Your memory is like the telephone game—Each time you recall an event, your brain distorts it

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Remember the telephone game where people take turns whispering a message into the ear of the next person in line? By the time the last person speaks it out loud, the message has radically changed. It's been altered with each retelling.

Turns out your memory is a lot like the telephone game, according to a new Northwestern Medicine study.

Every time you remember an event from the past, your brain networks change in ways that can alter the later recall of the event. Thus, the next time you remember it, you might recall not the original event but what you remembered the previous time. The Northwestern study is the first

to show this.

"A memory is not simply an image produced by time traveling back to the original event—it can be an image that is somewhat distorted because of the prior times you remembered it," said Donna Bridge, a postdoctoral fellow at Northwestern University Feinberg School of Medicine and lead author of the paper on the study recently published in the *Journal of Neuroscience*. "Your memory of an event can grow less precise even to the point of being totally false with each retrieval."

Bridge did the research while she was a doctoral student in lab of Ken Paller, a professor of psychology at Northwestern in the Weinberg College of Arts and Sciences.

The findings have implications for witnesses giving testimony in criminal trials, Bridge noted.

"Maybe a witness remembers something fairly accurately the first time because his memories aren't that distorted," she said. "After that it keeps going downhill."

The published study reports on Bridge's work with 12 participants, but she has run several variations of the study with a total of 70 people. "Every single person has shown this effect," she said. "It's really huge."

"When someone tells me they are sure they remember exactly the way something happened, I just laugh," Bridge said.

The reason for the distortion, Bridge said, is the fact that human memories are always adapting.

"Memories aren't static," she noted. "If you remember something in the context of a new environment and time, or if you are even in a different

mood, your memories might integrate the new information."

For the study, people were asked to recall the location of objects on a grid in three sessions over three consecutive days. On the first day during a two-hour session, participants learned a series of 180 unique object-location associations on a computer screen. The next day in session two, participants were given a recall test in which they viewed a subset of those objects individually in a central location on the grid and were asked to move them to their original location. Then the following day in session three, participants returned for a final recall test.

The results showed improved recall accuracy on the final test for objects that were tested on day two compared to those not tested on day two. However, people never recalled exactly the right location. Most importantly, in session three they tended to place the object closer to the incorrect location they recalled during day two rather than the correct location from day one.

"Our findings show that incorrect recollection of the object's location on day two influenced how people remembered the object's location on day three," Bridge explained. "Retrieving the memory didn't simply reinforce the original association. Rather, it altered memory storage to reinforce the location that was recalled at session two."

Bridge's findings also were supported when she measured participants' neural signals —the electrical activity of the brain—during session two. She wanted to see if the neural signals during session two predicted anything about how people remembered the object's location during session three.

The results revealed a particular electrical signal when people were recalling an object location during session two. This signal was greater when—the next day—the object was placed close to that location

recalled during session two. When the electrical signal was weaker, recall of the object location was likely to be less distorted.

"The strong signal seems to indicate that a new memory was being laid down," Bridge said, "and the new memory caused a bias to make the same mistake again."

"This study shows how memories normally change over time, sometimes becoming distorted," Paller noted. "When you think back to an event that happened to you long ago—say your first day at school—you actually may be recalling information you retrieved about that event at some later time, not the original event."

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