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ChatGPT May Foster Human Gist Memory While Offloading Less Sufficient Information

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Abstract. Recent research challenges the notion that digital offloading impairs memory, suggesting instead that at least gist memory may stay intact. Drawing from Walter Kintsch's tripartite model of text comprehension, we hypothesize that offloading spares cognitive resources, thus not merely sparing gist memory, rather improving it. Our methodology involves two experiments testing memory retention across different levels of text comprehension, under conditions of anticipated text accessibility, including the use of ChatGPT. Preliminary results from these experiments indicate comprehension level effect, with higher-order cognitive processes benefiting more from offloading. Although pilot data has no statistical significance, they hint at a potential advantage of digital offloading for gist memory, challenging traditional perceptions of memory decline due to technological reliance. The ongoing research aims to further elucidate the impact of digital offloading on memory processes, potentially shaping future hybrid cognitive architectures where human creativity and AI-driven memory retention coalesce.

Keywords. Cognitive offloading, Google-effect, digital externalization, hybrid intelligence.

Experimental evidence suggests that individuals are more likely to forget information that they have saved digitally, whereas information that has been deleted is more likely to be remembered [1]. This tendency to offload information is often perceived as a general decline in memory capacity. Recent experiments, however, reveal inconsistencies in this observed decline. A series of studies [2] demonstrated that the advantage in recalling categorized words, as opposed to non-categorized ones, was either equivalent to or greater in the offloading condition than in a condition where participants did not anticipate having access to their written lists during the recall test. Therefore, it appears that gist memory, which is bolstered by semantic associations, does not undergo significant reduction when offloading.

Here we propose a stronger hypothesis that gist memory may be not merely intact, but rather increased, because the cognitive resource, spared by offloading, is redirected from memorizing towards comprehension. To address this improvement, we need to use

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more detailed approach to levels of memory. The proper theoretical framework was proposed by Walter Kintsch [3], who suggested the tripartite model of text comprehension: text surface (TS), textbase (TB), and situation model (SM). The TS refers to the exact wording, the TB covers the semantic content that can be seen as a network of propositions, the SM is a coherent representation of the situation referred to in the text and is constructed by drawing inferences.

To examine our hypothesis, we conducted two experiments, each comprising of text reading and test stages. The instructions in the first stage present three conditions about text accessibility in the following test stage: 1) the text will not be available, 2) the text will be available, and 3) ChatGPT can be used for task resolution. Participants are students well-versed in ChatGPT's functionalities. In both experiments, during the testing phase, participants were, in fact, denied access to the text, allowing for the assessment of actual memory retention.

The first experiment employed sentence recognition paradigm [4] to access memory separately for three levels. Participants read 12 short texts on different topics under three aforementioned conditions. On the text day, they are presented with separate sentences from the text and asked to decide whether this sentence had appeared in the original text. These sentences could be either verbatim from the text or modified to align with one of the three memory levels being tested.

In the second experiment, we refined the textbase level into two sub-levels to differentiate between micro and macro semantic comprehension. During the initial stage, participants were exposed to three texts. In the testing stage, they were presented with multiple-choice questions designed to directly assess comprehension at one of the four specified levels. This approach allowed us to more precisely evaluate the nuances of semantic understanding facilitated by the offloading process.

Analysis of pilot series (N=27) from the second experiment yielded inconclusive results that, while not statistically significant, tended to support our hypothesis. A two-way repeated measures ANOVA revealed a significant effect for the Comprehension level ($p < 0.001$), but no significant interaction between Offloading type and Comprehension level ($F(6, 26) = 1.67$, $p = 0.131$). Absolute mean values show that in "ChatGPT" performance in macrosemantic and SM levels was highest, while in microsemantic and surface it was poorest. The performance in no-offloading condition was greatest on microsemantic level. To assess the quality of the questions, we administered them to individuals who had not read the texts. Their responses did not surpass the level of random guessing, indicating that the formulation of the questions was neutral and did not prime the answers.

Due to the high variance in the data and the small sample size in the pilot study, we were unable to obtain statistically significant results. However, the general patterns observed in the results align with our hypothesis, suggesting that AI and digital offloading might not necessarily impair human memory. Instead, they may offer benefits for higher-order gist memory of texts. The forthcoming results from the main experimental series are expected to provide significant insights into hybrid cognitive architectures. In these architectures, the role of humans is envisioned to be more creative, focusing on the management of generalized ideas, while AI fosters information retention.

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