

# Integrating the Three Areas of the Brain

*Notes from a presentation by Pam Nicholls, based on the work of Daniel Siegel, MD*

Touch your forehead on and above your eyebrows. Beneath your hand, on the other side of your skull, is your prefrontal cortex. When you are *aware that you are aware*, your prefrontal cortex is activated. This is a very good thing. The prefrontal cortex's activation and involvement in brain function are necessary for well-being.

When the brain is observed on brain scans during mindfulness practice, the prefrontal cortex's activation is observable. It is "lit up." It is this process of activation that leads to an integrated and regulated state in the practitioner. Through this activation, mindfulness cultivates the essential qualities of well-being. Here's an introduction to how it happens.

We can think of the brain as including three main sections.

## 1. Brain stem:

- known as the ancient "reptilian brain"
- coordinates basic bodily functions: heartbeat, swallowing, breathing
- regulates states of wakefulness and sleep, alertness and arousal
- mediates fight, flight, freeze
- takes in data from the outside world – external data from the perceptual system, except smell
- takes in data from the inside world, information from the body

(The reticular formation, located in the brain stem, filters this external and internal data, choosing what gets through and what doesn't, allowing us to focus on "what's important.")

## 2. Limbic area, located in both the left and the right hemispheres:

- mediates emotion
- generates motivational states
- specializes in detecting and analyzing the internal states (emotions) and motives of other mammals -- and of ourselves
- coordinates our internal states with the environment, especially our social environment
- enables us to create balance in the body, adapt to environmental demands, and create meaningful connections with others

Two of the important regions of the limbic system:

• Amygdala: Generates our fear, and perceives others' fear. Mediates a range of other emotions too (anger, sadness, joy). Creates our facial expressions, and interprets others'. Involved with implicit memory, which is not conscious. Bypasses conscious awareness to bring immediate attention to any threat. Signals the release of adrenaline.

(One way to remember "amygdala" – "Oh no, it's *Amy* – I'm afraid of her . . .").

• Hippocampus: mediates explicit and autobiographical memory. Note that stress blocks the functioning of the hippocampus, which is what makes it hard or even impossible to learn under duress. In fact, long-term stress actually shrinks the size of the hippocampus. (How to remember "hippocampus" – "You must remember when the *hippo* was on *campus*!")

3. Neocortex, also known as cerebrum or cerebral cortex, with a left and right hemisphere:

- processes sensory information and motor response
- acts as center of higher thought processes, such as reasoning and abstract thinking
- enables flexible thinking
- uses words to communicate

### The Goal: Integrating these three areas

Each of these areas of the brain makes an essential contribution. For our well-being, it is necessary to integrate their functions. "Integrated" means "brought together into a functioning whole." Another key word is "regulated," meaning "controlled and brought to the desired level." Integration of the three areas of the brain produces the best-regulated levels of physical, cognitive, and emotional activation.

### The prefrontal area of the neocortex is key to brain integration.

The prefrontal cortex area of the neocortex is:

- the feeling part of the thinking brain, closely connected to the limbic system
- activated during mindfulness practice, and actually thickens as brain cells (neurons) develop as a result of practice
- the link and coordinator among the three parts of the brain, that together address cognitive, emotional and somatic (body) processes, and our functioning in the social world
- the provider of a fundamental regulatory role, which is a component of "executive function." The involvement of the prefrontal cortex makes it possible to bring physical, cognitive and emotional activation to a desired level. When you hear that someone "can't self-regulate," that's a reference to the person's difficulty keeping their behavior, their cognition/thinking, and/or their emotions, at a level appropriate to the demands of the setting. Lack of appropriate self-regulation arises from being in a non-integrated state.

Integration occurs when neurons from the prefrontal cortex connect with neurons in the limbic system and brainstem. The linking of the areas, through the firing of neurons, creates neural pathways. Repeated return to the state of integration causes those neural pathways to strengthen and become permanent. "What fires together gets hard-wired."

- *integrated* can be thought of as being on the "high road," in which functions are connected and we can self-regulate, choosing flexible responses to life events
- when we're in an integrated state, we are far more likely to be able to regulate our own behavior, thinking, and emotions, so that we can remain stable, operating on the flexible "high road"
- *nonintegrated* can be thought of as being on the "low road," in which brain functions are cut off from each other, leaving us caught in a cycle of habit, without the freedom to regulate our responses
- stress and fear cause the limbic system to trigger the release of hormones (including adrenaline and cortisol) that actually sever the connection between the prefrontal cortex and the rest of the brain, causing a state of nonintegration – the disconnect among the sections of the brain.

Activating the prefrontal cortex makes possible an integrated state.

Over time, with repeated activation, that integrated state becomes a trait –

an enduring personal characteristic. This is a potential outcome of mindfulness practice.