Medical Xpress

Brain–computer interface experiments first to decode words 'spoken' entirely in the brain in real time

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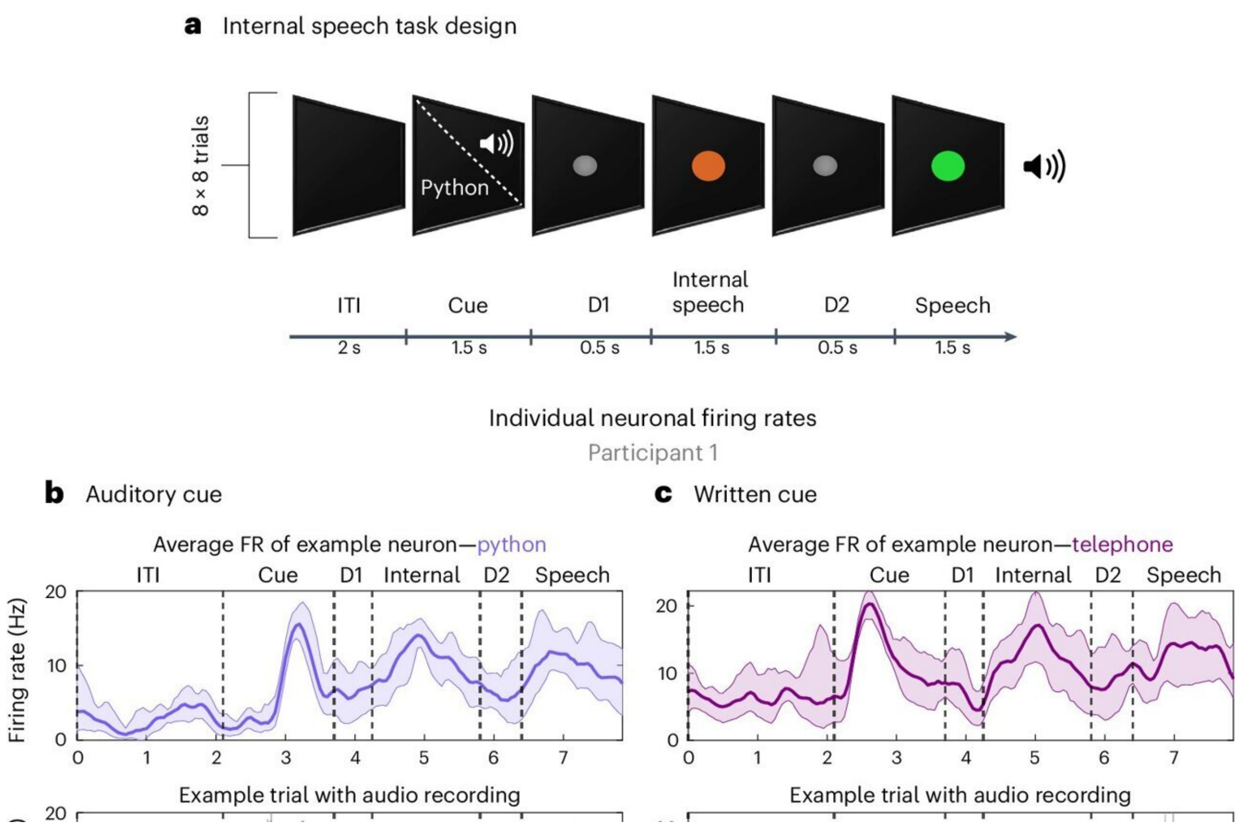

Neurons in the SMG represent language processes. a, Written words and sounds were used to cue six words and two pseudowords in a participant with tetraplegia. b–e, Example smoothed firing rates of neurons tuned to four words in the SMG for participant 1 (auditory cue, python (b), and written cue, telephone (c)) and participant 2 (written cue, nifzig (d), and written cue, spoon (e)). Top: the average firing rate over 8 or 16 trials Bottom: one example trial with associated audio amplitude (gray). Credit: *Nature Human Behaviour* (2024). DOI: 10.1038/s41562-024-01867-y

A team of brain specialists at the California Institute of Technology has developed a brain–computer interface (BCI) approach to decode words "spoken" entirely in the brain by recording signals from individual neurons in real time—a first.

In their study, reported in the journal *Nature Human Behavior*, the group implanted probes in the supramarginal gyrus, a region of the brain never before tested with BCI technology.

The editors at *Nature Human Behavior* have also published a Research Briefing in the same journal issue outlining the work by the group.

Over the past several decades, scientists have been developing technology to read a person's thoughts and convert them to printed words on a computer screen. Such work has led to the development of BCI technology, albeit with limited abilities. Some technologies could recognize words, for example, but most were used in conjunction with trained speech interpreters and were tested in individuals who were also speaking.

For this new study, the research team has moved the needle slightly by testing BCI technology on a different part of the brain; they were able to decode a few words that were "spoken" only in the brain.

The work involved placing electrodes into the brains of two volunteers with spinal cord injuries. The electrodes were implanted in the supramarginal gyrus, a part of the brain that recent research suggests is involved in subvocal speech.

After allowing the patients to heal for two weeks, the researchers began collecting data for the BCI, which had already been trained to recognize brain signals for six test words, along with two words that had no meaning, to serve as a control. The volunteers were then asked several times to imagine speaking the words as they were displayed on a computer screen while signals from their brains were decoded.

The research team found that they were able to decode the words for one patient with 79% accuracy and 23% for the other. Both efforts were considered a success, though the researchers were not able to explain why they found such a wide difference in the volunteers.

More information: Sarah K. Wandelt et al, Representation of internal speech by single neurons in human supramarginal gyrus, *Nature Human Behaviour* (2024). DOI: 10.1038/s41562-024-01867-y

Brain–machine-interface device translates internal speech into text, *Nature Human Behaviour* (2024). DOI: 10.1038/s41562-024-01869-w