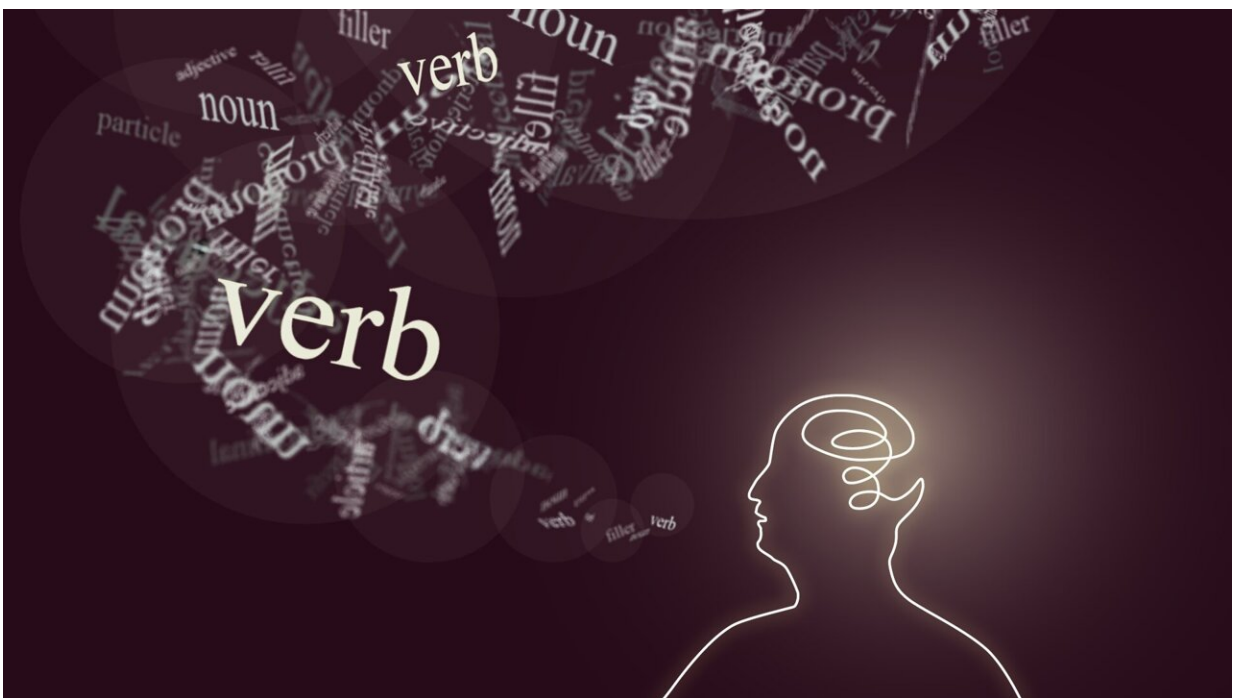


# AI study finds that speech patterns of Parkinson's disease patients are different from those of healthy patients

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AI study finds that patients with Parkinson's disease speak differently to healthy patients. Credit: Reiko Matsushita

Using artificial intelligence (AI) to process natural language, a research group evaluated the characteristics of speech among patients with Parkinson's disease (PD). AI analysis of their data determined that these

patients spoke using more verbs and fewer nouns and fillers. The study was led by Professor Masahisa Katsuno and Dr. Katsunori Yokoi, Nagoya University Graduate School of Medicine, in collaboration with Aichi Prefectural University and Toyohashi University of Technology. They published their results in the journal *Parkinsonism & Related Disorders*.

Natural language processing (NLP) technology is a branch of AI that focuses on enabling computers to understand and interpret large amounts of human language data using statistical models to identify patterns. Given that patients with PD experience a variety of speech-related problems, including impaired [speech production](#) and [language use](#), the group used NLP to analyze differences in patient speech patterns based on 37 characteristics using texts made from free conversations.

The analysis revealed that patients with PD used fewer common nouns, proper nouns, and fillers per sentence. On the other hand, they spoke using a higher percentage of verbs and variance for case particles (an important feature of the Japanese language) per sentence.

According to Yokoi, "When I asked them to talk about their day in the morning, a PD patient might say something like the following, for example: 'I woke up at 4:50 am. I thought it was a bit early, but I got up. It took me about half an hour to go to the toilet, so I washed up and got dressed around 5.30 am. My husband cooked breakfast. I had breakfast after 6 am. Then I brushed my teeth and got ready to go out.'"

Yokoi continued, "Whereas someone from the healthy control group might say something like this: 'Well, in the morning, I woke up at six o'clock, and got dressed, and, yeah, washed my face. Then, I fed my cat and dog. My daughter prepared a meal, but I told her I couldn't eat, and I, umm, drank some water.'"

"While these are examples that we created of conversations reflecting the characteristics of people with PD and healthy people, what you should see is that the total length is similar," Yokoi explained. "However, PD patients speak shorter sentences than people in the [control group](#), leading to more verbs in the machine learning analysis. The healthy control also uses more fillers, such as 'well' or 'umm,' to connect sentences."

The most promising aspect of this research is that the team performed the experiment on patients who did not yet show the characteristic cognitive decline seen in PD. Therefore, their findings offer a potential means of early detection to distinguish PD patients.

"Our results suggest that even in the absence of cognitive decline, the conversations of patients with PD differed from those of healthy subjects," Professor Katsuno, the head of the study, concludes. "When we attempted to identify PD patients or healthy controls based on these conversational changes, we could identify PD patients with over 80% precision. This result suggests the possibility of language analysis using [natural language](#) processing to diagnose PD."

**More information:** Katsunori Yokoi et al, Analysis of spontaneous speech in Parkinson's disease by natural language processing, *Parkinsonism & Related Disorders* (2023). [DOI: 10.1016/j.parkreldis.2023.105411](#)

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