Your brain suppresses perception of heartbeat, for your own good

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EPFL researchers have discovered that the human brain suppresses the sensory effects of the heartbeat. They believe that this mechanism prevents internal sensations from interfering with the brain's perception

of the external world. This mechanism could also have something to do with anxiety disorders.

Our heart is constantly beating yet we normally do not feel it. It turns out that our brain is capable of filtering out the cardiac sensation so that it doesn't interfere with the brain's ability to perceive external sensations. For the first time, researchers from the Center for Neuroprosthetics at EPFL have identified this mechanism. They discovered that a certain region in the brain determines where internal and external sensations interact. Their work appears in the *Journal of Neuroscience*.

EPFL's neuroscientists noted that the brain perceives visual stimuli less effectively if they occur in time with the heartbeat. It seems as if the brain wants to avoid processing information that is synchronized with the body's heartbeat.

"We don't see the same way as a video camera does"

"We are not objective, and we don't see everything that hits our retina like a video camera does," said Roy Salomon from the Laboratory of Cognitive Neuroscience, one of the study's co-authors. "The brain itself decides which information to bring to awareness. But what's surprising is that our heart also affects what we see!"

The researchers carried out an initial series of experiments with more than 150 volunteers. The volunteers were subjected to a visual stimulus—an octagonal shape flashing on a screen. When this geometric shape flashed in sync with the subject's heartbeat, the subject had more difficulties perceiving it.

What's happening in the brain—a first insight

The researchers just needed to figure out what was happening in the brain. They were able to show that a specific region, the insular cortex, acts as a filter and intercepts the sensations coming from the body's beating heart.

They did this by running the experiment again in an MRI scanner. When the visual stimuli were not in sync with the subject's heartbeat, the insular cortex functioned normally and the subject perceived the flashing octagon easily. But when the stimuli occurred in time with the heart rate, the level of activity in the insular cortex dropped noticeably: the subject was less aware—or totally unaware—of the flashing shape being shown.

It did not take long for Roy to get over his initial surprise at his discovery. "You don't want your internal sensations to interfere with your external ones. It's in your interest to be aware of what's outside you. Since our heart was already beating while our brain was still forming, we've been exposed to it since the very start of our existence. So it's not surprising that the brain acts to suppress it and make it less apparent."

Is feeling one's heartbeat related to anxiety?

Awareness of one's heartbeat is known to be correlated with a number of psychological problems, including anxiety disorders. Patients typically perceive their heart rate more clearly than most people. "But someone who does not suffer from this type of disorder can also be aware of their heartbeat," said Roy. "This can happen at times of intense excitement or fear, for example."

Could anxiety disorders be, at least in part, the cause or effect of someone's inability to silence their heartbeat? "We don't know that yet. What we do know now is that, under most conditions, we are not aware of our own heartbeat and that there is a specific region of the brain whose task is to suppress it."

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