

Research Article

Neuropsychiatric Implications of AI Overexposure: The Potential for Cognitive Decline and Alzheimer's Neuropathology

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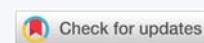
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Abstract

Artificial intelligence (AI) is rapidly reshaping human life by influencing how people think, process information, and make decisions. While its expanding presence across modern society offers significant advantages, this narrative Letter to the Editor interpretively examines whether unregulated dependence on AI may jeopardize cognitive well-being. Emerging, largely correlational evidence suggests that prolonged and passive use of AI tools is associated with cognitive offloading, weakened memory, heightened stress, and reduced problem-solving ability, although a direct causal relationship remains unestablished. EEG and neuroimaging findings, including reduced hippocampal activation during offloaded tasks, raise questions about early changes resembling Alzheimer's neuropathology, alongside concerns such as sleep disruption, neuroinflammation, and diminished intrinsic neural engagement. Yet AI also holds promise for detecting early neurodegenerative risk and supporting brain-health research. This editorial examines this dual reality and argues these potential harms warrant timely attention rather than alarm. Stakeholder-specific strategies spanning individual digital hygiene, developer-level design features, policy guidelines, and longitudinal research are proposed, together with clear guidelines limiting passive and prolonged use, to balance innovation with caution. Protecting neural stability requires deliberate, evidence-informed action before increasing AI dependence becomes an entrenched public health concern.

Introduction

AI has become an integral part of daily life, but excessive dependence on it is increasingly linked to issues such as weakened memory, reduced attention span, and diminished creativity, ultimately promoting cognitive decline. A recent study involving 500 individuals identified as AI overusers reported troubling findings: 66% experienced anxiety, 91% suffered from information overload with prolonged use, 67% reported exhaustion, and 36% noted a decline in confidence, all contributing to a deterioration of cognitive skills [1].

Beyond these immediate effects, excessive AI use may interfere with brain development and disrupt sleep

patterns, damaging critical neural connections and leading to difficulties in daily functioning—symptoms that resemble early neurological features seen in Alzheimer's disease. General screen time has already been associated with reduced language development, lower creativity, and decreased physical activity. The Alzheimer's Association estimates that the prevalence of Alzheimer's disease may rise to 13.8 million by 2050 [2]. These alarming trends raise important concerns about how long-term AI use could impact neurological function and overall mental health.

Method: literature search and strategy

This manuscript is a Letter to the Editor that uses



narrative style to interpretively discuss the possibility of neuropsychiatric and cognitive effects due to excessive AI exposure. Associated literature was manually chosen from scientific reports, research articles and reviews that are relevant to AI use, digital technology, cognitive overload, neuroplasticity, and neurodegenerative mechanisms. The possible relation between AI overexposure and cognitive health in the refereed studies/articles were thoroughly reviewed and descriptively synthesised. The findings in this review are exploratory and meant to highlight the possible association; they are not proven experimental evidence, primary data analysis or metaanalysis of the direct relation between AI exposure and Alziehmer’s disease pathology.

Mitigation strategies and policy imperatives

AI provides significant advantages for individuals with cognitive impairments. Nevertheless, excessive reliance among cognitively intact people reduces cognitive resilience through dependence and cognitive offloading; however, a causal relationship with reduced cognitive resilience has not been established [3,4]. The challenge is not AI itself, but rather passive use that displaces active mental engagement. Empirical evidence supports this concern. In an electroencephalography (EEG)-based study involving 54 participants, investigating AI-assisted written essays, reports variation in neural engagement between participants who performed the task independently and the participants who relied on AI assistance. The study was suggestive of decreased cognitive engagement showcasing increased reliability on external aids during AI assisted tasks. Higher neural activity, better creativity, stronger memory retention, and greater ownership of their work was exhibited in those without AI assistance. In contrast, large language model (LLM)-assisted users showed diminished brain activity, less originality, and increased reliance on AI over time, described as “metacognitive laziness” [3].

Personal strategies: At the individual level, approaches like “digital sabbaths,” limiting AI use for retention and navigation, and participating in cognitive exercises deliberately might support active cognitive engagement [3]. However, their effects on neuroplasticity and long-term cognitive health require empirical evaluation. Simple interventions like performing mental calculations without AI aid could act as mental workouts that may help preserve cognitive agility, although their long-term protective effects remain uncertain.

Developer-level measures: Developers can embed features that enhance cognitive growth rather than passive consumption, like untegrating recall prompts, challenge-based tasks, built-in friction and dashboards that highlight potentially harmful patterns of use. These strategies are suggested approaches instead of proven interventions that offer lasting cognitive advantages [4].

Policy interventions: The World Health Organization

(WHO) has issued digital health guidelines addressing privacy and safe engagement whilst UNESCO has developed ethical frameworks for AI in education and emphasizing human oversight [5]. Evidence-based recommendations for suitable AI interaction could be created by elaborating on these ideas. These frameworks should integrate measurable metrics such as

- 1. Usage budgets & time limits: track and manage passive AI usage.
- 2. Cognitive hygiene metrics: monitor ratio of cognitive offloading vs. active mental engagement [4].

Regulatory supervision may also be necessary in order to address invalidated AI elements that are being promoted for boosting cognition, especially those aimed at vulnerable populations [4].

Research imperatives: Research funding should prioritize longitudinal studies to examine the effects of sustained AI exposure on brain aging and neurodevelopment [3].

In sum, AI should be looked at not as an adversary but as a tool whose impact on cognitive health may depend on how consciously and strategically it is integrated into daily life.

Table 1 summarizes recommended mitigation strategies for managing cognitive impacts of AI across different stakeholder groups [3,4].

Cognitive offloading and neurological vulnerability

Recent studies in cognitive neuroscience raise concerns about the long-term effects of habitual reliance on external resources for mentally demanding tasks. Hippocampal function, which depends on interpretation, sustained attention, critical thinking, spatial navigation, memory encoding, and problem solving, shows reduced engagement when these functions are consistently outsourced. Neuroimaging suggests that this underactivation resembles early Alzheimer’s pathology, indicating potential reductions in synaptic plasticity within hippocampal circuits. MRI studies also report roughly a 30 percent decrease in hippocampal activation when individuals offload mnemonic or navigation tasks rather than performing them directly, which may impair neuroplasticity, diminish learning capacity, and increase vulnerability to age-related memory decline [6]; suggesting that dependence on external

Table 1		
Stakeholder	Recommended actions	Expected benefits
Individual	Practice digital sabbaths; set AI-use time limits; engage in memory and problem solving exercises.	Enhances cognitive resilience and reduces mental dependency
Developer	Include recall prompts, challenge-based features, and usage dashboards	Encourages active engagement and supports healthier AI habits
Policymaker	Issue WHO/UNESCO-style AI-use guidelines; regulate unvalidated cognitive enhancement applications	Ensures safe use and protects vulnerable populations
Researcher	Conduct longitudinal and neuroimaging studies on sustained AI exposure	Builds evidence base for cognitive health and informs policy design



assistance may enhance quick performance meanwhile potentially reducing memory engagement during the tasks involving learning.

Reward-related neural pathways may be engaged by continuous stimulation provided by the digital platforms, however the precise effects of AI-mediated activity on these systems is still uncertain. This shift toward short-term reward fragments attention, weakens impulse control, and increases emotional volatility, all of which are associated with accelerated cognitive decline. Over time, stronger digital stimuli are needed to achieve the same reward, encouraging compulsive device use and replacing intrinsically rewarding non-digital activities [7]. The ease of AI assistance can further discourage cognitive effort and promote reflexive screen use, particularly in the evening when fatigue lowers self-regulation. Blue light exposure suppresses melatonin, delays sleep onset, and disrupts slow wave sleep, leading to impaired memory consolidation, reduced emotional regulation, and diminished cognitive performance. Because slow wave sleep supports glymphatic clearance of neurotoxic waste such as amyloid beta, chronic disruption of sleep has been linked with reduced efficiency of glymphatic clearance and elevated neurodegenerative risk markers. Although it requires further research to evaluate whether AI-related behaviors cause similar effects [8].

Chronic digital engagement also activates the hypothalamic pituitary adrenal axis, increasing cortisol levels and damaging hippocampal neurons. Microglia release proinflammatory cytokines, including interleukin 6 and tumor necrosis factor alpha, which can cross the blood-brain barrier and initiate neuroinflammatory processes. This inflammation disrupts synaptic integrity, compromises neuronal survival, and accelerates apoptosis, contributing to early cognitive decline, memory impairment, and mood dysregulation [9]. Heavy digital users report difficulties with recall, short-term memory, processing speed, and emotional stability. However, these findings remain correlational, and without long-term, large-scale studies, it is unclear whether these symptoms represent reversible digital dementia, like fatigue or early neurodegenerative change. Further research is needed to establish safe digital use thresholds and to distinguish transient cognitive offloading from true dementia.

Conclusion

The benefits of AI in daily life are undeniable, yet

excessive and unregulated use may pose risks to cognitive health, including diminished mental resilience and potential links to Alzheimer's-related neuropsychiatric changes. As demonstrated by Neuro imaging, Alzheimer's pathology has also been linked to decreased synaptic plasticity due to underactivation of hippocampal function because of increased reliance on AI for cognitively intensive tasks. As stated earlier, different studies have shown that the individuals who don't rely on AI show higher neural activity, better creativity and stronger memory. Addressing these concerns requires timely, coordinated action. Hence, every individual should try to practice digital hygiene, try to engage in deliberate cognitive exercises to help preserve memory and neuroplasticity.

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