



ChatGPT May Be Eroding Critical Thinking Skills, According to a New MIT Study

Summary: The study found that using AI assistants for writing tasks significantly reduces brain engagement. Participants relying on ChatGPT exhibited up to 55% weaker neural connectivity, poorer memory recall, and a growing reliance on the tool, highlighting the risk of "cognitive debt."

Does ChatGPT harm critical thinking abilities? A new study from researchers at MIT's Media Lab has returned some concerning results.

The study divided 54 subjects—18 to 39 year-olds from the Boston area—into three groups, and asked them to write several SAT essays using OpenAI's ChatGPT, Google's search engine, and nothing at all, respectively. Researchers used an EEG to record the writers' brain activity across 32 regions, and found that of the three groups, ChatGPT users had the lowest brain engagement and "consistently underperformed at neural, linguistic, and behavioral levels." Over the course of several months, ChatGPT users got lazier with each subsequent essay, often resorting to copy-and-paste by the end of the study.

The paper suggests that the usage of LLMs could actually harm learning, especially for younger users. The paper has not yet been peer reviewed, and its sample size is relatively small. But its paper's main author Nataliya Kosmyna felt it was important to release the findings to elevate concerns that as society increasingly relies upon LLMs for immediate convenience, long-term brain development may be sacrificed in the process.

"What really motivated me to put it out now before waiting for a full peer review is that I am afraid in 6-8 months, there will be some policymaker who decides, 'let's do GPT kindergarten.' I think that would be absolutely bad and detrimental," she says. "Developing brains are at the highest risk."

Generating ideas

The MIT Media Lab has recently devoted significant resources to studying different impacts of generative AI tools. Studies from earlier this year, for example, found that generally, the more time users spend talking to ChatGPT, the lonelier they feel.

Kosmyna, who has been a full-time research scientist at the MIT Media Lab since 2021, wanted to specifically explore the impacts of using AI for schoolwork, because more and more students are using AI. So she and her colleagues instructed subjects to write 20-minute essays based on SAT prompts, including about the ethics of philanthropy and the pitfalls of having too many choices.

The group that wrote essays using ChatGPT all delivered extremely similar essays that lacked original thought, relying on the same expressions and ideas. Two English teachers who assessed the essays called them largely "soulless." The EEGs revealed low executive control and attentional engagement. And by their third essay, many of the writers simply gave the prompt to ChatGPT and had it do almost all of the work. "It was more like, 'just give me the essay, refine this sentence, edit it, and I'm done,'" Kosmyna says.

The brain-only group, conversely, showed the highest neural connectivity, especially in alpha, theta and delta bands, which are associated with creativity ideation, memory load, and semantic processing. Researchers found this group was more engaged and curious, and claimed ownership and expressed higher satisfaction with their essays.

The third group, which used Google Search, also expressed high satisfaction and active brain function. The difference here is notable because many people now search for information within AI chatbots as opposed to Google Search.

After writing the three essays, the subjects were then asked to re-write one of their previous efforts—but the ChatGPT group had to do so without the tool, while the brain-only group could now use ChatGPT. The first group remembered little of their own essays, and showed weaker alpha and theta brain waves, which likely reflected a bypassing of deep memory processes. “The task was executed, and you could say that it was efficient and convenient,” Kosmyna says. “But as we show in the paper, you basically didn’t integrate any of it into your memory networks.”

The second group, in contrast, performed well, exhibiting a significant increase in brain connectivity across all EEG frequency bands. This gives rise to the hope that AI, if used properly, could enhance learning as opposed to diminishing it.

Psychiatrist Dr. Zishan Khan, who treats children and adolescents, says that he sees many kids who rely heavily on AI for their schoolwork. “From a psychiatric standpoint, I see that overreliance on these LLMs can have unintended psychological and cognitive consequences, especially for young people whose brains are still developing,” he says. “These neural connections that help you in accessing information, the memory of facts, and the ability to be resilient: all that is going to weaken.”

Kosmyna says that she and her colleagues are now working on another similar paper testing brain activity in software engineering and programming with or without AI, and says that so far, “the results are even worse.” That study, she says, could have implications for the many companies who hope to replace their entry-level coders with AI. Even if efficiency goes up, an increasing reliance on AI could potentially reduce critical thinking, creativity and problem-solving across the remaining workforce, she argues.