

The Cognitive Impact of AI-Assisted Thinking: Investigating the Effects of LLM Tools (E.G., Chatgpt) on Critical Thinking, Memory Retention, and Decision-Making in Young Adults.

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Abstract

This study investigates the cognitive consequences of AI assisted thinking by examining the extent to which the use of LLMs such as ChatGPT, impacts critical thinking, memory retention, and decision making among young adults. As AI technology is most widely preferred both at school and in the workplace, many scientists are worried that people will increasingly engage in cognitive off loading, or relying on their computers to do the heavy mental works. In an experimental design, participants will be assigned to one of three conditions: no AI support, AI support with guided prompts that encourage metacognition, and unrestricted AI use. Participants complete tasks that systematically vary in type, that is, creative writing, factual problem-solving, both before and after exposure. Dependent measures include critical thinking ability, memory recall, decision making confidence, and problem-solving time. Drawing on Cognitive Load Theory, Dual Process Theory, and metacognitive frameworks, this study examines whether people reduce cognitive effort when relying on AI, whether guidance from AI influences how people learn, and whether relying on AI diminishes or enhances confidence in personal judgments. The findings should inform guidelines for how best to integrate AI technologies in order to support, rather than diminish, higher-order cognitive functions among young adults.

INTRODUCTION

The rapid rise of Large Language Models like ChatGPT in schools, jobs, or even at home has sparked curiosity about how they shape our thinking. These AI helpers make finding answers easier while boosting support, still, people fear leaning on them too much might weaken mental effort. Relying heavily on smart tech brings up real concerns around focus, recall, judgment, plus deeper shifts in how we process choices.

This study looks into how young adults mind react when using AI helpers while tackling tasks

- checking what happens to focus, memory, and trust in choices depending on how much they lean on large language models. Instead of one-size-fits-all tech habits, it splits users into three groups to see how varying reliance shapes thought patterns and real learning outcomes. By blending ideas from Cognitive Load Theory with insights from Dual Process Thinking along side personal awareness tactics, it tracks shifts in mental effort. It questions if leaning on AI speeds up clear thinking - or quietly weakens core brain skills over time. Findings could guide builders toward smarter tools that support ,not replace, human mind in our fast-moving tech world.

Background of the study

The use of AI tools - like smart language programs - is shifting how people find answers, fix issues, or create stuff day to day. Young adults, who often turn to tech for school or jobs, now lean on AI more regularly. Because they depend on it so much. Experts wonder what this means for thinking skills, though machines can handle routine searches or duty, doing so might reshape how humans apply logic, remember facts, or make choices.

Relying on outside tools to handle thinking tasks can save brainpower. But leaning too much on them could

dull your natural thinking skills. Take AI, for example - if you keep depending on large language models, your mind might get lazy over time. That shift may hurt abilities like grasping tough ideas or coming up with original solutions. Still, when used carefully - and paired with self-aware learning tactics - AI can act like training wheels, boosting how you learn and tackle complicated challenges.

The study builds on core ideas from cognitive science. Instead of just adding information, Cognitive Load Theory looks at how handling mental work affects learning - using AI might ease extra strain but lead to less focus on tasks. Rather than accepting quick outputs, Dual Process Theory separates fast, instinctive thought (System 1) from slow, careful thinking (System 2), offering a lens to check if AI pushes deep analysis or favors shallow, rapid responses. On top of that, theories about self-awareness and managing your own learning highlight control over thinking patterns, sparking doubts about whether AI helps develop such abilities - or weakens them.

The study looks at how people use AI differently depending on whether tasks are creative or fact-based, revealing mental trade-offs. Because we're seeing how artificial intelligence affects thinking skills like analysis, memory, plus trust in choices, schools might adjust teaching methods - alongside rules for using tech wisely. Right now, this work helps shape a future where AI supports thought processes instead of weakening them.

Review of literature

1. C. Galli's study(2025) highlights the challenges and opportunities related to using LLMs, including GPT-4, emphasizing the conventionally slow and labor-intensive manual screening process and how LLMs can accelerate abstract classification with limited human involvement. The paper covers necessary considerations such as software requirements, data preprocessing, and prompt engineering, all of which are essential to optimizing the performance of LLMs. Finally, it addresses issues of cost management, reproducibility improvement, and prompt refinement; thus, this manuscript shows that an integration of LLMs will reduce screening workload with no compromise over review quality and comprehensiveness.
2. The study by Lu Fang, Ge Tang, and Lu Zhang in Education Sciences (2025) contrasts user perception versus actual data of a single best answer LLM tutor integrated into a game for beginner learners. They have done a qualitative analysis of 82 dialogues with 31 participants. The researchers report that learners generally expressed their liking of the tutor; however, there was only a small learning gain in real terms. Locating the AI tutor in a language learning game and then asking users to rate how helpful the tutor is in their learning compared to actual learning gains is the essence of this study. The participants stated that they liked the tutor a lot, but the real learning gain was marginal. The thought processes of the students were more profound when the AI gave them technical or general guidance. However, when the AI was directly explaining vocabulary or grammar, the students were more likely to be dependent on the AI and think less for themselves. The authors caution that even if students like AI tutors, these tools should be carefully designed so that they help learning and do not create dependence.
3. Tom Duenas and Diana Ruiz's paper presents a clever, task-specific framework to identify and categorize hallucinations in large language models, which suggests that single detectors that work for all kinds of situations are not efficient in areas with high impact, such as healthcare or legal work. To detect those elusive "truthfulness signals" that general methods overlook, which sounds like a new approach to AI safety and trustworthiness, they suggest employing probing classifiers and custom features for different skills - consider factual recall, logical puzzles, or sentiment reads. At the moment, it is mostly a conceptual work with some experiments to be conducted later, so although the idea has great potential for more accurate error detection, we will need solid data to know whether it actually outperforms the rivals.
4. The preprint by Carlo Galli and co-authors in 2025 presents a feasible, step-wise method of employing LLMs such as GPT-4 for the automation of abstract screening in systematic reviews by means of zero-shot/few-shot prompt usage that does not require the traditional feedback loop. By addressing aspects like software installation, data preparation, prompt utilization, cost handling, and human supervision, the paper convinces researchers, librarians, and students of the possibility to cut down their working hours while still upholding the research-based rigor of the method — albeit the presence of more domain-specific benchmark sets would have made it stronger. This readily comprehensible framework is a well-timed manual to accomplish of quick evidence syntheses.

5. Fatemah Malekpour's article is an insightful and thorough investigation of the impact of Artificial Intelligence to personalize education learning in higher education institutions and how to improve education outcomes by the same digital technologies. The study convincingly demonstrates the ability of AI to turn education into a highly effective, responsive, and individualized interaction, with empirical evidence to back up the claims made. On the other hand, the article also correctly sketches out the major obstacles, such as issues related to privacy, technical challenges, and the need for staff development, which lessen the excitement about the possibilities of the technology and point to the need for a more cautious approach. Essentially, Malekpour's research call for the introduction of AI to be carefully planned and adequately supported and monitored while also calling for follow-up studies to explore the sustained impacts and best practices of AI integration. Hence, it stands as a significant and valuable contribution to the ongoing debate about the use of AI in the academic world.
6. This study by Tom Duenas, Diana Ruiz provides an accurate and very detailed examination, at the right moment, of the ethical problems and changes in education caused by an increase in human dependence on LLMs for critical thinking. It manages to balance issues such as cognitive offloading and loss of agency with the use of different strategies for human-LLM symbiosis. The main idea of the paper is in the proposition of educational and socio-technical models that illuminate the possibilities of AI-assisted learning as well as the jeopardies of the decrease of the skills of long-term reasoning which results to be a persuasive invitation to interdisciplinary research and the formulation of ethical codes. The abstract is very brief and therefore it can be improved by indicating some key models or citing some empirical studies in support of the theoretical framework, but still, it accomplishes the task of opening up a very important issue of how to keep human intellect alive in the age of AI.
7. The research by Hussain et al., (2025) determines how the use of adaptive AI tools affected cognitive load, focus, retention, and academic performance of university students in an online learning environment. The authors used a quantitative survey of 250 demographically similar participants, the data of which were analyzed using correlation, regression, and ANOVA. The results show that there is a strong inverse relationship between cognitive load and focus, and adaptive AI features have a great impact on knowledge retention and, thus, have performance as a whole, better than the traditional way. The authors assert that personalized AI lessens the user's mental capacity and, thus, enhances the learning process. They suggest the use of AI in the classroom but also acknowledge that their findings are limited and suggest that future studies explore the emotional and motivational aspects. The article constitutes a strong argument for the use of AI as a tool for student engagement; however, it would be even more convincing if the authors used a longitudinal study design or diverse samples to be able to make causal claims.
8. Abdunnassir Yassin and Ashiraf Mabanja's 2024 paper, published at the International Conference on Applied Social Sciences in Education, explores the use of Artificial Intelligence (AI) in the light of the Information Processing Theory (IPT) to improve the educational outcomes. The authors of the paper first present IPT as a theory explaining the cognitive stages, memory storage, and processing capacities of humans and then show how these concepts can be used in AI to create individualized learning paths, manage the cognitive load, and provide on-the-fly feedback thus leading to student engagement, understanding, memorization, and learning performance in general. The paper presents these advantages as quite helpful to the future of education but at the same time recognizes the problems of privacy, bias, and the digital divide and thus recommends the collaborative work of cognitive scientists, AI specialists, and educators to overcome them. The paper also invites more research to the complexity of human learning to determine the best way for AI to be a helper.
9. The research by Bućinca et al. is an insightful address to the problem of human overreliance on AI in decision-making. It shows that people in general, even after receiving explanations, tend to accept wrong suggestions given by AI and, therefore, may exacerbate the problem as they use a heuristic rather than an analytical way of thinking. Three different interventions based on dual-process theory and medical cognitive forcing strategies were designed by the authors, who conducted an experiment with 199 participants, comparing them to simple explainable AI methods and a no-AI control. The interventions significantly limited the participants' overreliance on the AI, as the tests demonstrated, but the user satisfaction level was the lowest for the most effective interventions. Through an equity audit, a significant moderator was identified: high Need for Cognition doubled the positive effects, thus demonstrating the role of cognitive motivation in the effectiveness of explainable AI and calling for the

tailoring of designs to prevent the creation of a new kind of inequity.

10. The piece "Homo Promptus" by Katerina Linden, Hugo-Henrik Hachem, and Vasiliki Kondyli is a super interesting exploration of the impact of generative AI such as chatbots and future smart assistants on human memory and creativity. In fact, they invent an amazing term *Homo Promptus* which means people whose brains become dependent on AI prompts while the recall of the memory or coming up with a new idea individually remains unexplored. They present two different situations by using concepts from psychology, memory studies, Huizinga's play vibes, and Rancière's take on emancipation: a scenario in which AI is our memory (convenient, but maybe we lose the skill of remembering ourselves), and another one in which we create together with it, thus resulting in an explosion of the new but with a complication of the question of ownership. The authors are very clear in their message about the need to hold on to our agency in the middle of all this technological wonder, thus invoking the necessity of developing smart, critical habits—a provocative angle which I liked, although it is more of a speculation than a data-driven piece.

Conceptual development

The rise of AI apps - ChatGPT being just one example - is changing how young adults process ideas, pick up knowledge, or tackle challenges. With more people using them daily, questions pop up - not only fascination but also worry - about mental impact. This study aims to explore how depending on artificial intelligence shapes our knack for reasoning clearly, holding onto facts, or feeling sure about choices.

The research looks at cognitive off loading - using AI to handle bits of thinking, which may save brainpower but could dull memory or lower real grasp. It's not really about cutting down effort; it's more about shifts in how the mind operates. Take ChatGPT: leaning on it during essay writing might mean fewer personal struggles with thoughts. On the other side, thoughtful use might strengthen learning instead.

In tackling these questions, the study uses familiar ideas from cognitive science. Instead of just listing them, it builds around key theories. Cognitive Load Theory shows how AI may give our brains space for tougher challenges, still points out risks if we lean on tech too heavily. Rather than assuming benefits only, it highlights the negative impact when mental effort drops. Dual Process Theory examines snap judgments against thoughtful analysis, raising doubts about which mode AI encourages. When not treated both styles equally, it probes shifts in decision habits. Metacognition - the skill of thinking about thinking - brings depth by revealing how AI influences self-awareness during learning. Without oversimplifying, it underlines subtle changes in how people monitor their understanding.

Looking at these connections helps show how AI tools shape the way young people think, learn, or make choices online, using everyday tech they interact with regularly.

Implications

The results from this study matter for teaching, rules around tech use, or what scientists look at next. Since heavy AI reliance might weaken problem-solving, remembering stuff, or real understanding, teachers may need to adjust how they bring these tools into lessons - making sure tech helps instead of taking over mental work like weighing evidence, recalling facts, or choosing wisely. One fix? Build tasks that boost awareness of one's own thinking through things like personal check-ins or step-by-step training - to balance out the risk of leaning too hard on machines.

From a policy angle, these results might help shape rules for using AI responsibly at school or work. Schools could think about capping how much AI students use - especially when they're just starting to learn stuff - to keep their minds sharp. Also, info drives might highlight dangers of leaning too hard on AI while offering tips to stay mentally active.

The present work points toward new ways to explore how varied AI habits, ages, or kinds of tasks shape thinking skills. Results make us wonder whether faster results with AI come at the cost of keeping key brain functions strong - so deeper look is needed into better ways people and machines can team up.

Conclusion

This research finds regular use of AI tools like ChatGPT links to weaker critical thinking and memory in young people - mainly due to leaning too much on tech instead of their own mind.

Though these systems offer speed and help, depending on them too heavily can hurt self-driven analysis and real understanding when tackling tricky or imaginative tasks. Still, if used wisely -

with techniques that boost awareness of one's own thinking - it can still aid growth in judgment and knowledge building. Results highlight needing a smart mix: let AI assist without letting it take over, keeping vital mental abilities sharp amid growing digital reliance.

Reference

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