The Neuroanatomy of an Emotion

Emotion regulation

Metaphor

20 min.

Client

No

Human beings are wired to experience events and situations emotionally before experiencing those same events and situations rationally. This is to help us survive (Simonov, 2013). Consider what happens when you encounter something dangerous, such as a snake on your walking path. Your eye sees the snake and a message is sent to the emotional centres of your brain circuitry, triggering an adrenalin reaction that leads your heart to beat faster, your breathing to quicken, your palms to become sweaty, and your muscles to tense up, as you get prepared to "fight or flee".

The area of the brain responsible for this response is the amygdala. The amygdala interprets images and sounds as "danger" and sends a distress signal to the hypothalamus. The hypothalamus then activates the sympathetic nervous system by sending signals through the autonomic nerves to the adrenal glands, giving rise to the above-described adrenalin reaction. The sympathetic nervous system can be likened to the accelerator pedal in a car. It triggers the fight-or-flight response in the face of perceived danger, providing the body with a burst of energy so that it can respond appropriately. The parasympathetic nervous system, by comparison, acts as the car's brake. It promotes the "rest and digest" response that calms the body down after the danger has passed.

Researcher Dan Siegel developed The Hand Model of the Brain (Siegel, 1999), which is a way to describe the above-mentioned functions of the brain. He makes the distinction between three main brain areas involved in an emotional reaction: the brainstem, which is the oldest and most primitive part of the brain, responsible for regulating automatic body functions like breathing lungs and beating heart and the fight or flight response; the limbic region, which is responsible for creating emotions, memories, and interpersonal connections; and, the cortex, which is the most newly developed part of the brain, and is responsible for thinking and consciousness, allowing us to imagine, to interpret facts and experiences, to create, and to think about thinking (Siegel, 1999). When we become distressed, the limbic region tends to override the cortex brain, resulting in the experience of "flipping one's lid". In this state, one's world becomes chaotic and rigid (Siegel, 2017).

Although human beings are the most intelligent and sophisticated species on the planet, there is still a part of us that is primal and causes us to react without thinking. And this kind of reacting can interfere with valued living and goal attainment. Emotional intelligence reflects the appropriate

Author

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Goal

This tool is designed to teach clients the neuroanatomy of emotions to (1) help them understand what is occurring during emotional distress and (2) learn how to effectively reduce this stress based on these insights.

Advice

- A common problem for clients is that they often *know* that there is no need to feel certain emotions, like fear or insecurity, but still *feel* that way. In these cases, challenging their thoughts about their emotions is unlikely to be effective in reducing the emotional experience. This tool can help clients to understand why their emotions (their emotional brain) sometimes "hijack" their thinking (their thinking brain) and that the solution is often to calm the emotional brain first, before trying to rationalize the emotional state.
- Advise clients that one effective way to calm their emotional brain during stressful moments is to engage in deep breathing. The 5-count breathing technique is easy to do and remember: instruct them to bring their attention to their breath and then inhale slowly to the count of 5, and then exhale slowly to the count of 5, and do this five times.
- This exercise can also be useful for increasing the self-compassion of clients who tend to be ashamed of their emotional reactions. Some clients feel that their (strong) emotions tell them that there is something wrong with them. This exercise can show these clients that much of what goes on in their minds is not of "their design" and not their fault.
- The various parts of the brain are described differently in the literature, and so while this tool uses the terms *primal brain*, *emotional brain* and *thinking brain* to differentiate between the brain functions of an emotion, other resources may use the following terms, respectively: *reptilian brain*, *mammalian brain*, and *human brain*; *automatic*, *emotional*, and *reactive*; other. Check in with the client to make sure that the terms *primal*, *emotional* and *thinking* resonate with him because these can easily be adapted/changed to the client's preference.
- You can clarify to clients that while the thumb in the hand model represents the limbic region, it would be more technically correct to have two thumbs to represent the opposing structures within this area of the brain.
- The practical nature of this exercise offers clients additional value, particularly for those clients with a tactile learning style.

Suggested Readings

Siegel, D. J. (2010). *Mindsight: The new science of personal transformation*. Bantam.

Siegel, D. J. [Dr. Dan. Siegel]. (2017, Aug 9): Dr. Dan Siegel's Hand Model of the Brain [Video file]. Retrieved from https://www.youtube.com/watch?v=f-m2YcdMdFw

Siegel, D. J. (1999). *The developing mind* (Vol. 296). New York: Guilford Press.

Simonov, P. V. (2013). *The emotional brain: Physiology, neuroanatomy, psychology, and emotion*. Springer Science & Business Media.

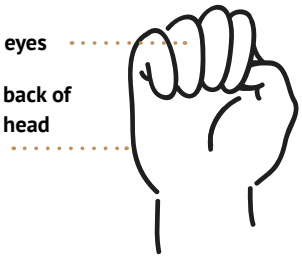
Tool Description

Instructions

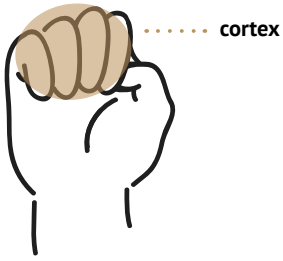
Step 1: Demonstrate the hand model of the brain

The practitioner demonstrates the hand model of the brain to the client by using his own hand and the following script:

If you put your thumb in the middle of your palm and then fold your fingers over the top, you'll have a model of your brain.



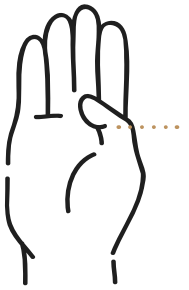
Your eyes are in front of the knuckles, the back of your head toward the back of the hand.



The top of the brain is called the cortex. This is represented by your four fingers.

The brain is connected to the rest of the body through the spinal cord, represented by your wrist.

If you lift up the cortex [straighten your four fingers], you'll see the brainstem, which is represented by your palm. The palm/brainstem is known as the **primal brain**. This is the oldest and most primitive part of the brain, approximately 300 million years old. The brainstem sends and receives messages from the brain to the body. It takes in information from the body and it helps you regulate things like how you breathe and how you digest food and how your heart functions. The brainstem also has a very important set of regions that create the fight or flight response that we experience when we feel threatened.



By straightening your four fingers, you can also see the limbic region, represented by your thumb. As you can see, this limbic region is connected upwards to the cortex, and downwards to the brainstem, which is represented by your palm.

The thumb/limbic region is known as the **emotional brain** and is approximately 200 million years old. This area of the brain works closely with the brainstem (the primal brain) and the body to promote not only our basic drives but also our emotions. The limbic region is concerned with the question "Is this good or is this bad?" and motivates us to move toward the good and away from the bad. The amygdala within the limbic region is responsible for carrying out the fight or flight response. The limbic region also helps us create memories and connect to others.

The fingers/cortex is known as the **thinking brain**, and this is the newest part of the brain. It is responsible for thinking and consciousness. It allows us to imagine, to interpret facts and experiences, to create, and to think about thinking. The burden of the rational brain is that it can work too well so that we end up thinking too much (i.e., dwelling) about situations.

Within the thinking brain is the prefrontal cortex (PFC), represented by the area between the fingers' second knuckles and the tips of the fingers. The PFC is responsible for keeping the cortex, limbic area, brainstem, body, and the social world connected and harmonious.

When we become distressed, our emotional brain can override our thinking brain, and we can "flip our lid". This is represented by the fingers/cortex lifting and disconnecting from the limbic region, brainstem, body and social world. When we are emotionally overridden, our world becomes chaotic and rigid.

Step 2: Client's example of being emotional overridden

Ask the client to think of a real-life example of where his emotions took control of his behaviors and caused him to do something that he later regretted (i.e., where he "flipped his lid"). E.g., getting cut off by another driver and cursing out loudly in front of one's children. Write down the example in the space below.

Step 3: Client applies personal example to hand model

Given what the client now knows about his brain, invite him to describe the emotional process using his own hand model of the brain. E.g., While driving along initially, my thinking brain was intact and keeping my emotional brain in check, as represented by my fingers folded snugly over my thumb. When the driver cut me off, my thinking brain went offline, as represented by my fingers unfolding from my thumb and springing backward. In this way, my thinking brain was unable to comfort my emotional brain and help it stay calm, which hindered my ability to think clearly and do the right thing, which would have been to remain calm, and not curse out loud in front of my children.

Step 4: Learning to calm the emotional brain

When we are in an emotional state, the rational thinking brain can become "hijacked" by the irrational emotional brain. Take for example a person who is afraid of snakes; if this person comes across a snake in a cage, he may *feel* intense fear and anxiety despite *knowing* that the snake is caged and cannot harm him. A solution to this emotional hijacking is to calm the emotional brain first, before trying to rationalize (i.e., think our way out of) the emotional state.

Invite the client to think of ways to calm the emotional brain. One effective calming strategy is deep breathing: the 5-count breathing technique is easy to do and remember: instruct them to bring their attention to their breath and then inhale slowly to the count of 5, and then exhale slowly to the count of 5, and do this five times.