Our Brain: Complex structure with simple goal

While the brain is our most complex organ, its main objective is simple: to keep us alive and achieve our goals. It does this by helping us breathe, eat, walk and talk—the basic essentials to our survival. It is geared to search for any dangers in our environment and primes us to respond quickly. What's more, our brain gives us the ability to plan ahead, solve problems, experience emotions, store memories, and communicate with others...all the things that make us human.

Our brain is the control center of our entire body, driving our every thought, feeling and action. Just how do our brains do this? There are three main regions within the brain that each serve a specific function as we interact with our environment.

At the base of our brain is the **primitive** region, in the middle is the feeling region, and at the front and top of our brain is the thinking region. While these three regions have their own special function, they operate as one connected network to keep us alive and reach our goals.

The primitive or survival region of our brain looks after those basic life functions that happen automatically, like our breathing and heartbeat. It also helps coordinate our basic physical movements such as our balance and posture. And it plays a key role in scanning our environment to search for those things that may threaten our chances of survival. This helps the instinctual part of our brain kick into action automatically.

The **middle**, feeling region of our brain plays a significant part in our emotional and social experiences through life. This is the part of our brain where emotions and impulses such as anger, fear, and pleasure come from. It is activated when our primitive region detects a threat in the environment and triggers our fight, flight or freeze response. This region drives many of our behaviors and habits and helps us form memories and attach feelings to them, particularly when we experience strong feelings such as fear or happiness.

Lastly, the **thinking** region is the largest, and most highly developed part of the human brain. It stores our memories, allows us to plan, enables us to imagine or analyze a situation, find a solution, and communicate with others. It is the part of the brain where we can take control of decision making and emotion and override our automatic responses from our primitive and feeling regions. Our thinking region holds our likes, dislikes, hopes and ambitions, those things that make us uniquely human and different from all other animals on this planet. These three regions of the brain work together to coordinate our every thought, feeling, and action.

The Three-part Model of the Brain

One helpful model for understanding how the brain and nervous system work is to divide them into three interconnected regions or layers. These are the neocortex, the limbic area, and the survival brain. While the brain is highly complex and interconnected, this simple three-fold division can provide an easy starting point for understanding the structure and function of the brain and nervous system.

The top layer is the neocortex. The neocortex is the outer surface of the brain, and is responsible for thought, speech, reflection, and decision-making. The neocortex is the most recently evolved part of the brain and is most developed in humans and non-human primates.

The second layer is the limbic system. The limbic system is highly involved in the processing of emotions. It sits in a middle region under the neocortex but above the survival brain. The limbic system is common to humans and non-human mammals.

The third layer is the primitive or survival brain. This refers to a set of structures that lie deeper down, under the limbic system, and that control the automatic functions of our body. This includes breathing, heart rate, body temperature, digestion, blood pressure, and the functioning of the organs of the body. This ancient part of the brain is common to humans, non-human mammals and reptiles.

Metaphorically, we can say that these three brain layers speak different "languages." The neocortex speaks the language of thought. The limbic system speaks the language of emotion. The survival brain speaks the language of sensations. Since they do not literally speak different languages, why use such a model? One reason is because it shows us that it is hard for the upper layers to override what's happening in the lower layers. If a person feels a sensation of pain and this is registered by the survival brain, it is not easy for that person to simply "think away" the sensation of pain. That sensation of pain could grow more intense and could trigger an emotion, such as fear, in the limbic system. That emotion, if it is strong, can sway the person's thinking. Even if the person wishes to be calm and generates the thought or decision, "I will be calm," this may not work, because the other two layers of the brain are not responding to the language of thought. However, the person could engage in other activities that do help regulate the body and lead to calmness by bringing about pleasant sensations or more neutral emotions, such as doing something that relieves the pain, or if that is not possible, going for a walk, listening to music, or engaging in some other activity that helps the body relax. If the person does this, their stress level can go down. If they don't, their stress might continue to elevate.

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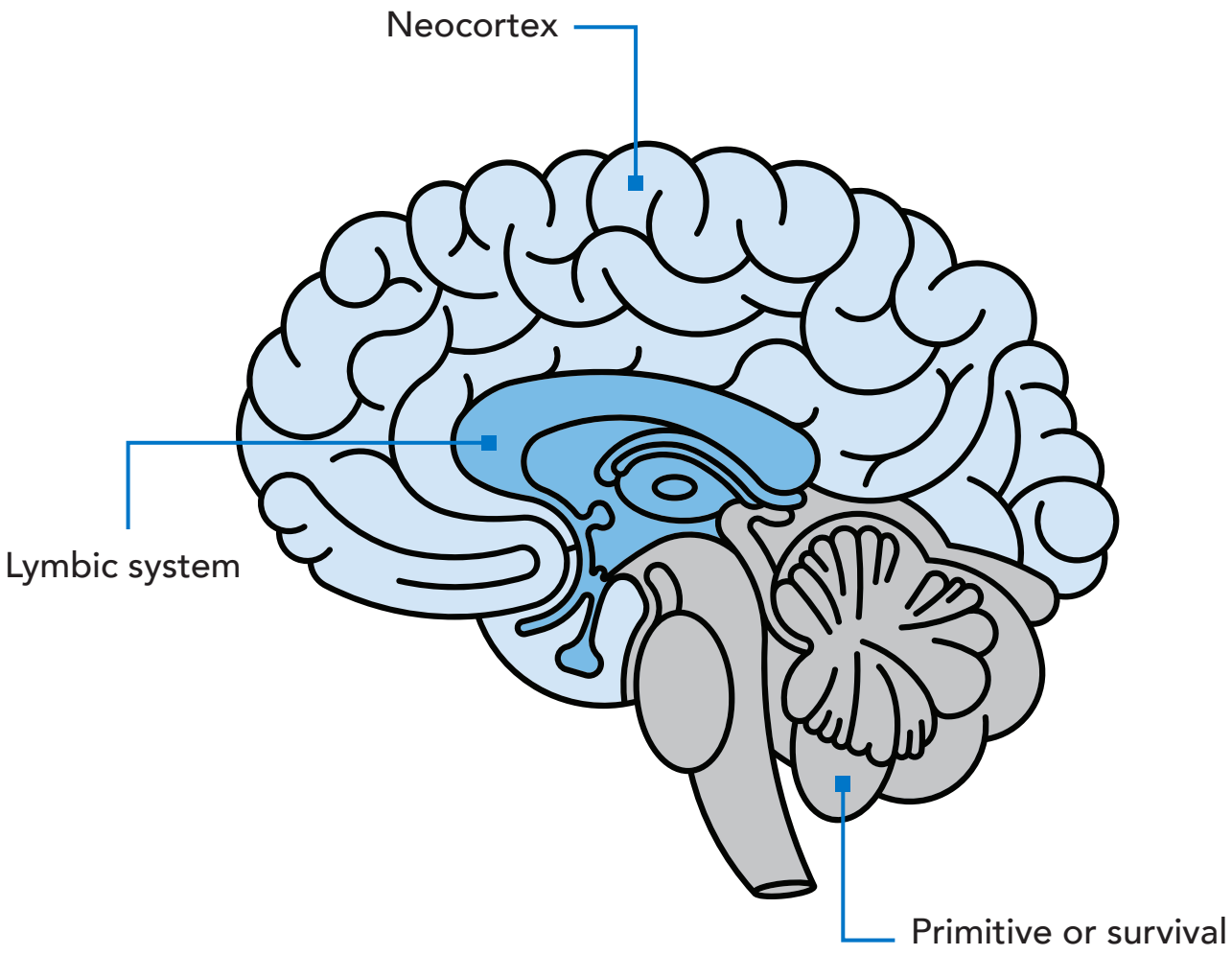

Learning to Direct Attention

By learning skills such as how to direct one's attention, a person can play an active role in the body and brain's emotional state, and help themselves deal with stress more constructively and healthfully. The body processes information constantly from within itself and from outside, including thoughts, memories, external sensory information, and internal sensations. Our 'attention' selects which sensations to prioritize or emphasize. The limbic system then assesses those sensations and messages the situation as dangerous or safe. This generates an emotional response and also changes in the autonomic nervous system that can be felt throughout the body. By learning to control and direct our attention, we can participate in this process consciously, rather than just reactively, and make choices that help to quiet our nervous system and shift our emotional state.

This is because the limbic system interprets painful sensations as signs of danger, but interprets neutral and pleasant sensations as signs of safety. If a painful sensation is signaling danger, the limbic system may start to focus on it, amplifying that signal. This can lead to an emotional response like fear. The emotion then triggers further activation of the survival brain (called sympathetic activation or the "fight and flight" response) to get ready for danger, resulting in changes to heart rate, breathing, muscle tension, digestion, and so on. It also releases chemicals in the body that are designed to fight disease and tissue damage, but that can harm the body if they are present for a long time. Without effective attention, chronic stress slowly harms the body and disturbs the person's peace of mind.

When attention is redirected to pleasant or neutral sensations, a sense of safety and well-being results. The body responds in the opposite way, with parasympathetic activation, also called the "relaxation response" or the "rest and digest" response. Muscles relax, breathing and heart rate slow, and the body's digestive system restarts.

We are fortunate that our neocortex allows us great flexibility in directing our attention. Even if we are experiencing something unpleasant, we can choose whether it might be useful to direct our attention to something that could lead to neutral or pleasant sensations. If we then focus on those sensations, we can generate the relaxation response throughout our body, helping us to better manage the stress.

Imagine if we do not eat for a long time. Our body recognizes that there is not enough food and we may experience an unpleasant sensation, such as a sensation of pain or hunger in our stomach.

Our body can experience many sensations simultaneously. But if this unpleasant sensation from our stomach is prolonged or intense, it could overpower other sensations and lead the limbic system to generate an emotional response of fear or anxiety. Unlike a sensation, an emotion is a whole-body response to a situation. This emotion will in turn affect our thinking, processed in the neocortex. We might think, "I'm feeling so anxious or unhappy. Why is that? Perhaps it's because I'm hungry."

If we do not pay attention to our sensations, we might not understand why we are feeling a certain emotion or why our thoughts are turning to a particular direction. By learning to control and direct our attention, we can participate in this process consciously, rather than just reactively. We can recognize when emotions are heightened and our bodies are feeling in distress.

Our brain responds to practice and learning. When we practice something — like paying attention consciously to sensations — the neurons (brain cells) that make up our brain develop stronger connections between them. These stronger connections lead to faster processing. A phrase used in neuroscience to describe this is "Neurons that fire together wire together." So, although it may be challenging in the beginning to direct our attention consciously to sensations in the body, we can develop "body literacy" over time through practice. Gradually, like learning to ride a bicycle or catch a ball, learning to notice sensations and direct our attention will become second nature to us. Those neurons begin to 'fire together' more readily and become more automatic more quickly. This helps us regulate emotions and our stress, and enhance our resilience.

References

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