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Description

For years researchers have struggled to understand how emotions are formed and processed by the brain. Neuroscientist Kevin LaBar and his team at Duke University are using a virtual reality room to study how the brain reacts to both negative and positive emotions. "Mysteries of the Brain" is produced by NBC Learn in partnership with the National Science Foundation.

Keywords


Citation

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Mysteries of the Brain - Emotional Brain

TOM COSTELLO, reporting:
This rabbit is running for its life. It's a response to one of the most common emotions in the animal kingdom: fear.

KEVIN LABAR (Duke University): Emotions are really important in order to guide behavior.

COSTELLO: For years researchers have struggled to understand how emotions are formed and processed by the brain. Kevin LaBar is a neuroscientist at Duke University and is funded by the National Science Foundation.

LABAR: In the brain, what you're doing in an emotional situation is you're taking the input from the environment and then it transforms that input to a body response.

COSTELLO: For the rabbit, fear begins when sensory information, like the scent of a predator, is transported through the central nervous system to the brain by a network of cells called neurons. The signals are integrated in a part of the brain called the limbic system, which is present in most animals, even humans. It's a complex system of nerves and networks in the brain that, among other tasks, controls instincts, emotions and drives.

LABAR: It has a way of shuttling the information from the environment and triggering a change in the body.

COSTELLO: In the limbic system, the signals are communicated to an area called the amygdala, which helps store memories, make decisions and controls many emotional reactions. It is here that the signals are analyzed and, in this case, are interpreted to mean that there is something to be feared. Signals quickly activate the hypothalamus which is the brain's link to what's called the autonomic nervous system, or ANS. The ANS regulates unconscious physical functions like breathing and heartbeat.

LABAR: The autonomic nervous system will redirect the blood flow to places that it needs. It will change heart rate and respiration levels in order to be able to confront the threat.

COSTELLO: In the rabbit, the increased heartbeat and breathing give it the ability to run faster and make
quicker decisions, increasing its chances of survival. Although fear is experienced by most animals in the world, humans possess emotions that can be far more complex.

LABAR: In humans, we can have emotions to very abstract things like music and art. And that's likely through the evolution of these connections to these higher order regions in the brain that allow us to then link those associations with emotional responses.

COSTELLO: Emotional responses can also be triggered by memories that are stored in another part of the limbic system called the hippocampus. Our brain's ability to store and trigger memories could be the reason humans are susceptible to prolonged issues like post-traumatic stress disorder.

LABAR: What's important about this is to then help identify brain regions that are dysfunctional in patients that suffer from emotional memories.

COSTELLO: To study human response to emotion, LaBar and his team use a high-tech virtual reality room and basic video and images to study how the brain and body respond to various situations. By monitoring physical changes in heart rate, respiration, sweat gland activity and muscle tension, they have been able to decode the body's responses to emotional triggers then identify patterns that indicate whether the subject has experienced emotions like fear, happiness or sadness. Surprisingly, the brain reacts to both negative and positive emotions, like fear and love, using the same set of brain systems, something scientists are still trying to understand.

LABAR: Emotions are notoriously hard to define. It takes a lot of expertise for us as human beings to even intuit what emotions we are having at times.

COSTELLO: Whether it's a rabbit on the run, or a human in love, the ability to study subjects in unique scenarios allows LaBar and his team to learn more about how each region of the brain controls emotions, leading to an even greater understanding of the brain.