GROWTH MINDSET SERIES • PART 2 OF 5 • MIND-BODY CARE

Mistakes Are How the Brain Learns

What neuroscience tells us about errors, and why shame interrupts the very process they begin

> *When you make a mistake, your brain produces a measurable electrical signal within a tenth of a second — long before you have consciously processed what happened. That signal is not failure. It is the brain marking a moment of exceptional learning potential. What you do next decides whether that potential is used or lost.*

What Happens in the Brain When You Err

In the early 1990s, researchers identified a brainwave called the error-related negativity (ERN) — a sharp electrical signal generated by the anterior cingulate cortex within 50 to 100 milliseconds of a mistake. A second signal, the error positivity (Pe), follows around 200 to 500 milliseconds later and reflects conscious awareness of having erred.

Together, these signals do something remarkable: they alert the brain that a prediction was wrong, recruit attention, and open a brief window of heightened plasticity — the brain's capacity to rewire itself. Caltech researchers (Fu et al., 2018) later identified individual "error neurons" in the medial frontal cortex whose firing predicted the size of the ERN. The brain has dedicated machinery for noticing mistakes, because mistakes are unusually informative.

The growth-mindset link: research by Jason Moser and colleagues (2011) found that people with a growth mindset showed larger Pe signals after mistakes — meaning they paid more conscious attention to their errors and were more likely to correct them on subsequent trials. The mindset literally changes how the brain processes mistakes.

> *An error is not a verdict on your ability. It is a moment when the brain has more to learn than usual — and is briefly more capable of learning it.*

Why Shame Hijacks the Learning Window

When the response to a mistake is shame, self-attack, or avoidance, the body shifts into a stress state. Cortisol rises, the prefrontal cortex narrows its focus, and the very neural conditions that support learning — open attention, reflection, integration — become unavailable. The brain is now defending, not learning.

This is why "I am so stupid" after an error is not just unkind; it is functionally counterproductive. The phrase signals threat to the nervous system, which then closes the learning window the mistake just opened. People with chronic high self-criticism show altered ERN/Pe patterns and learn less from their errors over time (Aarts & Pourtois, 2010).

What Helps the Learning Window Stay Open

→ **Curiosity over verdict** — "What happened?" rather than "What is wrong with me?" — the first question keeps the prefrontal cortex online.

→ **Self-compassion** — Kristin Neff's research shows self-compassion lowers cortisol and supports — not undermines — accountability.

→ **Specific naming** — "I missed step three" is more useful than "I failed." The brain can fix specifics; it cannot fix global judgments.

→ **Slowed-down review** — A few minutes of deliberate reflection consolidates learning. Speeding past mistakes leaves the data on the floor.

→ **Repair where needed** — If others were affected, repair restores connection and frees attention for learning rather than rumination.

The brain that made the mistake is the same brain that just got smarter from it.