

# Can Blocking a Frown Keep Bad Feelings at Bay?

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Your facial expression may tell the world what you are thinking or feeling. But it also affects your ability to understand written language related to emotions, according to research to be published in *Psychological Science*, a journal of the Association for Psychological Science.

The new study reported on 40 people who were treated with botulinum toxin, or Botox. Tiny applications of this powerful nerve poison were used to deactivate muscles in the forehead that cause frowning.

The interactions of facial expression, thoughts and emotions has intrigued scientists for more than a century, says the study's first author, University of Wisconsin-Madison psychology Ph.D. candidate David Havas.

Scientists have found that blocking the ability to move the body causes changes in cognition and emotion, but there were always questions. (One of the test treatments caused widespread, if temporary, paralysis.) In contrast, Havas was studying people after a pinpoint treatment to paralyze a single pair of "corrugator" muscles, which cause brow-wrinkling frowns.

To test how blocking a frown might affect comprehension of language related to emotions, Havas asked the patients to read written statements, before and then two weeks after the Botox treatment. The statements were angry ("The pushy telemarketer won't let you return to your dinner"), sad ("You open your e-mail in-box on your birthday to find no new e-mails") or happy ("The water park is refreshing on the hot summer day.").

Havas gauged the ability to understand these sentences according to how quickly the subject pressed a button to indicate they had finished reading it. "We periodically checked that the readers were understanding the sentences, not just pressing the button," says Havas.

The results showed no change in the time needed to understand the happy sentences. But after Botox treatment, the subjects took more time to read the angry and sad sentences. Although the time difference was small, it was significant, he adds. Moreover, the changes in reading time couldn't be attributed to changes in participants' mood.

The use of Botox to test how making facial expressions affect emotional centers in the brain was pioneered by Andreas Hennenlotter of the Max Planck Institute in Leipzig, Germany.

"There is a long-standing idea in psychology called the facial feedback hypothesis," says Havas. "Essentially, it says, when you're smiling, the whole world smiles with you. It's an old song, but it's right. Actually, this study suggests the opposite: When you're not frowning, the world seems less angry and less sad."

The Havas study broke new ground by linking the expression of emotion to the ability to understand language, says Havas' adviser, UW-Madison professor emeritus of psychology Arthur Glenberg. "Normally, the brain would be sending signals to the periphery to frown, and the extent of the frown would be sent back to the brain. But here, that loop is disrupted, and the intensity of the emotion and of our ability to understand it when embodied in language is disrupted."

Practically, the study "may have profound implications for the cosmetic-surgery," says Glenberg. "Even though it's a small effect, in conversation, people respond to fast, subtle cues about each other's understanding, intention and empathy. If you are slightly slower reacting as I tell you about something made me really angry, that could signal to me that you did not pick up my message."

Such an effect could snowball, Havas says, but the outcome could also be positive: "Maybe if I am not picking up sad, angry cues in the environment that will make me happier."

In theoretical terms, the finding supports a psychological hypothesis called "embodied cognition," says Glenberg, now a professor of psychology at Arizona State University. "The idea of embodied cognition is that all our cognitive processes, even those that have been thought of as very abstract, are actually rooted in basic bodily processes of perception, action and emotion."

With some roots in evolutionary theory, the embodied cognition hypothesis suggests that our thought processes, like our emotions, are refined through evolution to support survival and reproduction.

Embodied cognition links two seemingly separate mental functions, Glenberg says. "It's been speculated at least since Darwin that the peripheral expression of emotion is a part of the emotion. An important role of emotion is social: It communicates 'I love you' or 'I hate you,' and it makes sense that there would be this very tight connection between peripheral expression and brain mechanism."

"Language has traditionally been seen as a very high-level, abstract process that is divorced from more primitive processes like action, perception and emotion," Havas says. "This study shows that far from being divorced from emotion, language understanding can be hindered when those peripheral bodily mechanism are interrupted."