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A Botox gap in understanding emotion

The inability to show those subtle messages about our feelings – that smile or that frown – could hamper social awareness.

By Siri Carpenter, Special to the Los Angeles Times

May 31, 2010

Botox may be famous for erasing frown lines, but it also may disrupt an important chain of **communication between the face and the brain.**

Not only do **our facial expressions reflect our emotional ups and downs, they appear to send crucial feedback to our brain,** suggests a growing body of research. **Without that full feedback loop, our ability to understand — and be understood — might be constrained.**

In a recent study of women undergoing cosmetic treatment with Botox, researchers found that the treatment, which **blocks facial nerve impulses, seemed to slow the ability to comprehend emotional language.**


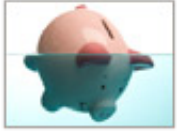

"We know that **language moves us emotionally,**" said the lead author, David Havas, a psychology graduate student at the University of Wisconsin-Madison. "What this study shows is that that's **partly because it moves us physically.**"

Those findings, which will be published in the journal *Psychological Science*, complement earlier research showing that **mimicking emotional expression triggers a matching emotional response,** says Fritz Strack, a psychologist who was not involved in the research and who studies emotion and cognition at the University of Würzburg in Germany.

He cited, as an example, the response elicited by holding a pen in one's teeth, activating the muscles used in smiling. In studies using this **pen-in-mouth procedure,** which Strack and his colleagues pioneered, people actually **feel happier and respond more positively to stimuli** such as cartoons when they hold a pen between their teeth than when they hold it between their lips, which forces a frown.

In a study published in 2007, Havas and colleagues built upon those findings. They found that participants holding a pen in the "smile" position read happy sentences — such as "Finally, you reach the summit of the tall mountain" — more quickly than they did while holding the pen in the "frown" position. In contrast, participants read sad sentences — such as "You hold back your tears as you enter the funeral home" — more quickly when holding a pen in the "frown" position.

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Similarly, research using electromyography, or EMG, to measure fine muscle activity indicates that **written materials' emotional meaning triggers activity in specific facial muscles**. For example, reading words such as "murder" or "fight" activates the corrugator supercillii, a muscle anchored above the nose that spreads outward across the brow. This muscle is responsible for the parallel, vertical furrows produced when a person frowns.

Frown line links

Such findings have raised the question of whether **emotional expression is itself necessary for fluid processing of emotional language**, Havas says.

In the new study, he and colleagues investigated whether temporarily paralyzing the corrugator muscle blocked people's ability to process negative emotional language.

The researchers asked 40 women waiting to receive first-time Botox injections to read a series of 60 sentences on a computer, pressing a key when they understood each sentence. To make sure participants were actually reading the sentences, the researchers periodically checked their reading comprehension. Participants repeated the test, using a fresh set of questions, two weeks later when the Botox treatment's paralyzing effect was at its height.

After treatment, participants were **slower to understand sentences conveying sadness or anger than they had been before treatment**. There was no such change for happy sentences. Mood analyses ruled out the possibility that the women were simply happier after receiving Botox, making them quicker to comprehend happier material.

The results indicate that **our own facial expressions help the brain make sense of the social world**, Havas says.

"Our facial expressions reveal social context by mirroring expressions of those around us, giving us insight into their emotions, states of mind, and future actions," he says. The Botox study, he says, suggests that **our facial expressions also guide how we interpret language**.

When the face's ability to provide feedback is disabled, as in Botox treatment, our understanding is hindered.

The new findings fit with the increasingly accepted theory that **aspects of higher thought**, such as language, judgment, and memory, **are shaped by our bodily sensations and movements**, says Paula Niedenthal, a psychologist at Blaise Pascal University in Clermont-Ferrand, France, and a leading scholar on the role of the body in emotion. According to this "embodied" view of cognition, which has gained popularity over the last decade or so, the brain makes sense of the world at least partly by simulating action.

In keeping with this view, some researchers suspect emotional language triggers the same neural systems used in real emotional experiences — including those brain signals produced by our own facial expressions.

This idea finds support in neuroscience. Last year, scientists in Germany used neuroimaging to study people's brain activity while they were imitating emotional facial expressions such as anger. They found that Botox treatment of frown muscles blunted neural activity in brain areas that are involved in emotional responding.

Useful muscles

It might be tempting to conclude, from such results, that getting Botox could help blot out unhappiness. But Niedenthal cautions that the opposite is true. "There are about 20 muscles of the face that produce the major expressions of emotion," she says. "We are supposed to use them in order to understand and communicate subtle meaning in social life."

In the new study, Botox-induced paralysis only slowed down participants' response to angry and sad sentences by about a tenth of a second, on average. But such effects can snowball when communicating with others. "Language is highly interactive, and we're very, very sensitive to all kinds of cues that happen on the order of milliseconds," says Arizona State University psychologist Arthur Glenberg, one of the study's authors.

Timing is crucial, for example, in the ritual of taking turns during conversation. Let's say that, in a marital disagreement, your spouse is repeatedly just a tenth of a second too slow in responding, leaving the mounting impression of disinterest or failure to comprehend. If such delays were chronic, Glenberg says, "That's enough time for a person to get really pissed off."

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