



## YOUR SMILE CAUGHT MY EYE: WHY DO EMOTIONAL THINGS CATCH AND HOLD OUR ATTENTION?

Andras N. Zsidó<sup>1\*</sup> and Michael C. Hout<sup>2,3</sup>

<sup>1</sup>Institute of Psychology, University of Pécs, Pécs, Hungary

<sup>2</sup>Department of Psychology, New Mexico State University, Las Cruces, NM, United States

<sup>3</sup>National Science Foundation, Alexandria, VA, United States

### YOUNG REVIEWERS:



HELENA

AGE: 14



LI JIA

AGE: 15

You know how you can feel how hot or cold a room is when you enter it? Well, most people can just as easily judge the “emotional temperature” of a room, too. You probably do that in many situations, like with a single glance at a movie on TV. Things that evoke either positive or negative feelings tend to catch our attention, like a spider on the wall that you automatically look at. In fact, it is easier to spot a spider than a fly because it is scarier (to most people)! This happens because evolution sharpened our senses to quickly detect how pleasant (or unpleasant) and intense (or dull) a situation is. Our brains are tuned to pick out emotionally important information in the environment and process it quickly. Understanding this process may help you to understand your emotions and “gut feelings” and maybe even to overcome your fears!

While watching your favorite TV shows, have you ever found that the emotional scenes grab your attention more than the neutral ones? It

may feel like those scenes entirely absorb you, and just will not let you turn your attention elsewhere. Both negative and positive emotional scenes—like frightening scenes, or scenes in which something really wonderful happens—tend to attract our attention. We can describe the characteristics of these experiences with two separate components. The first component involves initially capturing your attention. This can happen when you are just passing by the TV and an emotional scene catches your eye much more quickly than a boring one does. Interestingly, this can happen when you look directly at the TV or even if you just catch a limited view out of the corner of your eye. The second component of emotional scenes involves finding it hard to tear yourself away from them, even if you have more important things to do. These two characteristics work together to catch and hold your attention strongly.

## I HAVE GOT A FEELING

When most people enter a room, they can usually quickly get a feeling for whether the people in that room are sad, happy, or have been fighting about something. It is almost as if we can “feel” the emotions being experienced by the people in the room. This feeling is called the **emotional gist** of the scene. Most of us are good at feeling the emotional gist of various scenes—sometimes people are even good enough that they can determine the emotional gist from a single glance [1]! Think of this like an inner emotional-temperature camera that quickly identifies negative and positive emotional “hotspots” in your surroundings. Similar to a camera that tracks heat, your inner emotional-temperature camera gives you a general idea of how the people around you might be feeling.

Of course, a real heat camera will show you a range of temperatures from hot to cold, but precisely describing the emotional gist of a scene actually requires two separate measurements, because scenes are complicated. The first judgment is whether you find the scene *pleasant or unpleasant*—this is the **valence** of the emotion. The second judgment is *how intense* the emotion is—this is the **arousal level** of the emotion. These scales are independent from one another, so it is as if you need a pair of heat cameras instead of one. To understand this better, take a look at Figure 1, in which you can see several pictures arranged along the two measurements of emotion.

## I CANNOT TAKE MY EYES OFF OF IT

You have probably noticed that certain objects—just like emotional scenes—also tend to catch your eye. Sometimes these are pleasant things, like your best furry friend, and sometimes they are unpleasant things, like a big hairy spider you just spotted in your room... or it might be the other way around, if you are afraid of dogs but adore big

### EMOTIONAL GIST

Getting the idea of the emotional valence and arousal level of an object or picture within a single glance (in one to two tenths of a second!).

### VALENCE

Refers to the attractiveness or aversiveness of an event, object, or picture. Describes the pleasantness of an emotion from very negative or unpleasant to very positive or pleasant.

### AROUSAL LEVEL

Describes the intensity of an emotion elicited by viewing a picture or seeing a scene.

### Figure 1

Emotion has two dimensions: valence (unpleasant to pleasant) and arousal (dull to intense). Valence and arousal are independent of each other, so it is possible that when you look at something unpleasant (like a worm), the feeling may be only moderately intense. Other things, like a handsome, happy dog, might have a very positive valence and cause very intense arousal.

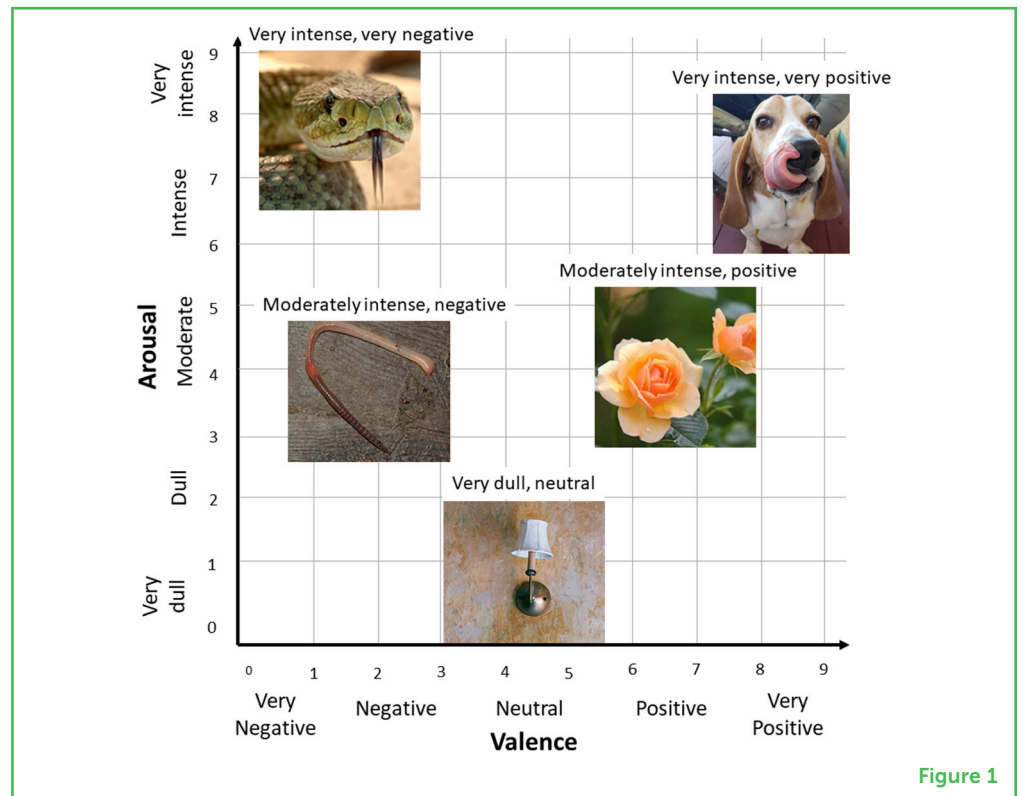


Figure 1

hairy spiders! Either way, these objects tend to be difficult to turn your attention away from. In fact, your brain captures the emotions from these objects even when these things blend into their surroundings, like when your dog sits on a blanket that has a similar color to her fur. Although the emotionality effect and the valence and arousal scales were originally developed to describe whole scenes, the same principles apply to smaller parts of the scene, like objects or animals. Emotional objects draw and hold your attention, just like magnets attract nails. No matter how messy your room is and how many random objects are scattered around, if there is an object that is emotionally important to you, chances are you will spot it right away. Previous studies have shown that you can spot emotionally important objects just as fast (or even faster) than you can spot a bright-colored object, like a neon sock.

For instance, in one study [2], researchers gathered a bunch of negative, positive, and neutral images of objects that were visually or emotionally **salient**, which means they stood out from the surrounding objects. The participants in the study had a simple task: they had to look at the images while their eye movements were recorded by an eye-tracker [3]. The researchers found that people looked more often at emotionally salient objects (like an adorable, sleepy dog) compared to things that just stand out from the background because they do not “blend in.” This suggests that emotionally charged objects (like the dog) can pop out at us even more than bright objects (like neon socks) (Figure 2)!

### SALIENT

The way an object stands out from the background or surrounding objects. The more an object stands out, the more salient it is.

## Figure 2

Three versions of the same scene. (A) The original image. (B) What your “emotional heat camera” picks up from the image. (C) The things that do not blend into the background. People tend to look more often at emotionally salient objects (like the cute dog or the fearsome spider) compared to things that stand out from the background visually (like the bright socks).

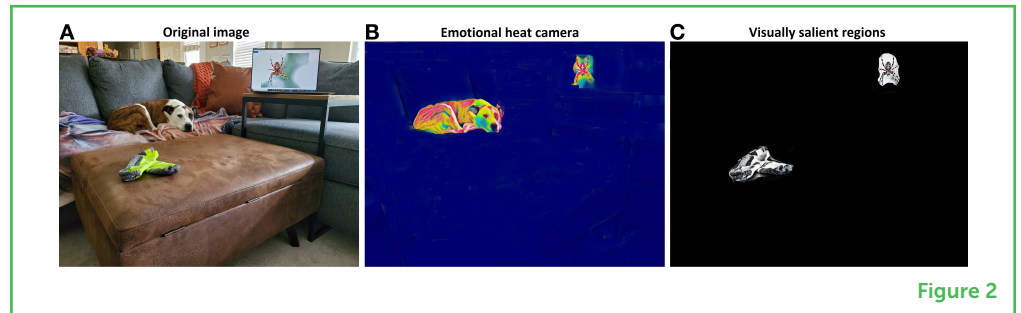


Figure 2

The ability to quickly determine the emotional gist of a scene, or to quickly spot emotionally charged objects in the environment are **evolutionarily adaptive processes** because they helped our ancestors survive in the past—and they might be good for you, too! Being able to quickly understand how people around you feel, or being able to spot pleasant and unpleasant things in your surroundings is good, because it can help you decide whether to approach or avoid those things. Evolutionarily adaptive processes are important for all living beings (including humans), because these processes increase our “fitness” as we compete with our peers. In the evolutionary sense, “fitness” means living long enough to give birth to and raise children, so that we can pass on our genes. The way our brains work and our patterns of behavior were shaped over 10,000–15,000 years of evolution, and this evolutionary process impacts how we behave to this day!

## EVOLUTIONARILY ADAPTIVE PROCESS

A process that helps the survival of an organism in its environment. The ability to quickly detect harmful things is an adaptive process because it helps you avoid injuries.

## BRAINSTEM

The part of the brain that connects the spinal cord with the cerebrum. It is responsible for maintaining vital functions like breathing and regulating our sleep cycle.

## CORTEX

The outer layer of the brain. It plays a key role in various cognitive processes such as attention, memory, and language.

## YOUR BUILT-IN ALARM SYSTEM

So, what is going on in your brain that enables you to process emotional information so much faster than other things? This emotional processing often happens so fast that you are not even consciously aware of what your brain is doing. How is that possible? One of the results of evolutionarily adaptive processes is that we have a set of nerve pathways that go from our senses (in this case, our eyes) to our brains, and these pathways allow us to process information quickly, so that we can act reflexively, which means without even thinking! Think about the last time you accidentally stepped on a sharp object, like a small toy or a Lego brick. When this happens, you instantly pull your foot away without even thinking about it, and your brain only registers the pain *after* you pull your foot away, causing you to look around to see what you stepped on.

Similarly, there is a kind of “alarm system” in your brain that connects the superior colliculus of the **brainstem**, which is responsible for producing combined head and eye movements and directing behavior toward objects, to the prefrontal **cortex**, which is involved in “higher” functions, like thinking and conscious, purposeful actions (Figure 3). This is a much faster route than the “traditional” one (used for processing ordinary objects) that also includes the occipital

## AMYGDALA

An almond-shaped deep-brain structure (or nucleus). It has a crucial role in the processing of emotional objects and in initiating emotional responses.

### Figure 3

The nerve pathway (in red) responsible for quick detection of emotional information. The incoming information from the eyes (in green) travels through the superior colliculus of the brainstem, then splits into two “streams.” One goes to the visual processing region of the brain (occipital cortex), and the second goes to the amygdala, where the brain checks to see if the information has emotional importance. If it does, the amygdala quickly notifies the prefrontal cortex so you become aware of the potential threat. We have to wait for the slower stream to “catch up” and tell us what we are looking at.

cortex, which is responsible for the neural representation of visual information. A brain region called the **amygdala** is believed to be the main area where the emotional value of information from the senses is initially monitored (“is this scary?”). When the amygdala detects something that is emotionally important (a loud noise, like a dog barking), it can quickly initiate reflex-like actions, such as guiding your eyes to gaze more directly at the object to learn more about it. The amygdala does this so quickly that you often donot even realize it has happened! However, the amygdala also “notifies” the brainstem and the prefrontal cortex. Have you ever noticed that when something emotional happens—like seeing your crush in school!—it feels like your heart “skips a beat”? Well, this is your amygdala sending signals to your brainstem, which coordinates with the nervous system and triggers bodily responses, like changes in heart rate or breathing. Once you acquire enough information about the emotional object, the cortex takes over and decides whether or not it is important (“it is an angry dog without a leash!” vs. “no, it is just an excited dog behind a fence”) and what to do next (“get away from it!” vs. “it is no big deal, just ignore it”).

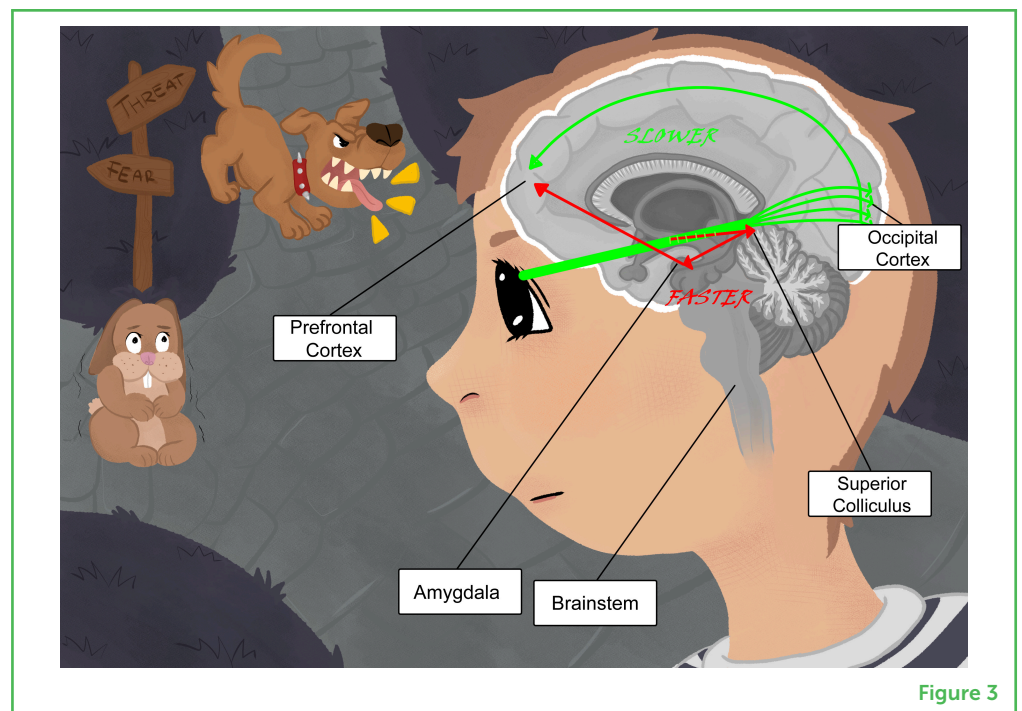


Figure 3

## CONCLUSION

Things that are very emotionally charged can quickly grab your attention, even when there is a lot going on around you. The body reacts to these things quickly because our bodies and behavioral responses have adapted, over the course of evolution, to help our ancestors (and now us!) survive. Throughout the course of evolution, our brains evolved specific nerve pathways that serve as

alarm systems. Nowadays, of course, we rarely have to worry about the kinds of threats that our ancestors did. When is the last time you saw a saber-toothed tiger, for instance? But remember, these behaviors are still useful for keeping us safe and alerting us as to important things around us—we use these ancient pathways to assess modern threats, too. Scientists are still studying the way that our life experiences form these pathways to be more responsive to the current threats of our environment so they can better understand how fears are learned and unlearned. This has important implications not just for understanding how our brains work, but for mental health concerns, like when a patient with a specific phobia wants to unlearn their fear.

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## YOUNG REVIEWERS



### HELENA, AGE: 14

My name is Helena and I am 14 years old. I spent 2 years in the US when I was younger where I discovered my passion for the English language. I love writing and listening to poems. I am also incredibly fascinated by all sorts of sciences but particularly genetics, microbiology, neuroscience, and psychology.



### LI JIA, AGE: 15

I am a year 10 student who is interested in science and maths. I enjoy reading, video games and crocheting in my free time.

## AUTHORS



### ANDRAS N. ZSIDÓ

Andras N. Zsidó is an assistant professor in the Psychology Institute at University of Pécs (Hungary) and the director of the Visual Cognition and Emotion Lab. He studies specific fears and phobias and how emotions affect visual attention and memory-related processes. He is the recipient of numerous scholarships and research grants. He spends his spare time with his kids and wife, playing and hiking. He also loves to read various kinds of novels and listen to (mostly) rock music. \*zsido.andras@pte.hu



### MICHAEL C. HOUT

Michael C. Hout is an associate professor in the Department of Psychology at New Mexico State University, and a program director at the National Science Foundation. His research focuses primarily on visual cognition (including search, attention, eye movements, and memory) and the development of methods of collecting similarity data for use in multi-dimensional scaling. He has won several awards for research and teaching, including the Rising Star award from the Association for Psychological Science. In his limited free time, he enjoys walking his dog, running, hiking, and playing hockey.