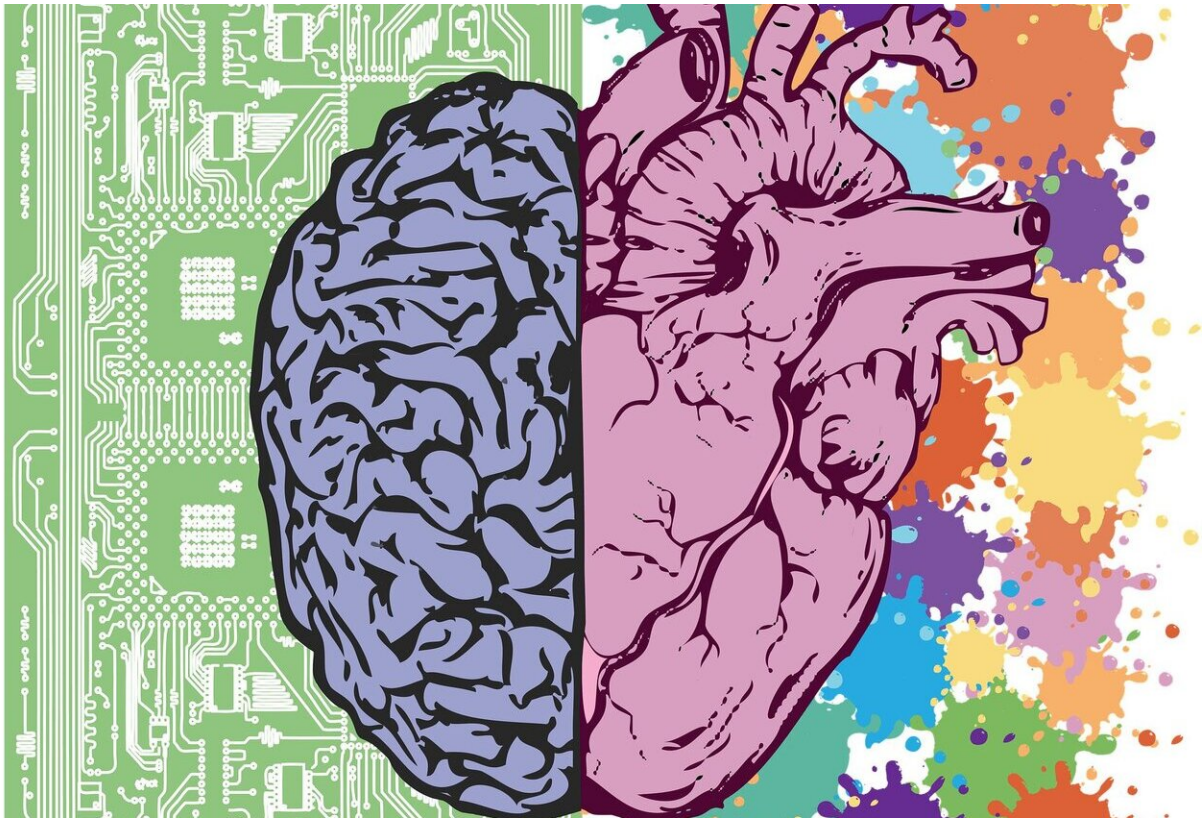


# The brain builds emotions regardless of the senses, neuroscientists find

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How much do our emotions depend on our senses? Does our brain and body react in the same way when we hear a fearful scream, see an eerie shadow, or smell a sinister odor? And does hearing upbeat music or

seeing a colorful landscape bring the same joy?

In an innovative study [published](#) in *Science Advances*, researchers have unveiled new insights into the intricate relationship between emotion and perception.

Led by a team of Italian neuroscientists from the IMT School for Advanced Studies Lucca, and conducted in collaboration with the University of Turin, the research project investigates whether the brain employs sensory-specific or abstract codes to construct [emotional experiences](#).

"Emotion and perception are deeply intertwined, yet the exact mechanisms by which the brain represents emotional instances have remained elusive," says Giada Lettieri, researcher in psychology at the IMT School, and lead author of the study.

"Our research addresses this fundamental question, providing critical insights into how the brain organizes and represents emotional information across different sensory modalities and as a result of past sensory experience."

To conduct the study, the researchers showed the movie "101 Dalmatians" to a group of 50 volunteers, and tracked with [functional magnetic resonance](#) imaging the [brain activity](#) associated with the unfolding of the movie plot.

The viewers of the movie in the scanner were both individuals with typical development and congenitally blind and congenitally deaf volunteers, who were presented with the audio play and the silent version of the movie, respectively.

The researchers also asked a group of 124 independent participants to

express and rate their emotions while watching the same movie outside the scanner, trying to predict the brain response of people with and without [sensory deprivation](#) during the experience of amusement, fear, and sadness, among other emotions.

"Including in the experiment individuals with congenital sensory deprivation—blind and [deaf people](#)—is a way to dissect and decipher the contribution of sensory experience to neural mechanisms underlying emotions," explains Luca Cecchetti, researcher at the IMT School, and senior author and supervisor of the study.

"Our results show that emotions categories are represented in the brain regardless of sensory experience and modalities. In particular, there is a distributed network encompassing sensory, prefrontal, and temporal areas of the brain, which collectively encode emotional instances. Of note, the [ventromedial prefrontal cortex](#) emerged as a key locus for storing an abstract representation of emotions, which does not depend on prior sensory experience or modality."

The existence of an abstract coding of emotions in the brain signifies that even though we are tempted to believe that our emotions directly depend on what happens in the surrounding world, it is our brain that is wired to generate emotional meaning regardless of whether we are able to see or hear.

"In a world where sensory-deprived individuals are frequently overlooked, it is essential to understand how mental faculties and their corresponding neural representations can evolve and refine without [sensory input](#), so to further advance the understanding of the emotion and the human brain," says Lettieri.

**More information:** Giada Lettieri et al, Dissecting abstract, modality-specific and experience-dependent coding of affect in the human brain,

*Science Advances* (2024). [DOI: 10.1126/sciadv.adk6840](https://doi.org/10.1126/sciadv.adk6840).  
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Provided by IMT School for Advanced Studies Lucca

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