

THE BEHAVIOUR INSTITUTE

Diploma in Trauma-Informed Psychotherapy

UNIT 2 • CORE READING 2 OF 6

02

The HPA Axis

The biological machinery underneath every threat response

What This Document Covers

The previous document introduced the four trauma responses. This document goes one layer deeper, into the specific biological system that produces them: the hypothalamic-pituitary-adrenal axis, generally shortened to the HPA axis, alongside the brain structure most closely associated with detecting threat in the first place, the amygdala.

Detecting Threat: The Amygdala

The amygdala is a small, almond-shaped structure, present on both sides of the brain, that plays a central role in detecting potential threat and initiating a response to it. It receives information rapidly from the senses — sound, sight, touch — and compares that information, essentially instantaneously, against stored patterns of what has previously signalled danger.

Critically, the amygdala operates faster than the parts of the brain responsible for conscious, deliberate thought. This is not a design flaw — it is precisely what allows a person to snatch their hand away from a hot surface before consciously registering pain, or to flinch at a sudden loud noise before consciously identifying what made it. The cost of this speed is that the amygdala can, and often does, respond to something that resembles a past danger, even when the present situation is genuinely safe.

The HPA Axis: From Detection to Response

Once the amygdala flags something as a potential threat, a cascade begins that involves three connected structures, giving the HPA axis its name.

Hypothalamus

A small region deep in the brain that, once alerted to threat, begins the hormonal cascade by releasing a chemical signal toward the pituitary gland.

Pituitary Gland

Sitting just below the hypothalamus, the pituitary gland responds to that signal by releasing its own hormone into the bloodstream, which travels onward to the adrenal glands.

Adrenal Glands

Located above the kidneys, the adrenal glands respond by releasing the hormones most associated with the stress response: adrenaline (also called epinephrine), and cortisol. Adrenaline acts quickly, producing the immediate, familiar sensations of a racing heart, rapid breathing, and a surge of physical energy. Cortisol acts more slowly, but its effects last considerably longer — which matters a great deal for understanding chronic and prolonged trauma responses, covered further in Document 3.

Pause and Consider

Think of a moment when you experienced a sudden fright — even something ordinary, like a near-miss while driving, or an unexpected loud noise. How long did the physical sensations — racing heart, alertness, shakiness — last after the actual moment of danger had passed? What does that gap tell you about how quickly the body actually recovers from activation?

Why This Matters Clinically

Understanding the HPA axis in even this much detail changes how a number of common trauma-related presentations can be understood. It explains why physical symptoms — a racing heart, nausea, muscle tension — are not simply “in someone's head,” but a direct, physiological consequence of a real hormonal cascade. It explains why the physical effects of a triggering event can linger considerably longer than the event itself, since cortisol clears from the system more slowly than adrenaline. And it explains why purely verbal reassurance — simply telling someone they are safe — often has limited effect in the moment: the amygdala and HPA axis are not persuaded by logical argument in the way the prefrontal cortex is.

This last point deserves particular emphasis, since it is easy to underestimate in practice. A client who intellectually knows they are safe, and says so, can still be in a state of significant physiological activation — elevated heart rate, cortisol still circulating, a nervous system still primed for threat. Effective trauma-informed work needs to address the physiological state directly, not only the thoughts and beliefs sitting on top of it.

Chronic Activation: When the System Doesn't Reset

Under normal circumstances, once a threat passes, the HPA axis winds down, and the body returns to baseline. Under conditions of chronic or repeated trauma — particularly trauma occurring in childhood, during a period when the nervous system is still actively developing — this system can remain activated far more of the time than it should, or become sensitised to respond intensely to relatively minor triggers.

This is closely connected to the ACE research covered in Unit 1: one plausible biological pathway between high ACE scores and the elevated rates of physical illness the study documented is precisely this — a chronically activated HPA axis, and the sustained, elevated cortisol levels that come with it, placing genuine, cumulative wear on the body over years and decades.

What's Next

With the underlying biology established, the next document turns to a related question this one has only touched on: why some experiences leave a lasting mark on this system, while other, sometimes objectively more severe, experiences do not.

A Few Things to Take With You

- The amygdala detects potential threat rapidly, faster than conscious thought, by matching sensory input against stored patterns of past danger
- The HPA axis — hypothalamus, pituitary, adrenal glands — translates a detected threat into a hormonal cascade involving adrenaline and cortisol
- Adrenaline acts quickly and clears relatively fast; cortisol acts more slowly but lingers considerably longer
- Purely verbal reassurance often has limited effect on a physiologically activated nervous system, since the amygdala does not respond to logical argument

- Chronic or repeated trauma, especially in childhood, can leave the HPA axis activated more often, or more sensitive to minor triggers, than it should be

Before You Move On

- Why do you think purely verbal reassurance so often falls short when someone is in a state of high physiological activation?
- How does understanding the HPA axis change how you might respond, in the moment, to someone who is visibly activated but insists they are fine?
- What connection do you see between this document and the ACE research covered in Unit 1?