifications, the alerts apps send on their own, left people **feeling more productive** (Pielot & Rello, 2017; see 5.2.1). Some felt anxious about missing messages.

Switching notifications off altogether **may not be the answer**. Batching them looks better than either extreme in early work, though attention was self-reported (Fitz et al., 2019; see 7.2.1).

Table 7.2 pairs **each design feature** with a counter-measure.

Table 7.2: Design features and counter-measures

Design Feature	How It Captures Attention	Counter-Measure
Pull-to-refresh and feeds	Variable rewards keep you pulling	Set a time or place where feeds are off-limits
Endless scrolling	No natural stopping point	Use time limits or apps without infinite feeds
Likes and streaks	Social rewards and fear of breaking a run	Turn off like counts or streak reminders where possible
Notifications	Each alert prompts a check and costs attention even unanswered	Batch notifications at set times

The counter-measures are **practice suggestions**. Only those with a source in the text above have been tested.

Key idea:

Feeds and notifications are built around unpredictable rewards and checking set off by cues, which is why stopping is hard. Notifications cost attention even when ignored, and early evidence suggests batching them may beat both constant alerts and a total cut-off.

Constant alerts, a total cut-off, or batching



Constant alerts



A total cut-off



Batching them

7.2 Using Technology Intentionally

7.2.1 Digital Boundaries and Device Hygiene

DECIDING ONCE **beats resisting a hundred times a day**. A boundary set in advance does the work willpower would otherwise repeat, and the doorkeeper no longer has to turn the phone away each time.

> **Key Concept:**
> Commitment device. A limit **you set on yourself in advance**, so the choice is already made when temptation arrives (Bryan et al., 2010).

Setting tonight's screen-time limit for tomorrow is **a commitment device** in miniature.



Settled in advance. One choice replaces a hundred.

Why Self-Control Tools Help, and What Changing Use Can Do

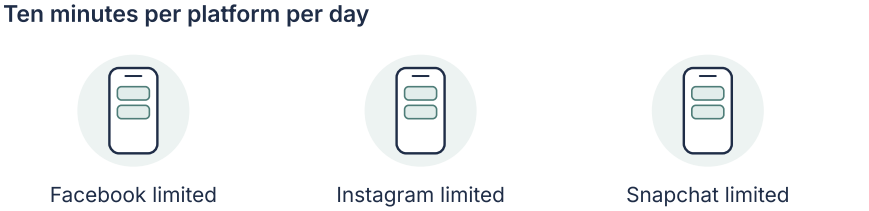
> **Science Says:**
>
> People often say they use their phones more than they want to. When a real-life study offered them limits on their own future screen time, use **fell substantially**, and many actively wanted help with self-control (Allcott et al., 2022; see 5.2.1 on field experiments).

The gap between intention and use is **real**, and tools can close part of it.

> **Science Says:**
> In a recent randomised trial (see 1.3.3), blocking mobile internet on smartphones for two weeks **improved sustained attention** (see 1.2.2), along with mental health and well-being (Castelo et al., 2025).

Attention in that trial was **measured on a task**, which is firmer evidence than asking people how focused they feel. A single trial still needs repeating by others.

In a small experiment with 143 students, limiting Facebook, Instagram and Snapchat to 10 minutes per platform per day **lowered loneliness and depression** after three weeks (Hunt et al., 2018).



143 students, three weeks.

A review of 21 “digital detox” studies, with 3,625 people, found **mixed effects** (Radtke et al., 2022). Results depended on what was measured and on the kind of detox. Treat a change in use as an experiment, and expect no cure. A planned break with a clear goal and an end date is **easier to judge**.

Judging a detox

If	Then
A planned break has a clear goal and an end date	It is easier to judge

Treat it as an experiment.

Boundaries for Notifications and Email

Batching delivers notifications **in a few set bundles** each day. In an experiment, batching improved well-being, while switching notifications off completely raised anxiety (Fitz et al., 2019; see 5.2.1).

Checking email **less often**, instead of whenever you like, reduced stress (Kushlev & Dunn, 2015; see 5.2.1).



Bundled, then opened. Alerts arrive on your schedule.

Predictable batches **look better than either extreme** so far. The studies are small and rely on self-report, meaning people rated their own attention.

Family and Youth Boundaries

A whole household can **set boundaries together**. The family media plan from the American Academy of Pediatrics helps families choose rules such as screen-free zones and times (American Academy of Pediatrics, n.d.; Moreno et al., 2024). As noted in 5.3.2, it describes rules without tested effects on attention.

The American Psychological Association's advisory on adolescents, its official guidance on teenagers' social-media use, recommends **protecting sleep** and limiting harmful features (American Psychological Association, 2023a). The Surgeon General's advisory urges caution (Office of the U.S. Surgeon General, 2023).

Large-scale data show **only small links** between technology use and adolescent well-being (Orben & Przybylski, 2019; see 7.1.1).

Household and advisory rules



Screen-free zones and times



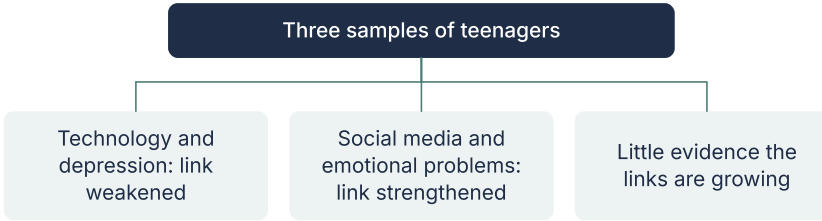
Protecting sleep



Limiting harmful features

> **Science Says:**
>
> Three nationally representative samples of teenagers, chosen to mirror the whole population, gave **mixed results** over a decade (Vuorre et al., 2021). The link between technology and depression weakened, while the link between social media and emotional problems strengthened. Overall, there was little evidence that the links are growing.

Mixed results over a decade



A decade of nationally representative data.

Schools with strict phone rules **had lower phone use only during school hours**, and pupils there showed the same wellbeing and overall use as elsewhere (Goodyear et al., 2025; see 5.1.2). It was a one-time snapshot, so it shows only a link. Parents' own device habits go with children's behaviour (McDaniel & Radesky, 2018; see 5.3.2).

Strict school phone rules

	Changed?
Phone use during school hours	Lower
Wellbeing	The same as elsewhere
Overall use	The same as elsewhere

A link only, from one snapshot.

Jenny Odell's book makes **a cultural case**, an argument about how we want to live, for resisting the attention economy (Odell, 2019; see 7.1.1).

Device Hygiene

Each step below **is decided once**, so the doorkeeper has less to turn away.

> Exercise:
>
> Device hygiene.
>
> 1. Turn off non-essential notifications, or **batch them** at set times.
> 2. Set screen-time limits or use a blocker.
> 3. Keep phones out of the bedroom (see 8.1.2 on evening screens).
> 4. Create tech-free zones and times at home.
> 5. Put your phone out of sight during focus work.

Removing a newsfeed **kept students on task** over six weeks, at the cost of some fear of missing out (Lyngs et al., 2020; see 7.1.2).

Step 5 is **a low-cost precaution** without proof behind it. The claim that a phone's mere presence harms thinking is in doubt (Ward et al., 2017; Ruiz Pardo & Minda, 2022; Böttger et al., 2023; see 3.3.1).



House rules for screens. Settings, limits and phone-free places.

Table 7.3 grades each boundary. A grade **drops a level** for self-rated attention, a small student sample or mixed results. It drops to the bottom grade where results vary widely between studies and a direct repeat of the key study failed.

Table 7.3: Digital boundaries

Boundary	How to Set It	Evidence
Notification batching	Deliver notifications in a few set bundles each day	Weak, from a single randomised trial, lowered because attention was self-rated (Fitz et al., 2019)
Email batching	Check email at set times	Moderate, from a single field experiment (Kushlev & Dunn, 2015)
Blocking mobile internet	Turn off mobile data or use a blocker	Moderate, from one randomised trial that still needs repeating (Castelo et al., 2025)
Social-media time limits	Set app limits, such as 10 minutes per platform	Weak, from a single randomised experiment, lowered for its small student sample (Hunt et al., 2018)
Digital detox	Take a planned break from devices or apps	Weak, from a systematic review, lowered because results varied by outcome and detox type (Radtke et al., 2022)
Family media plan	Agree device-free zones and times	Not rated, because attention was never tested (Moreno et al., 2024)
Phone out of sight	Keep the phone in another room or a bag	Weak, from a meta-analysis, lowered to the bottom grade for widely varying results and a failed direct repeat (Ward et al., 2017; Ruiz Pardo & Minda, 2022; Böttger et al., 2023)

The "How to Set It" entries are **practice suggestions**, drawn from the cited studies where a source is given.

Key idea:

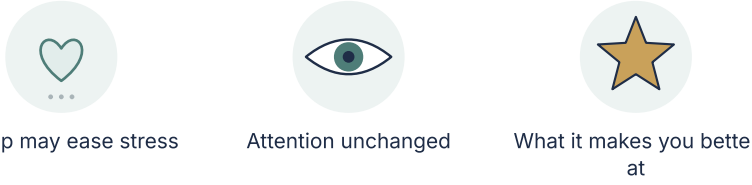
Deciding once, with a setting, a limit or a phone-free zone, beats resisting a hundred times a day. Batch notifications instead of cutting them off, and treat any detox as an experiment, because the evidence is mixed.

7.2.2 Tools and Apps That Support Focus

APPS HELPED CREATE THE focus problem, and **an app can sometimes ease it**, in a narrow way.

The test for any focus tool is **what it makes you better at**. An app may ease stress and leave attention unchanged.

The test for any focus tool



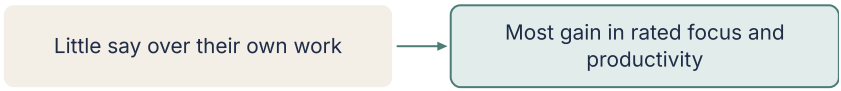
Blockers and Limiters

A website blocker **works like a doorkeeper you hire in advance**, turning chosen sites away before you reach them.

Blocking distracting websites **raised people's own ratings** of focus and productivity in a small study of 32 workers (Mark et al., 2018; see

5.2.1). Those with **little say over their own work** gained the most, a feeling linked to lower conscientiousness and perseverance.

Who gains most from a blocker



Self-rated, so a weak result.



Hired in advance. The blocked site never reaches the door.

A review of 367 digital self-control tools found that **many of the ways they might work** remain little explored (Lyngs et al., 2019).

Another team reviewed 42 digital-wellbeing apps, sold to help people use their phones in healthier ways, and added a small field study (Monge Roffarello & De Russis, 2019). The apps **helped in specific situations** and did little to build new habits.

Two reviews of focus tools



Specific help, few new habits.

Changing a site's own design is another route. Hiding the Facebook newsfeed **helped students stay on task**, though some missed it (Lyngs et al., 2020; see 7.1.2).

Hiding the Facebook newsfeed



Mindfulness Apps

> **Science Says:**
> Pooling 34 trials of mindfulness apps (see 1.3.2 on meta-analyses) showed **small-to-moderate gains** on stress, anxiety and depression (Gál et al., 2021).

Few apps **provide genuine mindfulness training**, judged against what the practice involves (Mani et al., 2015).

> **Science Says:**
>
> Across 176 randomised trials (see 1.3.3), mental-health apps had **small effects** on depression (g = 0.28) and generalised anxiety (g = 0.26) (Linardon et al., 2024; see 3.2.1 on g). The outcomes were mood and worry, and attention went unmeasured.

A review of 28 app trials found results **tending to favour apps for attention regulation**, the skill of steering and holding your focus (Macrynikola et al., 2024). Keeping people using the apps was a common problem.



Calmer first, sharper maybe. Stress eases sooner than focus.

> **Science Says:**
>
> Six weeks with a meditation app **lifted sustained attention and working memory** in young adults (Ziegler et al., 2019; see 1.2.2 and 1.2.3). The app's developers were involved in the research, so an independent team needs to repeat it.

An online mindfulness programme **reduced behavioural signs of mind-wandering**, meaning slips that show up in task performance (Bennike et al., 2017). In-person training gave a similar result in 1.3.3.

Workplace results look **more hopeful**. A 30-day app programme for 623 employees improved sustained attention (Axelsen et al., 2022).

Headspace itself showed **no gain in executive function** (see 1.3.4) against sham meditation in a double-blind trial (Noone & Hogan, 2018; see 4.2.2). We met that sham-controlled trial in 4.1.1. Half of Headspace trials had a conflict of interest involving the company (O'Daffer et al., 2022). A conflict of interest means **the researchers stood to gain** from a good result.

App trials of attention

	Result	Note
Meditation app, six weeks	Sustained attention and working memory lifted	Developers involved
Workplace app, 30-day programme	Sustained attention improved	623 employees, one study
Headspace against sham meditation	No gain in executive function	Conflicts of interest common

Independent repeats needed.

Games, Brain Training and Digital Therapeutics

Action video games show **modest effects** on attention, inflated by publication bias (Bediou et al., 2018; see 1.3.2). As 6.1.2 showed, brain-training gains **mostly stay with the trained task** (Simons et al., 2016; Melby-Lervåg et al., 2016), and Lumosity settled charges with the Federal Trade Commission (Federal Trade Commission, 2016).

Key Concept:

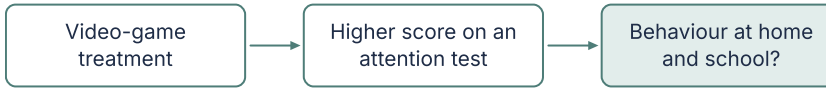
Digital therapeutic. A **treatment delivered by software**, such as an app or game, that needs a doctor's prescription.

Science Says:

Children with ADHD (see 1.3.4) who played a video-game treatment in a randomised trial **scored higher on a computerised attention test** (Kollins et al., 2020). The trial was industry-funded.

The game, later called EndeavorRx, became **the first game-based prescription treatment** for attention in children with ADHD (U.S. Food and Drug Administration, 2020). Its proven gain is on a test score. Parents and teachers would want to know about **behaviour at home and school**, which a test score alone cannot show.

From game to prescription



Home and school would want more.

Neurofeedback (see 1.3.4) **lost its benefits for ADHD** under blinded assessment, where the people rating symptoms did not know who had been treated (Cortese et al., 2016).

Neurofeedback under blinded assessment



Blinding changed the result.

Five checks sort stronger claims from weaker ones, and the doorkeeper deserves a tool that passes them.

> **Exercise:**
>
> Five checks for any focus app.
>
> 1. Look for **an independent randomised trial**, run by people with no stake in the app.
> 2. See whether attention was measured, or only stress or mood.
> 3. Check whether gains reached everyday life or stayed with the trained task.
> 4. Find out whether the people scoring results knew who used the app. Blinded scoring is stronger.
> 5. Find out who funded the study.



Five checks before you download. Better at what, and who says so.

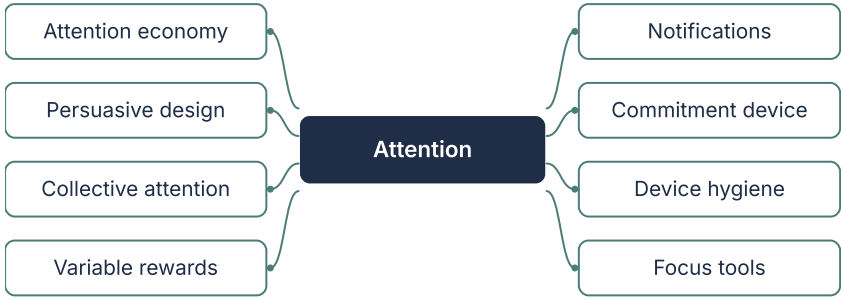
Table 7.4 grades **each kind of focus tool**. Risk of bias means flaws in how trials were run that could tilt the results.

Table 7.4: Focus tools

Tool Category	What Evidence Shows	What to Do
Website blockers and limiters	Weak, from a small exploratory field study. Self-rated focus and productivity rose, most of all for people with little say over their work (Mark et al., 2018)	Try one if you feel little control over your workday
Mindfulness apps	Moderate for stress, anxiety and depression, lowered one level for uncertain risk of bias (Gál et al., 2021). Weak for attention, lowered for small samples, developer involvement and risk of bias (Macrynikola et al., 2024; Walsh et al., 2019; Axelsen et al., 2022; Ziegler et al., 2019)	Use them for stress, and treat focus gains as uncertain
Action video games	Moderate, from a meta-analysis lowered one level for publication bias (Bediou et al., 2018)	Play for fun, and look elsewhere for focus
Brain-training apps	Strong, from a review and a meta-analysis. Gains mostly stay with the trained tasks (Simons et al., 2016; Melby-Lervåg et al., 2016)	Expect to get better at the game itself
Digital therapeutics	Weak, from a single industry-funded trial with a test-score outcome (Kollins et al., 2020)	Use only under a doctor's care
Neurofeedback	Strong, from a meta-analysis of randomised trials. No benefit appeared under blinded assessment (Cortese et al., 2016)	Look elsewhere for help with attention

The "What to Do" entries are **practice suggestions** built on the evidence column.

Apps, attention and boundaries



Key idea:

Blockers help some people, especially those with little say over their own work, and mindfulness apps ease stress more reliably than they sharpen attention. Brain games train the game. Before trusting any focus app, ask what it improves and who says so.



Module

8

Attention and Lifestyle

8.1 Sleep and Alertness

8.1.1 How Sleep Loss Affects Attention

A SHORT NIGHT **hurts your focus more than you notice**. Attention keeps working, but it drops out for a moment here and there. The doorkeeper nods off and does not tell you.



Gone for a second. Small gaps you rarely catch.

How Much Sleep, and What Loss Hits Hardest

Sleep experts agree that adults should **regularly sleep 7 or more hours** a night (Watson et al., 2015). Needs vary with age (Hirshkowitz et al., 2015; Centers for Disease Control and Prevention, 2024).

> **Science Says:**
> Pooling studies of people kept from sleeping for one or two days showed **the largest effects on simple and sustained attention** (Lim & Dinges, 2010; see 1.3.2 and 1.2.2). Lapses rose sharply ($g \approx -0.78$, see 3.2.1 on g).

Picture 100 rested people and 100 people short of sleep. About 78 of the tired group would **lapse more often** than the average rested person.

Picture 100 people short of sleep

78 in 100

Of the tired group would lapse more often

> **Key Concept:**
> Lapse. A brief moment when attention **drops out completely**, so you miss something you would normally catch.

Sleep loss **makes attention unstable**, with good moments and lapses mixed together (Lim & Dinges, 2008). Simple attention here means reacting quickly to a plain signal.

> **Key Concept:**
> Psychomotor vigilance test (PVT). A **simple reaction-time task** on a small handheld device (Dinges & Powell, 1985). Psychomotor means linking what you see to a quick movement.

The PVT



The PVT is a vigilance task, a long watch for rare signals (see 1.1.2). It is **extremely sensitive to sleep loss** (Lim & Dinges, 2008).

> Science Says:
>
> For three nights, 77 children aged 9 to 12 slept **an hour more or an hour less** than usual, tracked with wrist monitors at home (Sadeh et al., 2003). The single hour made a measurable difference on tests of how well their minds worked. The children who slept less reported feeling less alert.

Chronic Restriction Adds Up

After several short nights, you may **feel used to it**. Your performance tells a different story, because the doorkeeper keeps slipping even when you feel fine.

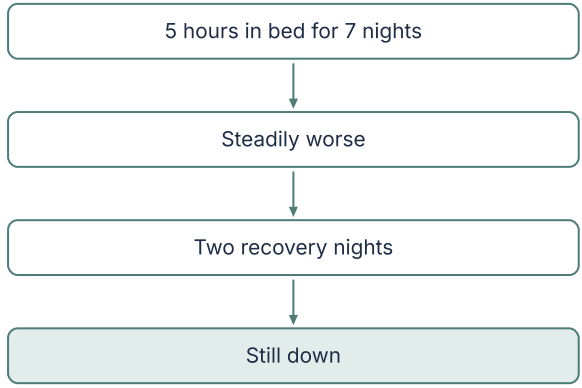
> Science Says:
>
> For two weeks, people slept 6 or 4 hours a night (Van Dongen et al., 2003). Their attention problems **built up until they matched one or two nights with no sleep**. Their feeling of sleepiness levelled off.



Feeling fine, doing worse. Two lines that drift apart.

Teenagers show **the same slide**. In a randomised experiment (see 1.3.3), 56 teens spent 5 hours in bed for 7 nights (Lo et al., 2016). Sustained attention, working memory and executive function got steadily worse, and two recovery nights left sustained attention still down.

Teens with 5 hours in bed



Recovery was incomplete.

Recovery from a longer run is **uncertain**. Adults who spent a week with 5 or 7 hours in bed showed no recovery after three nights of 8 hours (Belenky et al., 2003). Those who had only 3 hours a night recovered only partly.

Time of Day and Chronotype

The hours you slept are **one factor among several**. The time of testing plays a part.

> 🗝 **Key Concept:**
> Chronotype. Whether you are **naturally a morning or an evening person**.

Time of day, how long you have been awake and your chronotype all **shape attention** (Schmidt et al., 2007). Performance is best when a task falls at your personal peak.

What shapes attention

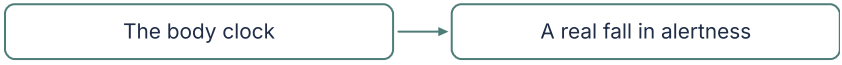


In two small experiments, older and younger adults each had **their best inhibitory control** at their own best time of day (May & Hasher, 1998). Inhibitory control means holding back a response you don't want (see 4.1.1 on inhibition).

In a small study, night owls **did worse in the morning** on vigilance and on executive tasks, the planning and control jobs (see 1.3.4) (Facer-Childs et al., 2018).

The post-lunch dip is **a real fall in alertness** (Monk, 2005). It is tied to the body clock, the inner timer that runs on a roughly daily cycle, and it happens even without lunch. These effects depend on the task, its length, practice and the person (Blatter & Cajochen, 2007).

The post-lunch dip



Lunch is not the cause.

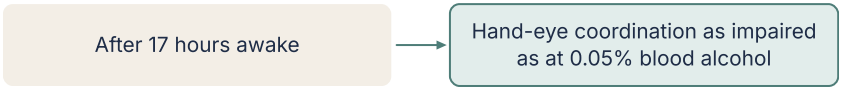
Two Popular Claims

Stolen Focus claims that adults now **get much less sleep** than in the past (Hari, 2022; see 7.1.1). The claim is unsupported.

> **Science Says:**
> A review of 168 studies of healthy adults from 1960 to 2013 **found no decline** in sleep over time (Youngstedt et al., 2016). Each study recorded sleep with devices, without relying on what sleepers said.

Tired is **a little like tipsy**. After 17 hours awake, hand-eye coordination in 40 people was as impaired as at a blood alcohol level of 0.05% (Dawson & Reid, 1997). That means 0.05 grams of alcohol in every 100 millilitres of blood.

Tired is a little like tipsy



Williamson and Feyer found **similar results** on some tests in 39 workers, after 17 to 19 hours awake (Williamson & Feyer, 2000). Treat the match as a rough comparison, since the two states differ in many ways.

> Exercise:
>
> A sleep and focus log.
>
> 1. For one week, note **when you went to bed and woke up**.
> 2. Each afternoon, note one moment when your focus slipped.
> 3. At the end of the week, look for a link between short nights and slips.

Table 8.1 sets out **each sleep pattern** and what it does to attention.

Table 8.1: Sleep patterns and attention

Sleep Pattern	Effect on Attention	Source
Short-term total sleep loss	Largest effects on simple and sustained attention, plus more lapses	Lim & Dinges (2010)
6 or 4 hours a night for two weeks	Deficits build up to match one or two nights without sleep, while sleepiness levels off	Van Dongen et al. (2003)
5 hours in bed for 7 nights (teens)	Sustained attention, working memory and executive function decline, and sustained attention stays down after 2 recovery nights	Lo et al. (2016)
Restricted sleep, then 3 nights of 8 hours	Recovery incomplete in all restricted groups	Belenky et al. (2003)

Sleep Pattern	Effect on Attention	Source
Testing off your body-clock peak	Worse performance than at your peak	Schmidt et al. (2007); Facer-Childs et al. (2018)
Early afternoon	Post-lunch dip in alertness, even without lunch	Monk (2005)

Key idea:

Short sleep hits sustained attention hardest, causing brief lapses you may not notice. After a run of short nights your performance keeps sliding even when you feel fine, so the feeling of being used to it is a poor guide.

8.1.2 Habits for Restful Sleep

TONIGHT'S HABITS **set up tomorrow's focus**, though the evidence behind each habit varies. Some have firm support, others rest on small studies, and a few sleep problems need real treatment.

Establishing a Sleep Routine

> 🗝 Key Concept:
>
> Sleep hygiene. Everyday **habits and surroundings that help sleep**, such as limits on caffeine and a calm bedroom.

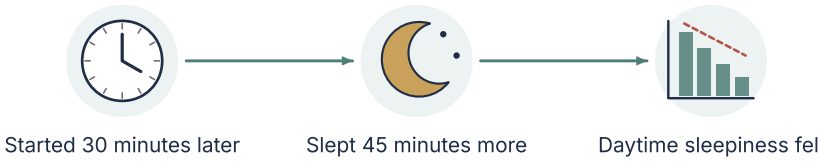
Reviews of sleep-hygiene advice give **some support** to limiting caffeine and alcohol and to exercising (Irish et al., 2015). The evidence for strict sleep schedules is weak, and the reviewers advise against regular

bedtimes as a general rule. A fairly regular wake time may help some people.

Sleep hygiene on its own is **a weak treatment for insomnia**, long-lasting trouble falling or staying asleep. The National Heart, Lung, and Blood Institute gives practical guidance on schedules, surroundings and pre-bed routines (National Heart, Lung, and Blood Institute, 2022).

When one high school started 30 minutes later, students **slept 45 minutes more** on school nights (Owens et al., 2010). The share sleeping 8 hours or more rose from about 16% to about 55%, and daytime sleepiness fell. The figures came from surveys before and after the change.

One high school started later



A Singapore school that started 45 minutes later saw **a lasting gain** (Lo et al., 2018). Time in bed rose by about 23 minutes, and total sleep was still about 10 minutes longer after 9 months. Sleepiness fell.

A Singapore school started 45 minutes later



Evening Screens and Late Caffeine

Screens and caffeine are **two evening habits** that can push sleep later.

> **Science Says:**
>
> In a small study, 12 young adults lived in a research unit and read for about four hours before bed on five evenings (A.-M. Chang et al., 2015). Each person read from an e-reader and from a printed book, a design called a crossover study. The e-reader **held back melatonin and delayed its rise**.

> **Key Concept:**
>
> Melatonin. The hormone that tells the body clock (see 8.1.1) **it is night**.

After the e-reader, people **took longer to fall asleep** and were less alert the next morning. Their doorkeeper started the day drowsy, though real-world reading is usually shorter and dimmer.

In school-age youth, screen use **goes with later bedtimes** and shorter sleep (Hale & Guan, 2015). Most of those studies only track links (see 3.2.1 on correlational studies).

Students aged 12 to 19 were asked to **stop using screens after 9 pm** (Perrault et al., 2019). Cutting late screen time went with earlier sleep, longer sleep and better daytime vigilance (see 1.1.2). The study compared the same students before and after the change.

Screens off after 9 pm



> **Science Says:**
> Caffeine is **the other evening habit**. Across many studies, it cut total sleep by about 45 minutes (Gardiner et al., 2023; see 1.3.2 on meta-analyses).

In one study, **a moderate dose** of 400 mg disrupted sleep even when taken 6 hours before bed (Drake et al., 2013). A late cup leaves the doorkeeper on duty when it should rest.

A moderate dose, taken late

400 mg, 6 hours before bed → Disrupted sleep

The same review suggests **a cut-off of about 8.8 hours** before bedtime for a standard coffee (Gardiner et al., 2023). With a 10:30 pm bedtime, the last coffee would come at about 1:45 pm.



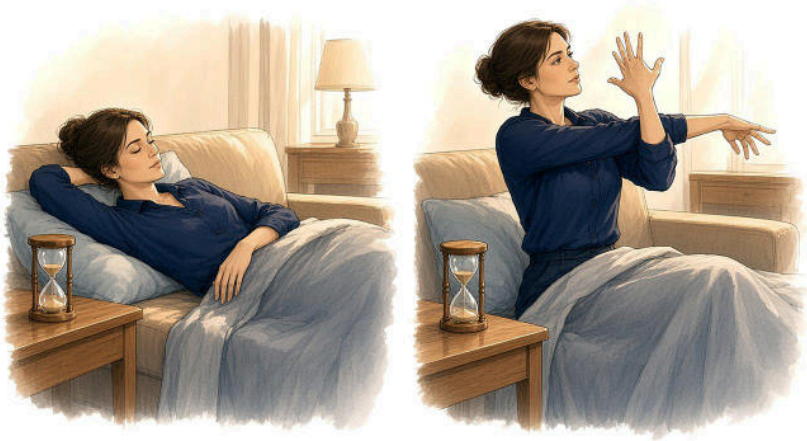
Last cup after lunch. A late coffee is still working at bedtime.

Short Naps and When to Seek Help

> **Science Says:**
>
> After about 5 hours' sleep, 24 young adults tried afternoon naps of different lengths (Brooks & Lack, 2006). **A 10-minute nap gave the quickest all-round boost**. A 5-minute nap did little, a 20-minute nap helped only after about half an hour, and a 30-minute nap caused grogginess before helping.

> **Key Concept:**
>
> Sleep inertia. The **grogginess after waking**, worst after waking from slow-wave sleep, the deepest stage (Tassi & Muzet, 2000).

Longer naps **risk this grogginess**. Without major sleep loss, it usually lasts 30 minutes or less, though reported durations range from 1 minute to 4 hours. It is worse after sleep loss and at times when your body clock expects sleep (Hilditch & McHill, 2019).



Ten minutes, then up. Short beats long after a short night.

> Key Concept:
>
> CBT-I. Cognitive behavioural therapy for insomnia (see 1.3.4 on CBT), a talking therapy that works on **sleep habits and thoughts about sleep**.

CBT-I



Sleep habits



Thoughts about sleep



A talking therapy

If poor sleep lasts for weeks, **more tips will fall short**. A clinical guideline, official treatment advice for doctors, strongly recommends CBT-I for chronic insomnia, the long-lasting kind (Edinger et al., 2021). Across trials, CBT-I helped people fall asleep sooner and stay asleep (Trauer et al., 2015).

Diagnosing and treating sleep disorders is **a job for a doctor** or sleep specialist. Public-health guidance is to talk to a healthcare provider about regular sleep problems or signs of common sleep disorders (Centers for Disease Control and Prevention, 2024). CBT-I is usually delivered by a trained professional, and group and online versions exist.

> Exercise:
>
> An evening wind-down.
>
> 1. Set **a caffeine cut-off** about 8.8 hours before your usual bedtime.

2. Pick a screens-off time, such as 9 pm, or dim the screen and switch to print.
3. Keep your wake time fairly regular, even at weekends.
4. If poor sleep lasts for weeks, book a visit to your doctor.

Table 8.2 grades **each sleep habit**.

Table 8.2: Sleep habits

Tip	How to Do It	Evidence
Regular schedule	Keep a fairly regular wake time, since evidence for strict schedules is weak	Weak, from a review of observational (see 3.2.1) and small experimental studies, lowered for small samples, self-report and inconsistent results (Irish et al., 2015)
Caffeine cut-off	Stop about 8.8 hours before bed	Strong, from a meta-analysis (Gardiner et al., 2023)
Evening screens	Read print, dim screens or set a screens-off time	Weak, from a small crossover study, a before-and-after study and a mostly correlational review (A.-M. Chang et al., 2015; Perrault et al., 2019; Hale & Guan, 2015)
Short nap	About 10 minutes in the early afternoon	Weak, from a small study (Brooks & Lack, 2006)
CBT-I for chronic insomnia	See a doctor or sleep specialist	Strong, from a meta-analysis and a clinical guideline (Trauer et al., 2015; Edinger et al., 2021)

Key idea:

A fairly regular wake time may help. Stop caffeine well before bed and dim the screens, and a short nap can help after a poor night. If sleep problems last for weeks, see a doctor about CBT-I, the proven treatment.

8.2 Movement, Nature and Rest

8.2.1 Exercise and the Focused Brain

A BRISK WALK BEFORE A demanding task gives **a small, short-lived lift**. The doorkeeper perks up for a while, and the lift soon fades.

One Session and the Long Run

> **Science Says:**
>
> Pooling 79 studies of single exercise sessions showed **small positive effects on thinking** ($g \approx 0.10$) (Y. Chang et al., 2012; see 1.3.2 on meta-analyses). After a session, about 54 in 100 exercisers would score above the average rested person, against 50 by chance.

The size of the effect **depended on how long and how hard** people exercised, the kind of thinking test and their fitness (Y. Chang et al., 2012).

The size depended on



> **Key Concept:**
>
> Executive function. The mental skills that **steer attention**, such as planning and holding back responses (see 1.3.4).

One session of moderate aerobic exercise **briefly boosts executive function** (Ludyga et al., 2016). The largest reaction-time gains were in children (g = .54, about 71 in 100) and older adults (g = .67, about 75 in 100). For a while, their doorkeeper responded faster.

Largest reaction-time gains



> **Key Concept:**
>
> Flanker task. You **respond to a middle item** and ignore the ones beside it (see 1.2.2).

In a small study, 20 nine-year-olds did a single 20-minute moderate treadmill walk (Hillman et al., 2009). Compared with a resting session, the walk **improved accuracy** on a flanker task.

Short classroom activity breaks show **a similar lift**. In a programme called Energizers, on-task behaviour rose by 8%, and by 20% in the pupils who were least on task (Mahar et al., 2006).

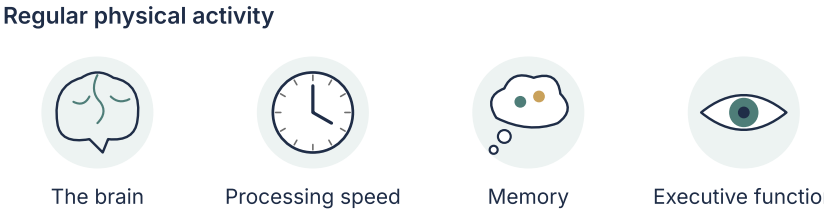
Energizers



> **Science Says:**
>
> Across 31 studies of children aged 6 to 12, **single bouts of activity improved attention** (g = 0.43, about 67 in 100) (de Greeff et al., 2018).

Regular Exercise and the Shrinking Effect

Reviews report that regular physical activity **benefits the brain and thinking**, especially executive control (Hillman et al., 2008). The committee behind the 2018 US activity guidelines concluded that activity improves thinking, measured as processing speed, memory and executive function (Erickson et al., 2019).

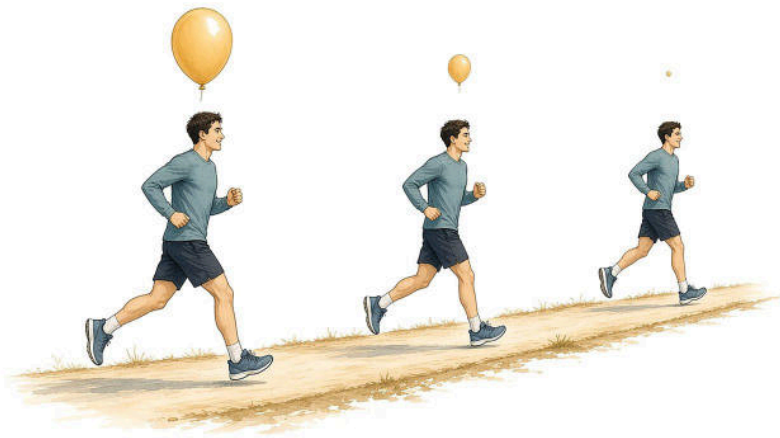


> **Key Concept:**
>
> Umbrella review. A review that **pools earlier meta-analyses**, so it sits above many reviews at once.

> **Science Says:**
>
> One umbrella review brought together 24 meta-analyses (Ciria et al., 2023; see 6.2.2). It covered 109 eligible trials, analysed 100 and included 11,266 healthy people. It found **a small benefit** (d = 0.22, about 59 in 100).

Some trials gave the comparison group another activity, an active control (see 4.1.1). Groups could differ at the start, called baseline differences. Accounting for both, the benefit **shrank to d = 0.13**, about 55 in 100.

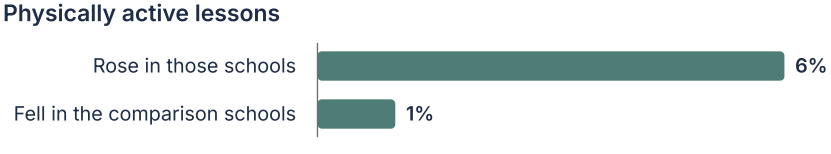
Once the authors allowed for the bias against publishing null results (see 1.3.2 on publication bias), the benefit **fell to d = 0.05**. That is about 52 in 100, close to the 50 you would get by chance, so the effect is negligible.



The shrinking effect. Three numbers, each smaller.

Older meta-analyses reported **clearer effects in older adults** (Colcombe & Kramer, 2003; see 6.2.2). One trial found benefits in children (Hillman et al., 2014; see 5.1.2). The umbrella review found no clear difference by age (Ciria et al., 2023).

> **Science Says:**
>
> In one trial, whole schools were assigned by chance to **physically active lessons** (see 1.3.3 on randomised trials). Achievement scores rose 6% in those schools and fell 1% in the comparison schools (Donnelly & Lambourne, 2011). The trial measured school achievement, and attention was never tested.



Achievement scores, schools assigned by chance.

For adults, the World Health Organization recommends **150 to 300 minutes** of moderate activity a week (Bull et al., 2020). That advice is about health, and any focus gain is a bonus.

> **Exercise:**
>
> A walk before hard work.
>
> 1. Before a demanding task, take **a brisk 20-minute walk**.
> 2. Start the task soon after you get back.
> 3. Over a week, compare those sessions with ones where you started straight away.

Yoga, Strength Training and Safety

Researchers have studied **other kinds of exercise** besides walking and running.

Yoga trials, pooled, showed **some benefits for thinking** ($g = 0.33$, about 63 in 100) (Gothe & McAuley, 2015; see 3.2.1). The strongest

area was attention and processing speed, at g = 0.29, about 61 in 100. Most trials were small, and they differed a lot.



A meta-analysis of 24 studies looked at resistance training, exercise against weights or bands (Landrigan et al., 2020). It **improved overall cognition** (see 6.2.2) and executive functions (SMD 0.39, about 65 in 100). SMD, the standardised mean difference, is read like d.

Working memory **showed no gain**, results varied a lot, and attention was never analysed on its own (Landrigan et al., 2020). A single session of resistance training improved overall cognition, inhibitory control and flexibility, with an unclear effect on attention (Wilke et al., 2019).

> **Science Says:**
>
> One 12-month trial studied women aged 65 to 75 (Liu-Ambrose et al., 2010). Once- or twice-weekly strength training **improved test scores** on selective attention and conflict resolution, settling a clash between competing responses. Whether these test gains carry over to everyday focus is unknown.

If you have heart, metabolic or kidney disease, **get medical advice first** (Riebe et al., 2015). Metabolic diseases, such as diabetes, affect how the body uses energy.

Certain symptoms during exercise are **a reason to stop and ask**. Examples are chest pain, faintness or unusual breathlessness. The same goes for you if you are inactive and want to start vigorous exercise.

A reason to stop and ask



Chest pain



Faintness



Unusual breathlessness

Table 8.3 grades **each kind of exercise** for attention.

Table 8.3: Exercise and attention

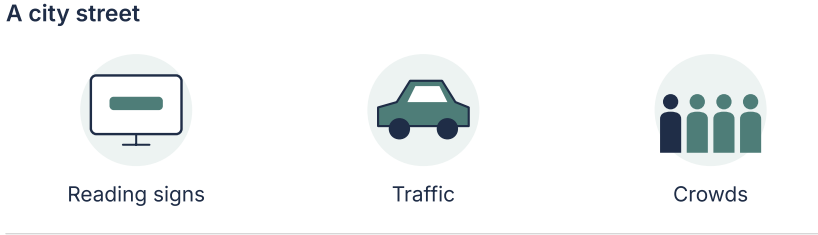
Activity	Evidence for Attention	Population	Recommendation
Single aerobic session	Strong, a small, temporary executive-function lift (Y. Chang et al., 2012; Ludyga et al., 2016)	All ages, largest in children and older adults	A brisk walk before demanding work
Regular aerobic exercise	Strong, small at best and negligible after correcting for publication bias (Ciria et al., 2023)	Healthy people of all ages	Exercise for health, and expect little for focus
Yoga	Weak, based on one meta-analysis and lowered for small samples and mixed groups of people (Gothe & McAuley, 2015)	Mixed	Optional, for overall well-being
Resistance training	Weak, based on one meta-analysis and lowered for widely varying results and no separate attention analysis (Landrigan et al., 2020), plus one trial in older women (Liu-Ambrose et al., 2010)	Adults and older women	Include for health, and expect executive-function effects at most

Key idea:

One bout of exercise gives a small, temporary lift in executive function. Regular exercise has small effects at best, with no clear difference by age. Move for your health first, and count any focus gain as a bonus.

8.2.2 Breaks, Nature and Attention Restoration

A WALK IN THE PARK often **feels like a reset** for your head. On a city street, you steer your attention all the time, reading signs and picking your way through traffic and crowds. The street keeps asking the doorkeeper for decisions.



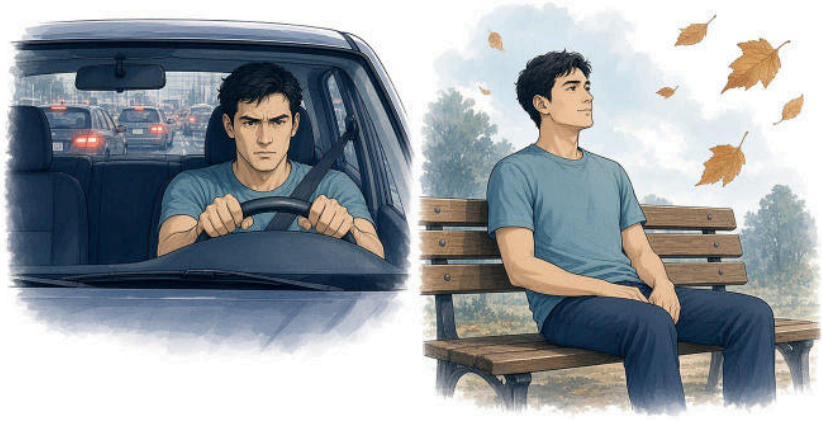
Steering all the time.

> **Key Concept:**
> Directed attention. The **steering kind of attention**, the effort you spend choosing what to focus on and what to block out.

A park offers **a different kind of pull**. Things like moving leaves and drifting clouds hold your eye without any steering.

> **Key Concept:**
> Soft fascination. Things that **hold your eye without effort**, such as leaves moving or clouds drifting.

In a park, the doorkeeper gets **fewer calls to answer** and can recover. This idea is called attention restoration theory (S. Kaplan, 1995).

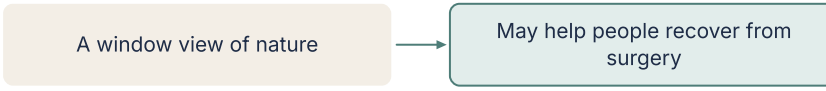


Steering and soft fascination. A plausible idea with mixed evidence.

A classic older study of hospital patients suggested that **a window view of nature** may help people recover from surgery (Ulrich, 1984).

Ulrich's study only observed the patients and **never tested the idea**. Treat the theory as plausible, with mixed evidence. A nature break may or may not reset your doorkeeper.

Ulrich's hospital study



Observed, never tested.

What Studies Show

Newer studies have **put the idea to the test**.

> **Science Says:**
> In small studies, people took an hour-long walk in a park or simply looked at nature pictures (Berman et al., 2008). **Both improved backwards digit span**, a test of hearing a list of numbers and saying it in reverse.

A 40-second look at a green roof **reduced errors** on a sustained-attention task (Lee et al., 2015; see 1.2.2). In another study, a nature film helped people recover after office noise (Jahncke et al., 2011).

Children who have ADHD (see 1.3.4 for ADHD) showed **a similar pattern** in one small study. After a 20-minute walk in a park, 17 children did better on backwards digit span than after two other walks (Faber Taylor & Kuo, 2009). The effects were d = .52 and .77, about 70 and 78 in 100.

In 2,593 Barcelona schoolchildren, **greener schools went with bigger gains** in working memory over 12 months and less inattentiveness (Dadvand et al., 2015). The study tracked links only (see 3.2.1), so other features of those schools could explain it.

Greener schools



Links only.

Children from low-income families who moved house **did best on thinking tests** when their new home had the most greenery around it (Wells, 2000).

Reviews are **more cautious**. One review checked 13 attention measures, and nature reliably improved only 3 of them, backwards digit span among them (Ohly et al., 2016). Study quality was unclear.



3 of 13. A small tally.

> **Science Says:**
>
> Another review pooled many studies (Stevenson et al., 2018; see 1.3.2 on meta-analyses). It found **gains in working memory**, flexibility and attentional control, the ability to keep attention where you want it (see 1.2.3 on working memory). Effects elsewhere were limited.

A broader review links time in nature to **directed attention and mental health** (Bratman et al., 2012).

Breaks That Restore

Breaks of any kind are **the other half of the picture**. Micro-breaks, short pauses lasting no more than 10 minutes (see 3.3.3), raise vigour, the feeling of being energetic, and reduce fatigue (Albulescu et al., 2022; see 6.1.2). They did not reliably improve performance.

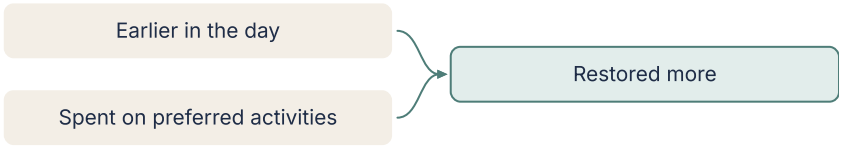
Micro-breaks



Performance did not reliably improve.

Some breaks **restore more than others** (Hunter & Wu, 2016; see 6.1.2). In an experience-sampling study (see 1.3.3), breaks earlier in the day and breaks spent on preferred activities restored more.

Breaks that restore more



> **Exercise:**
>
> A restorative break.
>
> 1. Mid-morning, step away from your work for **up to 10 minutes**.
> 2. If you can, go outside among trees, or look at greenery from a window.

3. Otherwise, do something you enjoy that has nothing to do with work.
4. Afterwards, note how energetic you feel.

Table 8.4 grades **each kind of break**.

Table 8.4: Restorative breaks

Break Type	Evidence	Practical Use
Nature walk	Weak, from meta-analyses, lowered to the floor for outcomes that differed, mixed support, risk of bias (see 7.2.2) and small samples (Berman et al., 2008; Ohly et al., 2016; Stevenson et al., 2018)	A short walk in a park between demanding tasks
Green view	Weak, from one small study (Lee et al., 2015)	Look at greenery from a window for a minute
Micro-break	Strong for well-being, with unclear effects on performance (Albulescu et al., 2022)	Short pauses to reduce fatigue
Preferred activity	Weak, from an experience-sampling study (Hunter & Wu, 2016)	Choose a break you enjoy, earlier in the day

Key idea:

Nature may let the steering part of attention rest, though the evidence is mixed. Breaks reliably help you feel better, but whether they make you sharper is less certain.

8.3.1 Eating for Steady Energy and Focus

No food has been **proven to sharpen focus**, though a few things about eating and drinking still matter. Water and regular meals keep the doorkeeper on duty.

Hydration, Meals and Breakfast

A long, hot afternoon without a drink **costs you more than comfort**. Losing about 2% or more of your body weight in water measurably impairs thinking (Wittbrodt & Millard-Stafford, 2018).

> **Key Concept:**
> Dehydration threshold. The point, about **2% of body weight lost as water**, at which thinking starts to suffer.

> **Science Says:**
> Pooled studies showed **the largest effect on attention-based tasks** (about −0.52) (Wittbrodt & Millard-Stafford, 2018; see 1.3.2 on meta-analyses). Of 100 people past the threshold, about 70 would score below the average well-hydrated person.

Attention and quick reactions **suffer more** than higher-level executive function, the planning and control skills (see 1.3.4) (Adan, 2012). The doorkeeper's work slips first.

What slips first

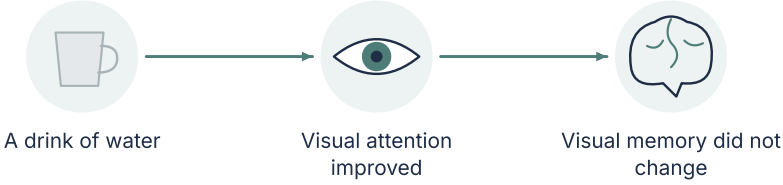




About 2%. The point where focus starts to slip.

Children show **a similar effect**. In 23 children aged 6 and 7, a drink of water improved visual attention, measured by spotting differences between pictures and crossing out letters (Edmonds & Jeffes, 2009). Visual memory did not change.

A drink of water for children



Meals matter **less clearly**. Breakfast has a positive short-term effect on children's on-task behaviour in class, while the evidence on thinking skills is mixed (Adolphus et al., 2013).

> **Science Says:**
> A review of 45 studies found that **eating breakfast beats skipping it** for children's thinking (Hoyland et al., 2009). The benefit was clearer in children who were poorly nourished. The studies could not name a best type of breakfast.

Breakfast for children



Clearer in poorly nourished children.

In one small study of 29 children, a cereal breakfast **slowed the morning decline** in attention and memory, compared with a glucose drink or no breakfast (Wesnes et al., 2003). The study had links to a cereal maker.

In adults, breakfast gives **a small benefit for memory** (Galioto & Spitznagel, 2016). Results for attention are largely unclear.

> **Key Concept:**
> Macronutrients. The three main parts of food that **give you energy**, namely carbohydrate, fat and protein.

Macronutrients



Meal timing matters too.

An older review covers **how macronutrients and meal timing** affect mental performance (Dye et al., 2000).

Omega-3 and Other Supplements

Supplements are **a separate question**. Five have been tested for attention.

Earlier meta-analyses of omega-3 reported **small benefits** for ADHD symptoms in children and young people (Bloch & Qawasmi, 2011; J. P.-C. Chang et al., 2018; see 1.3.4 on ADHD).

> **Science Says:**
>
> The largest and most recent Cochrane review (see 5.1.2) covered 37 trials (Gillies et al., 2023). It found **high-certainty evidence of no effect** on symptoms as judged by parents. High certainty means the reviewers rated the evidence very trustworthy.

The Gillies review **supersedes the earlier ones**, meaning it replaces them. In healthy people, omega-3 results are inconclusive (Stonehouse, 2014).

Omega-3 for ADHD

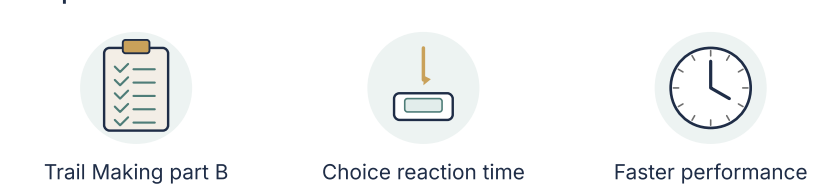


Ginkgo biloba had **no effect on attention** in healthy people (Laws et al., 2012).

A meta-analysis pooled 9 placebo-controlled trials of Bacopa with 518 adults (Kongkeaw et al., 2014). A placebo is a dummy treatment that looks the same as the real one. The adults took **a standardised extract**,

made to contain a set amount of the active ingredients, for at least 12 weeks.

Bacopa led to **faster performance on two timed tests** (Kongkeaw et al., 2014). These were Trail Making part B (see 1.2.2) and choice reaction time, pressing the right key for one of several signals. The authors read this as improved "speed of attention", and they say only a large, well-designed trial would settle the question.



Creatine trials were small and found **conflicting effects** on attention (Avgerinos et al., 2018). Tyrosine, an amino acid found in protein, may help only in **short-term stressful or demanding situations** (Jongkees et al., 2015).

My advice is to **talk to a doctor or pharmacist** before you take a supplement. This matters most if you take medicines or want to treat a health condition. The National Institutes of Health fact sheet is a reference point for omega-3 claims (Office of Dietary Supplements, 2025).

Food Additives, Sugar and Children

> **Science Says:**
> One double-blind trial (see 4.2.2) gave ordinary children drinks with artificial colours plus a preservative (McCann et al., 2007). The drinks **slightly increased hyperactivity**.

In children with ADHD, colour effects are **small**, and perhaps 8% react to colours (Nigg et al., 2012). With blinded rating (see 7.2.2), cutting out artificial food colours still had a significant effect (SMD 0.42, about 66 in 100; see 8.2.1 on SMD) (Sonuga-Barke et al., 2013).

Artificial food colours



Children with ADHD



Perhaps 8% react to colours



Cutting out colours still had an effect

Hari claims that additives harm focus, and **the effect is small** (Hari, 2022). His claim that ultra-processed diets erode focus is unsupported for healthy adults. The MIND diet trial found no effect on thinking (Barnes et al., 2023; see 6.2.2).

Two popular beliefs are that **sugar gives you a rush** and makes children hyperactive. Sugar does not improve mood, and it is linked to more fatigue and less alertness within an hour (Mantantzis et al., 2019).

Blinded trials found **no effect of sugar** on children's behaviour or thinking (Wolraich et al., 1995). A small effect in some children can't be ruled out.

Caffeine aside, no food or supplement has **strong evidence** of sharpening attention in healthy adults. Bacopa's evidence is moderate and comes from small trials, and ginkgo had no effect (Laws et al., 2012).

> Exercise:
>
> A focus-friendly day of eating.
>
> 1. Keep **a water bottle** in sight and sip through the day, more in heat.
> 2. Eat breakfast and regular meals at roughly the same times.
> 3. Note any afternoon slump, and check how much you drank before it.

Table 8.5 sets out **each food claim** and what the evidence shows.

Table 8.5: Food, drink and attention

Claim	What the Evidence Shows	What You Can Do
Hydration helps attention	Strong, 2% dehydration impairs attention most (Wittbrodt & Millard-Stafford, 2018)	Drink regularly, especially in heat
Breakfast helps focus	Weak, from systematic reviews (see 3.2.1), lowered for mixed results and mostly short-term studies (Adolphus et al., 2013; Galioto & Spitznagel, 2016)	Good for children's on-task behaviour, with no promise for adults
Macronutrients shape focus	Weak, from a narrative review, one that describes studies without pooling them, lowered for inconsistent results and mixed designs (Dye et al., 2000)	No specific diet for focus
Omega-3	Weak for healthy people (Stonehouse, 2014). In ADHD, strong evidence of no effect on symptoms (Gillies et al., 2023), replacing earlier small positive estimates	Skip it as a focus aid
Ginkgo	Strong evidence of no effect (Laws et al., 2012)	Skip it

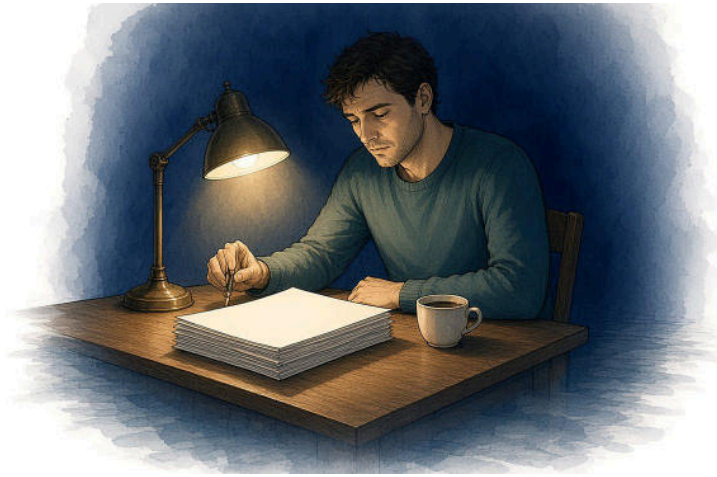
Claim	What the Evidence Shows	What You Can Do
Bacopa	Moderate, from a meta-analysis of 9 trials, lowered for small trials (Kongkeaw et al., 2014)	Gains on two timed tests only, so ask a doctor or pharmacist first
Creatine and tyrosine	Weak, from small trials with conflicting or mixed results (Avgerinos et al., 2018; Jongkees et al., 2015)	Ask a doctor or pharmacist first
Food additives	Weak, from a trial and a meta-analysis, lowered for publication bias and small samples (McCann et al., 2007; Nigg et al., 2012)	A small effect, and rarely a main cause of attention problems
Sugar	Strong, no rush and no hyperactivity (Mantantzis et al., 2019; Wolraich et al., 1995)	Skip sugar as a focus aid

Key idea:

Apart from caffeine, no food or supplement has strong evidence of sharpening attention in healthy adults, and sugar doesn't give you a rush. Staying hydrated matters most, and regular meals help.

8.3.2 Caffeine and Other Stimulants, Uses and Limits

Your morning coffee **reliably helps attention**, in rested and sleep-deprived people alike. Stronger stimulants promise more and deliver less.



The morning cup. A small, dependable lift.

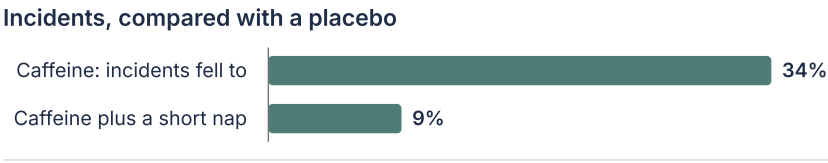
What Caffeine Does for Attention

Caffeine **improves attention and reaction time** (McLellan et al., 2016; see 1.3.2). It helps the doorkeeper stay on watch for longer, which is vigilance (see 1.2.2).

> **Science Says:**
> Pooled studies of sleep-deprived people **confirm clear gains in attention** from caffeine (Irwin et al., 2020; see 1.3.2 on meta-analyses).

Caffeine acts on **the brain's alerting and executive-control networks** (Einöther & Giesbrecht, 2013). These are the brain systems that keep you ready to respond and that steer attention.

> **Science Says:**
>
> In a driving simulator, 12 sleepy drivers had **far fewer incidents** after 200 mg of caffeine (Reyner & Horne, 1997). Incidents fell to 34% of the level seen with a placebo, the dummy drink (see 8.3.1). Caffeine plus a short nap cut them to 9%.



12 sleepy drivers in a simulator.

> **Key Concept:**
>
> Withdrawal reversal. Relief from the **mild slump of going without caffeine** overnight, which can feel like a boost.

Regular drinkers face **a catch** (James & Rogers, 2005). Part of their morning lift may simply be relief from overnight withdrawal, the doorkeeper getting back to normal.

The withdrawal debate is **still open**. Some reviewers argue the effects go beyond withdrawal reversal (Einöther & Giesbrecht, 2013).

Safe Amounts and Timing

In most healthy adults, up to 400 mg a day is **not generally linked to harm** (U.S. Food and Drug Administration, 2024). That is about 2 to 3 mugs of brewed coffee.

Safe amounts



Up to 400 mg a day



About 2 to 3 mugs of brewed coffee



Children and teens: much less

Single doses up to 200 mg are **considered safe** (EFSA Panel on Dietetic Products, Nutrition and Allergies, 2015). During pregnancy and breastfeeding, the European limit is 200 mg a day (EFSA Panel on Dietetic Products, Nutrition and Allergies, 2015).

Children and teens should have **much less**. Even so, about 73% of US children had some caffeine on a given day, with coffee giving about 24% of it and energy drinks about 6% (Branum et al., 2014).

Children's caffeine: coffee and energy drinks



> **Science Says:**
>
> A safety review urged **more caution for vulnerable groups**, including children and pregnant women (Temple et al., 2017).

Timing **matters for sleep**, and your last cup should come roughly 8.8 hours ahead of bedtime (Gardiner et al., 2023; see 8.1.2).

More caution for vulnerable groups



Children



Pregnant women



A safety review

Check with your doctor or pharmacist before using caffeine if **any of these apply to you** (MedlinePlus, n.d.).

- You are pregnant or breastfeeding.
- You have a heart-rhythm problem, high blood pressure, anxiety or a sleep disorder.
- You take medicines such as stimulants, some antibiotics, asthma or heart medicines.

Caffeine Plus L-Theanine

Tea contains L-theanine, **an amino acid**, one of the building blocks of protein.

> **Science Says:**
> Taken with caffeine, L-theanine gave **some short-term gains** in alertness and in accuracy when switching attention, within the first two hours (Camfield et al., 2014).

The benefit tracked **the caffeine dose** more than the L-theanine dose. The studies are few and small, and some were run by tea-industry researchers (e.g., Owen et al., 2008).

Caffeine plus L-theanine

The caffeine dose → Short-term gains in alertness

Some studies had tea-industry links.

Smart Pills, Nicotine and Where to Get Advice

Stronger stimulants are **a different matter**. So-called smart pills give small effects in healthy people and carry real risks.

> **Key Concept:**
> Off-label use. Using a medicine **for a purpose it was never approved for**.

> **Science Says:**
> In healthy people, amphetamine and methylphenidate, stimulant medicines prescribed for ADHD (see 1.3.4), have **small effects on inhibitory control** (see 4.1.1) and memory (Ilieva et al., 2015). The pooled results show publication bias, explained in 1.3.2.

Users may **feel more energy and motivation**, and their thinking improves only a little (Ilieva et al., 2015). Evidence for these drugs as boosters of thinking is limited (Smith & Farah, 2011).

Smart pills in healthy people



Feel more energy and motivation



Thinking improves only a little



Real risks

Modafinil, a wakefulness drug, is **used off-label** to boost thinking, and the studies vary widely (Battleday & Brem, 2015). They were brought together in a systematic review (see 3.2.1).

Non-medical use **carries risks**. Taking someone else's prescription stimulant is illegal and risky (U.S. Food and Drug Administration, 2023).

Nicotine does **improve attention** in users who have not gone without it (Heishman et al., 2010). Its health risks rule it out.

Nicotine is **highly addictive** (Centers for Disease Control and Prevention, 2025). Using it during adolescence can harm the parts of the brain that control attention.

Nicotine



Improves attention in users

Highly addictive

Harm in adolescence

Ask your doctor or prescriber about **prescription medication**, nicotine or supplements, including stimulant medication for ADHD.

> Exercise:
>
> A caffeine audit.
>
> 1. For three days, write down **every caffeinated drink** and the time you had it.
> 2. Add up the total and compare it with 400 mg a day.
> 3. Move your last cup to roughly 8.8 hours ahead of bedtime.

Table 8.6 sets out **each stimulant**, its effect and its risks.

Sleep, movement, food and attention

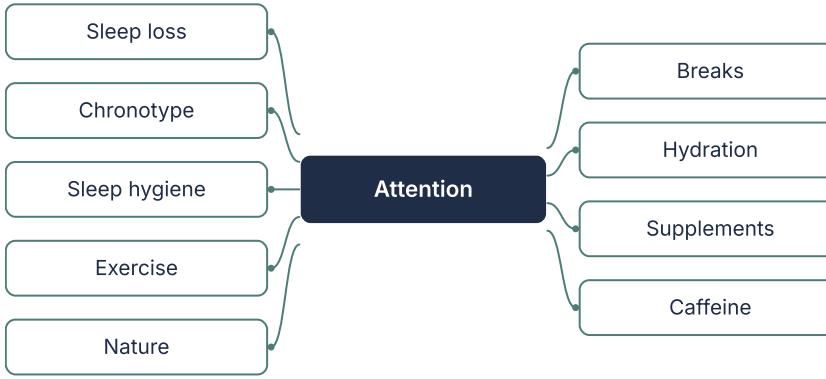


Table 8.6: Stimulants and attention

Substance	Effect on Attention	Limits and Risks	What You Can Do
Caffeine	Improves vigilance and attention. Strong in sleep-deprived people, from a meta-analysis (Irwin et al., 2020), and moderate in rested people, from a narrative review of many controlled studies (McLellan et al., 2016)	Up to 400 mg a day for healthy adults, disrupts sleep if taken late, withdrawal debate open	Use it in moderation, with the last cup roughly 8.8 hours ahead of bedtime
Caffeine plus L-theanine	Gains in alertness and attention switching. Weak, from pooled studies marked down for few small studies and industry funding (Camfield et al., 2014)	Same caffeine limits	Optional, with modest expectations
Prescription stimulants (healthy users)	Small effects on inhibitory control and memory. Moderate, from pooled trials marked down one level for publication bias (Ilieva et al., 2015)	Medical and legal risks of non-medical use	Talk to a doctor

Substance	Effect on Attention	Limits and Risks	What You Can Do
Modafinil	Benefits mostly on complex tasks. Weak, from a systematic review (see 3.2.1) of controlled trials, marked down for mixed results and inconsistent methods (Battleday & Brem, 2015)	Off-label	Talk to a doctor
Nicotine	Improves attention in users who have not gone without it. Not rated, left out on safety grounds (Heishman et al., 2010)	Serious health risks and highly addictive (Centers for Disease Control and Prevention, 2025)	Avoid it

Key idea:

Caffeine reliably helps attention, in rested and sleep-deprived people alike, as long as you stop well before bed. Stronger stimulants give small effects in healthy people and carry real risks, and medication questions belong with a doctor.



Module

9

Attention Practitioner Levels

9.1 Levels of Attention Practice

Being "at a level" in attention practice works like **the belt grades in a martial-arts school**. Each belt marks what you can do in that school's own system. The Attention Practitioner levels are our own system in the same way, and each level is made of three strands, set out below.



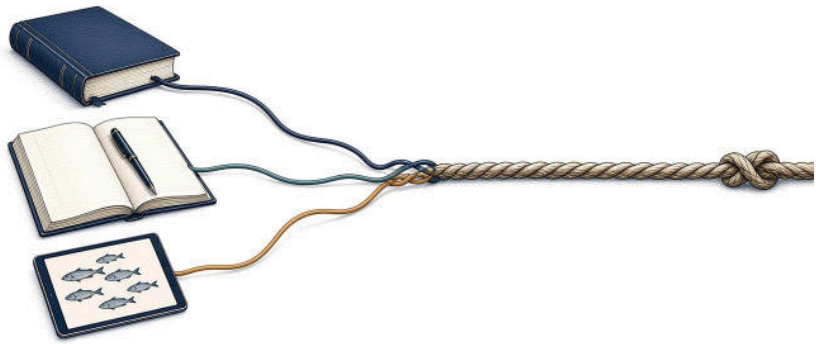
Five levels, one programme's own grades. Each marks progress in this book's practice and makes no claim to rank attention on a natural scale.

What a Level Means

No tested score ranges or published studies define "levels of attention mastery". Tested score ranges, often called norms, come from

measuring large groups of people. Without them, the levels can't rank attention ability against other people. They are **a design for practice with set steps**, and each level combines three strands.

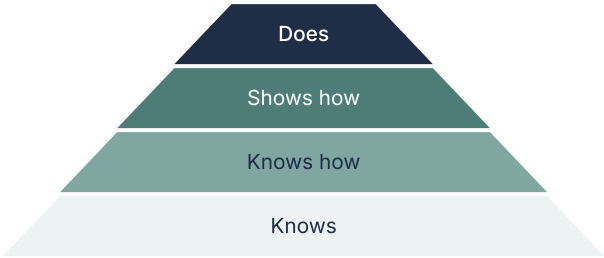
- Our practice methods, from focus techniques to sleep and food, named by unit (Modules 3 to 8).
- Real-life practice, recorded in a practice journal you keep yourself.
- Benchmarks from Cleverini's free browser games.



Three strands make a level. You know the methods, log practice in real life, and reach game benchmarks.

The three strands follow **Miller's pyramid**, a ladder that medical teachers use to judge skill (G. E. Miller, 1990). It climbs from knowing and knowing how to showing it and doing it every day. Miller called these steps "knows", "knows how", "shows how" and "does".

Miller's pyramid



> 🗝 **Key Concept:**
>
> Miller's pyramid. Skill grows in **four steps, from knowing to doing**. In this book, the methods strand covers "knows" and "knows how". A game benchmark is a small "shows how". The journal is the "does".

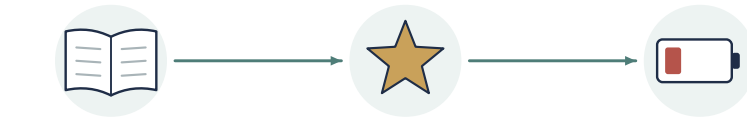
You assess yourself, alone or with a peer or mentor (see 9.3.2). No outside body checks or records your level. A level marks your own progress in this programme and carries no professional standing.

Why Practice Is Built Into Every Level

Each level asks for **practice you can show**. Deliberate practice, the hard and focused practice that targets your weak spots (see 3.1.2), is the classic account of how experts get there (Ericsson et al., 1993). Even among top performers, **how much of it they had done** went closely with how good they were.

At the US National Spelling Bee, **studying words alone** predicted how well children did better than being quizzed or reading for pleasure (Duckworth et al., 2011). The spellers rated solo study **the most effortful and least enjoyable** thing they did.

Spelling Bee



> **Science Says:**
>
> Chess has a real ladder of levels, its player ratings. In two groups of rated players, **serious study alone** was the strongest predictor of skill (Charness et al., 2005). Grandmasters had spent about 5,000 hours on it in their first ten years, **nearly five times** as much as intermediate players.

Chess players, first ten years

5,000 hours

Hours grandmasters spent on serious study alone

Nearly 5 times the intermediate players.

The Five Levels

Dreyfus's five stages, from novice to expert, describe **how skills develop** (Dreyfus, 2004). The model is a theory about skills in general, and nobody built it to measure attention. We borrow only the idea of stages, and **the level names are our own**.

Basic and Intermediate, the first two levels, are **for yourself** (Modules 3 and 4). You learn the core focus techniques and the daily exercises, and you use them in your own day.

Advanced and Expert, the middle two, move into **harder settings**. You keep focus under pressure and fatigue when real demands arrive in class, on the job and at home.

Who the levels are for



For yourself



Harder settings



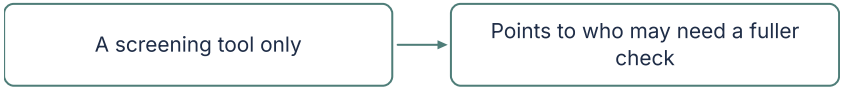
Helping someone else practise

The Advanced and Expert methods draw on **flow and pressure** (see 4.2), common attention problems, and using technology on purpose (see 7.2). Sleep, movement and food are part of them (Modules 5, 6 and 8).

The top level, Master, is about **helping someone else practise**, within scope. A practitioner supports and never diagnoses.

The ASRS v1.1 questionnaire is **a screening tool only** (Kessler et al., 2005). A screening tool only points to who may need a fuller check (see 1.3.4). **It must never be used to label anyone**.

The ASRS v1.1 questionnaire



Never a label.

> **Exercise:**
>
> Find your starting level. Read the Basic row of Table 9.2 and **tick each method you already use** most days. If you tick most of them, read the Intermediate row next. Start at the first level where several methods are still new to you.

Table 9.1: Five levels at a glance

Level	Focus	Methods strand (see Table 9.2)	Journal strand (see Table 9.2)	Benchmark strand (see Table 9.4)
Basic	Learn the basics for yourself	Basic row	Basic row	Basic column
Intermediate	Build steady daily practice	Intermediate row	Intermediate row	Intermediate column
Advanced	Hold focus under pressure and fatigue	Advanced row	Advanced row	Advanced column
Expert	Apply it in real settings	Expert row	Expert row	Expert column
Master	Help others practise, within scope	Master row	Master row	Master column

Key idea:

A level combines three strands, knowing the methods, logging real practice and reaching game benchmarks. It is our own design for regular, effortful practice that you assess yourself.

9.2 Qualification Criteria

Reaching a level works like **a runner moving up a training group**. The runner knows the drills, logs the runs in a training diary and times a trial run. Each level asks for **the same three things**. Two are methods and a journal (Table 9.2), and the third is game benchmarks (Tables 9.3 and 9.4).

Moving up a training group



Knows the drills



Logs the runs in a training diary



Times a trial run

Book Methods and Real-Life Practice

In the methods strand, you can explain each level's named methods in your own words, and you have practised them (Table 9.2). The strand tests **understanding and use**, and recall of facts plays no part.

Basic and Intermediate draw on **the core focus techniques**, the daily exercises and digital boundaries (Modules 3 and 4, and 7.2.1). Advanced and Expert bring in **pressure, fatigue and real settings**, from flow (see 4.2) to sleep, movement and food (Modules 5, 6 and 8) and focus apps (see 7.2.2). Table 9.2 lists every unit by level.

Master adds **a teaching strand**, where you support another person through the Basic methods. You use the units on children and students, on families and teams, and on staying sharp in later life (5.1.2, 5.3.2 and 6.2.2). You stay within the 1.3.4 scope, which means **you support and never diagnose**.

The Master teaching strand



Children and students



Families and teams



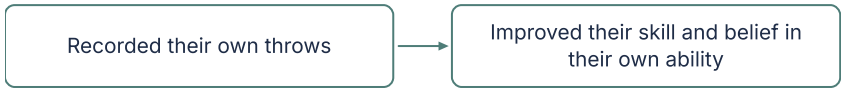
Staying sharp in later life

The journal strand shows what you practised and where you used it in real life. You write it close to the moment. Tracking progress makes reaching goals more likely (Harkin et al., 2016; see 4.1.2).

> **Key Concept:**
> Ecological momentary assessment. Researchers sample people's experience **in daily life, as it happens** (Shiffman et al., 2008). The name means recording in the real setting and in the moment. Your journal does this kind of sampling.

> **Science Says:**
> Ninety high-school girls learned to throw darts (Zimmerman & Kitsantas, 1997). Those who **recorded their own throws** improved their skill, their belief in their own ability and how they felt about their progress.

Ninety girls learned darts



Self-recording is **an established tool in schools**. One review found 41 studies from 2000 to 2012 in which school pupils with ongoing behaviour problems tracked their own behaviour (Bruhn et al., 2015).

Table 9.2: Methods and journal strand by level

Level	Methods strand (unit and method)	Journal strand (real-life practice)
Basic	3.1.1 Single-Tasking and Clear Intentions (if-then plans). 3.3.1 External and Internal Distractions (distraction audit). 4.1.1 Short Exercises for Every Day (breath counting, single-object focus, body scan). 4.1.2 Building Attention Habits (habit plan template)	A full baseline week (9.3.2), then a short exercise and one single-tasking block logged on each practice day, plus one distraction audit
Intermediate	3.1.2 Deep Work (how to plan a deep-work block). 3.2.1 Focused-Attention and Open-Monitoring Meditation (Exercise Table 1). 3.2.2 Noticing and Returning (the four-phase cycle). 3.3.2 Designing a Focus-Friendly Environment. 3.3.3 Attention Aids (timers, checklists, pre-task routines). 7.2.1 Digital Boundaries (device hygiene checklist)	Deep-work blocks and meditation sessions logged with notes on drift and return. One change to your environment and one to your devices, tried and reviewed
Advanced	4.2.1 Entering and Sustaining Flow (setting up conditions for flow). 4.2.2 Concentration under Pressure and Fatigue (quiet eye, reappraising arousal). 6.1.2 Strategies for Regaining Focus (structured breaks, planning and restarting). 8.1.2 Habits for Restful Sleep. 8.2.1 How Much to Move. 8.2.2 Ideas for Restorative Breaks. 8.3.2 Caffeine, Safe Amounts and Timing	Practice under real pressure or fatigue, logged with sleep, breaks and caffeine notes, and what helped and what didn't

Level	Methods strand (unit and method)	Journal strand (real-life practice)
Expert	5.1.1 Study Techniques that Use Attention Well. 5.2.1 Focus in the Modern Workplace (email and messaging, meetings, protected time). 5.2.2 Practical Habits for Attentive Leaders. 5.3.1 Practical Listening Skills. 7.2.2 How to Evaluate a Focus App	Methods applied over time in one real setting (study, work or relationships), plus a written review of whether your game results show up in daily life (7.2.2)
Master	Everything above, plus 5.1.2 Ten Practical Steps for Teachers and Parents. 5.3.2 Shared Attention in Families and Teams. 6.2.2 Keeping Up Practice. 1.3.4 scope (support, never diagnose)	A teaching record. You support another person through the Basic methods, within scope, and write a reflective case. A level review with a peer or mentor is recommended

The methods and journal assignments by level are our own recommendations, and so is the Master teaching strand. Cleverini does not set them.

Cleverini Benchmarks

I built Cleverini, so you should know that before you read about its games. The third strand uses seven of them, **one per skill** (Table 9.3). They are free to play in the browser, with no ads and no sign-up. Each has a lab cousin, a research test built on the same idea (see 9.3.1).

Free to play



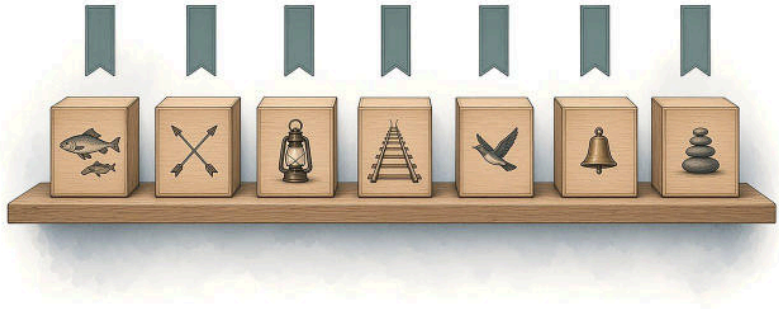
In the browser



No ads



No sign-up



Seven skills, seven games. Each attention skill we cover has one core Cleverini game.

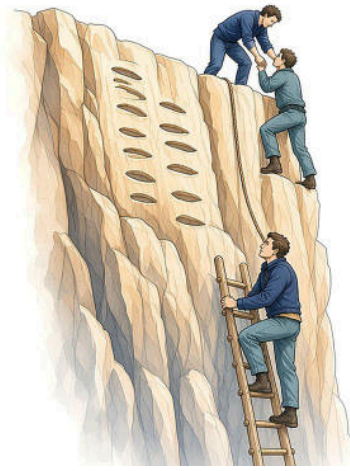
Each game's code has **built-in score ranges**, called bands, and benchmarks use only these bands. **I set the band cut-offs myself** when I wrote the games. For the Schulte 5×5, they are under 45, 30 and 20 seconds. These are my platform's own settings, and no study stands behind them.

The bands carry **the game's own labels**, "Good run", "Great focus" and "Elite focus". On the game's web page, they are "Good", "Great" and "Elite".

Five levels outnumber most games' bands. When a game runs out of bands, the top levels ask for one of three things.

- Consistency across days
- A harder version that exists in the game
- The journal and teaching strand

These starred criteria in Table 9.4 are our own recommendations, and no band is ever made up.

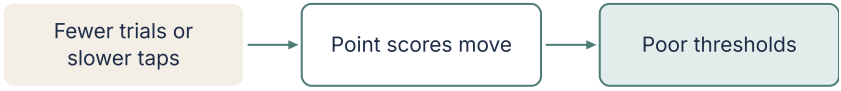


When bands run out, the top levels ask for consistency, a harder version or teaching. They never ask for a made-up number.

Some numbers are steadier than others. The Schulte time is the best single benchmark. The Shell Game level is fixed by the game's own table.

Some point scores **move when a device delivers fewer trials** or slower taps. This applies to Echo Match, Switcheroo, Shoal and Lighthouse, and it makes those scores poor thresholds on their own.

Scores depend on the device



Game scores depend on the device you play on. Treat them as personal yardsticks, for comparing yourself with yourself. For this reason, you keep the same device and compare with your own baseline (see 9.3.1).

Other games are optional extra practice, outside the benchmark strand.

- Honeycomb (a spatial pattern span, which its own page presents as a game)
- Fresh Pick (updating which items you have already picked)
- Laser Mirrors (visual working memory)
- Rail Dispatch (divided attention across several trains)

The site files **some casual puzzles** under Attention & focus. Examples are Gem Swap and Mahjong Pairs. They are fine for practice and sit outside the benchmarks.

Optional extra practice



Honeycomb



Laser Mirrors



Casual puzzles

Table 9.3: Skill-to-game map

Skill	Core game	What you do	Number used for the benchmark	Lab cousin (9.3.1)
Sustained attention and visual search	Schulte Table	Tap 1 to 25 in order on a shuffled 5×5 grid (sizes 3, 4 and 5 exist), with no time limit	Finish time (strict "under" cut-offs)	Visual search. The games have no long CPT-style watching task
Working memory	Echo Match	Answer "Same as the last card?" (1-back) for 25 s, then "two back" (2-back), in a 60 s run with one stream of cards	Score band	n-back (Kirchner, 1958), as the game calls it. It doesn't adapt and stops at 2-back

Skill	Core game	What you do	Number used for the benchmark	Lab cousin (9.3.1)
Task switching	Switcheroo	A cue tells you to judge shape, colour or (later) count	Score band. Switch cost in ms shows only with enough trials and has no cut-off	Task-switching tests (Jersild, 1927; Monsell, 2003, see 1.2.2)
Ignoring distractors	Shoal	Report the lead fish's direction while the school points the other way (a flanker task), then a rule switch	Score band. Distraction cost in ms shows only with enough trials and has no cut-off	Flanker (Eriksen & Eriksen, 1974) and Stroop (Stroop, 1935)
Response inhibition	Goalkeeper	Save white balls and let golden and star balls through. Flags flip the rule at levels 5 and 6	The lower of the save band and the hold band	Go/no-go tasks such as the SART (Robertson et al., 1997)
Divided and peripheral attention	Lighthouse	Watch the lamp's symbol stream while spotting ships at the edge. Decoys and fog appear in later nights	Score band, plus "dawn" when all six nights are cleared	Dual-task tests, doing two tasks at once
Multiple-object tracking	Shell Game	Track the cups that hold gems while they shuffle. A colour lure appears from level 6	Level reached (highest cleared + 1)	Multiple-object tracking (Pylyshyn & Storm, 1988)

Table 9.3 comes from my own game code and the in-game result screens, as of October 2026. In the table, ms means thousandths of a second. An n-back task asks whether each item matches **the one a set number of steps back**.

Table 9.4: Level-by-game benchmarks

Game	Basic	Intermediate	Advanced	Expert	Master
Schulte Table (5×5)	Under 45 s, "Good run"	Under 30 s, "Great focus"	Under 20 s, "Elite focus"	★ Under 20 s every day (no higher band, so consistency)	★ Under 20 s every day with no mistakes (the bands ignore mistakes, so this adds accuracy)

Game	Basic	Intermediate	Advanced	Expert	Master
Echo Match	Score ≥ 250, “Steady”	≥ 550, “Sharp”	≥ 900, “Lightning”	≥ 1300, “Echo master”	★ ≥ 1300 every day (no higher band, as the game stops at 2-back)
Switcheroo	Score ≥ 300, “Steady switcher”	≥ 700, “Flexible mind”	≥ 1200, “Switch master”	★ ≥ 1200 every day (consistency)	★ ≥ 1200 every day, and switch cost (when shown) below your own baseline-week median (no ms cut-off exists)
Shoal	Score ≥ 250, “Steady fin”	≥ 600, “Sharp eye”	≥ 1100, “Unshakable”	★ ≥ 1100 every day (consistency)	★ ≥ 1100 every day, and distraction cost (when shown) below your own baseline-week median (no ms cut-off exists)
Goalkeeper	“Safe hands”, with saves ≥ 60% and holds ≥ 50%	“The wall”, with saves ≥ 80% reaching level 3 and holds ≥ 70%	“Golden gloves”, with saves ≥ 90% reaching level 5 and holds ≥ 80% with at least 8 let-in balls	★ “Golden gloves” and clear level 6, the game’s win (harder version in the code)	★ The Expert result every day (consistency)
Lighthouse	Score ≥ 1200, “Lookout”	≥ 2600, “Lighthouse keeper”	≥ 4000, “Eagle eye”	★ ≥ 4000 and reach dawn, all six nights cleared (harder version in the code)	★ The Expert result every day (consistency)
Shell Game	Level reached ≥ 4, “Keen eye”	≥ 7, “Table hawk”	≥ 10, “Shell master”	★ ≥ 10 every day (consistency)	★ Clear level 12, the last level in the game’s own table (8 cups, 4 gems), every day (harder version in the code)

We recommend one protocol for every cell (see 9.3.1). Use the same device, with three benchmark sessions on three different days. A cell is met when **the median of the three** meets it (see 1.2.3).

> **Key Concept:**
> Starred and every-day cells. Cells marked every day **must be met in each of the three sessions**. A ★ marks a criterion without a number, used because the game has no further band. These criteria are our own recommendations.

Schulte cut-offs are strict. A time that equals a cut-off falls into the band below.

In Shell Game, **"level reached" means highest level cleared + 1**. For example, "≥ 4" means you have cleared level 3.

Shell Game level



Goalkeeper's hold is "not rated" when **fewer than 3 balls were let in**, and the result is then capped at "Safe hands". Echo Match's "Echo master" is **a points band**. It says nothing about which n-back step you reached.

The point scores for Echo Match, Switcheroo, Shoal and Lighthouse depend on your device, so they work as personal yardsticks. Table 9.4, like Table 9.3, comes from my game code and the in-game result screens, as of October 2026.

What a Benchmark Shows

A benchmark shows **that you practised** and that you can reach a band in that game, on that device. It is evidence of practice. Whether your everyday attention has improved is **a separate question**.

What a benchmark shows

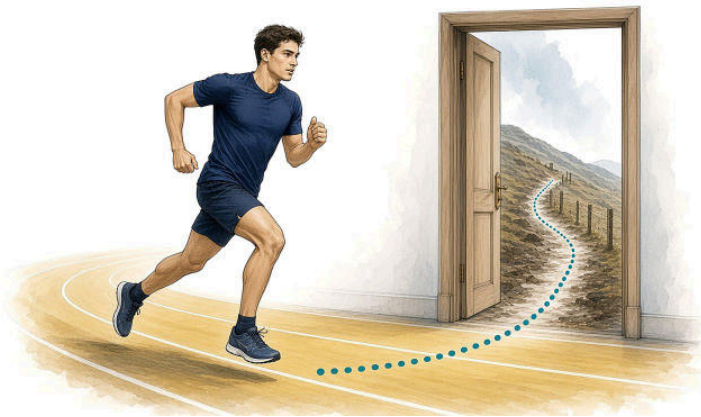
Reach a band in that game → Evidence of practice

Everyday attention is a separate question.

The games' own pages say as much. They use "friendly markers, not a test" and "not a calibrated test". One calls itself "a mental workout, not a treatment or a test".

> **Science Says:**
>
> Practice on a brain-training game **mostly improves that game** (Simons et al., 2016; see 6.1.2). A meta-analysis (see 1.3.2) of 23 studies found reliable short-term working-memory gains on similar tasks, which is near transfer (see 6.1.2). The verbal gains had faded by follow-up (Melby-Lervåg & Hulme, 2013).

Ask the 7.2.2 question, **"Better at what?"** The methods and journal strands carry equal weight with the games for this reason.



A game score shows up in the game. Whether the gain reaches daily life is the open question.

The instant browser games forget your results between visits. A best lasts only while the page stays open and vanishes on reload. There is no saved history, and nothing can be shared or exported.

No game or app awards an Attention Practitioner level, which makes your practice journal your only record.

Some Cleverini games, such as Colors and Figures, **use a free account**, and so does the Cleverini mobile app. The account keeps a game level and a multiplayer rating, a score that rises and falls as you win or lose against other players. **Both are optional context only**, and neither counts as one of our levels or benchmarks.

A free Cleverini account



A game level



A multiplayer rating



Optional context only

Key idea:

A level needs three kinds of evidence, methods you can explain and use, a journal of real practice, and game benchmarks from fixed bands. The benchmarks show practice in a game, so the journal carries the real-life proof.

9.3 Self-Assessment Process

Testing yourself fairly works like **weighing yourself at home**. You use the same scale at the same time of morning over several days, and you don't panic over one reading.

Weighing yourself at home



The same scale



The same time of morning



Several days

Self-assessment is done **alone or with a peer or mentor**, and no outside body runs it. The process moves through **four parts in order**, covered in 9.3.2 after the testing methods in 9.3.1.

- A baseline week
- A retest schedule
- The practice journal
- A level review

Keeping a level after you reach it comes last (see 9.3.3).

Key idea:

Fair self-assessment is slow and steady. Start from your own baseline, retest under the same conditions, log real practice, and review the evidence before you claim a level.

9.3.1 Assessment Methods

Measuring attention works like **checking a car engine from the outside**. You can't see attention, so you give someone a task that uses it and watch what happens. Each task shows **only one slice** of the whole.

Why Attention Is Hard to Measure

Lab tests **come in families**, and 1.2.2 met each family once (see 1.2.2).

The continuous performance test, or CPT, keeps you **watching a screen for minutes** for a rare target (see 1.2.2). Its first version was built to pick out brain damage (Rosvold et al., 1956).

The CPT



Watching a screen



For minutes



A rare target

> **Science Says:**
> Across a sample of 10,430 people, **staying on task was best in the early 40s** (Fortenbaugh et al., 2015; see 6.2.1). Age shapes a CPT score, so a stranger's result is a poor yardstick for yours.

Go/no-go tasks ask you **to hold back on some items** and respond to the rest (see 1.2.2). The SART is one of them (Robertson et al., 1997; see 1.3.3). **Goalkeeper resembles them**, so its misses carry the same limits.

As 1.3.3 showed, SART errors **partly come from speed** (Seli et al., 2012; Seli, Jonker, et al., 2013). **Fewer errors may then only mean you slowed down**. Check your speed whenever your error count drops.

SART errors and speed



Check your speed too.

Tests of Ignoring and Switching

The Stroop task (see 1.2.2) is **one of the most studied tasks in psychology**. One review gathered about 400 studies from half a century of research on it (C. M. MacLeod, 1991). That long record makes it a well-understood test of ignoring a strong habit.

The flanker task (see 1.2.2) began with **letters**. People named a target letter while noise letters on either side slowed them down (Eriksen & Eriksen, 1974). Later versions swapped in arrows, as in the ANT (Fan et al., 2002; see 1.3.2). **Shoal is a flanker task with fish**.

The flanker task



A target letter

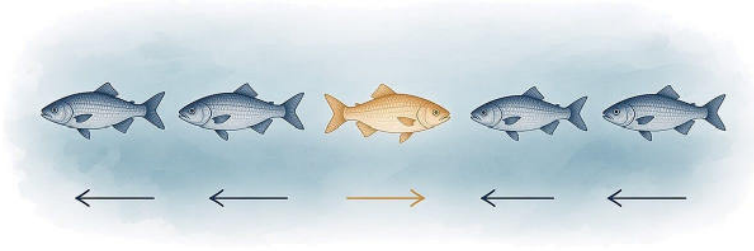


Noise letters on either side



Later versions: arrows

The noise slowed people down.



In both tasks, you must ignore a strong but misleading signal to answer correctly. Shoal uses the same idea with fish.

Task-switching tests measure **the switch cost** (see 1.2.2), the price you pay in time just after a change (Monsell, 2003). **Switcheroo reports this extra time**. One older pen-and-paper test is the Trail Making Test (Reitan, 1958). Its norms come from 911 people aged 18 to 89 (Tombaugh, 2004).

One Person Is Harder to Measure Than a Crowd



A test that reads true for a whole fleet of cars can still misread one engine. Many attention tasks share that limit.

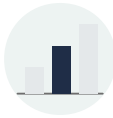
There is **a catch**. An engine check can be right on average across a fleet and still give one car a shaky reading. Many attention tasks work **well for group averages** and poorly for individuals.

> 🗝 **Key Concept:**
>
> Test-retest reliability. Take the same test twice, and your scores may differ. **How well the two tries match** is called test-retest reliability. It runs from 0, no match at all, to 1, a perfect match.

> 🧪 **Science Says:**
>
> Across common attention tasks, test-retest reliabilities ranged **from 0 to .82** (Hedge et al., 2018). Some tasks that work well in group studies give one person very different scores on two days.

Another check compares **one half of a test's trials with the other half**. This is called split-half reliability. The ANT's alerting and orienting scores reached only .20 and .32 (J. W. MacLeod et al., 2010). Its executive control score reached .65.

ANT split-half scores



Alerting: only .20



Orienting: .32



Executive control: .65

Part of the problem is that **results jump around** from one trial to the next (Rouder & Haaf, 2019). This is called trial-to-trial noise.

A full research battery, meaning **a whole set of tests**, does better. Its combined scores are highly reliable in adults, with test-retest values of .86 to .92 (Heaton et al., 2014).

No single score is a pass/fail gauge of your attention. A level rests on three strands and several days. A single game on a single day can never decide it.

Fair Conditions for Testing Yourself

Reaction times **depend on the device**. Goalkeeper's own page says touch screens and monitors add their own small delays. Tests run on computers need **their own rules for hardware and software** (Bauer et al., 2012).

> **Science Says:**
> In 1,469 people, the average simple reaction time was 231 thousandths of a second. After correcting for **delays from the computer hardware and software**, it was 213 (Woods et al., 2015). The equipment alone added about 18 thousandths of a second.

Average simple reaction time



Two devices give two different measurements. Keep conditions the same each time, and write the device down in every journal entry. Keep these four things steady.

- The same device
- The same browser
- A similar time of day
- A note of how you slept

One session is mostly noise. For each benchmark, we recommend three sessions on three different days. Then take the median, the middle result (see 1.2.3).

For the top cells marked “every day”, **all three sessions must meet the cell**. This protocol is our own recommended practice. Cleverini has no official rule on it, and no research standard sets it.



Same device, three different days, take the middle result. One session is mostly noise.

The browser games **forget your result** when the page closes. Write it in the journal before you close or reload the page.

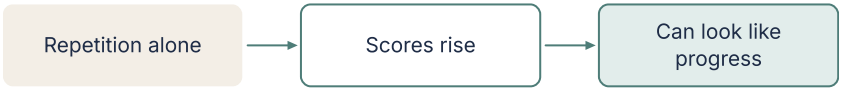


The game forgets your result when the page closes, so write it down first.

Practice Makes Scores Rise

Scores rise with repetition alone, and that rise can look like progress.

Practice effect



> **Key Concept:**
> Practice effect. Doing the same puzzle twice makes you faster even if your attention hasn't changed. This is **a practice effect** (Calamia et al., 2012). Your score rises because you know the test better.

> **Science Says:**
> Thirty-six healthy adults took the same tests 7 times over a year (Bartels et al., 2010). Most tests showed **clear practice effects up to month 3**, largest in the early sessions, and then scores levelled off. Across the different tests, the gains ranged from d = 0.36 to 1.19. In everyday terms, depending on the test, the average score after practice was higher than about 64 to 88 in 100 scores from the first session.

Expect your first few weeks of scores to climb for this reason alone. Compare your results with your own baseline on your own device, and

only after the early climb has levelled off. Never compare them with other people's scores.

Key idea:

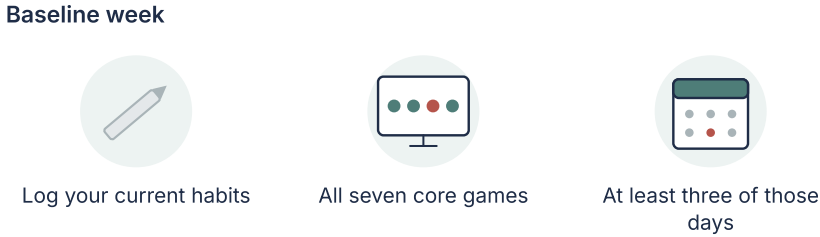
Each attention test shows one slice, and one person's scores wobble from day to day. Fair self-testing means the same device and conditions, three days with the median, and comparing only with your own baseline once practice gains level off.

9.3.2 Assessment Structure and Content

A LEVEL REVIEW READS YOUR journal the way **an art teacher reads a student's portfolio**. The portfolio holds a whole term's work, so one good or bad piece doesn't decide anything. Your journal does the same for **weeks of practice**.

Baseline Week and Retest Schedule

Start with a baseline week before you work towards a level. We recommend logging your current habits for that week, and playing all seven core games on at least three of those days. **The spread of those results** is your own starting point.



The practice block comes next. Work through the level's methods and use them in real life (Table 9.2). Log as you go. The games are **only part of the practice**.

Retest when the methods and journal strands are complete. Run the three-day protocol for each core game (see 9.3.1). Then compare the median with Table 9.4 and with your baseline. We recommend that **all seven core games** meet the level's cell.



The self-assessment path. Baseline week, practice block, three-day retest, then a level review.

> **Key Concept:**
>
> Reliable Change Index. Every score wobbles a little from day to day. The Reliable Change Index is a measure that asks **whether a change is bigger than that normal wobble** (Jacobson & Truax, 1991).

Your baseline spread shows **how big your own wobble is**. Only count a change as real if it falls outside that range.



Bigger than the wobble? Only a change beyond your own day-to-day spread counts as real.

Single tasks are **unreliable for individuals** (Hedge et al., 2018; see 9.3.1). A level therefore never rests on one game or one day.

> ✎ **Exercise:**
>
> Start your baseline week. For seven days, **log your current habits** in Table 9.5 without changing them. On three of those days, play all seven core games under your fixed test conditions (see 9.3.1).

The Practice Journal and Level Review

The journal follows **the plan, do and review cycle** of self-regulated learning (Zimmerman, 2002; see 4.1.2). Each entry records what you planned, what you did and what changed (Table 9.5).

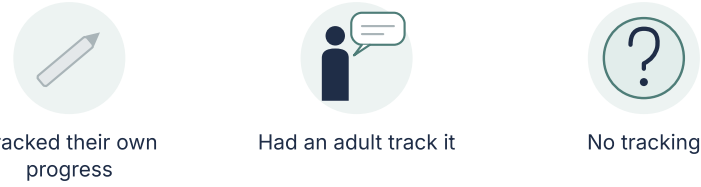


Plan, do, review. Each entry adds one more page to your portfolio.

A diary captures **the details of daily life** that a one-off test misses. Diary reports make change within one person measurable over time (Bolger et al., 2003). That is the job your journal does.

> **Science Says:**
>
> Children learning subtraction either tracked their own progress after each session, had an adult track it, or had no tracking (Schunk, 1982). **Both kinds of tracking raised** their belief in their own ability, their skill and their persistence, compared with no tracking. Self-tracking and adult tracking worked equally well.

Children learning subtraction



Both kinds of tracking worked equally well.

Each self-check in the journal gives you **a clue about your attention**, and **none of them is a diagnosis** (see 1.3.4). The journal holds these four.

- Breath-counting accuracy (Levinson et al., 2014; Wong et al., 2018)
- The Cognitive Failures Questionnaire, a list of everyday slips in noticing, memory and action (Broadbent et al., 1982)
- A flow questionnaire after demanding work (Jackson & Eklund, 2002)
- If you like, self-ratings such as the MAAS, the Mindful Attention Awareness Scale, which asks how often you are aware of the present moment (Brown & Ryan, 2003), or the Mind-Wandering Questionnaire (Mrazek, Phillips, et al., 2013)

The level review works through **the checklist in Table 9.6**. It covers every method, every journal requirement and every benchmark cell for the level. It adds **the honesty checks**, which cover practice effects, the wobble and whether game gains reach daily life (see 7.2.2).

> **Science Says:**
>
> People's ratings of their own skill match their actual performance **only moderately or weakly** (Dunning et al., 2004). Most people rate themselves above their real level and feel more sure than they should.

Rating your own skill



So a reviewer asks for evidence.

For this reason, **a reviewer asks for the evidence** behind each tick. You can review alone, with a peer or with a mentor. A reviewer reads the whole journal along with the scores. No outside body takes part.



Three ways to run a level review, all using the same checklist and journal.

The outcome goes in your own journal. One outcome is "level reached", with the date and evidence. The other is "keep practising", naming the strand that is missing.

Table 9.5: Practice-log template

Date and conditions	Practice	Real life	Result and review
Time, device, sleep, caffeine	Unit and minutes	Where I used it	Game band, what changed

Table 9.6: Level-review checklist

Strand	Check	Evidence (journal page or entry)	Met?
Methods	I can explain each method listed for this level (Table 9.2) in my own words		☐
Methods	I have practised each method, and the journal shows when		☐
Journal	My baseline week is complete, with device and conditions noted		☐

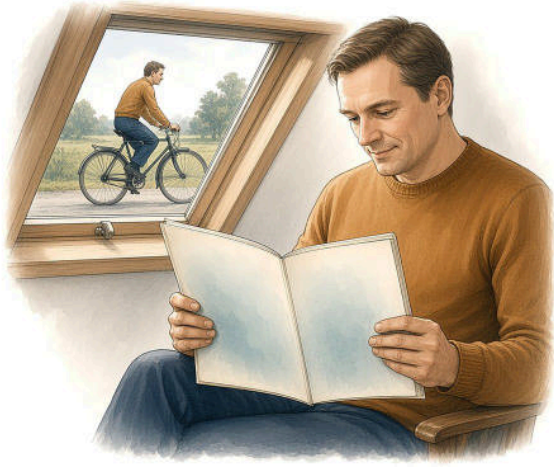
Strand	Check	Evidence (journal page or entry)	Met?
Journal	Real-life use for this level is logged (Table 9.2, journal strand)		☐
Journal	(Master only) My teaching record and reflective case are complete, within the 1.3.4 scope		☐
Benchmarks	Each of the seven core games meets its Table 9.4 cell by the three-day median, on the same device as my baseline		☐
Benchmarks	Cells marked “every day” were met in each of the three sessions		☐
Honesty	I have allowed for practice effects, and my change is bigger than my own wobble		☐
Honesty	I have checked whether my game gains show up in daily life (7.2.2)		☐
Review	Reviewed by myself, a peer or a mentor (circle one), with the outcome and date written in the journal		☐

Key idea:

A level review reads the whole journal, from baseline week to retest. Count only changes bigger than your own wobble, and back every tick with evidence, because self-ratings alone run high.

9.3.3 Keeping Your Level

A LEVEL WORKS LIKE **a language learnt at school**. It stays yours only while you keep using it, and a skill fades with disuse.



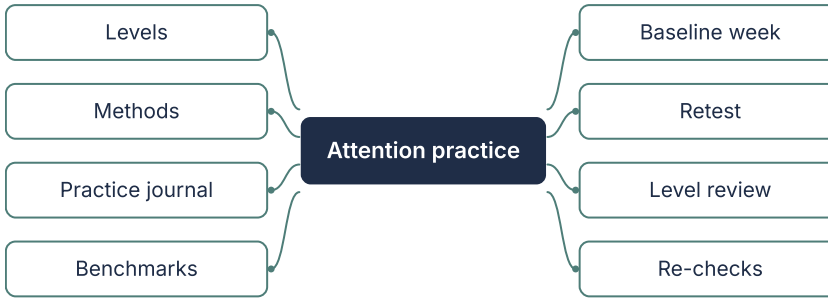
Like a school language, skills fade with disuse. Thinking skills fade more than physical ones.

> **Science Says:**
>
> Researchers tested 733 people **up to 50 years after they learnt Spanish at school** (Bahrick, 1984). Memory for it fell over the first 3 to 6 years and then held steady for up to 30 years. People who had trained more to begin with **kept more**.

Practice Keeps a Level Current

A meta-analysis (see 1.3.2) of skill loss found **large losses after more than a year** without use (Arthur et al., 1998). The difference was d ≈ -1.4. In everyday terms, after a year off, the average score fell below about 92 in 100 of the scores people had right after training. **Thinking skills faded more** than physical ones.

Levels and self-assessment



The same pattern shows up **over a school summer**. Across 39 studies, test scores dropped by about a month of school progress over the holidays, more for maths and spelling than for reading (Cooper et al., 1996).

Over a school summer



Practice may slow the fade. One study followed people for up to 7 years after three months of full-time meditation (Zanesco et al., 2018; see 6.2.2). Their gains in **holding back unwanted responses** were partly kept several years later.

Those who kept practising more **showed smaller age-related declines** (Zanesco et al., 2018). That link is correlational (see 3.2.1), so it leaves open whether practice was the cause.

Practice and ageing



Correlational only.

What keeps a level current is ongoing practice and an ongoing journal. The date you first reached it counts for little on its own.



Keep a level the way you reached it. Practise, log and re-check.

When to Re-Check

Spaced, repeated practice tends to **work better than one burst** (Cepeda et al., 2006; see 5.1.1). After a long break, repeat the baseline-and-retest steps before you claim the level again (see 9.3.2). Allow for **practice effects** when you do (Calamia et al., 2012; see 9.3.1).

Science Says:

More than 1,350 people learnt facts and reviewed them after different gaps. **The best gap grew** with how long the memory had to last (Cepeda et al., 2008). For a test a week later, the best gap was about 20 to 40% of that week. For a test a year later, it was about 5 to 10% of the year.

Longer goals call for longer gaps between re-checks.

Longer goals, longer gaps



Exercise:

Plan your re-checks. Decide **how far ahead you need the skill**, such as a year. As a rough guide, the further ahead that is, the longer the gaps between short re-checks can be. Write the dates in your journal. The spacing study above tested one review of learnt facts before a final test, so treat it as a loose pointer for attention practice.

Key idea:

A level fades without use, faster for thinking skills than for physical ones. Keep it current with ongoing practice, spaced re-checks and an honest journal.

A. A Simple Weekly Practice Planner

A WEEK OF ATTENTION practice fits on one sheet of paper. **A few minutes on a Sunday are enough to fill it in.** You write a short practice into the days ahead, tie each one to a moment you already have and pin the sheet where you will see it on Monday morning.

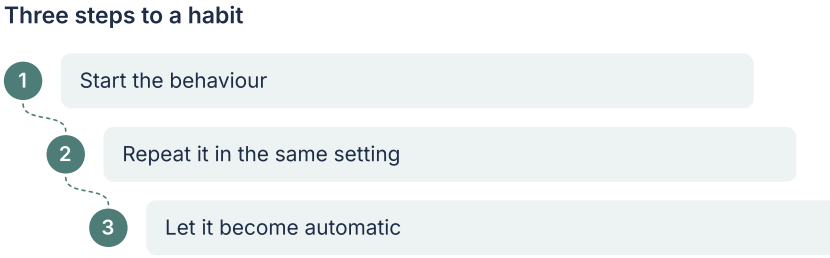


Habit plan template. Pick a cue, a practice and a duration. Log it, and review each week to adjust.

> Key Concept:
>
> **How to use this planner.** Every sheet here is a blank copy of a plan from the book**. The filled rows are examples to change. The From column names the section that explains each idea, and Appendix C writes out every exercise the sheets name. Use a pencil, because the first version is a draft.**

The week rests on three habits. **Tie each practice to a cue you meet every day, keep it short and write down what you did.** A cue is a moment that happens anyway, such as pouring your morning coffee or sitting down at your desk. Habits are triggered by context, so the moment itself reminds you.

Write each practice as an if-then plan made in advance. **"After I pour my morning coffee, I'll do three minutes of breath counting"** is one example from the book. Write the cue in the second column of the planner, so the plan starts itself and you have nothing to weigh up.



Breaking an old habit starts with its setting.

Table A.1: My weekly planner

Day	Cue (after this)	What I do (exercise from Appendix C)	Minutes	Done
Monday				
Tuesday				
Wednesday				

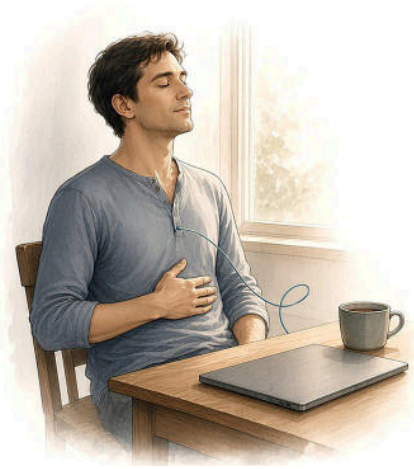
Day	Cue (after this)	What I do (exercise from Appendix C)	Minutes	Done
Thursday				
Friday				
Saturday				
Sunday		Check my log and adjust next week		

Fill in the cue column first, then the practice. Pick moments that come on most days, and tick the Done column as soon as the practice ends. Leave a missed day blank, because the gaps are part of the record you read on Sunday.

If you want a starting point, copy the hooks below. **Each one pairs a daily moment with one short exercise**, and the last two rows add a start-up routine and a deep-work block for the working day.

Table A.2: Sample hooks

Moment	What you do	Minutes	From
After pouring your morning coffee	Breath counting	3	4.1.2
On the commute, never while driving	A body scan or single-object focus	Your choice	4.1.2
Before opening email	Slow breathing	1	4.1.2
When you sit down at your desk after lunch	The start-up routine, then open the report first	Under 5	3.3.3
A block in your calendar, booked like a meeting	One deep-work block with one written outcome	Your choice	3.1.2
Each week	Check your log and adjust	Your choice	4.1.2



Hook it onto something you already do. An existing routine becomes the cue for one short practice, written as an if-then plan.

Pick a length you can keep up, and treat steady practice as the goal. No study has tested a minimum dose, so start short, and add one minute a week if you want longer sessions. Each session can begin with one weak spot, because hard, focused practice aims at the parts you cannot do yet.

A habit takes longer than people expect. **The popular figure of 21 days has no evidence behind it.** Expect weeks to months, and expect the time to vary a lot from one person to the next. Missing one day did no harm in the study of new habits, so carry on at the next cue.

> Science Says:
>
> **In mindfulness courses, people did about two-thirds of their assigned home practice (Parsons et al., 2017). More practice was modestly linked to better outcomes.** Doing most of it, on most days, is a normal result**, and nobody in those courses did everything.**

Plan for imperfect weeks before they arrive. **Agree a minimum version of the practice for busy days**, such as one minute of breath counting. That way, the cue still gets its response and the habit keeps building. The idea itself has not been put to a test, so try it and see whether it holds for you.

Your week sits inside a longer plan. **Each Practitioner Level follows the same four steps**, set out in Table A.3. The weekly planner covers the practice block, and Appendix E holds the sheets for the other steps.

Table A.3: The level plan

Step	What you do	From	Done
Baseline week	Log your current habits for seven days without changing them, and record your benchmark sessions on three of those days (Appendix C)	9.3.2	
Practice block	Work through the level's methods, use them in real life and log as you go (Table E.2)	9.3.2	
Retest	When the methods and journal strands are complete, run the three-day retest and compare it with your baseline	9.3.2	
Level review	Work through the checklist in Table E.5, alone or with a peer or mentor	9.3.2	

The baseline week comes first because **the spread of those results is your own starting point**. Change nothing in that week. A plan that starts before the baseline leaves you with nothing fair to compare against.

Bumps come to every plan, and **an if-then plan written in advance brings you back**. Fill in the blank rows below for the bumps you can see coming, such as a late shift, a trip or a busy month.

Table A.4: Plans for bumps

If this happens	Then I will	From
My phone buzzes during practice	Leave it until my break	6.1.2

If this happens	Then I will	From
I have to stop in the middle of a task	Write the very next action on a note and put it where I will see it	6.1.2
A busy day leaves no room	Do the minimum version, such as one minute of breath counting	4.1.2
I miss a day	Carry on at the next cue	4.1.2
My pinned list stops catching my eye	Move it to a new place	4.1.2
I take a long break from practice	Repeat the baseline and retest steps before I claim my level again	9.3.3

The pinned list needs a word of its own. **The brain stops noticing something that never changes**, and that is called habituation. A list in the same spot every day soon fades from view. Moving it now and then keeps it new enough to catch your eye.

Keeping track helps you reach a goal, and in the studies it worked better when progress was physically recorded. **A simple log on paper or in an app** fits the cycle of planning, doing and reflecting. Write one line after each practice, and read the lines back on Sunday before you plan the next week.

Exercise:

A five-part habit plan.

1. Pick the cue, an existing daily routine, and write “After I...”.
2. Pick the practice, one exercise from 4.1.1, and write “I will...”.
3. Set the duration as “For... minutes”.
4. Choose how you will log it, such as paper, an app or a calendar, and write “I will record it in...”.
5. Set **a weekly review** with “Each... I’ll check my log and adjust.”

Expect the planner to change as the weeks go by. **A crossed-out cue with a better one pencilled beside it shows the planner is working.** Keep the old sheets in a folder, and at your level review they show the pattern of your own practice.

Key idea:

Tie each practice to a daily cue, keep it short and log it**, and let a minimum version carry you through the busy weeks.**

B. Sleep, Movement and Meal Planning Worksheets

Tonight's habits **set up tomorrow's focus**. The worksheets here turn the advice of Module 8 into short weekly logs.

> Key Concept:
>
> **How to use these worksheets.** Each sheet copies a log or a habit from Module 8**, and the From column names the section behind it. Fill in one sheet for a week, then look for a pattern. These sheets support everyday habits and never replace advice from a doctor.**

Sleep

Sleep experts agree that adults should **regularly sleep 7 or more hours** a night (Watson et al., 2015). A short night hurts your focus more than you notice, and after a run of short nights your performance keeps sliding even when you feel fine, so the feeling of being used to it is a poor guide.

For one week, note when you went to bed and woke up, and each afternoon note one moment when your focus slipped. At the end of the week, look for a link between short nights and slips.

Table B.1: My sleep and focus log

Day	Went to bed	Woke up	Hours	One moment my focus slipped this afternoon
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

> Science Says:
>
> **The time of day plays a part.** The post-lunch dip is a real fall in alertness **(Monk, 2005). It is tied to the body clock, and it happens even without lunch.**

The habits for restful sleep vary in how strong their evidence is. **A fairly regular wake time may help some people**, while the evidence for strict sleep schedules is weak. Caffeine and screens are the two evening habits that can push sleep later.



E-reader versus printed book. In a small study, an e-reader before bed delayed sleep and lowered next-morning alertness. Real-world reading is usually shorter and dimmer.

The review behind the caffeine advice suggests **a cut-off of about 8.8 hours** before bedtime for a standard coffee (Gardiner et al., 2023). With a 10:30 pm bedtime, the last coffee would come at about 1:45 pm. Work out your own cut-off once.

A moderate dose, taken late

400 mg, 6 hours before bed	→ Disrupted sleep

Exercise:

An evening wind-down.

1. Set **a caffeine cut-off** about 8.8 hours before your usual bedtime.
2. Pick a screens-off time, such as 9 pm, or dim the screen and switch to print.

3. Keep your wake time fairly regular, even at weekends.
4. If poor sleep lasts for weeks, book a visit to your doctor.

Tick each step on the evenings you managed it, and leave a blank where you did not. After a short night, a nap of about 10 minutes in the early afternoon gave the quickest all-round boost in a small study.

Table B.2: My evening wind-down

Day	Caffeine cut-off kept (my cut-off is ___)	Screens off by ___, or dimmed and print	Wake time	Short nap, about 10 minutes
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

If poor sleep lasts for weeks, **more tips will fall short**. A clinical guideline strongly recommends CBT-I for chronic insomnia, the long-lasting kind. Diagnosing and treating sleep disorders is a job for a doctor or sleep specialist, so talk to one about regular sleep problems.

Movement and breaks

> Science Says:
>
> **A brisk walk before a demanding task gives** a small, short-lived lift. **Pooling 79 studies of single exercise sessions showed small positive effects on thinking (Y. Chang et al., 2012). For adults, the World Health Organization recommends 150 to 300 minutes of moderate activity a week (Bull et al., 2020). That advice is about health, and any focus gain is a bonus.**

If you have heart, metabolic or kidney disease, get medical advice first. Chest pain, faintness or unusual breathlessness during exercise are a reason to stop and ask. The same goes for you if you are inactive and want to start vigorous exercise.

Before a demanding task, take a brisk 20-minute walk and start the task soon after you get back. Over a week, compare them with sessions where you started straight away.



Move for health first. For adults, the World Health Organization recommends 150 to 300 minutes of moderate activity weekly.

Table B.3: My walk before hard work

Day	Demanding task	Walked first (yes or no)	How the session went
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Weekly minutes of moderate activity			

Breaks of any kind help you feel better. **Micro-breaks of no more than 10 minutes** raise the feeling of being energetic and reduce fatigue, though they did not reliably improve performance. Breaks earlier in the day and breaks spent on things you enjoy restored more. Nature may help too, though the evidence is mixed.

Table B.4: My restorative break

Day	Mid-morning break, up to 10 minutes	Where (trees, a green view or something I enjoy)	How energetic I felt afterwards
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			

Meals and caffeine

No food has been **proven to sharpen focus**, though a few things about eating and drinking still matter. Losing about 2% or more of your body weight in water measurably impairs thinking (Wittbrodt &

Millard-Stafford, 2018). Staying hydrated matters most, and regular meals help. Sugar does not give you a rush.

Keep a water bottle in sight and sip through the day, more in heat. Eat breakfast and regular meals at roughly the same times. Note any afternoon slump, and check how much you drank before it.

Table B.5: My day of eating

Day	Breakfast time	Lunch time	Evening meal time	Water through the day	Afternoon slump, and what I drank before it
Monday					
Tuesday					
Wednesday					

Talk to **a doctor or pharmacist** before you take a supplement, most of all if you take medicines or want to treat a health condition.

> Science Says:
>
> **Your morning coffee** reliably helps attention **(McLellan et al., 2016). In most healthy adults, up to 400 mg a day is not generally linked to harm (U.S. Food and Drug Administration, 2024). That is about 2 to 3 mugs of brewed coffee. During pregnancy and breastfeeding, the European limit is 200 mg a day (EFSA Panel on Dietetic Products, Nutrition and Allergies, 2015), and children and teens should have much less.**

For three days, write down every caffeinated drink and the time you had it. Add up the total and compare it with 400 mg a day. Then move your last cup to roughly 8.8 hours ahead of bedtime.

Table B.6: My caffeine audit

Day	Drink	Time	Running total for the day	Within my cut-off (yes or no)
Day 1				
Day 1				
Day 2				
Day 2				
Day 3				
Day 3				

Check with your doctor or pharmacist before using caffeine if you are pregnant or breastfeeding, or if you have a heart-rhythm problem, high blood pressure, anxiety or a sleep disorder. The same applies if you take medicines such as stimulants, some antibiotics, asthma or heart medicines (MedlinePlus, n.d.).

Key idea:

Log your sleep, movement, meals and caffeine for a week each**, then read the pattern back, and see a doctor when a problem lasts for weeks.**

C. Exercise Bank, Cleverini Game Guide and Offline Alternatives

Some evenings you have twenty minutes and no wish to search a whole book for something to practise. **This bank writes out every exercise in the book in full**, so you can pick one and start straight away. There are 108 of them, sorted by module, and each one carries four tags.

> 🔑 **Key Concept:**
>
> **How to use this bank.** Pick a sub-skill, then a level and a time that fit your day. **Each row gives the exercise in the words of its module, and the Topic column names the section it comes from. Table C.1 explains the four tags.**

The tags are short labels for planning. **Sub-skill says what the exercise works on**, format says how you do it, time says how long it takes and level says where it sits in the book's plan for practice.

Table C.1: The four tags

Tag	What it tells you	Values used
Sub-skill	The part of attention the exercise works on	Sustained, Selective, Switching, Working memory, Control, Intake, Modes, Noticing and returning, Habits and plans, Setting and devices, Body and lifestyle, With others, Self-check
Format	How you do it	Sitting practice, Paper, Daily life, On the move, With a partner, Log, Checklist, Plan
Time	The time the exercise names, or the unit of work it names, such as one task or one week	"Your choice" means the exercise sets no time
Level	Where the exercise sits in the book's plan	Step: Try it, Step: Starter, Step: Middle and Step: Advanced are Module 2's own steps. Basic to Master is the level whose methods list in Table E.2 names the section. Any means the section is not on that list

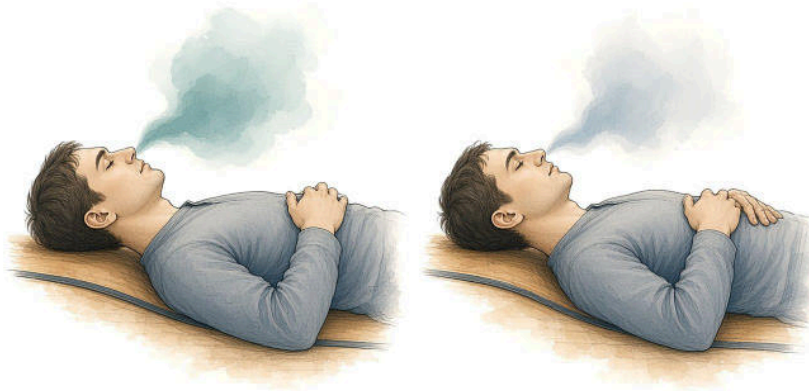
The sub-skill tags use the book's own names. **Sustained, selective and switching attention** and working memory come from Module 1. Control is the steering part of attention that keeps a chosen goal in charge, and intake is taking something in with full attention. Modes means choosing focused or open attention for a step.

Each row is copied from its module with light trims. **Pointers to other sections are taken out**, and two rows name a table in Appendix E

where the module names one in Module 9. The guided session in Table C.5 carries the safety advice from its own section in full, where the module points to it.

Exercises by module

The first module ends most sections with a short test of your own attention. **These tests let you feel each idea for yourself**, from the cost of a switch to the pull of your phone. Most take a few minutes, and two of them run for a week.



A hand on the belly shows the breath. It lifts with each slow in-breath and sinks as you let the air go.

Table C.2: Module 1, Foundations of Attention

Topic	Exercise	Sub-skill	Format	Time	Level
Contemplative Traditions and the Training of Focus	A ten-second test. Pick one word, such as "calm", and hold it in mind for ten seconds. You may find that another thought slips in before the time is up. A noise or a thought about lunch pushes the word aside.	Sustained	Sitting practice	10 seconds	Any

Topic	Exercise	Sub-skill	Format	Time	Level
Contemplative Traditions and the Training of Focus	Three-minute return practice. 1. Sit comfortably and choose one object, such as your breath. 2. Set a timer for three minutes and rest your attention on the breath. 3. Each time you notice that your mind has drifted, gently bring it back, without scolding yourself. 4. When the timer ends, write down roughly how many times you came back. Each return is **the move these traditions practise**. A high count means you noticed often.	Noticing and returning	Sitting practice	3 minutes	Any
From William James to Modern Attention Research	Two-voice test. 1. Play two talk recordings at the same time, one from your phone and one from a laptop. 2. Follow only one of them for two minutes. 3. Stop and write down everything you remember from the other one. Notice **how little got through** from the voice you did not follow, and whether anything did, such as a name.	Selective	Daily life	2 minutes	Any
What Attention Is and Why It Matters	Look up for one block. 1. On a walk you take often, put your phone away for one block or one corridor. 2. Look around as you go. 3. At the end, write down one thing you saw that you had never noticed before. If you find something new, it was there all along. **Your attention had simply not picked it.**	Selective	On the move	One block of a walk	Any

Topic	Exercise	Sub-skill	Format	Time	Level
What Attention Is and Why It Matters	Name the skill. 1. Think of three moments this week when your focus slipped. 2. For each one, write which skill failed. Was it holding focus, ignoring a distraction or switching between jobs? 3. Next to each, write one small change to the setting that would have helped, such as closing a tab or moving away from a TV. **Naming the skill** turns “I can’t focus” into a problem you can work on.	Self-check	Paper	One sitting	Any
The Main Types of Attention: Sustained, Selective, Divided and Alternating	Feel the switch cost. 1. Time yourself writing the letters A to J, and then the numbers 1 to 10. 2. Now time yourself mixing them, as A1, B2, C3 and so on, up to J10. Timing single lists against a mixed one follows a comparison Jersild (1927) introduced. 3. Compare the two times, and count any mistakes. The same twenty marks are written both ways. Any extra time in the mixed version is **your own switch cost**.	Switching	Paper	A few minutes	Any
Attention Span, Capacity and Limits	Count your switches. 1. Pick a 20-minute stretch of normal screen work. 2. Each time you move to another window, app or screen, make a tally mark on paper. 3. At the end, note the task, the setting and what pulled you away each time. The tally shows **your own switching habit**. It is a record of the setting as much as of you, so change one thing about the setting and count again another day.	Switching	Log	20 minutes	Any

Topic	Exercise	Sub-skill	Format	Time	Level
How the Brain Selects What Matters: Bottom-Up and Top-Down Control	Three-force check before you start. 1. Write your goal for the next 25 minutes in one short line. 2. Look around you and remove or cover one thing that stands out and has nothing to do with that goal. 3. Put your phone where you cannot see it, and note how often you think of reaching for it. The count in step 3 shows the pull of selection history on your own attention.	Selective	Daily life	25 minutes	Any
Attention Networks and Brain Chemistry	Find your middle. 1. Before your next focused task, rate how wound up you feel from 1 (sleepy) to 10 (jittery). 2. After the task, rate how well you stayed on it, from 1 to 10. 3. Do this for a week and look at which starting levels went with your best focus. Your best level is your own middle of the inverted U. It may differ from a friend's, and it may differ between tasks.	Self-check	Log	One week	Any
Mind-Wandering and the Default Mode Network	Quiz yourself. 1. Next time you watch a long video lesson, pause it every ten minutes or so. 2. Write down two things you just learned, without looking back. 3. Then press play again. The pause gives your attention a reason to stay with the lesson.	Sustained	Daily life	One video lesson	Any

Topic	Exercise	Sub-skill	Format	Time	Level
Mind-Wandering and the Default Mode Network	Catch and return. 1. Choose a reading or work task of about 15 minutes. 2. Each time you catch your mind wandering, make a small mark on paper, then return to the task. 3. Afterwards, look at the marks. Were they spread out, or bunched together when the task got dull? 4. Later in the day, give yourself five minutes of chosen wandering on a short walk. Every mark is one moment you noticed and came back.	Noticing and returning	Paper	15 minutes, then 5	Any

Module 2 shows how attention works with memory, intellect and creativity. **Every topic has a Try it and three steps**, Starter, Middle and Advanced. The steps build on each other, so a row that names "the Try it task" means the Try it just above it.

Table C.3: Module 2, How Attention Works with Memory, Intellect and Creativity

Topic	Exercise	Sub-skill	Format	Time	Level
Attention Decides What You Remember	Try it. Next time someone tells you their name, stop what you are doing for those seconds. Look at them and say the name back once.	Intake	With a partner	A few seconds	Step: Try it
Attention Decides What You Remember	Guard the way in, Starter. Before a short instruction, such as a recipe step or a message from your manager, put the second task down until the instruction ends. Then say the instruction back in your own words.	Intake	Daily life	One instruction	Step: Starter

Topic	Exercise	Sub-skill	Format	Time	Level
Attention Decides What You Remember	Guard the way in, Middle. Run an intake check. Learn a list of ten everyday words while you count backwards by threes out loud. Learn a second list of ten words with full attention. An hour later, write down both lists from memory and compare.	Intake	Paper	Two lists, then an hour	Step: Middle
Attention Decides What You Remember	Guard the way in, Advanced. Keep an encoding log for a week. Each evening, note three things you took in that day with full attention and three you took in while doing something else. **Next morning, check which ones you can still recall**, and look for the pattern.	Intake	Log	One week	Step: Advanced
Working Memory: The Small Desk That Attention Guards	Try it. Ask someone to read you five words. Hold them for one minute, and say out loud which word you are thinking about at each moment.	Working memory	With a partner	1 minute	Step: Try it
Working Memory: The Small Desk That Attention Guards	One sheet at a time, Starter. Hold a short list of four errands in your head. Work through them one by one, and each time say which errand is “in focus” before you start it.	Working memory	Daily life	One round of errands	Step: Starter
Working Memory: The Small Desk That Attention Guards	One sheet at a time, Middle. Add up a bill of six items in your head. Say the running total after each item, and notice that only one new number is in your hands at a time.	Working memory	Daily life	One bill	Step: Middle

Topic	Exercise	Sub-skill	Format	Time	Level
Working Memory: The Small Desk That Attention Guards	One sheet at a time, Advanced. Before a complex task, such as a report or a tax form, write down everything on your mind that the task does not need now. Then start the task, and **notice how the work changes** when the desk holds only the job in front of you.	Working memory	Paper	One task	Step: Advanced
Memory Guides Attention: Knowing Where to Look	Try it. Before you next open your fridge, say three things you expect to see. Then open it and notice one thing you had not named.	Selective	Daily life	A few seconds	Step: Try it
Memory Guides Attention: Knowing Where to Look	Outside the list, Starter. Before a walk, write three things you expect to see on the way. Afterwards, write down what you saw that was not on the list.	Selective	On the move	One walk	Step: Starter
Memory Guides Attention: Knowing Where to Look	Outside the list, Middle. Before a meeting, write three things you expect people to say or do. Afterwards, note what happened that was not on your list, and which of those you nearly missed.	Selective	Daily life	One meeting	Step: Middle
Memory Guides Attention: Knowing Where to Look	Outside the list, Advanced. Choose a room you know very well, such as your kitchen or your office. Describe it in writing as if you were seeing it for the first time, and **list five details you had stopped noticing**.	Selective	Paper	One sitting	Step: Advanced
Attention Control: The Common Thread in Reasoning	Try it. Write RED in blue pen and BLUE in red pen. Name each ink colour out loud, and notice the pull to read the word. It is a two-word take on the Stroop task (Stroop, 1935).	Control	Paper	A few minutes	Step: Try it

Topic	Exercise	Sub-skill	Format	Time	Level
Attention Control: The Common Thread in Reasoning	Against the habit, Starter. Write twenty colour words, each in an ink colour that does not match it. Name the ink colours as fast as you can, then read the words. Notice which one is harder, and where you slip. This is a paper version of the Stroop task (Stroop, 1935).	Control	Paper	A few minutes	Step: Starter
Attention Control: The Common Thread in Reasoning	Against the habit, Middle. Ask a friend to stand in front of you and wiggle a finger beside one ear or the other. Each time, look to the opposite side, away from the movement, ten times in a row. Count how often your eyes go towards the finger first. I adapted this from the anti-saccade task, where you look away from a sudden target (Hallett, 1978).	Control	With a partner	Ten tries	Step: Middle
Attention Control: The Common Thread in Reasoning	Against the habit, Advanced. During one real reasoning task, such as a budget or a timetable, keep a tally of each pull away from your plan. Note what pulled you, a habit, a distraction or a temptation, and **what you did to come back**.	Control	Daily life	One task	Step: Advanced
Lapses, Mind-Wandering and Problem Solving	Try it. In your next long task, stop after every five steps and write one line saying where you are.	Sustained	Daily life	One task	Step: Try it
Lapses, Mind-Wandering and Problem Solving	Catch and return, Starter. Do a sum with at least six lines, such as adding up a month of shopping. After every two lines, write the total so far in the margin as a checkpoint.	Sustained	Paper	One sum	Step: Starter

Topic	Exercise	Sub-skill	Format	Time	Level
Lapses, Mind-Wandering and Problem Solving	Catch and return, Middle. During one reasoning session of about twenty minutes, such as planning a trip, keep a lapse tally. Mark each drift with an O for outside or an I for inside.	Sustained	Log	20 minutes	Step: Middle
Lapses, Mind-Wandering and Problem Solving	Catch and return, Advanced. In a real multi-step task at work or home, use checkpoints every few steps. Each time you lapse, **restart from the last checkpoint** and note how many steps you lost.	Sustained	Daily life	One task	Step: Advanced
Related but Not the Same: Attention, Working Memory and Intelligence, and the Limits of Training	Try it. Choose one reasoning task that gave you trouble this week. Write the exact step where you lost track or made the first error.	Working memory	Paper	One task	Step: Try it
Related but Not the Same: Attention, Working Memory and Intelligence, and the Limits of Training	Practise the work you need, Starter. In the Try it task, circle the facts you had to hold. Copy them onto a new sheet and try that step again.	Working memory	Paper	One task	Step: Starter
Related but Not the Same: Attention, Working Memory and Intelligence, and the Limits of Training	Practise the work you need, Middle. Choose a similar task and decide how you will check it. Record the first wrong step, any lost facts and the help you used. Compare it with the earlier task.	Working memory	Paper	One task	Step: Middle
Related but Not the Same: Attention, Working Memory and Intelligence, and the Limits of Training	Practise the work you need, Advanced. Make a short plan for one real reasoning task you do often. Say where attention is needed and how you will keep the facts available. Use it on several similar tasks and **judge the finished work** by the same check each time.	Working memory	Plan	Several tasks	Step: Advanced

Topic	Exercise	Sub-skill	Format	Time	Level
Focused and Open Attention: Two Modes for Two Kinds of Task	Try it. Before your next task, say out loud whether it has one answer or many. Then name the mode you will use.	Modes	Daily life	A few seconds	Step: Try it
Focused and Open Attention: Two Modes for Two Kinds of Task	Choose the mode, Starter. List five tasks for tomorrow. Mark each one as one answer or many answers, and write the mode beside it.	Modes	Paper	One sitting	Step: Starter
Focused and Open Attention: Two Modes for Two Kinds of Task	Choose the mode, Middle. Pick one task that has both kinds of step, such as planning a meal for guests. Write where you will open up to gather ideas and where you will close in to choose.	Modes	Plan	One task	Step: Middle
Focused and Open Attention: Two Modes for Two Kinds of Task	Choose the mode, Advanced. In one real project, switch modes on purpose at least twice. At each switch, **write one line naming the mode you are entering** and why. Note afterwards whether the switch came too early or too late.	Modes	Daily life	One project	Step: Advanced
Noticing What Others Overlook: Selective and Leaky Attention	Try it. After your next focused task, write one thing you filtered out while you worked. Say whether it has any use for the next step.	Selective	Paper	One task	Step: Try it
Noticing What Others Overlook: Selective and Leaky Attention	What I filtered out, Starter. Finish one short focused block, then name one side detail you ignored. Write why it had no place in the block you just finished.	Selective	Paper	One block	Step: Starter
Noticing What Others Overlook: Selective and Leaky Attention	What I filtered out, Middle. Review that detail against the next step of the task. Decide whether to use it, check it or leave it aside, and write your reason.	Selective	Paper	One task	Step: Middle

Topic	Exercise	Sub-skill	Format	Time	Level
Noticing What Others Overlook: Selective and Leaky Attention	What I filtered out, Advanced. Repeat the review across several real tasks. For each one, record the step you had finished and what the side detail did for the next step. Keep the focused work separate from the review, so you can see which part helped.	Selective	Log	Several tasks	Step: Advanced
Mind-Wandering and Breaks: What They Do and Do Not Do for Ideas	Try it. Before your next break from a stuck problem, write one line saying where you stopped and what you are trying to find.	Modes	Paper	One break	Step: Try it
Mind-Wandering and Breaks: What They Do and Do Not Do for Ideas	Leave and return, Starter. Work on a many-answers problem, such as gift ideas, for at least twenty minutes. Write a return note, take a ten-minute break doing something light, then come back and read the note first.	Modes	Daily life	20 minutes plus a 10-minute break	Step: Starter
Mind-Wandering and Breaks: What They Do and Do Not Do for Ideas	Leave and return, Middle. Try two breaks on two similar problems. Fill one with something light and one with a hard task, such as difficult emails. Count the new ideas in the ten minutes after each return.	Modes	Daily life	Two problems	Step: Middle
Mind-Wandering and Breaks: What They Do and Do Not Do for Ideas	Leave and return, Advanced. For one real project over a week, plan each break in advance. Note the length of work before it, what filled it and when you returned. Look for the pattern in which breaks gave you most.	Modes	Log	One week	Step: Advanced
When You Need Which: Choosing the Right Kind of Attention for Each Step	Try it. Pick one task for tomorrow. Write one word for its main step, intake, hold or widen.	Modes	Paper	One task	Step: Try it

Topic	Exercise	Sub-skill	Format	Time	Level
When You Need Which: Choosing the Right Kind of Attention for Each Step	Draw the attention map, Starter. Take one small task, such as a birthday card. List its steps and mark each one intake, hold or widen.	Modes	Plan	One task	Step: Starter
When You Need Which: Choosing the Right Kind of Attention for Each Step	Draw the attention map, Middle. Take one larger task, such as planning a weekend away. For each step, write what you will do with your attention, such as phone away, sheet in view or a break with a note.	Modes	Plan	One task	Step: Middle
When You Need Which: Choosing the Right Kind of Attention for Each Step	Draw the attention map, Advanced. Use the map on one real project at work or at home. After each step, note whether the kind of attention fitted. When a step went wrong, name the part of the map where it went wrong and plan the fix.	Modes	Daily life	One project	Step: Advanced

The core techniques cover single-tasking, deep work, meditation, distractions and attention aids. **Three tables of drills from this module are written out here as rows**, beside the main exercises. The book suggests one meditation drill a week once the four core practices feel familiar.

Table C.4: Module 3, Core Techniques for Training Attention

Topic	Exercise	Sub-skill	Format	Time	Level
Single-Tasking and Clear Intentions	The A-1 test. 1. Write the letters A to Z as fast as you can. 2. Write the numbers 1 to 26 as fast as you can. 3. Now mix the two lists, as in A, 1, B, 2, C, 3, and keep going to the end. This mixing test goes back to Jersild (1927). Notice how the third line feels next to the first two.	Switching	Paper	A few minutes	Basic

Topic	Exercise	Sub-skill	Format	Time	Level
Single-Tasking and Clear Intentions	Single-task setup. 1. Name the one task you are doing now, either out loud or on paper. 2. Write a specific goal for this session. 3. Form one if-then plan for the interruption you are most likely to face. 4. Close windows and tabs that have nothing to do with the task. 5. Before you switch, finish the task or **"park" it with a next-step note**.	Habits and plans	Checklist	One session	Basic
Deep Work: Protecting Long Blocks of Concentration	Plan one deep-work block. 1. Put the block in your calendar as you would a meeting. 2. Write **one outcome** for the block. 3. First answer urgent messages, and tell colleagues when you will be free. 4. When you stop, leave a short "next step" note to park the task (Leroy, 2009; see also Masicampo & Baumeister, 2011). 5. Afterwards, write down what worked and what broke your focus.	Sustained	Plan	One block	Intermediate
Focused-Attention and Open-Monitoring Meditation	The four core practices. 1. **Breath-focused FA.** Sit up straight but comfortably. Rest attention on the feeling of breathing, at the nose or belly. When you notice you have drifted, note where you went and return to the breath. 2. **Body scan.** Move attention slowly through the body, one part at a time. Notice what you feel without trying to change it. 3. **OM "noting".** Let attention rest on whatever stands out most. Give it a soft label, such as "hearing", "thinking" or "feeling", and let it pass. 4. **Mindful movement.** Practise gentle movement, such as yoga, with attention on the body.	Noticing and returning	Sitting practice	One session	Intermediate

Topic	Exercise	Sub-skill	Format	Time	Level
Focused-Attention and Open-Monitoring Meditation	Breath anchor. For 3 minutes, rest on the breath, or count out-breaths to 10 and start again.	Sustained	Sitting practice	3 minutes	Intermediate
Focused-Attention and Open-Monitoring Meditation	Sound anchor. Rest on the sounds around you without naming them.	Noticing and returning	Sitting practice	Your choice	Intermediate
Focused-Attention and Open-Monitoring Meditation	Label and return. When you drift, silently say “wandering” and come back.	Noticing and returning	Sitting practice	Your choice	Intermediate
Focused-Attention and Open-Monitoring Meditation	Open sit. Sit for 5 minutes with no chosen object, noticing what comes up.	Noticing and returning	Sitting practice	5 minutes	Intermediate
Focused-Attention and Open-Monitoring Meditation	Longer sessions. Add one minute to your usual session each week.	Sustained	Sitting practice	One extra minute a week	Intermediate
Noticing and Returning: Working with a Wandering Mind	Catch and return. 1. When you notice your mind has wandered, give it a gentle mental label, such as “wandering”. 2. Come back **without scolding yourself**. Noticing the drift counts as the success. 3. Now and then, ask yourself where your attention is right now. 4. Allow intentional mind-wandering, such as planning on a walk. Chosen wandering differs from the kind that sneaks in (Seli et al., 2016).	Noticing and returning	Daily life	Any moment	Intermediate
External and Internal Distractions	The distraction audit. 1. For one working session, jot down every time your attention is pulled away. 2. Mark each one as external (sound, sight, device) or internal (thought, worry, feeling). 3. Pick **one fix for your most common external distraction**. Pick another for your most common internal one. 4. Try them for a week, and then repeat the audit.	Selective	Log	One session, then a week	Basic

Topic	Exercise	Sub-skill	Format	Time	Level
Designing a Focus-Friendly Environment	Set up a space for focus. 1. Audit your space. Sit at your desk and list everything that catches your eye or ear. 2. Reduce visible clutter. Clear the surface and keep only what the current task needs. 3. Control speech noise. Find a quiet room or close the door. Use ear protection at a shared desk. 4. Remove device triggers. Silence notifications and move the phone out of sight. 5. Test one change for a week, and then review whether it helped.	Setting and devices	Checklist	One week	Intermediate
Attention Aids: Timers, Checklists and Rituals	The Focus Timer. 1. Set a timer for a block of single-task work, and then take a short break. 2. Try different lengths, because the evidence does not favour 25 minutes over self-chosen breaks.	Sustained	Daily life	One block	Intermediate
Attention Aids: Timers, Checklists and Rituals	10-minute sprint. Work on one task only for 10 minutes.	Sustained	Daily life	10 minutes	Intermediate
Attention Aids: Timers, Checklists and Rituals	Compare schedules. Try 25/5 blocks one day and self-chosen breaks the next, and note how each felt.	Sustained	Log	Two days	Intermediate
Attention Aids: Timers, Checklists and Rituals	Quiet breaks. Stand, stretch or look away from screens instead of checking messages.	Body and lifestyle	Daily life	One break	Intermediate
Attention Aids: Timers, Checklists and Rituals	Micro-pause. In a long task, pause for 30 seconds every 15 to 20 minutes.	Sustained	Daily life	30 seconds every 15 to 20 minutes	Intermediate
Attention Aids: Timers, Checklists and Rituals	Stop note. When the timer ends, write where you stopped and the next step.	Habits and plans	Paper	A minute	Intermediate

Topic	Exercise	Sub-skill	Format	Time	Level
Attention Aids: Timers, Checklists and Rituals	The Focus Checklist. 1. List your steps for **before, during and after** focused work. 2. Tick them off, and cut any you never use.	Habits and plans	Checklist	One session	Intermediate
Attention Aids: Timers, Checklists and Rituals	Setup list. List 3 to 5 steps to prepare, such as clearing the desk and silencing the phone, and keep it where you start work.	Habits and plans	Checklist	One session	Intermediate
Attention Aids: Timers, Checklists and Rituals	Shutdown list. End the day by writing down open tasks and tomorrow's first task.	Habits and plans	Checklist	End of the day	Intermediate
Attention Aids: Timers, Checklists and Rituals	Capture and plan. When a stray to-do or worry pops up, write it down with one next step, then return to the task.	Noticing and returning	Paper	A few seconds	Intermediate
Attention Aids: Timers, Checklists and Rituals	One top task. Each morning, write your most important task at the top of your list.	Habits and plans	Paper	Each morning	Intermediate
Attention Aids: Timers, Checklists and Rituals	Interruption log. Note each interruption in a session and where it came from.	Selective	Log	One session	Intermediate
Attention Aids: Timers, Checklists and Rituals	The Start-Up Routine. 1. Use **the same short sequence** to begin focused work, and keep it under five minutes. 2. Clear the desk, close tabs you don't need and put your phone in a drawer. 3. Write an if-then start, such as "When I sit down at my desk after lunch, I will open the report first." 4. Take three slow breaths, then name the one result you want from the session. 5. Begin with the smallest next step from yesterday's note, and after two weeks drop any step that does not help.	Habits and plans	Checklist	Under five minutes	Intermediate

The daily exercises take a few minutes each. **Breath counting, single-object focus and the body scan are Basic methods** in Table E.2, and the habit plan ties them to your day. If focusing on the breath makes you anxious, count sounds or steps instead.

Table C.5: Module 4, Practical Attention Exercises

Topic	Exercise	Sub-skill	Format	Time	Level
Short Exercises for Every Day	Breath counting. 1. Sit comfortably. 2. Silently count each out-breath from 1 to 9, and then start again at 1. 3. If you lose count or go past 9, simply start again at 1. 4. Begin with a few minutes, and build up as it feels manageable. If focusing on the breath makes you anxious, count sounds or steps instead.	Sustained	Sitting practice	A few minutes	Basic
Short Exercises for Every Day	Slow diaphragmatic breathing. 1. Place one hand on your belly. 2. Breathe in slowly so the hand rises. 3. Breathe out slowly so it falls. 4. Keep going for a few minutes a day, and notice whether your attention settles on your hand. Stop if you feel dizzy, and return to normal breathing.	Sustained	Sitting practice	A few minutes a day	Basic
Short Exercises for Every Day	A ten-minute guided focus session. 1. Play a 10-minute guided meditation. 2. Follow the instructions. 3. Each time you drift, return to the guide's anchor. 4. At the end, note roughly how often you drifted and how quickly you came back. Check in with your mental health first. Start short, and stop and seek other help if you feel distressed.	Noticing and returning	Sitting practice	10 minutes	Basic

Topic	Exercise	Sub-skill	Format	Time	Level
Short Exercises for Every Day	Single-object focus. 1. Choose one object, such as a ticking clock or a mark on the wall. 2. Rest attention on it for a few minutes. 3. When attention drifts, **return to the object**. 4. Notice how long you stay before drifting.	Sustained	Sitting practice	A few minutes	Basic
Short Exercises for Every Day	Mindful listening. 1. Sit still, with your eyes closed if that is comfortable. 2. Let sounds arrive, such as traffic, a fan or your breath. 3. Notice each one, and then **let it go**. 4. If a sound pulls you into a story, come back to just hearing. 5. After a few minutes, ask whether you could hear a sound without labelling it.	Noticing and returning	Sitting practice	A few minutes	Basic
Short Exercises for Every Day	A still gaze before a task. 1. Get ready to take a shot or start a precise movement. 2. Rest your eyes on **one spot of the target** for a second or two. 3. Then begin. 4. Afterwards, ask whether your eyes were still or darting when you started.	Selective	On the move	A second or two	Basic
Short Exercises for Every Day	Deliberate switching. 1. Rest attention on your breath. 2. Every fifth out-breath, **move it to a sound**. 3. On the next cue, move it back. 4. After a few minutes, ask whether you switched on the cue or drifted before it.	Switching	Sitting practice	A few minutes	Basic
Short Exercises for Every Day	Body scan. 1. Lie down or sit. 2. Move attention slowly from your feet to your head. 3. Notice sensations in each region **without trying to change them**. 4. Spend 5 to 10 minutes, and notice where attention tends to jump ahead or wander off.	Noticing and returning	Sitting practice	5 to 10 minutes	Basic

Topic	Exercise	Sub-skill	Format	Time	Level
Building Attention Habits into Daily Routine	Three daily hooks. 1. After pouring your morning coffee, do three minutes of breath counting. 2. On the commute, do a body scan or single-object focus, but never while driving. 3. Before opening email, do one minute of slow breathing.	Habits and plans	Daily life	1 to 3 minutes each	Basic
Building Attention Habits into Daily Routine	A five-part habit plan. 1. Pick the cue, an existing daily routine, and write “After I…”. 2. Pick the practice, one exercise from 4.1.1, and write “I will…”. 3. Set the duration as “For… minutes”. 4. Choose how you will log it, such as paper, an app or a calendar, and write “I will record it in…”. 5. Set a weekly review with “Each… I’ll check my log and adjust.”	Habits and plans	Plan	One sitting	Basic
Entering and Sustaining Flow	Four steps to set up flow. 1. Set a clear goal for the session (Csikszentmihalyi, 1990). 2. Arrange immediate feedback, so you can tell how you are doing as you go (Csikszentmihalyi, 1990; Fong et al., 2015). 3. Pick a task just a little beyond your current skill (Csikszentmihalyi, 1990; Fong et al., 2015). 4. Remove interruptions.	Sustained	Plan	One session	Advanced
Concentration under Pressure and Fatigue	Five tips for pressure and fatigue. 1. Before a key action, take a still final look at the target (quiet eye). 2. Say a reappraisal statement, such as “This energy can help me”. 3. During long monitoring work, take brief planned breaks (Ariga & Lleras, 2011, a small study). 4. Rotate tasks where you can. 5. Protect your sleep.	Control	Daily life	Your choice	Advanced

The context module carries practice into lessons, work, leadership and conversation. **These rows are plans for one week or one real setting**, and most of them name the studies behind each step. The citations stay as the module gives them.

Table C.6: Module 5, Attention in Context

Topic	Exercise	Sub-skill	Format	Time	Level
Helping Children and Students Focus	A focus plan for one week of lessons. 1. Drop the ten-minute rule and plan short active moments all through each lesson (Bunce et al., 2010). 2. Insert short questions into recorded or online lectures. In live ones this is likely, but not proven, to help (Szpunar et al., 2013). 3. Set clear rules for non-academic device use, and seat laptop users so screens don't distract others (Glass & Kang, 2019; Sana et al., 2013). 4. Keep wall displays purposeful (Fisher et al., 2014). 5. Build in physical activity, and set self-testing and spacing for homework (Hillman et al., 2014; Dunlosky et al., 2013).	With others	Plan	One week	Master
Focus in the Modern Workplace: Meetings, Messages and Multi-tasking	A one-week focus reset at work. 1. Batch email and notifications at set, predictable times. 2. Agree team quiet hours. 3. Write down where you stopped before switching tasks. 4. Cut or shorten low-value meetings. 5. Keep phone calls out of driving and any work where a lapse can hurt someone.	Setting and devices	Daily life	One week	Expert

Topic	Exercise	Sub-skill	Format	Time	Level
Attentive Leadership and Decision-Making	Four habits for an attentive leader. 1. **Protect the team's focus time** (Perlow, 1999). 2. Define clearly what deserves attention (Ocasio, 1997). 3. Run short check-ins on perceive, understand and project (Endsley, 1995). 4. Reduce meeting load (Rogelberg et al., 2006).	With others	Daily life	Your choice	Expert
Listening and Being Present with Others	Five listening steps for your next real conversation. 1. Give the speaker **your full attention**, and put your phone away. 2. Let them finish. Short signals like a nod or "mm-hm" show you're following without interrupting. A brief pause after they stop helps. 3. Reflect back what you heard, by paraphrasing or naming the feeling. 4. Ask open questions before adding your view, and hold back advice nobody asked for. Steps 3 and 4 follow the active listening that Rogers and Farson (1957) described. 5. Notice when you're preparing your reply instead of listening. Your doorkeeper has turned to your own thoughts. Come back to what they are saying. Step 5 is a practice suggestion that goes beyond the review's signals.	With others	Daily life	One conversation	Expert

The challenges module helps you tell problems apart and start again after a break. **If problems last and affect daily life, see a doctor or**

psychologist. The later-life plan comes from the section on keeping attention sharp in later life.

Table C.7: Module 6, Overcoming Attention Challenges

Topic	Exercise	Sub-skill	Format	Time	Level
Distractibility, Procrastination and Mental Fatigue	Which problem is it? 1. Notice **frequent small slips**, with outside noise and your own thoughts both pulling you away. That points to distractibility. 2. Notice whether you avoid one task, especially an unpleasant one, and feel relief doing something else. That points to procrastination. 3. Notice whether, after long effort, the task feels harder and other things feel more tempting. That points to mental fatigue. 4. Notice whether your accuracy slips as a dull, repetitive task goes on. That points to lapses during long tasks. 5. If problems last and affect daily life, **see a doctor or psychologist**.	Self-check	Daily life	Your choice	Any
Strategies for Regaining Focus	A restart plan. 1. Before you stop, write **the very next action** on a note. 2. Name the interruption most likely to pull you away, such as a message alert. 3. Write an if-then plan for it, such as “If my phone buzzes, then I will leave it until my break.” 4. Put the note where you will see it when you sit back down.	Habits and plans	Paper	A few minutes	Advanced

Topic	Exercise	Sub-skill	Format	Time	Level
Keeping Attention Sharp in Later Life	A later-life plan. 1. Build in regular aerobic activity, such as brisk walks, at moderate intensity or above. 2. If you train, pick the skill you want, and expect gains mainly there. 3. Get your hearing checked, and treat hearing loss for its own sake. 4. Eat well and stay social for general brain health.	Body and lifestyle	Daily life	Your choice	Master

The technology rows start with noticing. **You note which apps reach you first and what comes just before you check**, then change one thing and watch what follows. The last row gives five checks to run on any focus app.

Table C.8: Module 7, Technology and the Attention Economy

Topic	Exercise	Sub-skill	Format	Time	Level
How Apps and Platforms Compete for Attention	An attention audit. 1. For one day, note which apps reach you first, before you have chosen them. 2. Next to each, write how it earns from your time, such as ads or subscriptions. 3. Keep the ones that serve your goals, and move the rest off your home screen.	Setting and devices	Log	One day	Any
Notifications, Infinite Feeds and Habit Loops	Reshaping a checking habit. 1. For a day, notice what comes just before you check, such as boredom, a pause or a buzz. 2. Put a small step between cue and check, such as moving apps off your home screen. 3. Treat checking as a habit you can reshape. It says nothing bad about your character. 4. If one feed pulls you most, hide it for a week and note what changes.	Setting and devices	Log	One day, then a week	Any

Topic	Exercise	Sub-skill	Format	Time	Level
Digital Boundaries and Device Hygiene	Device hygiene. 1. Turn off non-essential notifications, or batch them at set times. 2. Set screen-time limits or use a blocker. 3. Keep phones out of the bedroom. 4. Create tech-free zones and times at home. 5. Put your phone out of sight during focus work.	Setting and devices	Checklist	Your choice	Interme diate
Tools and Apps That Support Focus	Five checks for any focus app. 1. Look for an independent randomised trial, run by people with no stake in the app. 2. See whether attention was measured, or only stress or mood. 3. Check whether gains reached everyday life or stayed with the trained task. 4. Find out whether the people scoring results knew who used the app. Blinded scoring is stronger. 5. Find out who funded the study.	Self-check	Checklist	One app	Expert

The lifestyle rows turn sleep, movement, breaks, food and caffeine into small tests. **Each one asks you to note what happens**, so your own record shows what helps you. Appendix B gives blank sheets for the same habits.

Table C.9: Module 8, Attention and Lifestyle

Topic	Exercise	Sub-skill	Format	Time	Level
How Sleep Loss Af-fects Attention	A sleep and focus log. 1. For one week, note when you went to bed and woke up. 2. Each afternoon, note one moment when your focus slipped. 3. At the end of the week, look for a link between short nights and slips.	Body and lifestyle	Log	One week	Any

Topic	Exercise	Sub-skill	Format	Time	Level
Habits for Restful Sleep	An evening wind-down. 1. Set a caffeine cut-off about 8.8 hours before your usual bedtime. 2. Pick a screens-off time, such as 9 pm, or dim the screen and switch to print. 3. Keep your wake time fairly regular, even at weekends. 4. If poor sleep lasts for weeks, book a visit to your doctor.	Body and lifestyle	Checklist	Each evening	Advanced
Exercise and the Focused Brain	A walk before hard work. 1. Before a demanding task, take a brisk 20-minute walk. 2. Start the task soon after you get back. 3. Over a week, compare those sessions with ones where you started straight away.	Body and lifestyle	On the move	20 minutes	Advanced
Breaks, Nature and Attention Restoration	A restorative break. 1. Mid-morning, step away from your work for up to 10 minutes. 2. If you can, go outside among trees, or look at greenery from a window. 3. Otherwise, do something you enjoy that has nothing to do with work. 4. Afterwards, note how energetic you feel.	Body and lifestyle	Daily life	Up to 10 minutes	Advanced
Eating for Steady Energy and Focus	A focus-friendly day of eating. 1. Keep a water bottle in sight and sip through the day, more in heat. 2. Eat breakfast and regular meals at roughly the same times. 3. Note any afternoon slump, and check how much you drank before it.	Body and lifestyle	Daily life	One day	Any
Caffeine and Other Stimulants, Uses and Limits	A caffeine audit. 1. For three days, write down every caffeinated drink and the time you had it. 2. Add up the total and compare it with 400 mg a day. 3. Move your last cup to roughly 8.8 hours ahead of bedtime.	Body and lifestyle	Log	Three days	Advanced

The last three rows start your level work. **Find your starting level, log a baseline week and plan your re-checks.** Appendix E holds the tables these rows name, copied from Module 9.

Table C.10: Module 9, Attention Practitioner Levels

Topic	Exercise	Sub-skill	Format	Time	Level
Levels of Attention Practice	Find your starting level. Read the Basic row of Table E.2 and **tick each method you already use** most days. If you tick most of them, read the Intermediate row next. Start at the first level where several methods are still new to you.	Self-check	Paper	One sitting	Any
Assessment Structure and Content	Start your baseline week. For seven days, **log your current habits** in Table E.1 without changing them. On three of those days, play all seven core games under your fixed test conditions.	Self-check	Log	Seven days	Any
Keeping Your Level	Plan your re-checks. Decide **how far ahead you need the skill**, such as a year. As a rough guide, the further ahead that is, the longer the gaps between short re-checks can be. Write the dates in your journal. The spacing study above tested one review of learnt facts before a final test, so treat it as a loose pointer for attention practice.	Self-check	Plan	One sitting	Any

Two count tables close the bank. **Sustained and selective attention have the most rows**, and every sub-skill has at least three. Use the counts to spot a sub-skill you have not tried yet.

Table C.11: Rows by sub-skill

Sub-skill	Rows
Sustained	17
Selective	14
Modes	12
Noticing and returning	11
Habits and plans	10
Working memory	8
Body and lifestyle	8
Self-check	7
Control	5
Setting and devices	5
Switching	4
Intake	4
With others	3
Total	108

Table C.12: Rows by level

Level	Rows
Step: Try it	10
Step: Starter	10
Step: Middle	10
Step: Advanced	10
Basic	13
Intermediate	23
Advanced	7
Expert	4

Level	Rows
Master	2
Any	19
Total	108

The two ladders in the level count work side by side. **Module 2's four steps sit inside one topic**, while Basic to Master follow the Practitioner Levels in Module 9. An Any row fits whatever level you are working on.

Cleverini game guide

I built Cleverini, so you should know that before you read about its games. **Seven of its games give the benchmark strand of the levels, one per skill.** They are free to play in the browser, with no ads and no sign-up, and each has a lab cousin, a research test built on the same idea.



Seven skills, seven games. Each attention skill we cover has one core Cleverini game.

Table C.13: The seven core games

Skill	Core game	What you do	Number used for the benchmark	A paper option from this book (a suggestion)
Sustained attention and visual search	Schulte Table	Tap 1 to 25 in order on a shuffled 5×5 grid (sizes 3, 4 and 5 exist), with no time limit	Finish time (strict "under" cut-offs)	Single-object focus (Table C.5)
Working memory	Echo Match	Answer "Same as the last card?" (1-back) for 25 s, then "two back" (2-back), in a 60 s run with one stream of cards	Score band	One sheet at a time, Middle (Table C.3)
Task switching	Switcheroo	A cue tells you to judge shape, colour or (later) count	Score band. Switch cost in ms shows only with enough trials and has no cut-off	Feel the switch cost (Table C.2) and The A-1 test (Table C.4)
Ignoring distractors	Shoal	Report the lead fish's direction while the school points the other way (a flanker task), then a rule switch	Score band. Distraction cost in ms shows only with enough trials and has no cut-off	Against the habit, Starter (Table C.3)
Response inhibition	Goalkeeper	Save white balls and let golden and star balls through. Flags flip the rule at levels 5 and 6	The lower of the save band and the hold band	Against the habit, Middle (Table C.3)
Divided and peripheral attention	Lighthouse	Watch the lamp's symbol stream while spotting ships at the edge. Decoys and fog appear in later nights	Score band, plus "dawn" when all six nights are cleared	This book has no paper version
Multiple-object tracking	Shell Game	Track the cups that hold gems while they shuffle. A colour lure appears from level 6	Level reached (highest cleared + 1)	This book has no paper version

Table C.13 comes from the game code and the in-game result screens, as of October 2026. **The paper option column is only a suggestion from this appendix**, made by matching each game's skill with the sub-skill tags in the bank. No study has tested the pairs. In the table, ms means thousandths of a second.

The benchmark bands are built into each game's code. **I set the band cut-offs myself when I wrote the games**, and no study stands behind them. A cell is met when the median of three sessions on three different days, on the same device, meets it.

Table C.14: Benchmark bands by level

Game	Basic	Intermediate	Advanced	Expert	Master
Schulte Table (5×5)	Under 45 s, "Good run"	Under 30 s, "Great focus"	Under 20 s, "Elite focus"	★ Under 20 s every day (no higher band, so consistency)	★ Under 20 s every day with no mistakes (the bands ignore mistakes, so this adds accuracy)
Echo Match	Score ≥ 250, "Steady"	≥ 550, "Sharp"	≥ 900, "Lightning"	≥ 1300, "Echo master"	★ ≥ 1300 every day (no higher band, as the game stops at 2-back)

Game	Basic	Intermediate	Advanced	Expert	Master
Switcheroo	Score ≥ 300, “Steady switcher”	≥ 700, “Flexible mind”	≥ 1200, “Switch master”	★ ≥ 1200 every day (consistency)	★ ≥ 1200 every day, and switch cost (when shown) below your own baseline-week median (no ms cut-off exists)
Shoal	Score ≥ 250, “Steady fin”	≥ 600, “Sharp eye”	≥ 1100, “Unshakable”	★ ≥ 1100 every day (consistency)	★ ≥ 1100 every day, and distraction cost (when shown) below your own baseline-week median (no ms cut-off exists)
Goalkeeper	“Safe hands”, with saves ≥ 60% and holds ≥ 50%	“The wall”, with saves ≥ 80% reaching level 3 and holds ≥ 70%	“Golden gloves”, with saves ≥ 90% reaching level 5 and holds ≥ 80% with at least 8 let-in balls	★ “Golden gloves” and clear level 6, the game’s win (harder version in the code)	★ The Expert result every day (consistency)

Game	Basic	Intermediate	Advanced	Expert	Master
Lighthouse	Score ≥ 1200, “Lookout”	≥ 2600, “Lighthouse keeper”	≥ 4000, “Eagle eye”	★ ≥ 4000 and reach dawn, all six nights cleared (harder version in the code)	★ The Expert result every day (consistency)
Shell Game	Level reached ≥ 4, “Keen eye”	≥ 7, “Table hawk”	≥ 10, “Shell master”	★ ≥ 10 every day (consistency)	★ Clear level 12, the last level in the game’s own table (8 cups, 4 gems), every day (harder version in the code)

> 🗝 **Key Concept:**
>
> **Starred and every-day cells.** Cells marked every day must be met in each of the three sessions. **A ★ marks a criterion without a number, used because the game has no further band. These criteria are the book’s own recommendations.**

A few details change how you read a cell. **Schulte cut-offs are strict**, so a time that equals a cut-off falls into the band below. In Shell Game, “level reached” means the highest level cleared plus one. Goalkeeper’s hold is “not rated” when fewer than 3 balls were let in, and the result is then capped at “Safe hands”.

Scores also depend on the device you play on. **The point scores for Echo Match, Switcheroo, Shoal and Lighthouse move with the**

device, so treat them as yardsticks for comparing yourself with yourself. The browser games forget your result when the page closes, so write it in your journal first.

Table C.15: Optional games, extra practice outside the benchmarks

Game	What it covers
Honeycomb	A spatial pattern span
Fresh Pick	Updating which items you have already picked
Laser Mirrors	Visual working memory
Rail Dispatch	Divided attention across several trains
Gem Swap and Mahjong Pairs	Casual puzzles, fine for practice too

Some games, such as Colors and Figures, use a free account, and so does the Cleverini mobile app. **The account's game level and multiplayer rating are optional context only.** Neither counts as one of the book's levels or benchmarks.

A benchmark shows that you practised and that you reached a band in that game, on that device. **Whether your everyday attention has improved is a separate question.** The games' own pages say as much, and no game or app awards an Attention Practitioner level.

Offline alternatives

Every paper option in Table C.13 is a row in this bank. **A paper option needs only a pen, paper and sometimes a friend.** Record the game and the paper option in your journal, each with its date.

For two games, this book has no paper version. **Lighthouse and Shell Game ask you to keep track of moving things on a screen**, and no

exercise in the bank does that on paper. Play them as games, and let the methods and journal strands carry the rest of your evidence.

Key idea:

Pick an exercise by sub-skill, level and time**, and treat a game score as practice in that game, with a paper option from this book close at hand.**

Appendix

D. Practice Tasks with Worked Examples

A METHOD IS EASIER to use once you have **watched it work on a real task**. Each example below walks through an everyday job from the book and ends with a practice task.

> 🔑 **Key Concept:**
>
> **How to use these examples.** Read the worked example first, then do the practice task **under it on a task of your own. The From column in Table D.1 names the section that explains each method. The numbers in the examples are there to show the steps and come from no study.**

Table D.1: The worked examples

Example	Method	From
D.1 Halving a recipe	Say the one rule that is different	2.2.1
D.2 A long sum	Checkpoints and reading the question twice	2.2.2
D.3 Planning a family trip	Let the result choose the next exercise	2.2.3
D.4 The library report	Review what you filtered out	2.3.2
D.5 Stuck on party themes	A break with a return note	2.3.3

Example	Method	From
D.6 A talk for a 90th birthday	The attention map	2.3.4
D.7 Your caffeine cut-off	Working back from bedtime	8.1.2

D.1 Halving a recipe

Say you have to halve a recipe for a smaller dinner. You know how to halve numbers, and you know the recipe. **The trap is the habit of reading the old amounts** and pouring them in as you always do. Attention control is what makes you stop at each line and use the new number.

Before you start, **say the one rule that is different this time**, such as "half of every amount". Write it at the top of the page. A written rule gives the doorkeeper something to check each guest against.

> Exercise:
>
> **Practice task. The same trap waits in a new password, a changed meeting time or a form that has moved one box.** Pick one of these this week**, write the changed rule at the top of the page and check each step against it.**

D.2 A long sum

Think of a long sum on paper with many lines. **A lapse in line three spoils every line after it**, even if the rest of your working is perfect. A lapse while you read the question is the costliest of all, because you may solve the wrong problem with every step correct.

With checkpoints, **read the question once before you start.** Add the first two lines and write the total so far in the margin. Add the next two

and write the new total. If your mind drifts, go back to the last margin total and start from there. Read the question again at the end.

> Key Concept:
>
> **Checkpoint.** A checkpoint is a short note of where you are in the task**, written every few steps. A lapse now costs a few steps. You lose those steps and keep everything before them.**

> Exercise:
>
> **Practice task. Do a sum with at least six lines, such as adding up a month of shopping.** After every two lines, write the total so far **in the margin as a checkpoint.**

D.3 Planning a family trip

Suppose you want to stop losing your place when you plan a family trip. **Start with the work itself.** Write the dates and costs on paper, and leave a checkpoint after each booking choice. Count the errors in the plan you finish, then try the same kind of planning again with those aids in place.

You might find fewer errors, or you might find that the cost calculation is still wrong. **In the second case, practise the calculation with a worked example** beside you. Let the result choose the next exercise, so your practice follows the problem you actually have.



A woman at a dining table comparing two written travel plans, with train timetables and a small calculator spread beside them.

> Exercise:
>
> **Practice task. Keep the task close enough to compare.** Plan two similar jobs**, one before and one after you add the aids, and note any help you used.**

D.4 The library report

Suppose the report is about visitors to a library. While checking the figures, you ignore a colleague's remark that children cannot see the signs. **When you turn to ideas for the entrance, the remark becomes worth examining.** The detail changed its value because the step changed.

The review comes after the focused block. **Finish the block, save the file and pause** before opening the next task. Ask what you left outside while you were working. Choose one detail and ask whether it bears on the task now.

> Exercise:
>
> **Practice task. After your next focused block,** write down one detail you filtered out **and decide whether it bears on the next step.**

D.5 Stuck on party themes

Divergent thinking tasks ask for many answers, such as party themes. **Stay with the problem long enough to load the room**, so a break has a full room waiting. Then fill the gap with something light, such as making tea or folding washing.

Before the break, write a return note. **Write one or two lines saying what you are trying to do and where you stopped**, and decide when you will return, such as after the kettle. When you come back, read the note first, look at what you had and add whatever arrives before you judge it.



A woman standing by a kitchen window waiting for a kettle to boil, a notepad of crossed-out party ideas on the table behind her.

> Exercise:
>
> **Practice task. Next time an idea is stuck,** take one break with a return note **and a set time to come back.**

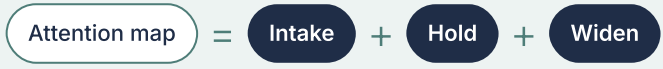
D.6 A talk for a 90th birthday

Your grandmother turns ninety next month, and the family has asked you to give a short talk at her party. **The talk is one task, and it asks for several kinds of attention.** The attention map names three parts, intake, hold and widen. The last step is a check.

Table D.2: The talk on the attention map

Step	Part of the map	What you do
Ring your aunt and your father for stories	Intake	Put the phone on speaker, close the laptop and write as they speak
Get every name and date right	Hold	Write them on one sheet, keep it in view and check each story against it
Find an opening line	Widen	Look over the stories for an odd detail and let the side remarks back in
Need the name of her village	Back to intake	A quick call and full attention while your father answers
Read the talk aloud and time it	Check	Check every name against the sheet

The attention map



The map also tells you where a task is likely to go wrong. If a name was wrong, look at the hold step, and if the talk felt flat, look at the widen step.

> Exercise:
>
> **Draw the attention map.**
>
> 1. Starter. Take one small task, such as a birthday card. List its steps and mark each one intake, hold or widen.
> 2. Middle. Take one larger task, such as planning a weekend away. For each step, write what you will do with your attention, such as phone away, sheet in view or a break with a note.
> 3. Advanced. Use the map on one real project at work or at home. After each step, note whether the kind of attention fitted. When a step went wrong, **name the part of the map** where it went wrong and plan the fix.

D.7 Your caffeine cut-off

The review behind the sleep advice suggests **a cut-off of about 8.8 hours** before bedtime for a standard coffee. The 0.8 of an hour is 48 minutes, so the cut-off is 8 hours 48 minutes.

Count back from a 10:30 pm bedtime. Eight hours back gives 2:30 pm, and 48 minutes more gives 1:42 pm. Rounded, that is about 1:45 pm.

> Exercise:
>
> **Practice task. Count back 8 hours 48 minutes from** your own usual bedtime **and write the time on Table B.2.**

Key idea:

Watch a method work on one worked task**, then try it on your own and let the result choose your next step.**

E. Progress Journal and Practitioner-Level Rubrics

A LEVEL REVIEW READS your journal the way **an art teacher reads a student's portfolio**. One good or bad piece decides nothing, because the portfolio holds weeks of work. The sheets here are the journal and the rubrics from Module 9, ready to copy.



Plan, do, review. Each entry adds one more page to your portfolio.

> 🗝 **Key Concept:**
>
> **How to use these sheets.** The Attention Practitioner levels are our own system**, a design for practice with set steps. No tested score ranges define them, so they can't rank your attention against other people. You assess yourself, alone or with a peer or mentor. A level marks your own progress and carries no professional standing.**



Three ways to run a level review, all using the same checklist and journal.

Each level combines **three strands**. The methods strand covers knowing the methods and knowing how to use them, a game benchmark is a small "shows how" and the journal is the "does". These are the steps of Miller's pyramid, a ladder that medical teachers use to judge skill.

Miller's pyramid

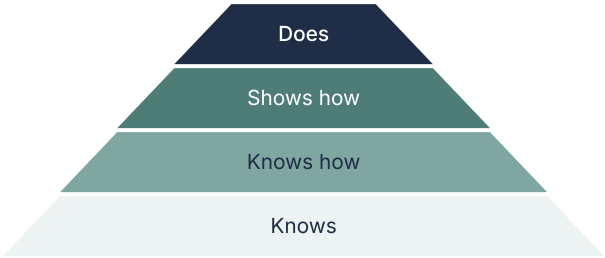


Table E.1: A journal page

Date and conditions	Practice	Real life	Result and review
Time, device, sleep, caffeine	Unit and minutes	Where I used it	Benchmark band (see 9.2, Table 9.4 and Appendix C), what changed

Write each entry **close to the moment**. The journal follows the plan, do and review cycle of self-regulated learning, so each entry records what you planned, what you did and what changed. Tracking progress makes reaching goals more likely (Harkin et al., 2016).

The table below lists every unit by level. **The methods and journal assignments by level are our own recommendations**, and so is the Master teaching strand. Cleverini does not set them.

Table E.2: Methods and journal strands by level

Level	Methods strand (unit and method)	Journal strand (real-life practice)
Basic	3.1.1 Single-Tasking and Clear Intentions (if-then plans). 3.3.1 External and Internal Distractions (distraction audit). 4.1.1 Short Exercises for Every Day (breath counting, single-object focus, body scan). 4.1.2 Building Attention Habits (habit plan template)	A full baseline week (9.3.2), then a short exercise and one single-tasking block logged on each practice day, plus one distraction audit

Level	Methods strand (unit and method)	Journal strand (real-life practice)
Intermediate	3.1.2 Deep Work (how to plan a deep-work block). 3.2.1 Focused-Attention and Open-Monitoring Meditation (Exercise Table 1). 3.2.2 Noticing and Returning (the four-phase cycle). 3.3.2 Designing a Focus-Friendly Environment. 3.3.3 Attention Aids (timers, checklists, pre-task routines). 7.2.1 Digital Boundaries (device hygiene checklist)	Deep-work blocks and meditation sessions logged with notes on drift and return. One change to your environment and one to your devices, tried and reviewed
Advanced	4.2.1 Entering and Sustaining Flow (setting up conditions for flow). 4.2.2 Concentration under Pressure and Fatigue (quiet eye, reappraising arousal). 6.1.2 Strategies for Regaining Focus (structured breaks, planning and restarting). 8.1.2 Habits for Restful Sleep. 8.2.1 How Much to Move. 8.2.2 Ideas for Restorative Breaks. 8.3.2 Caffeine, Safe Amounts and Timing	Practice under real pressure or fatigue, logged with sleep, breaks and caffeine notes, and what helped and what didn't
Expert	5.1.1 Study Techniques that Use Attention Well. 5.2.1 Focus in the Modern Workplace (email and messaging, meetings, protected time). 5.2.2 Practical Habits for Attentive Leaders. 5.3.1 Practical Listening Skills. 7.2.2 How to Evaluate a Focus App	Methods applied over time in one real setting (study, work or relationships), plus a written review of whether your game results show up in daily life (7.2.2)
Master	Everything above, plus 5.1.2 Ten Practical Steps for Teachers and Parents. 5.3.2 Shared Attention in Families and Teams. 6.2.2 Keeping Up Practice. 1.3.4 scope (support, never diagnose)	A teaching record. You support another person through the Basic methods, within scope, and write a reflective case. A level review with a peer or mentor is recommended

Exercise:

Find your starting level. Read the Basic row of Table E.2 and tick each method you already use **most days. If you tick most of**

them, read the Intermediate row next. Start at the first level where several methods are still new to you.

The five levels move from yourself to other people. The first two are for yourself, the middle two move into harder settings and the top level is about helping someone else practise, within scope. A practitioner supports and never diagnoses.

Table E.3: The five levels

Level	Focus	Methods and journal strands	Benchmark strand
Basic	Learn the basics for yourself	Basic row of Table E.2	See 9.2, Table 9.4 and Appendix C
Intermediate	Build steady daily practice	Intermediate row	See 9.2, Table 9.4 and Appendix C
Advanced	Hold focus under pressure and fatigue	Advanced row	See 9.2, Table 9.4 and Appendix C
Expert	Apply it in real settings	Expert row	See 9.2, Table 9.4 and Appendix C
Master	Help others practise, within scope	Master row	See 9.2, Table 9.4 and Appendix C

Testing yourself fairly works like **weighing yourself at home**. Keep four things steady, the same device, the same browser, a similar time of day and a note of how you slept. One session is mostly noise, so we recommend three sessions on three different days and the median, the middle result.

Table E.4: Baseline and retest record

Check	Baseline week	Retest	Change bigger than my wobble?
Device, browser and time of day			
Breath-counting accuracy			

Check	Baseline week	Retest	Change bigger than my wobble?
Cognitive Failures Questionnaire			
Flow questionnaire after demanding work			
If you like, the MAAS or the Mind-Wandering Questionnaire			
Benchmarks, three days and the median	See 9.2, Table 9.4 and Appendix C		

Every score wobbles a little from day to day. **Your baseline spread shows how big your own wobble is**, and the Reliable Change Index asks whether a change is bigger than that. Only count a change as real if it falls outside that range. Scores also rise with repetition alone, so compare only after the early climb has levelled off.

Each self-check gives you **a clue about your attention**, and none of them is a diagnosis. The ASRS v1.1 questionnaire is a screening tool only, and it must never be used to label anyone.

Table E.5: Level review checklist

Strand	Check	Evidence (journal page or entry)	Met?
Methods	I can explain each method listed for this level (Table E.2) in my own words		☐
Methods	I have practised each method, and the journal shows when		☐
Journal	My baseline week is complete, with device and conditions noted		☐
Journal	Real-life use for this level is logged (Table E.2, journal strand)		☐
Journal	(Master only) My teaching record and reflective case are complete, within the 1.3.4 scope		☐
Benchmarks	See 9.2, Table 9.4 and Appendix C		☐

Strand	Check	Evidence (journal page or entry)	Met?
Honesty	I have allowed for practice effects, and my change is bigger than my own wobble		☐
Honesty	I have checked whether my game gains show up in daily life (7.2.2)		☐
Review	Reviewed by myself, a peer or a mentor (circle one), with the outcome and date written in the journal		☐

People's ratings of their own skill match their actual performance **only moderately or weakly**, so a reviewer asks for the evidence behind each tick. The outcome goes in your own journal. One outcome is "level reached", with the date and evidence, and the other is "keep practising", naming the strand that is missing.

A level stays yours **only while you keep using it**. After a long break, repeat the baseline and retest steps before you claim the level again. Longer goals call for longer gaps between re-checks.

> Exercise:
>
> **Plan your re-checks. Decide** how far ahead you need the skill, **such as a year. As a rough guide, the further ahead that is, the longer the gaps between short re-checks can be. Write the dates in your journal. The spacing study in 9.3.3 tested one review of learnt facts before a final test, so treat it as a loose pointer for attention practice.**

Key idea:

Log each practice close to the moment, test under the same conditions **and back every tick with evidence before you write "level reached".**

Appendix

F. A Short Glossary

THIS GLOSSARY GATHERS THE terms the book explains, each in a line or two. The wording follows the book, so a term means the same here as it does in the module where you first met it.

> Key Concept:
>
> **How to use this glossary.** Look up a term, then turn to the section in the last column **for the full story and the studies behind it. Terms are in alphabetical order across three tables.**

Table F.1: Terms from A to D

Term	Plain meaning	First explained in
ADHD	Attention-deficit/hyperactivity disorder, a lasting pattern of trouble paying attention, or of being overactive and acting without thinking, or both	1.3.4
Alternating attention	One job, then the other, back and forth	1.2.2
Arousal	How wound up your body and mind are	1.3.2
Attention	In this book's terms, choosing what is important and staying with it	2.1.1

Term	Plain meaning	First explained in
Attention control	The steering part of attention that keeps a chosen goal in charge of what you do next	2.2.1
Attention map	Intake + Hold + Widen. Intake is what you must take in fully, hold is which known variables must stay in view and widen is where you need side detail or a break	2.3.4
Attention residue	The leftover thinking about an unfinished task that stays with you after you switch to a new one	3.1.2
Attentional blink	Missing the second of two quick targets when it comes a few tenths of a second later	1.2.3
Body scan	Moving your attention slowly through the body, region by region, and noticing what you feel without trying to change it	1.1.1
Capacity	The most your mind can hold or handle at one time	1.2.3
CBT-I	Cognitive behavioural therapy for insomnia, a talking therapy that works on sleep habits and thoughts about sleep	8.1.2
Choking under pressure	Performing worse than you normally would because the stakes feel high	4.2.2
Chronotype	Whether you are naturally a morning or an evening person	8.1.1
Commitment device	A limit you set on yourself in advance, so the choice is already made when temptation arrives	7.2.1
Continuous performance test	A lab test that keeps going for minutes, where you press only when a rare target appears	1.2.2
Deep work	Work done in “a state of distraction-free concentration”, the phrase Cal Newport uses for it	3.1.2
Default mode network	The brain areas that get busy when your mind is left to itself	1.3.2
Deliberate practice	Hard, focused practice designed to improve one part of a skill, aimed at the parts you cannot do yet	3.1.2
Directed attention	The steering kind of attention, the effort you spend choosing what to focus on and what to block out	8.2.2
Divided attention	Two jobs at the same moment	1.2.1

Some terms come in pairs. **Focused-attention and open-monitoring meditation** are two ways to sit, and both are in the next table, along with flow and mind-wandering.

Table F.2: Terms from E to O

Term	Plain meaning	First explained in
Encoding	Taking information in, the stage at which divided attention does the most damage to memory	1.2.1
Executive function	The mental skills that steer attention, such as planning and holding back responses	8.2.1
Experience sampling	Asking people at random moments what they are thinking	1.3.3
Flow	A state of absorbed attention that feels effortless, usually with clear goals, immediate feedback and a task matched to your skill	4.2.1
Focused-attention meditation	Holding attention on one object, such as the breath, and coming back to it each time you notice you have drifted	3.2.1
Habituation	The brain no longer noticing something that never changes	4.1.2
Implementation intention	An if-then plan made in advance, in the form "If X happens, then I will do Y"	3.1.1
Incubation	Setting a problem aside for a while and then coming back to it, a planned gap in attention with a planned return	2.3.3
Inhibition	The ability to hold back an automatic response, such as glancing at a buzzing phone	4.1.1
Joint attention	Two people coordinating their attention on the same thing, each aware that they share it	5.3.2
Lapse	A brief moment when attention drops out completely, so you miss something you would normally catch	8.1.1
Load theory	An idea about when distractions get in, which splits the load on your mind into the load on your senses and the load on your working memory	3.3.1

Term	Plain meaning	First explained in
Meditation	Methods people use on themselves to change from the inside	1.1.1
Meta-analysis	A study that combines the results of many studies	1.3.2
Meta-awareness	Noticing what your own mind is up to at any given moment	3.2.2
Miller's pyramid	Skill growing in four steps, from knowing to doing	9.1
Mind-wandering	Thought that drifts away from the task at hand	1.3.3
Open-monitoring meditation	Noticing whatever comes up, such as sounds, feelings in the body or thoughts, without holding on to any one object	3.2.1

The last table runs from P to Z. **Several of its terms belong to Module 9**, such as the practice effect and the Reliable Change Index, and they matter most when you read your own scores in Appendix E.

Table F.3: Terms from P to Z

Term	Plain meaning	First explained in
Perceptual decoupling	Attention coming loose from what is in front of you while the mind wanders	3.2.2
Perceptual load	How much a task asks of your eyes, so a busy task leaves little room for distractions	1.2.3
Phubbing	Snubbing someone by turning to your phone in their company	5.3.1
Plasticity	The brain changing as you live and learn	1.3.2
Pomodoro Technique	A way of working in 25-minute blocks with short breaks in between	3.3.3
Practice effect	A score that rises because you know the test better, even if your attention hasn't changed	9.3.1
Reappraisal	Interpreting the same body signals differently, such as reading a pounding heart as energy	4.2.2

Term	Plain meaning	First explained in
Reliable Change Index	A measure that asks whether a change is bigger than the normal day-to-day wobble	9.3.2
Screening scale	A short list of questions that flags who may need a full check, never used to label anyone	1.3.4
Selective attention	Picking one thing and ignoring the rest	1.2.2
Sleep hygiene	Everyday habits and surroundings that help sleep, such as limits on caffeine and a calm bedroom	8.1.2
Sleep inertia	The grogginess after waking, worst after waking from the deepest stage of sleep	8.1.2
Soft fascination	Things that hold your eye without effort, such as leaves moving or clouds drifting	8.2.2
Sustained attention	Holding on over time	1.2.2
Switch cost	The extra time and the extra mistakes that come from changing from one task to another	1.2.2
Test-retest reliability	How well two tries at the same test match, from 0 for no match to 1 for a perfect match	9.3.1
Time on task	How long you have been working on the same task without a break	3.2.2
Transfer	Practice on one task improving a different task. Near transfer reaches similar tasks, and far transfer reaches very different ones	6.1.2
Vigilance decrement	The drop in attention that comes with watching for rare signals over a long time	1.1.2
Working memory	The space in your mind where you hold facts while you use them	1.2.3

Key idea:

Look up the term, then read the section it came from, **because each line here is a short version of a longer explanation.**

G. Further Reading

Every work below is **already cited in the book**, so you can follow up any idea from the modules. Each one has a single line on why it is worth your time, and a pointer to the section where the book uses it.

> Key Concept:
>
> **How to use this list.** Start with the group that matches what you want to practise next. **The papers and guidelines go further into the evidence, and the health sources are the places to check before you change your sleep, exercise, food or caffeine.**

The oldest works on the list show **how long people have trained attention**, from Stoic and Christian practice to the first scientific chapter on it.





What the traditions teach comes from their own texts. The few lab studies are small. None of them is a controlled test of attention training.

Table G.1: Classic and traditional works

Work	Why read it
James, W. (1890). The principles of psychology (Vol. 1, Chap. 11, "Attention"). Henry Holt. Online edition: Classics in the History of Psychology, York University.	The chapter that opens modern attention research, and the source of the definition quoted in 1.1.2.
Kabat-Zinn, J. (1990). Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness. Delacorte Press.	The book behind the body scan, one of the Basic daily exercises (1.1.1).
Hadot, P. (1995). Philosophy as a way of life: Spiritual exercises from Socrates to Foucault (A. I. Davidson, Ed.; M. Chase, Trans.). Blackwell.	How the Stoics kept attention to oneself going as a daily spiritual exercise (1.1.1).
Keating, T. (2006). Open mind, open heart: The contemplative dimension of the Gospel (20th anniversary ed.). Continuum.	Centering Prayer and its sacred word, a soft cue to set a thought down and return (1.1.1).
Kahneman, D. (1973). Attention and effort. Prentice-Hall.	The classic case for attention as effort, the idea that you only have so much (1.1.2).

These books describe **the methods behind Modules 3 and 4**, each from the person who named or studied it.

Table G.2: Methods for focused work

Work	Why read it
Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper & Row.	The book that named flow, the state of absorbed attention that feels effortless (4.2.1).
Newport, C. (2016). Deep work: Rules for focused success in a distracted world. Grand Central Publishing.	Where the phrase deep work comes from, and the case for blocks of distraction-free concentration (3.1.2).
Cirillo, F. (2018). The Pomodoro Technique: The acclaimed time-management system that has transformed how we work. Currency.	The Pomodoro Technique in its author's own words, 25-minute blocks with short breaks (3.3.3).
Jha, A. P. (2021). Peak mind: Find your focus, own your attention, invest 12 minutes a day. HarperOne.	A lab's mindfulness research for general readers, and the source of the 12-minutes-a-day advice (3.2.1).
Mark, G. (2023). Attention span: A groundbreaking way to restore balance, happiness and productivity. Hanover Square Press.	How long people stay on one screen before switching, from the researcher who tracked it (1.2.3).

These sources sit behind **the planner, the journal and the levels**, from if-then plans to the pyramid that shapes each level.

Table G.3: Habits, practice and progress

Work	Why read it
Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. American Psychologist, 54(7), 493-503.	The paper on if-then plans, the tool behind the habit plan and the bump plans (3.1.1 and 4.1.2).
Lally, P., van Jaarsveld, C. H. M., Potts, H. W. W., & Wardle, J. (2010). How are habits formed: Modelling habit formation in the real world. European Journal of Social Psychology, 40(6), 998-1009.	A real-world study in which a new behaviour felt automatic after anything from 18 to 254 days (4.1.2).

Work	Why read it
Harkin, B., Webb, T. L., Chang, B. P. I., Prestwich, A., Conner, M., Kellar, I., Benn, Y., & Sheeran, P. (2016). Does monitoring goal progress promote goal attainment? A meta-analysis of the experimental evidence. Psychological Bulletin, 142(2), 198-229.	The evidence that tracking progress makes reaching goals more likely (4.1.2 and 9.2).
Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory Into Practice, 41(2), 64-70.	The plan, do and review cycle that the practice journal follows (9.3.2).
Ericsson, A., & Pool, R. (2016). Peak: Secrets from the new science of expertise. Houghton Mifflin Harcourt.	Deliberate practice for general readers, and why Ericsson rejected the popular 10,000-hour reading (3.1.2).
Miller, G. E. (1990). The assessment of clinical skills/competence/performance. Academic Medicine, 65(9), S63-S67.	The pyramid from knowing to doing that the three strands of each level follow (9.1).

Two large reviews help you **judge claims about study and brain training** for yourself.

Table G.4: Weighing the evidence

Work	Why read it
Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. Psychological Science in the Public Interest, 14(1), 4-58.	A major review that rated ten study techniques and found practice testing and spread-out study highly useful (5.1.1).
Simons, D. J., Boot, W. R., Charness, N., Gathercole, S. E., Chabris, C. F., Hambrick, D. Z., & Stine-Morrow, E. A. L. (2016). Do "brain-training" programs work? Psychological Science in the Public Interest, 17(3), 103-186.	A major review of brain-training programs, which mostly improve the game you practise (1.3.2 and 9.2).

The health sources are **official guidance and fact sheets**, and Module 8 takes its health limits from them.

Table G.5: Health guidance

Work	Why read it
Watson, N. F., Badr, M. S., Belenky, G., Bliwise, D. L., Buxton, O. M., Buysse, D., Dinges, D. F., Gangwisch, J., Grandner, M. A., Kushida, C., Malhotra, R. K., Martin, J. L., Patel, S. R., Quan, S., & Tasali, E. (2015). Recommended amount of sleep for a healthy adult: A joint consensus statement of the American Academy of Sleep Medicine and Sleep Research Society. SLEEP, 38(6), 843-844.	The joint statement that adults should regularly sleep 7 or more hours a night (8.1.1).
Centers for Disease Control and Prevention. (2024, May 15). About sleep. U.S. Department of Health and Human Services. Retrieved October 26, 2026, from https://www.cdc.gov/sleep/about/index.html	Public-health guidance on sleep, including when to talk to a healthcare provider (8.1.2).
National Heart, Lung, and Blood Institute. (2022). Sleep deprivation and deficiency: Healthy sleep habits. National Institutes of Health.	Practical guidance on sleep schedules, surroundings and pre-bed routines (8.1.2).
Edinger, J. D., Arnedt, J. T., Bertisch, S. M., Carney, C. E., Harrington, J. J., Lichstein, K. L., Sateia, M. J., Troxel, W. M., Zhou, E. S., Kazmi, U., Heald, J. L., & Martin, J. L. (2021). Behavioral and psychological treatments for chronic insomnia disorder in adults: An American Academy of Sleep Medicine clinical practice guideline. Journal of Clinical Sleep Medicine, 17(2), 255-262.	The clinical guideline that strongly recommends CBT-I for chronic insomnia (8.1.2).
Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., . . . Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. British Journal of Sports Medicine, 54(24), 1451-1462.	The World Health Organization guidelines behind the 150 to 300 minutes of weekly activity (8.2.1).
U.S. Food and Drug Administration. (2024, August 28). Spilling the beans: How much caffeine is too much? https://www.fda.gov/consumers/consumer-updates/spilling-beans-how-much-caffeine-too-much	Plain guidance on how much caffeine is too much, including the 400 mg a day figure (8.3.2).

Work	Why read it
MedlinePlus. (n.d.). Caffeine. National Library of Medicine. Retrieved October 27, 2026, from https://medlineplus.gov/caffeine.html	Who should check with a doctor or pharmacist before using caffeine (8.3.2).
Office of Dietary Supplements. (2025, August 22). Omega-3 fatty acids: Fact sheet for health professionals. National Institutes of Health. Retrieved October 26, 2026, from https://ods.od.nih.gov/factsheets/Omega3FattyAcids-HealthProfessional/	The fact sheet the book uses as a reference point for omega-3 claims (8.3.1).
American Academy of Pediatrics. (n.d.). Family media plan [Interactive tool]. HealthyChildren.org. Retrieved October 26, 2026, from https://www.healthychildren.org/English/fmp/Pages/MediaPlan.aspx	An interactive plan for setting device-free times and zones as a family (5.3.2 and 7.2.1).

Key idea:

Pick one work from the group you need next, **and use the section pointer to see how the book drew on it.**

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