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REVISITING THE GOOGLE EFFECT: A HYBRID SYSTEMATIC REVIEW AND BIBLIOMETRIC MAPPING OF INTERNET-DRIVEN MEMORY OFFLOADING

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Abstract

This study undertakes a comprehensive hybrid systematic review and bibliometric analysis to examine the evolving landscape of the Google Effect, defined as the cognitive tendency to rely on digital platforms, such as search engines, as external repositories of memory. Employing rigorous PRISMA screening, the review synthesizes findings from 23 Scopus-indexed publications, mapping the conceptual progression, research trajectories, and international distribution of scholarship on this phenomenon. The bibliometric analysis reveals robust thematic linkages among cognitive offloading, memory retrieval, digital amnesia, and search behavior, underscoring the multifaceted nature of internet-driven memory practices. While foundational research predominantly characterized the Google Effect as detrimental to internal memory retention, recent studies suggest that strategic digital offloading can facilitate more efficient cognitive resource allocation, support gist memory, and enhance complex information processing. Notably, the research field remains geographically concentrated, with the majority of contributions originating from the United States and China, thus identifying a critical gap in representation from developing regions. By integrating current evidence and mapping scholarly trends, this review offers a synthesized conceptual framework that advances understanding of the Google Effect and its implications for cognitive science, digital education, and the design of technology-mediated learning environments.

Keywords: ***Cognitive Offloading, Digital Amnesia, Google Effect, Information Behavior, Memory.***

INTRODUCTION

The proliferation of digital tools has reshaped human cognition, particularly in how individuals store, access, and manage information. The Google Effect introduced (Chen et al., 2025; Gong & Yang, 2024; Sparrow et al., 2011) refers to the tendency of individuals to rely on search engines such as Google as external memory systems. Rather than encoding information internally, individuals remember where information can be retrieved. This phenomenon has implications for cognitive load, digital learning, decision-making, and long-term memory consolidation. Despite its relevance, research remains scattered and inconsistent, necessitating a structured systematic review supported by bibliometric evidence to clarify research development and identify future opportunities (Yacci & Rozanski, 2012).

LITERATURE REVIEW

The Google Effect describes how people tend to remember where to find information rather than the content itself, as they expect easy future access (Sparrow et al., 2011) This cognitive offloading leads to less effort encoding information internally (Dempsey et al., 2024; Heersmink, 2016), weaker spatial learning from digital maps (Sugimoto et al., 2022), and greater forgetfulness when information is stored externally (Schooler & Storm, 2021).

Beyond memory, the Google Effect contributes to challenges in information literacy, as the internet's vast information, including unvetted sources can blur the distinction between credible knowledge and opinion, undermining academic authority (Brabazon, 2006). Socially, digital media reliance increases machine-mediated interactions, fostering echo chambers and social fragmentation (Sikdar, 2018). Economically, search engines encourage superficial analysis, such as focusing on headline earnings over relevant financial details (Cikurel, 2024). Internet use can even prompt false memories and reduced brain activity during recall (Dong & Potenza, 2016) , while

persistent online personal data complicates 'social forgetting' (Stacey, 2017). Overall, the Google Effect is the tendency to use external media as auxiliary memory, reducing internal retention and reshaping cognition (Dempsey et al., 2024; Feng et al., 2021; Giebl et al., 2021; Gong & Yang, 2024). However, recent studies contest the idea that digital offloading is wholly negative. Digital tools can reinforce core understanding by freeing cognitive resources for complex processing (Vzorin et al., 2024) and support productivity through transactive memory systems (Varshney, 2012). Storing information externally may relieve cognitive load and aid task focus (Schooler & Storm, 2021). The Google Effect describes how easy access to information online leads to reduced internal memory, as people rely on external sources for knowledge. It is believed that when information is readily available, the brain offloads memory, adapting to the digital age for more efficient knowledge management (Kahn & Martinez, 2020). Digital amnesia, like the Google Effect, refers to decreased memory retention caused by dependence on digital devices or external sources (Artman, 2020; Robert & Kadhiravan, 2022).

METHOD

This study employs a hybrid approach, integrating a systematic literature review (SLR) with a bibliometric analysis to comprehensively examine the phenomena of the Google effect, digital amnesia, and digital distraction. The methodology is structured according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, ensuring transparency, rigor, and reproducibility throughout the research process. The literature search was conducted using the Scopus database, targeting peer-reviewed articles published up to September 24, 2025. To maintain the quality and relevance of the review, the following inclusion criteria were applied, (1) Publications are written in English to ensure accessibility and consistency in analysis, (2) Only articles published in reputable, peer-reviewed journals were included (3) The search was restricted to studies that specifically address the "Google effect" and "digital amnesia," with "digital distraction" considered as an associated phenomenon (4) Keywords used in the search were "google effect" and "amnesia digital" (5) Studies that focus on empirical research, theoretical frameworks, or conceptual discussions related to these phenomena were prioritized.

Following the PRISMA model, the initial search yielded a broad set of articles, which were then filtered through a four-step process: identification, screening, eligibility, and inclusion. During the identification phase, all articles containing the specified keywords were extracted. In the screening phase, abstracts and titles were reviewed to exclude irrelevant studies. The eligibility phase involved a full-text assessment to ensure the articles met the inclusion criteria. Finally, the most relevant articles were included for qualitative and quantitative synthesis. To supplement the systematic review, a bibliometric analysis was conducted using VOSviewer software. This tool enabled the visualization of publication trends, co-authorship networks, keyword co-occurrences, and citation patterns within the selected literature. The bibliometric analysis provided insights into the most influential authors, institutions, and articles in the domain, as well as the evolution of research themes over time.

RESULTS AND DISCUSSION

The Google effect refers to the tendency of individuals to forget information that can be easily accessed through search engines, relying on external digital sources rather than personal memory. Digital amnesia expands on this concept, describing the increasing inability to retain information due to habitual dependence on digital devices for information storage and retrieval. Digital distraction, meanwhile, encompasses the cognitive and behavioral impacts of constant digital interruptions, which can further exacerbate memory lapses and reduce sustained attention. By synthesizing findings from the systematic review and visualizing bibliometric data, this study aims to clarify the relationships among these phenomena, identify research gaps, and suggest directions for future studies. The hybrid methodology enables a multifaceted understanding of how digital technologies are reshaping cognitive processes and information management in the digital era.

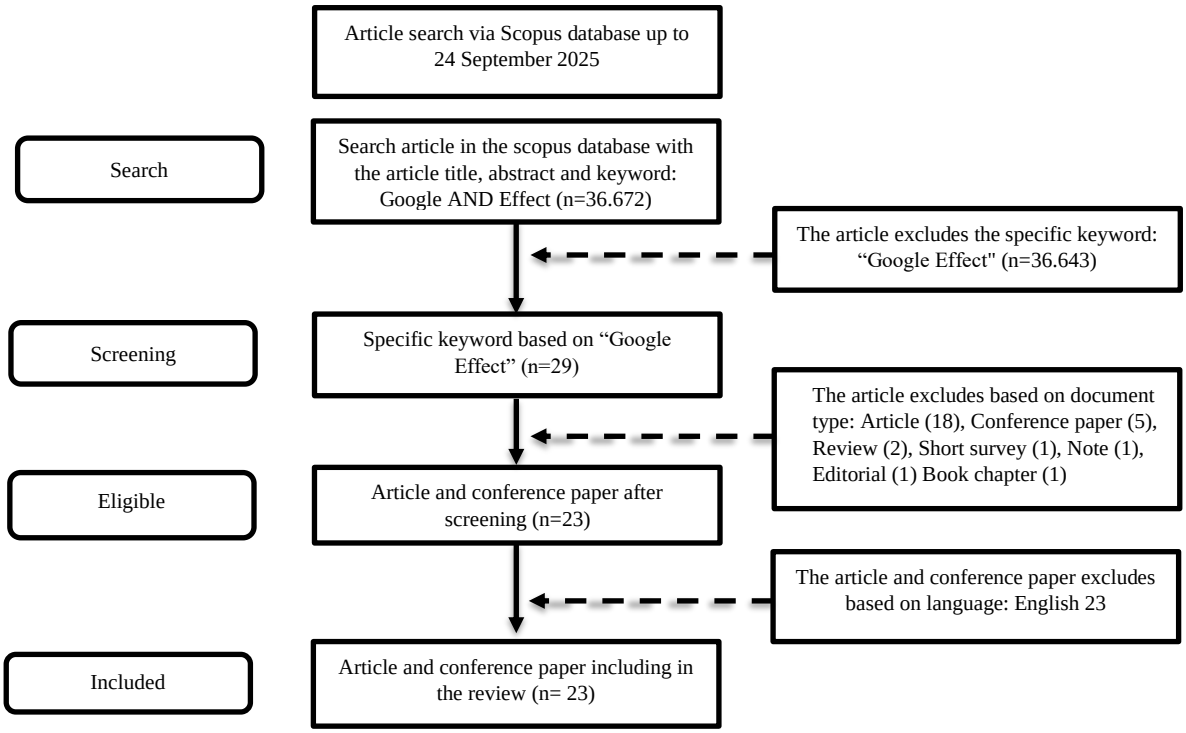


Figure 1. PRISMA diagram

Based on the systematic review using the PRISMA method, several interesting findings emerged concerning the search using the keyword "google effect." In the initial search phase with the keyword "google and effect" (without quotation marks), a total of 36,672 documents were found. However, after further filtering by focusing the keyword on "google effect" (with quotation marks), the number of relevant documents drastically decreased to just 29. This significant difference in search results raises questions about the scope and focus of the keywords used. The phrase "google and effect" separately has a broader meaning, thus encompassing various topics that may not specifically discuss the phenomenon of the google effect directly. On the other hand, the use of the specific keyword "google effect" points directly to discussions related to a particular condition well-known in the literature, resulting in far fewer but more focused results.

Out of the 29 identified documents, classification was carried out based on document type as follows: scientific articles (18), conference papers (5), reviews (2), short surveys (1), notes (1), editorials (1), and book chapters (1). To maintain consistency and relevance in further analysis, only documents categorized as scientific articles and conference papers were selected, resulting in a total of 23 documents to be reviewed. All these documents were written in English. Based on the results of this selection, several critical questions arise that need to be addressed in further research: (QR1) Why does the google effect phenomenon seem to attract limited attention from researchers, as evidenced by the limited number of publications in the Scopus database to date? (QR2) Has research on the Google effect achieved global coverage, or is it still limited considering the relatively small number of available studies? (QR3) Will the google effect develop into a new phenomenon in future literature studies? A systematic analysis of the 23 selected documents is expected to provide answers to the questions above, while also clarifying the position of the google effect within the contemporary research landscape related to digital amnesia and digital distraction.

Result

Addressing QR1, the limited number of studies on the Google effect in the Scopus database reflects more than just lack of interest. Research began with (Brabazon, 2006) and saw notable growth in 2024, when seven studies were published. Two impactful 2024 publications, (Gilbert, 2024) "Cognitive Offloading is Value-Based Decision Making" and (Gong & Yang, 2024) "Google Effects on Memory", have received 11 and 8 citations, respectively, indicating rising academic attention and interest in the topic. The assertion that the Google effect is uninteresting to researchers does not hold up under closer examination. Rather, the limited number of early publications on this topic likely stems from a general lack of public and academic awareness, as well as the novelty of the phenomenon in its formative years. As digital technologies and online information access have become more deeply integrated into daily life, awareness of the Google effect has grown, leading to a marked increase in scholarly attention. The notable surge in research output seen in 2024, including several highly cited studies, demonstrates that the topic is gaining momentum and attracting increasing interest within the academic community. This trend suggests that the field is evolving and that research on the Google effect is likely to expand further as its relevance to cognitive science, education, and digital behavior becomes more widely recognized.

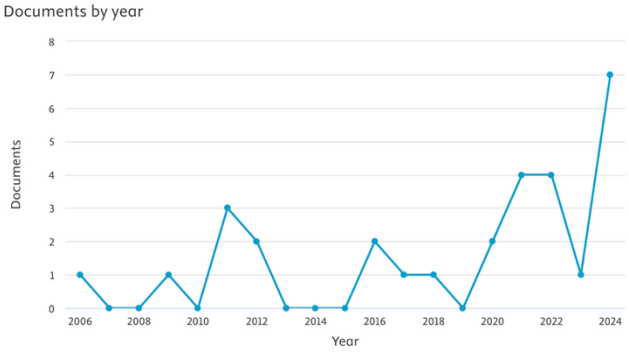


Figure 2. Documents by year

To address QR2, a detailed analysis of the 23 selected documents reveals that research on the Google effect is primarily concentrated in a small number of countries. The United States leads with 15 studies, followed by China with 4, and Russia and the United Kingdom with 3 each. Meanwhile, countries such as Australia, Bulgaria, India, and Japan contributed only one publication each. This distribution pattern indicates that research on the Google effect is not yet globally widespread and instead tends to emerge from nations with advanced technological infrastructures and high levels of internet access. Such a concentration highlights a clear geographical bias, as well as significant opportunities for expanding research to underrepresented regions (Brabazon, 2006; Gilbert, 2024; Gong & Yang, 2024).

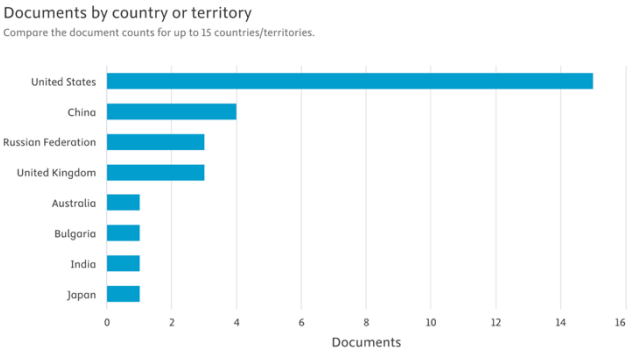


Figure 3. Documents by country territory

The current literature on the Google effect and generative AI primarily reflects views from technologically advanced societies, missing insights from regions with lower internet access or different digital habits. As a result, global research on this phenomenon is limited in both quantity and geographic diversity. Expanding international and cross-cultural collaborations will allow future studies to better represent worldwide experiences and challenges (Clark, 2025; Fisher et al., 2022). Analysis shows that research on the Google Effect is part of a broader knowledge ecosystem, with clusters in VOSviewer highlighting key topics like cognition, information-seeking, and memory impacts. These patterns help future researchers identify gaps and direct new studies. Using VOSviewer makes

literature mapping clearer and more systematic, offering an overview of global trends in Google Effect research. This approach supports targeted development and deeper theoretical and practical understanding of the phenomenon. (see Figure below)

Figure 4. VOSviewer based on country

VOSviewer mapping indicates the United States leads Google Effect research in both output and collaboration, with China following. Russia and the UK contribute less; the US and UK collaborate frequently, while China and Russia form a distinct cluster. Edge thickness in the visualization shows strong collaboration between China and the US, and between Russia and China, while US-UK and US-Russia links are weaker. Overall, the analysis highlights the US as the central hub, with China, Russia, and the UK forming clusters that underscore the importance of established academic networks. Developing countries like Indonesia have limited participation, signaling opportunities for local researchers, especially given high rates of digital adoption. Rising publication numbers reflect growing interest, and analysis of author affiliations identifies leading institutions and international collaborations.

The main institutions involved in Google Effect research include Lomonosov Moscow State University (3 publications), University of California (2), and others like Santa Cruz, CASA Columbia, SCI-Arc, Unlock, Shanghai Lida University, Rochester Institute of Technology, Zhejiang Normal University, and NC State University (each with 1). This shows dominant contributions from Russian and American institutions, highlighting not only strong global collaboration but also the diversity of perspectives brought by researchers from these leading nations. Such international partnerships enhance the richness and depth of the research, fostering a more comprehensive understanding of the Google Effect by integrating insights from different academic traditions and technological environments. These collaborative efforts are instrumental in shaping the evolving landscape of this research area and emphasizing the importance of cross-border exchanges in advancing knowledge.

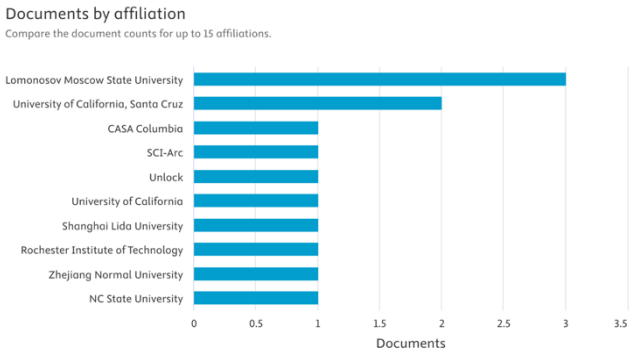


Figure 5. Documents by affiliation

The following is data on scientific fields/journals based on the year of publication. Publications on the Google Effect are distributed across various interdisciplinary academic sources. The earliest article appeared in the journal Science (2011), introducing this phenomenon to the global scientific community. Subsequently, research continued in the field of information technology, as evidenced by publications in the ACM International Conference Proceeding Series (2012, 2021) and CEUR Workshop Proceedings (2021). This topic also attracted attention in the area of environmental policy, as shown by a publication in Clean Technologies and Environmental Policy (2018), indicating the application of the Google Effect beyond pure psychology. Most recently, an article in Frontiers in Artificial Intelligence and Applications (2024) demonstrates that this phenomenon is now considered relevant in the context of artificial intelligence development. With this sporadic yet interdisciplinary distribution, the Google Effect has not yet become a mainstream research topic; however, it opens significant opportunities for future interdisciplinary exploration.

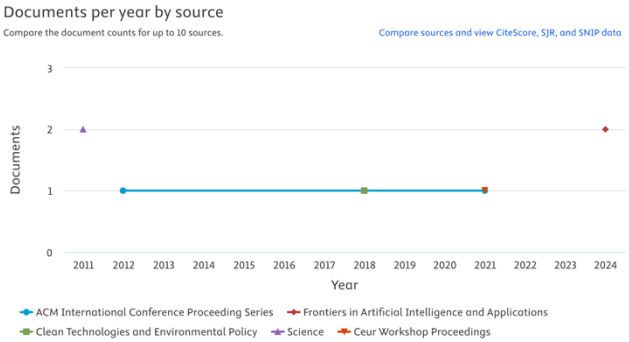


Figure 6. Documents per year by source

Research on the Google Effect is primarily led by Storm, B.C. (3 publications), with significant contributions from Bjork, E.L., Bjork, R.A., Giebl, S., Mena, S., and Vzorin, G. (2 each). Other authors like Artman, N., Bankov, K., Bohannon, J., and Brabazon, T. have published once, reflecting limited interdisciplinary expanion so far. This concentration among a few researchers highlights the need for broader involvement and interdisciplinary collaboration in future studies on the Google Effect. Expanding participation to include experts from fields such as education, information management, psychology, artificial intelligence, and digital humanities can help generate more comprehensive and diverse insights. By engaging researchers with varied backgrounds and perspectives, future investigations can better address the multifaceted impacts of the Google Effect on learning, memory, technology use, and digital behavior. Such an inclusive approach will not only enrich the academic discourse but also ensure that findings are relevant and applicable to a wider range of real-world contexts, ultimately advancing both theoretical understanding and practical applications of this phenomenon.

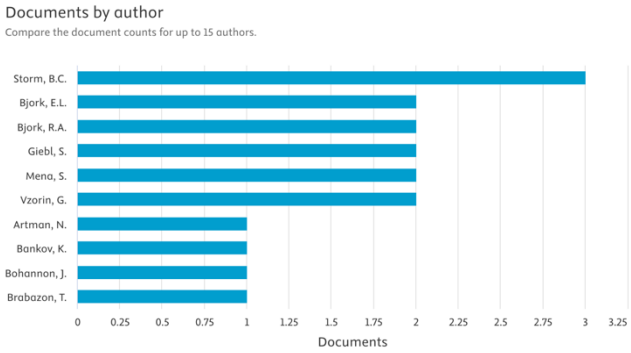
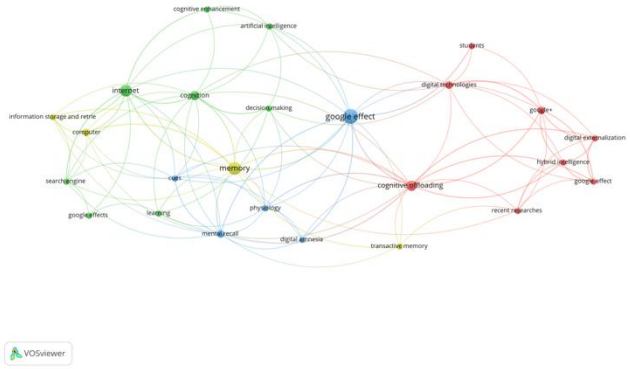


Figure 7. Documents by author

The third question (QR3) asks whether the Google Effect will become a new trend in future literature studies. With the rapid rise of digital technology and AI, it is likely the Google Effect will evolve and gain more academic interest. Research using VOS Viewer, as indicated by the link strength graph shows that although studies on the Google Effect are still relatively limited, there is already a discernible thread connecting this phenomenon to various fields of study, such as cognitive psychology, digital education, and information literacy. The emerging pattern of connections suggests that this issue has significant potential to become one of the rapidly developing research areas in the future. The closer this phenomenon is linked to other topics, the greater its potential to become a rich new source of scientific exploration. (see Figure below)



With the accelerating advancement of digital technology and AI, the Google Effect has the potential not only to remain a temporary psychological phenomenon but also to develop into a new conceptual framework for understanding how humans interact with knowledge. Questions such as: will humans increasingly rely on external memory? what is the impact on long-term memory retention? are new cognitive compensation mechanisms emerging? all open up broad avenues for further research. Therefore, this graph can be interpreted as an early indicator that the Google Effect has great potential to become an increasingly significant research field and to generate new literature in the coming decade.

CONCLUSION

This study concludes that Google Effect is increasingly establishing itself as a critical and growing domain in the digital cognition research landscape. Preliminary studies have generally focused on their potential adverse impacts, particularly on an individual's memory retention ability, suggesting that easy access to online information can weaken the need to store knowledge internally. However, recent research is beginning to highlight the cognitive efficiency that is possible through memory offloading, which is when individuals strategically rely on digital resources to optimize mental load and improve problem-solving abilities. Bibliometric analysis showed a significant increase in the number of publications related to the Google Effect, indicating an increase in academic interest and cross-disciplinary engagement. Despite this, research contributions are still concentrated in a few leading countries and institutions, while developing regions, despite having high levels of digital technology adoption are still underrepresented. This inequality underscores the need for broader international collaboration and the engagement of more diverse perspectives to produce a more comprehensive understanding of this phenomenon.

Going forward, further research needs to prioritize the expansion of cross-cultural studies to explore how the Google Effect manifests in different sociocultural and technological contexts. The integration of approaches from cognitive ergonomics can help identify strategies for designing user interfaces and digital environments that align with human cognitive strengths while mitigating their potential weaknesses. In addition, there is an urgent need to investigate the implications of the Google Effect on the digital learning environment, the integration of AI-assisted cognition, and the development of strong information literacy skills, areas that are increasingly relevant as digital technologies and AI continue to transform the way humans interact with information. By fostering inclusive, interdisciplinary, and cross-border collaboration, the field can move toward a richer and deeper understanding of the impact of Google Effect on learning, memory, knowledge acquisition, and digital behavior. Such efforts will not only enrich the theoretical framework but also provide practical implications for supporting effective adaptation to the rapidly changing information landscape.

REFERENCES

Artman, N. (2020). Applying the cognitive theory of multimedia learning: Using the addie model to enhance instructional video. *Explorations in Media Ecology*, *19*(3), 371–380. https://doi.org/10.1386/eme_00054_1

Brabazon, T. (2006). The Google effect: Googling, blogging, wikis and the flattening of expertise. *Libri*, *56*(3), 157–167. https://doi.org/10.1515/LIBR.2006.157

Chen, Y., Wang, Y., Wüstenberg, T., Kizilcec, R. F., Fan, Y., Li, Y., Lu, B., Yuan, M., Zhang, J., Zhang, Z., Geldsetzer, P., Chen, S., & Bärnighausen, T. (2025). Effects of generative artificial intelligence on cognitive

effort and task performance: study protocol for a randomized controlled experiment among college students. *Trials*, *26*(1), 244. https://doi.org/10.1186/s13063-025-08950-3

Cikurel, D. (2024). How does perceived ease of information access affect investors' judgments? *Contemporary Accounting Research*, *41*(4), 2325–2353. https://doi.org/10.1111/1911-3846.12979

Clark, A. (2025). Extending Minds with Generative AI. *Nature Communications*, *16*(1), 4627. https://doi.org/10.1038/s41467-025-59906-9

Dempsey, R. P., Coin, A., & Dubljević, V. (2024). Is the Internet a Cognitive Enhancement? *Journal of Cognitive Enhancement*, *8*(1–2), 155–169. https://doi.org/10.1007/s41465-024-00289-y

Dong, G., & Potenza, M. N. (2016). Internet Searching and Memory Processing During a Recollection fMRI Task: Evidence from Pseudo Recollected Trials. *Journal of Technology in Behavioral Science*, *1*(1–4), 32–36. https://doi.org/10.1007/s41347-016-0002-2

Feng, Y., Qiu, L., & Sun, B. (2021). Internet and Cognition-Based Decision Making: A Survey. *ACM International Conference Proceeding Series*, 50–54. https://doi.org/10.1145/3503181.3503190

Fisher, M., Smiley, A. H., & Grillo, T. L. H. (2022). Information without knowledge: the effects of Internet search on learning. *Memory*, *30*, 375–387. https://doi.org/10.1080/09658211.2021.1882501

Giebl, S., Mena, S., Storm, B. C., Bjork, E. L., & Bjork, R. A. (2021). Answer First or Google First? Using the Internet in ways that Enhance, not Impair, One's Subsequent Retention of Needed Information. *Psychology Learning and Teaching*, *20*(1), 58–75. https://doi.org/10.1177/1475725720961593

Gilbert, S. J. (2024). Cognitive offloading is value-based decision making: Modelling cognitive effort and the expected value of memory. *Cognition*, *247*. https://doi.org/10.1016/j.cognition.2024.105783

Gong, C., & Yang, Y. (2024). Google effects on memory: a meta-analytical review of the media effects of intensive Internet search behavior. *Frontiers in Public Health*, *12*. https://doi.org/10.3389/fpubh.2024.1332030

Heersmink, R. (2016). The Internet, Cognitive Enhancement, and the Values of Cognition. *Minds and Machines*, *26*(4), 389–407. https://doi.org/10.1007/s11023-016-9404-3

Kahn, A. S., & Martinez, T. M. (2020). Text and you might miss it? Snap and you might remember? Exploring "Google effects on memory" and cognitive self-esteem in the context of Snapchat and text messaging. *Computers in Human Behavior*, *104*. https://doi.org/10.1016/j.chb.2019.106166

Robert, S. J., & Kadhiravan, S. (2022). Prevalence of digital amnesia, somatic symptoms and sleep disorders among youth during COVID-19 pandemic. *Heliyon*, *8*(8). https://doi.org/10.1016/j.heliyon.2022.e10026

Schooler, J. N., & Storm, B. C. (2021). Saved information is remembered less well than deleted information, if the saving process is perceived as reliable. *Memory*, *29*(9), 1101–1110. https://doi.org/10.1080/09658211.2021.1962356

Sikdar, S. K. (2018). Artificial intelligence, its impact on innovation, and the Google effect. *Clean Technologies and Environmental Policy*, *20*(1). https://doi.org/10.10098-017-1478-y

Sparrow, B., Liu, J., & Wegner, D. M. (2011). Google effects on memory: Cognitive consequences of having information at our fingertips. *Science*, *333*(6043), 776–778. https://doi.org/10.1126/science.1207745

Stacey, C. (2017). Rehabilitation in the internet age: The Google-effect and the disclosure of criminal records. *Probation Journal*, *64*(3), 269–275. https://doi.org/10.1177/0264550517711280

Sugimoto, M., Kusumi, T., Nagata, N., & Ishikawa, T. (2022). Online mobile map effect: how smartphone map use impairs spatial memory. *Spatial Cognition and Computation*, *22*(1–2), 161–183. https://doi.org/10.1080/13875868.2021.1969401

Varshney, L. R. (2012). The Google effect in doctoral theses. *Scientometrics*, *92*(3), 785–793. https://doi.org/10.1007/s11192-012-0654-4

Vzorin, G. D., Petrova, V., & Sedykh, A. V. (2024). ChatGPT May Foster Human Gist Memory while Offloading Less Sufficient Information. *Frontiers in Artificial Intelligence and Applications*, *386*, 485–487. https://doi.org/10.3233/FAIA240232

Yacci, M., & Rozanski, E. P. (2012). Student information consumption strategies: Implications of the Google effect. *ACM International Conference Proceeding Series*, 248–253. https://doi.org/10.1145/2132176.2132208