

# Researchers find word choices can reflect stress-related changes in gene expression

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Credit: Paul Brennan/public domain

(Medical Xpress)—A team of researchers from the University of Arizona, the University of Wisconsin and the University of California has found that the word choices people make can be reflected in stress-related gene expression in some immune cells. In their paper published in *Proceedings of the National Academy of Sciences*, the group describes experiments they carried out with volunteers wearing vocal recording

devices and what they found when comparing the recordings with gene expression in white blood cells.

Prior research has shown that when people go through stressful events the experiences can have a detrimental impact on their health, particularly if it is long term. But it is still not clear what sorts of mechanisms are involved in these processes, though some studies have shown a link to inflammation due to gene expression in [immune cells](#). To learn more about such a possibility, the researchers asked 143 adult volunteers to wear a device that randomly recorded some of their conversations. The researchers then transcribed the recorded words so that they could be analyzed. The volunteers also underwent regular blood tests that allowed for recording expressions in [white blood cells](#) by 50 particular genes that had previously been associated with stress.

In analyzing their data, the researchers first studied the words used by the volunteers at different points in their lives—they were most particularly interested in what are known as "function words" which are typically certain types of adjectives and pronouns. Function words, the researchers note, have been found to be used more often when people are experiencing a [stressful event](#). Next, the team looked at stressful times for the volunteers as suggested by their function word use and compared it with gene expression in white blood cells. They report that the word choices made by the volunteers were a good predictor of gene expression.

The researchers also asked the volunteers to report their stress levels throughout the study, as well—the team compared what the volunteers self-reported about their [stress levels](#) with the [gene expression](#) and word choices and found they did not always match. Thus, they claim, analyzing word choice used by patients might be a better measure of actual stress than the opinion of the patient.

**More information:** Matthias R. Mehl et al. Natural language indicators of differential gene regulation in the human immune system, *Proceedings of the National Academy of Sciences* (2017). [DOI: 10.1073/pnas.1707373114](https://doi.org/10.1073/pnas.1707373114)

## Abstract

Adverse social conditions have been linked to a conserved transcriptional response to adversity (CTRA) in circulating leukocytes that may contribute to social gradients in disease. However, the CNS mechanisms involved remain obscure, in part because CTRA gene-expression profiles often track external social–environmental variables more closely than they do self-reported internal affective states such as stress, depression, or anxiety. This study examined the possibility that variations in patterns of natural language use might provide more sensitive indicators of the automatic threat-detection and -response systems that proximally regulate autonomic induction of the CTRA. In 22,627 audio samples of natural speech sampled from the daily interactions of 143 healthy adults, both total language output and patterns of function-word use covaried with CTRA gene expression. These language features predicted CTRA gene expression substantially better than did conventional self-report measures of stress, depression, and anxiety and did so independently of demographic and behavioral factors (age, sex, race, smoking, body mass index) and leukocyte subset distributions. This predictive relationship held when language and gene expression were sampled more than a week apart, suggesting that associations reflect stable individual differences or chronic life circumstances. Given the observed relationship between personal expression and gene expression, patterns of natural language use may provide a useful behavioral indicator of nonconsciously evaluated well-being (implicit safety vs. threat) that is distinct from conscious affective experience and more closely tracks the neurobiological processes involved in peripheral gene regulation.

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