The Invisible Biology of Perimenopause: Oestrogen, Dopamine, Cortisol and the Cognitive Experience of Midlife

(A Science Based Review - for Humans)

David Bovis – Dec 2025
www.Duxinaroe.com

Abstract

Perimenopause represents one of the most significant neurological transitions in the adult female lifespan. Fluctuating and declining levels of Oestrogen (particularly 17β-oestradiol interact directly with dopaminergic, serotonergic and cholinergic systems to shape executive function, attention, working memory and emotional regulation. At the same time, chronic psychosocial stress and altered cortisol dynamics exert pressure on prefrontal and limbic circuits essential for cognitive stability.

This review integrates findings across neuroendocrinology, cognitive neuroscience, stress physiology and lifespan psychology, presenting a mechanistic, human-centred explanation for why many women in their forties and fifties experience changes in focus, emotional resilience, motivation and memory. These mechanisms are further amplified in individuals with lower baseline dopaminergic tone, such as those with ADHD. While the content is grounded in primary research, it is written for a broad audience unfamiliar with neuroscience. Light BTFA™ framing is used in the conclusion to connect biological state with behaviour in a human-centred, non-pathologizing way.

Introduction: A Biological Shift Hiding in Plain Sight

Most discussions about menopause focus on hot flashes, mood swings or hormone replacement therapy. Very little public conversation addresses what neuroscience has understood for years: perimenopause is a neurological transition before it is a reproductive one.

It affects the chemistry of attention, the machinery of working memory, the architecture of emotional regulation and the motivational circuits that drive goal-directed behaviour. And it does so in predictable, measurable ways.

For many women, the experience is disorienting. Emerging in statements like:
- “I can’t hold a thought steady anymore.”
- “My confidence fell through the floor.”
- “I’m working harder than ever and achieving less.”
- “I cry at things that never used to bother me.”

This paper explains why.

Oestrogen: A Neuromodulator Hiding in Hormone's Clothing

Most people grow up believing that hormones belong to the reproductive system, that oestrogen is something that manages periods, pregnancy and menopause. In truth, oestrogen is as much a **brain chemical** (a neuromodulator) as serotonin or dopamine (neurotransmitters). The brain is full of receptors whose entire job is to respond to oestradiol, the most active form of oestrogen.

If you imagine the brain as a city, oestradiol is like **the city's electrical grid**. It doesn't carry the thoughts, memories or emotions themselves, but it powers the systems that do.

Where does oestrogen act in the brain?

Oestradiol receptors are distributed widely in the areas that matter most for thinking, feeling and functioning:

- **Prefrontal cortex (PFC)** - planning, decision-making, attention, emotional regulation
- **Striatum** - motivation, effort, reward learning
- **Hippocampus** - memory, context, learning
- **Amygdala** - emotional significance and threat detection

These receptors have different names - **ERα, ERβ and GPER** - which sound technical, but all you really need to know is this:

They are molecular switches that allow oestradiol to influence how neurons grow, connect and communicate.

Think of them as different types of electrical sockets. Some power big appliances, some power small ones, but they all allow energy to flow.

Oestradiol and dopamine: the keystone interaction

Dopamine is often misunderstood as the brain's "pleasure molecule." In reality, its role is much broader and more essential.

Dopamine drives:

- working memory
- focus
- task initiation
- persistence
- curiosity
- emotional steadiness
- the ability to feel progress and reward

Without dopamine, even simple tasks feel effortful. With optimum dopamine, complex tasks feel engaging.

Oestradiol is the regulator that keeps dopamine functioning well.

It does this in **four key ways**, all supported by clinical and preclinical research:

1. Oestradiol increases dopamine synthesis

Inside dopamine neurons, there is an enzyme called **tyrosine hydroxylase** that acts like a "production line supervisor," ensuring dopamine is made efficiently. Oestradiol upregulates this enzyme, meaning:

- more dopamine is produced
- dopamine stores replenish more quickly
- the system has more capacity under pressure

When oestradiol falls, production slows. The result? Mental tasks feel heavier.

Reference:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10273222/

---

2. Oestradiol increases dopamine release

The brain does not release dopamine constantly. It releases it **on demand**, especially during activities requiring attention, planning or motivation.

Oestradiol enhances this release, particularly in:

- the **prefrontal cortex**, where executive function lives
- the **striatum**, where motivation begins

This is why many women report feeling:

- more decisive
- more energetic
- more focused
- more confident

… during phases of the menstrual cycle when oestradiol is naturally higher.

Reference:
https://academic.oup.com/cercor/article/33/13/8485/7158363

---

3. Oestradiol slows dopamine clearance

Dopamine does not linger. The brain breaks it down quickly using enzymes such as **COMT** (catechol-O-methyltransferase).

Oestradiol ***suppresses*** COMT activity.

This means:

- dopamine remains active longer
- fewer molecules are "wasted"
- signals in the prefrontal cortex become clearer and more stable

Why does this matter?
Because the PFC relies heavily on dopamine to keep thoughts coherent, organised and resistant to distraction.

When oestradiol drops and COMT becomes more active, dopamine vanishes faster, and mental stability wavers.

Reference:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10273222/

---

4. Oestradiol tunes dopamine receptor sensitivity

Dopamine works by binding to receptors on neurons like keys fitting into locks.

But the locks themselves are adjustable.

Too much dopamine stimulation overwhelms the system.
Too little leads to fogginess and indecision.

Oestradiol helps keep the receptors functioning within the **optimal range**, the sweet spot often described in neuroscience as the "inverted-U curve" of dopamine performance.

This tuning determines:

- how steady your attention feels
- how calm your emotional responses are
- how rewarding effort feels
- how motivated you are to begin tasks

Reference:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3089976/

Putting it all together

A woman with healthy oestradiol levels has dopamine systems that function like a strong, stable Wi-Fi network.

- Multiple devices (tasks, thoughts, emotions) can run at once
- Signals remain clear
- Interruptions are minimal
- Performance feels reliable

When oestradiol fluctuates or falls, the network becomes unstable:

- slower connection
- intermittent signal
- unexpected dropouts
- more effort to complete the same tasks

This is why perimenopause often feels like a sudden drop in cognitive bandwidth - not because anything has gone wrong psychologically, but because **the chemical systems that support thinking have lost their stabiliser.**

Metaphor:

Dopamine is the Wi-Fi signal of executive function.
Oestradiol is the signal boosting grid.
When the booster flickers, the whole system feels unreliable.

When Oestradiol Falls: The Cognitive Signature of Perimenopause

Oestradiol is not simply a reproductive hormone; it is one of the brain's most important chemical stabilisers. When it rises and falls in the normal menstrual cycle, most women feel the effects - a shift in mood, energy, emotional sensitivity, concentration or sleep. But during perimenopause the fluctuations become far less predictable and far more dramatic.

If you imagine the brain as a beautifully choreographed ballet, oestradiol is the *conductor*, the *timekeeper* and the *floor manager* **all at once**. It ensures that dopamine, serotonin, acetylcholine and other neurotransmitters communicate in a coordinated, efficient and stable way so that the dancer (***you***) can move through life with balance.

When oestradiol drops suddenly or inconsistently, that choreography falters.
The dancers are still there, but the rhythm is gone.

And the woman experiences the loss not as biology, but as **herself changing**.

Why falling oestradiol feels like "losing yourself"

To understand this, it helps to think less about hormones and more about *systems*.

Oestradiol supports:

- attention and concentration
- memory formation
- emotional stability
- motivation
- stress tolerance
- sleep quality
- verbal fluency
- learning and decision-making

It does this through multiple brain regions simultaneously. Oestradiol is not a single switch; it is a **network regulator**.

So when it drops, the effect is not local. It is *everywhere at once*.

This is why perimenopause feels like so many things changing simultaneously - because they are.

Working memory becomes less reliable

Working memory is the brain's mental notepad. It allows us to:

- remember what we were about to say
- hold numbers in mind while dialling
- follow a conversation
- keep track of what we were doing next
- read an email *and* retain its meaning by the time we reach the end

Oestradiol directly supports the dopamine signals that fuel working memory performance. When oestradiol drops, dopamine becomes less efficient, and the notepad becomes "smudged."

Women describe this as:

- "I lose the thread mid-sentence."
- "I walk into a room and forget why."
- "I know what I need to do, but the steps fall apart."
- "My thoughts feel slippery."

This is not incompetence. It is *prefrontal cortex physics, chemistry and biology rolled into one*, dopamine destabilises when oestradiol does.

Emotional regulation becomes harder

To understand why cortisol often rises during perimenopause, we need to introduce a system in the body called the **HPA axis**. Most people have never heard of it, yet it operates behind the scenes every day and controls our entire stress response.

Think of the HPA axis as **the body's internal alarm network**:

- The **H**ypothalamus is the *smoke detector*: it senses threat.
- The **P**ituitary gland is the *control centre*: it receives the alert.
- The **A**drenal glands are the *firefighters*: they release cortisol to deal with the situation.

When everything is working smoothly, this network switches on when needed and switches off when the threat is gone.

But here's the key point for perimenopause: *Oestrogen helps regulate this alarm system*

Oestrogen normally keeps the stress system from overreacting. It helps the brain "dial down" the cortisol response so we don't stay in a heightened state longer than necessary.

What happens during perimenopause?

As oestrogen levels fluctuate wildly, sometimes high, sometimes low, sometimes crashing unexpectedly, they stop providing consistent regulation for the HPA axis.

The result is like having:

- a smoke alarm that goes off too easily
- fire alarms that stay ringing after the danger has passed
- or a firefighter who keeps spraying long after the fire is out

This manifests in three measurable ways:

1. Shifts in "basal" (baseline) cortisol

Basal cortisol is simply the **background level of stress hormone in your body**, even when nothing stressful is happening.

During perimenopause, studies show that this background level can **creep upward**, meaning the stress system is running hotter than before, even at rest.

This alone affects:

- emotional stability
- irritability
- motivation
- sleep
- cognitive clarity

Because cortisol interacts directly with brain regions such as the prefrontal cortex (focus) and hippocampus (memory).

2. Weakened diurnal regulation

Cortisol follows a natural daily rhythm:

- high in the morning (to help you wake)
- low in the evening (to help you wind down)

During perimenopause, this rhythm can **flatten** or become irregular.

A practical example:
A woman wakes tired because cortisol *didn't rise enough in the morning*, but then feels wired at night because cortisol *didn't fall when it was supposed to*.

This leads to:

- morning "brain fog"
- difficulty activating
- night-time anxiety
- poor sleep (which further increases cortisol)

It's becomes a self-reinforcing loop.

3. Heightened stress reactivity

Without stable oestrogen moderating the system, the HPA axis becomes more sensitive. This means everyday stressors, email volume, deadlines, interpersonal tension, managing teenagers, youngsters saying "Mum" 1000 times an hour, Husbands breathing or chewing, trigger bigger cortisol responses than they once did.

Layer on top of this the physical symptoms of perimenopause such as:

- hot flashes
- night sweats
- disrupted sleep

…which themselves act as **internal stressors**, and cortisol can remain elevated for long periods.

This is why many women say things like:

- "I feel like my reactions are bigger than they should be."
- "Everything feels like too much."
- "I can't switch off my stress response anymore."

This is not psychological fragility. It is a direct consequence of **a stress system losing its hormonal regulator.**

In summary:
Oestrogen normally helps keep your internal fire alarm system calm, rational and proportionate. During perimenopause, that regulatory signal weakens.

So the alarm rings more often, more loudly, and for longer. Cortisol rises not because the woman is "more stressed," but because **the system designed to manage stress becomes dysregulated.**

This is why cortisol is essential to the story of perimenopause, not as an abstract biochemical concept, but as a lived experience that shapes:

- focus and attention
- mood and anxiety
- overwhelm and irritability
- fatigue
- memory
- sleep
- motivation

Motivation becomes inconsistent

Motivation is not a character trait. It is a **neurochemical state**, largely powered by dopamine.

Dopamine helps us:

- start tasks
- keep going

- experience reward
- feel progress
- maintain enthusiasm
- push through resistance

When oestradiol falls, dopamine signalling weakens. Tasks feel heavier, initiation requires more effort, and the sense of reward becomes muted.

Women often say:

- "I know what I should do, but I can't get started."
- "Everything feels harder than it used to."
- "I'm not myself. My drive has gone."

It hasn't gone. The *signal* has softened. The engine is still there; it's just the **fuel pressure dropped**.

Cognitive resilience shrinks

Cognitive resilience is the brain's ability to stay composed when life piles up:

- too many emails
- three competing deadlines
- an urgent request
- a personal worry
- a hormonal shift
- a bad night's sleep

With healthy oestradiol, the brain can cope with these micro-shocks. It absorbs them like a sponge.

With fluctuating or falling oestradiol, the sponge becomes thinner. A small stressor soaks the whole system.

A task that used to feel trivial can suddenly feel impossible.

Again, this is not a psychological flaw. It is a **neuroendocrine bandwidth issue**.

Stress tolerance decreases

Oestradiol does more than regulate dopamine, it influences cortisol too. When oestradiol weakens, the stress system (the HPA axis) becomes less stable.

This means:

- stress responses activate more easily
- cortisol stays elevated longer
- tension lingers in the body
- threat perception increases

This is why perimenopause can feel like:

- "Everything is too much"
- "I'm overwhelmed by things that used to be fine"
- "I overreact and then regret it"
- "My resilience has disappeared"

It has not disappeared. It has been **temporarily outpaced by biology**.

What this means to you …

When women experience these changes without understanding the mechanism, they often internalise it as:

- "I'm failing."
- "I'm losing my edge."
- "Something is wrong with me."
- "I can't trust my brain anymore."

The truth is far more compassionate, say this to yourself (out loud if you have to):

Nothing is wrong with me.
Something is changing within me. A change that follows the laws of biology, not the **myths** of personal inadequacy.

Evidence review:
https://www.sciencedirect.com/science/article/pii/S1878747923018111

The Double Hit: When Dopamine Falls and Cortisol Rises

By this point we have two major players on the stage:

1. **Oestradiol**, which stabilises dopamine and supports clarity, motivation and emotional steadiness
2. **Cortisol**, the body's internal alarm signal, which keeps us alert but reshapes the brain under prolonged stress

Either system shifting on its own can cause disruption. But perimenopause is not a single-system event. It is a **collision**.

When **oestradiol falls**, dopamine signalling weakens.
When **cortisol rises**, stress pathways intensify.

This combination, a drop in the chemical that supports clear thinking, and a rise in the chemical that primes the brain for threat, creates what many women describe as one of the most destabilising cognitive periods of their lives.

Let's walk through what is happening biologically, using language that makes the mechanisms visible rather than abstract.

Why the interaction matters: two systems, one experience

Think of the brain as a team trying to do its best work.

- Dopamine is the *strategist*: it keeps plans organised, helps you start tasks, and ensures you stay on track.
- Cortisol is the *security officer*: it responds whenever something seems dangerous, uncertain or overwhelming.

In a well-functioning system, these two roles balance each other.
The strategist leads; the security officer steps in only when needed.

During perimenopause:

- The strategist becomes under-resourced and unfocused (dopamine ↓).
- The security officer becomes jumpy, overreactive and overprotective (cortisol ↑).

This creates a perceptual and emotional environment where:

- simple tasks feel harder
- small stressors feel larger
- patience wears thin

- confidence fluctuates
- emotional reactions intensify
- mental stamina decreases

It is not a personality change. It is a **state change**.

How cortisol reshapes the brain — in human terms

Chronic cortisol exposure physically alters the architecture of the brain:

1. Prefrontal cortex (PFC)

The PFC is the home of:

- working memory
- logic
- attention
- inhibition
- decision-making

Cortisol weakens the dendrites, the "branches" that allow neurons to communicate, reducing the PFC's processing power. (Not only in women or perimenopause, but for everyone). Link.

Subjectively, this feels like:

- foggy thinking
- difficulty concentrating
- trouble switching tasks
- misplacing things
- losing the thread of a conversation

2. Hippocampus

The hippocampus is responsible for:

- forming new memories
- recalling stored memories
- orienting yourself in events and time

Cortisol reduces levels of **BDNF** (a growth factor essential for neuronal health) and decreases neurogenesis (the birth of new neurons).

Women experience this as:

- "Why is my memory unreliable?"
- "I forget facts I used to recall instantly."
- "I can't keep hold of details."

3. Amygdala

The amygdala is the threat-detection centre. Cortisol heightens its sensitivity and increases its activity.

This leads to:

- increased anxiety
- quicker emotional reactions
- overinterpretation of tone
- feeling under threat even when safe

Reference for structural and functional effects:
https://link.springer.com/article/10.1007/s43440-025-00782-x

Why the combination is uniquely destabilising in perimenopause

The **dopamine drop** and the **cortisol rise** do not occur independently; they amplify each other.

Low dopamine means tasks require more effort

Starting, sustaining or finishing tasks becomes mentally expensive.

High cortisol means the brain feels under pressure

Stress signals arrive faster, linger longer, and feel more intense.

Together, this creates a state where:

- the world feels faster than your internal processing speed
- your emotional buffer feels thinner
- your tolerance for complexity decreases
- your sense of control fluctuates

Many women describe this as "losing their edge" or "becoming unlike themselves."
In reality, their brain is working with **reduced fuel and increased load simultaneously**.

I can't reinforce this enough … this isn't psychological frailty. It is a direct consequence of interacting neurochemical systems. *(Just as every part of life is for every human being at every moment of existence – hence my passion to help people understand themselves as brain function through the work we do at Duxinaroe).*

A clearer version of the model

System	Oestradiol	Cortisol	Result
Dopamine	↓	—	Reduced executive function, tasks feel harder, thinking feels slower
Stress reactivity	—	↑	Emotional volatility, small triggers feel large
Cognitive resilience	↓	↑	Decreased tolerance for complexity, overwhelmed more easily
Working memory	↓	—	Fragmentation, forgetfulness, difficulty holding thoughts steady
Motivation	↓	—	Difficulty initiating tasks, starting feels heavier than usual
Anxiety	—	↑	Heightened threat sensitivity, worries feel more compelling

None of these outcomes are behavioural in origin. They are biochemical.

A woman is not "becoming more emotional," "less capable," or "less rational."

She is operating with:

- a reduced neurotransmitter stabiliser, and
- an overactive stress-signalling system

Both of which are responding to internal physiology, not personal character.

The lived experience of the double hit

A real-world example makes the mechanism clearer:

A woman wakes after a poor night's sleep. Her cortisol is already elevated.
She sits down to begin work, but dopamine, already diminished by a low-oestradiol day, does not provide its usual clarity.

- She opens her laptop.
- The inbox feels overwhelming.
- She stares at a task but cannot initiate it.
- A small interruption derails her.
- She becomes frustrated, which raises cortisol further.
- Her thinking tightens.
- Her emotions sharpen.

- Her confidence dips.

By mid-morning she may interpret this as “I’m failing,” when what is actually happening is:

Her brain is attempting to do high-complexity work with fewer cognitive resources and a more sensitive stress system.

Why this understanding matters

When women (and the people who work / live with them) do not understand the mechanism, they often attribute these changes to:

- personality
- mood
- motivation
- attitude
- capability

Yet none of these domains are the root cause. The cause is **a neurochemical shift**, entirely expected, entirely human, and entirely understandable once explained.

Understanding these mechanisms helps remove:

- shame
- self-blame
- misinterpretation from partners
- misunderstanding from colleagues
- unfair assumptions from leaders

And most importantly, it gives women a new language for what is happening inside them.

Modifiers: Why Some Days Feel Impossible

By now, we can see how falling oestradiol destabilises dopamine, and how rising cortisol amplifies stress sensitivity. But most women notice that perimenopause symptoms do not appear in a straight line. Some days feel manageable; others feel like the bottom has fallen out.

That variability is not random.
It reflects the influence of three powerful *modifiers* that interact with the underlying hormonal shift:

1. **Sleep**
2. **Nutrition**
3. **Coping behaviours**

These are not "lifestyle choices" in the superficial sense. They are physiological forces that either relieve pressure from an already-strained system or add weight to it.

Let's break them down ….

Sleep: The Brain's Nightly Repair Schedule

If the waking brain is a high-performance machine, sleep is its **maintenance window**. It is during sleep that the brain:

- consolidates memories
- resets emotional circuits
- clears metabolic by-products
- restores neurotransmitter balance
- calibrates the stress system for the coming day

Think of sleep as the overnight "reset" button that prepares the brain to function.

Perimenopause disrupts sleep in multiple ways

Oestradiol influences:

- body temperature regulation
- serotonin pathways
- REM sleep quality
- circadian rhythm stability

When it falls, the night becomes fragmented.

Women describe:

- waking at 3–4am with a racing mind
- night sweats breaking sleep cycles
- difficulty falling asleep
- shallow, non-restorative sleep
- vivid or disturbing dreams

Why this matters so much

Sleep loss impairs the prefrontal cortex even in young, healthy adults with stable oestradiol and normal cortisol.

In perimenopause, where dopamine is already compromised and cortisol is already elevated, sleep deprivation multiplies the load.

The result is:

- lower stress tolerance
- increased emotional reactivity
- memory glitches
- slowed processing
- reduced resilience

This is why a woman can feel "normal" on Tuesday and completely overwhelmed on Wednesday, *simply because she slept badly*.

The system is already on a tightrope; sleep determines whether she stays balanced or wobbles.

Nutrition: Fuel for a System Under Pressure

Nutrition is often framed as a moral choice in society; scientifically, it is a biochemical one. The brain is an energy-intensive organ, consuming around **20% of the body's total energy**, despite being only 2% of its weight.

It relies on key nutritional precursors to manufacture neurotransmitters.

Two examples illustrate this clearly:

Tryptophan → Serotonin

Serotonin influences:

- mood
- patience
- sleep regulation
- emotional balance

Tryptophan (its precursor) comes from diet.

5 top sources:

- **Turkey & Chicken:** Classic sources, especially dark meat, are packed with tryptophan for serotonin and melatonin.
- **Eggs:** A complete protein, eggs (especially yolks) significantly boost plasma tryptophan levels.
- **Fish (Salmon, Tuna):** Oily fish like salmon and canned light tuna are excellent sources, providing significant tryptophan.
- **Dairy (Cheese, Milk):** Cheeses (like cheddar) and milk offer good amounts, making dairy a strong choice.
- **Nuts & Seeds (Pumpkin, Sesame):** These are rich in tryptophan, plus minerals, making them great for snacks or toppings.

When tryptophan levels fall, serotonin availability drops.

Studies show that even short-term tryptophan depletion can cause:

- irritability
- low mood
- increased anxiety
- difficulty coping with stress

Reference:
https://www.ncbi.nlm.nih.gov/pubmed/18978636

Perimenopause already destabilises serotonin indirectly through oestradiol loss.
Poor nutrition compounds the effect.

Choline → Acetylcholine

Acetylcholine is essential for:

- attention
- memory encoding
- learning
- neuroplasticity

Choline (the precursor) is found in foods such as eggs, salmon, broccoli, and nuts. Low intake impairs memory and cognitive performance, as documented in multiple studies.

Reference: Link

When oestradiol drops, reducing acetylcholine receptor sensitivity, insufficient choline exacerbates issues with:

- recalling information
- processing new details
- staying mentally organised

Why nutrition matters more in perimenopause

Oestradiol normally enhances the efficiency of many neurotransmitter systems.
When oestradiol drops, those systems run less efficiently.

This means the brain's **nutrient requirement does not change,**
but reliance on those nutrients increases.

The system has less margin for error. Small deficits have larger consequences.

A skipped meal, low protein intake, or poor hydration can tip the cognitive balance on a day when hormones are already shifting.

Coping Behaviours: The Brain's Attempt to Self-Regulate

When women feel overwhelmed, foggy, unmotivated or emotionally raw, they naturally reach for coping behaviours, not as weaknesses, but as **solutions**.

The brain is always trying to regulate itself.

But without understanding the underlying biology, women often adopt coping mechanisms that unintentionally worsen the internal state.

Let's explore a few:

1. Caffeine as a substitute for dopamine

Caffeine increases alertness by blocking adenosine, but it does not fix dopamine deficits. In fact, caffeine can:

- elevate cortisol
- destabilise sleep
- increase anxiety

On a stable neurological baseline, this is manageable. In perimenopause, it often backfires.

2. Sugar as a substitute for energy and emotional relief

Sugar produces a brief glucose spike, which the brain interprets as relief or reward.

But the crash that follows:

- reduces energy
- worsens mood
- increases irritability
- amplifies cravings

This creates a cycle many women misinterpret as "lack of discipline," when it is actually **neurochemical turbulence**.

3. Overworking to feel in control

Many high-performing women default to productivity when they feel their internal world slipping.

But:

- longer hours
- increased pressure
- reduced recovery
- greater cognitive load

… all raise cortisol further.

This leads to burnout cycles that feel personal but are driven by physiology.

4. Avoidance behaviours

Avoidance is a stress-regulation strategy. It provides short-term relief, but:

- increases long-term stress
- raises cortisol
- worsens task backlog
- deepens feelings of inadequacy

Avoidance is not laziness, it is the brain trying to protect itself from a task that feels too heavy for the available dopamine. *(Many people with a low self-concept feel similarly, because the 'lack of confidence' e.g. established neurological wiring patterns, have a negative effect on the homeostatic chemical state of the brain).*

Why modifiers matter in the wider story

Modifiers explain why:

- symptoms fluctuate day to day
- stress tolerance feels inconsistent
- cognitive ability rises and falls without warning
- people underestimate how difficult perimenopause can be

Because in reality:

Hormones set the stage.
Modifiers determine whether the performance succeeds or collapses.

A bad night's sleep, a poor breakfast, or an emotionally demanding day at work is not "just life" during perimenopause, it is a physiological amplifier.

These factors make the ***system*** fragile. **Not the woman**.

The Lived Experience: A Human Story

By the time women reach their forties and fifties, most have spent decades building a sense of themselves, their competence, their emotional strengths, their intellectual identity, their work habits, their relationships, and their ways of coping with stress. Perimenopause threatens none of this intentionally, yet it can make all of it *feel* unstable.

This is because the biological systems that help maintain "self-consistency", the predictable patterns of thinking, feeling, and behaving, begin to shift beneath the surface.

To understand what this feels like in real life, imagine a woman who, for decades, has been known for her clarity, resilience and reliability. She wakes one morning having slept poorly, her brain still carrying the high night-time cortisol peak that perimenopause often produces. At the same time, her oestradiol levels are low, and with them, the dopamine support she normally relies on.

- She opens her laptop.
- Her inbox looks larger than usual.
- Her brain hesitates.

The **prefrontal cortex**, which handles attention and planning, is running at reduced efficiency because dopamine is low. The **amygdala**, which scans for emotional significance or threat, is more reactive because cortisol is elevated. The **hippocampus**, which helps place events into context, is struggling because cortisol has impaired its ability to integrate new information smoothly.

To her, this does not feel like biology. It feels like *overwhelm*.

- She tries to begin a task.
- Her working memory flickers.
- She forgets what she meant to do next.

This is not a cognitive failure. It is the predictable result of weakened dopaminergic signalling in the PFC, which depends on oestradiol for stability.

- She sighs, frustrated.
- Her frustration increases amygdala activation.
- Which increases cortisol.
- Which reduces PFC activation further.

A self-reinforcing loop emerges, not because she is failing, but because the **feedback systems of the limbic and prefrontal regions are misaligned**.

Later, a colleague's comment lands harsher than intended. Her emotional buffer is thinner today.

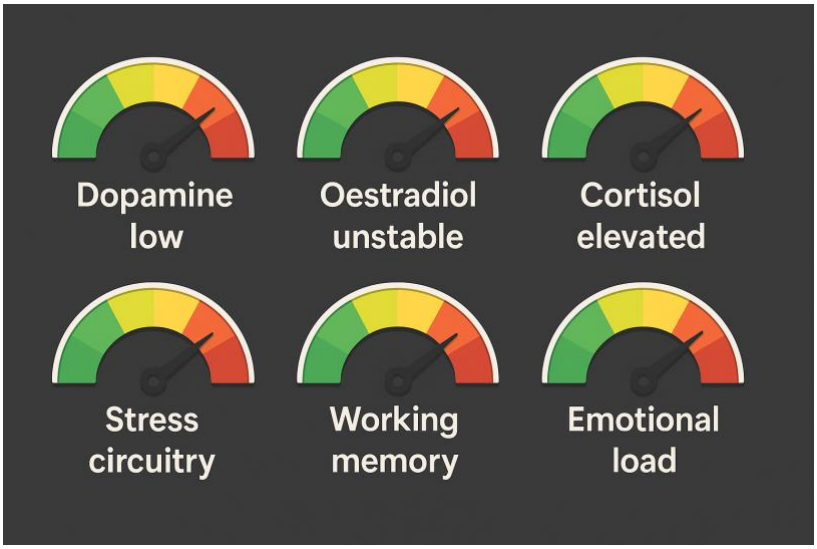
This is because Oestradiol, which normally strengthens **serotonergic modulation of emotional circuits**, is low, leaving the limbic system more exposed.

- She feels the heat of tears behind her eyes.
- Then shame.
- Then confusion. “Why am I like this?”

The truth is:
She is **biologically consistent**, not inconsistent. Her reactions match her internal state with perfect accuracy.

If her brain had a dashboard, the lights would read:

- **Dopamine: low**
- **Oestradiol: unstable**
- **Cortisol: elevated**
- **Stress circuitry: sensitised**
- **Working memory: taxed**
- **Emotional load: high**



But because society does not equip women with this dashboard, she attributes the effect to character, competence, or emotional weakness.

And this is where the psychological injury occurs, not from biology, but from misinterpretation.

What she experiences inside her head is not disorder. It is **homeostasis attempting to re-establish itself under changing conditions**.

Perimenopause is the moment the brain renegotiates its internal chemistry. The self is not disappearing, it is passing through a state change.

BTFA Framing: Biology First, Behaviour Second

The BTFA™ framework (**Beliefs, Thoughts, Feelings, Actions)** is built on a simple but profound scientific truth:

The brain does not produce behaviour in a vacuum.
It produces behaviour in accordance with its current biological state.

Perimenopause alters that biological state across multiple axes simultaneously:

Beliefs

Oestradiol influences **prefrontal cortical integration**, which helps create coherent self-narratives, i.e. the stories we tell ourselves about who we are.

When dopamine is low and cortisol is high, the brain becomes more sensitive to negative self-assessment. This is because:

- the **PFC** (which generates perspective and reasoning) is weakened
- the **amygdala** (which generates emotional salience) is strengthened

This combination tilts beliefs and the inner voice that goes with them, toward:

- “I’m not coping”
- “I’m losing my abilities”
- “I can’t trust myself”

These are not cognitive distortions in the psychological sense. They are **state-dependent interpretations** shaped by a temporarily altered neurochemical landscape.

Thoughts

Thoughts arise from dynamic interactions between:

- dopamine (sustains attention and working memory)
- acetylcholine (supports focus and encoding)
- serotonin (shapes emotional tone and patience)
- cortisol (biases cognition toward threat detection)

During perimenopause:

- reduced dopamine → scattered thinking, difficulty sequencing
- reduced oestradiol → weaker cortical coherence
- elevated cortisol → faster threat detection, less nuance
- disrupted sleep → lower PFC efficiency

The result is not “irrationality,”
but **logical processing under impaired conditions**.

The brain is still doing its job; the environment inside it has changed.

Feelings

Feelings emerge from the interaction between the limbic system and the frontal lobes.

Oestradiol normally:

- increases serotonin receptor sensitivity
- dampens amygdala reactivity
- enhances communication between limbic areas and the PFC

When oestradiol falls:

- emotions rise faster
- feelings linger longer
- conflicts feel more intense
- uncertainty feels more threatening

Elevated cortisol further heightens the emotional load by increasing **amygdala connectivity and reactivity**, making emotional states more sticky.

This is why women say things like:

- “Everything hits me harder.”
- “I can’t bounce back the way I used to.”
- “Small things feel enormous.”

It is not emotional instability, it is **reduced top-down modulation of limbic circuits**.

Actions

Actions are the final expression of the internal cascade.

When dopamine is low:

- initiation falters
- tasks feel heavy
- avoidance increases
- consistency decreases

When cortisol is high:

- urgency increases
- overworking becomes a temporary coping strategy
- emotional reactions become quicker
- withdrawal becomes protective

When sleep is disrupted:

- the brain cannot reset its neurotransmitter ratios
- motivation collapses

None of these behaviours originate from personal failure.
They originate from **temporarily altered neurochemical constraints**.

Although this paper focuses on the experience of women in midlife, it is essential to recognise that **these mechanisms are not exclusive to perimenopause**. They are variations on a theme that applies to *everyone*. Every human being, regardless of age or sex, performs according to the same underlying biomechanics: neurotransmitter availability, prefrontal cortex function, limbic system activity, sleep quality, stress exposure and the brain's ongoing attempt to maintain internal balance.

Perimenopause simply makes the mechanisms more visible because the changes are sharper, faster and harder to ignore. But the principle is universal. The same neural laws govern every meeting, every conflict, every decision, every act of leadership, every moment of motivation or disengagement.

Every behaviour in an organisation, every micro-expression, every silence, every burst of innovation or lapse in judgement, is the end result of brain function.
And the extent to which leaders understand this determines whether they cultivate high performance, average performance, or chronic dysfunction.

Perimenopause is not an exception to the rule. It is a clear window into the rule itself.

BTFA's value in this context

BTFA shows women, and the organisations they work in, that:

- Behaviour is not the starting point
- Behaviour is the *output* of evolving internal conditions
- Self-compassion overlaps with scientific reality
- Leaders must understand biology to interpret behaviour fairly
- Organisations must recognise cognitive transitions as real, not optional

Most importantly, BTFA reframes the entire experience:

There is nothing wrong with you.
Your brain is adjusting to a new regulatory environment.
Your behaviour makes sense once you understand your biology.

This recognition is not only comforting, it is clinically accurate, neurologically grounded, and psychologically protective.

Conclusion: The Chemistry Is Human, and So Are You

Perimenopause is not a personal failing, a psychological weakness, or a sign that a woman is "losing herself." It is the direct consequence of a brain recalibrating its internal chemistry in response to profound hormonal shifts, shifts that influence dopamine, cortisol, serotonin, acetylcholine, limbic regulation, and the prefrontal circuitry that supports memory, focus and emotional steadiness.

This transition does not diminish a woman's intelligence, capability, or worth.
It simply changes the **conditions under which her brilliance is expressed**.

Understanding this is not merely comforting, it is essential. It allows women to interpret their experience through biology, not self-blame. It allows leaders and organisations to interpret behaviour with compassion rather than judgement. And it allows society to move beyond outdated narratives that frame cognitive or emotional changes as character flaws rather than physiological events.

Because once we understand the internal mechanics, the experience becomes not a mystery but a map.

A map that explains:

- why motivation wavers
- why emotions intensify

- why memory becomes slippery
- why stress responses heighten
- why confidence fluctuates
- why days feel inconsistent

A map that reveals, with surprising clarity, that what feels like fragmentation is in fact **reorganisation**. The brain is not breaking; it is adapting.

And in this transition, something profoundly human emerges:

We see, perhaps more clearly than at any other stage of life, that our behaviour is not simply who we are, it is the outcome of the systems that sustain us.

Perimenopause shines a bright light on this truth, but it is not the only context in which it applies. Every person in every workplace, every household, every team, every leadership role is governed by the same principles of neurobiology. We are all, every one of us, navigating the delicate balance of neurotransmitters, hormones, stress signals, and adaptive circuits that shape how we think, feel and act.

This understanding changes how we view people.
It changes how we view performance.
It changes how we view ourselves.

Because when we fully grasp that our behaviour is the final expression of our biology, modulated by context, stress, sleep, nutrition and environment, we stop interpreting human difficulty as personal weakness. We start seeing it as an invitation: to redesign work, to support each other more intelligently, and to meet ourselves with far greater compassion.

Perimenopause is not the end of capability; it is the beginning of **awareness**.
Awareness of how deeply human we are.
Awareness of how our brains shape our lives.
Awareness of how much more empathetic and effective our workplaces could be if we aligned leadership with neuroscience.

Because the chemistry is human. And so are you.