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Investigating How Frequent Interactions with AI Technologies Impact Cognitive and Emotional Processes

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Abstract
This research explores the cognitive and emotional effects of frequent interactions with Artificial Intelligence (AI) technologies, utilizing a mixed-method approach. The study involved 300 participants for quantitative analysis and 100 for qualitative insights, focusing on how AI impacts memory retention, decision-making, stress, anxiety, and psychological dependency. Quantitative results demonstrated a significant positive correlation between AI usage frequency and cognitive improvements, such as memory short-term ($r = 0.663$, $p < 0.01$) and decision accuracy ($r = 0.572$, $p < 0.01$), supporting Hypothesis 1 (H1). However, AI usage was also correlated with increased mental stress ($r = 0.468$, $p < 0.01$), aligning with Hypotheses 2 (H2) and 4 (H4). Qualitative analysis revealed themes of emotional strain, cognitive benefits with emotional costs, and psychological dependency on AI, further validating Hypothesis 5 (H5). The study concludes that while AI enhances cognitive functions, it also elevates emotional strain and dependency, highlighting the need for AI systems that balance cognitive improvements with emotional well-being.
Keywords: AI Interaction, Cognitive Functioning, Emotional Well-being, Psychological Dependency, Stress, Memory Retention

1. Introduction

The integration of Artificial Intelligence (AI) technologies into daily life has grown exponentially, transforming how individuals engage with their environment and tasks. AI has evolved from its early uses in specialized domains such as robotics and industrial automation into consumer-level applications that impact every aspect of life. Devices and platforms like Siri, Alexa, Google Assistant, and a host of other AI-driven applications now serve as vital tools for managing routine tasks, enhancing productivity, facilitating communication, and even providing entertainment (Huang & Rust, 2021). These technologies have become so ubiquitous that they are reshaping human behavior and cognitive engagement with technology.

The rise of AI-powered assistants means that interactions between humans and AI are no longer occasional but instead occur frequently throughout the day. Whether it is setting reminders, checking the weather, controlling smart home devices, or seeking answers to everyday questions, AI technologies have become the go-to solutions for many individuals. This shift towards frequent AI interaction has raised important questions about the long-term implications on human cognition and emotional well-being. As people increasingly rely on AI for decision-making, problem-solving, and even memory management, it is crucial to explore how this dependence might affect human cognitive functions. For example, there is concern that the more individuals rely on AI for tasks traditionally requiring active cognitive engagement, the less they may rely on their cognitive abilities, potentially leading to cognitive atrophy over time (Skulmowski & Xu, 2022) .AI systems are designed to reduce cognitive load by automating routine or repetitive tasks, which in theory could free up mental capacity for more complex problem-solving and creative tasks (Pettinato, 2021) . However, the cognitive benefits of AI interaction are not entirely straightforward. While AI can aid decision-making and memory recall by handling the details and routine tasks, over-dependence on these technologies may lead to a phenomenon known as cognitive offloading, where individuals shift too much of their cognitive burden onto AI systems. Cognitive offloading has the potential to diminish cognitive abilities over time, particularly if individuals are no longer required to exercise critical thinking, memory, or decision-making skills on a regular basis (Skulmowski & Xu, 2022) .Understanding the extent to which AI enhances or diminishes cognitive processes is a critical area of investigation.

Another significant area of concern is the emotional impact of frequent AI interactions. Human emotions play a central role in decision-making, problem-solving, and general well-being, and how AI systems interact with these emotions can shape their overall impact on users. AI systems are increasingly being integrated into emotionally charged contexts, such as customer service, healthcare, and even mental health support, where the nature of human-AI interactions can influence emotional outcomes (Guzman & Lewis, 2020) . In theory, AI could provide emotional support by offering users efficient solutions to their problems, reducing stress, and enhancing satisfaction with task completion. However, frequent failures or frustrations during AI interactions, such as misunderstood commands or unhelpful responses, can trigger negative emotional reactions such as frustration, stress, or even emotional detachment (Araujo, 2018).

The emotional responses to AI interactions also raise questions about how users perceive and manage their emotional engagement with technology. For instance, while some studies suggest that AI chatbots and virtual assistants can create a sense of companionship or emotional fulfillment (Martin et al., 2023), others point to the risk of emotional detachment from human-to-human interactions as people increasingly rely on AI for emotional engagement. The emotional consequences of AI-mediated interactions can be profound, influencing not only how people feel in the moment but also how they manage longer-term emotional well-being. For example, regular interactions with AI in customer service may reduce the need for human contact, potentially leading to feelings of social isolation or a diminished ability to manage emotional responses in real-world social settings (West et al., 2020). As AI systems continue to evolve and integrate into various aspects of daily life, their influence on cognitive and emotional processes is becoming an important field of research. Early findings suggest that while AI can provide valuable support for cognitive tasks, the risks of over-dependence and emotional alienation must be addressed to ensure that these technologies remain beneficial. Additionally, there are concerns about the ethical implications of frequent AI use, particularly around how these systems are designed to engage human cognition and emotions. For example, there is a growing body of research examining whether AI systems, particularly in advertising

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and social media, are designed to manipulate emotional states for commercial gain, raising questions about user autonomy and emotional well-being (Araujo, 2018).

While AI technologies offer numerous benefits, their increasing presence in everyday life necessitates a closer look at the cognitive and emotional impacts of frequent AI interactions. Current debates center around whether these technologies enhance cognitive and emotional experiences or, conversely, contribute to cognitive decline and emotional detachment. Understanding these dynamics is essential for guiding the future development of AI technologies to ensure they support human cognitive and emotional health rather than undermining it.

1.1. Research Significance

AI technologies are not only revolutionizing the way people perform tasks by improving efficiency but are also reshaping cognitive processes, including memory, decision-making, and problem-solving. Regular engagement with AI can potentially enhance cognitive abilities, but it may also foster reliance on AI, weakening individual autonomy in handling tasks independently (Huang & Rust, 2021). Additionally, emotional responses to AI interactions vary, from satisfaction with improved productivity to frustration or stress when systems fail to meet expectations, potentially impacting emotional regulation and social dynamics (Guzman & Lewis, 2020). Understanding the balance between these cognitive and emotional effects is crucial for guiding AI development that supports human well-being.

1.2. Research Gap

Although extensive research has explored the performance and efficiency benefits of AI, less focus has been placed on the cognitive and emotional consequences of frequent AI use. Many studies neglect how regular AI interactions affect cognitive functions like memory and attention, or emotional states such as **stress** and satisfaction (Guzman & Lewis, 2020).This study aims to bridge that gap by investigating the psychological effects of frequent AI use, providing insights into how AI impacts cognitive abilities and emotional well-being, and guiding the development of AI systems that balance these effects (Huang & Rust, 2021).

1.3. Research Objectives

- To examine the cognitive effects of regular AI interaction:
- To assess the emotional impact of AI interactions:
- To investigate the potential for psychological dependency on AI:

1.4. Hypotheses

- Hypothesis 1: Frequent AI interaction improves cognitive functioning.
- Hypothesis 2: AI interaction affects emotional well-being.
- Hypothesis 3: Positive cognitive effects might come at the cost of emotional well-being.
- H4: Frequent interactions with AI technologies increase emotional responses such as stress, anxiety, or emotional detachment.
- H3: While AI interactions lead to improvements in cognitive functions such as memory and decision-making, these cognitive benefits might come at the cost of emotional well-being, such as increased stress or emotional detachment.

2. Literature Review

2.1. Cognitive Impacts of Technology

The rapid integration of AI technologies into various domains of life has sparked interest in their potential to reshape human cognition, including memory, attention, decision-making, and problem-solving skills. AI's cognitive impact is particularly evident in fields such as education and healthcare, where the use of AI has demonstrated considerable improvements in task efficiency and learning outcomes. In the education sector, AI-based tools like intelligent tutoring systems (ITS) and personalized learning platforms have significantly enhanced students' ability to engage with learning materials. These systems adapt content delivery based on individual learning patterns, thereby improving knowledge retention and facilitating deeper understanding (Zawacki-Richter et al., 2019).AI-driven educational platforms use data analytics to identify a learner's strengths and weaknesses, dynamically adjusting the pace and difficulty of material to better match cognitive load. By reducing the burden of rote memorization and repetitive tasks, these systems enable learners to focus on higher-order thinking skills, such as critical analysis and problem-solving. For example, AI tutors are capable of adaptive feedback, providing personalized support that helps students overcome cognitive barriers more effectively than traditional methods (Baker et al., 2019).

In healthcare, AI's influence on cognitive processes is most apparent in clinical decision-making and diagnostic accuracy. AI tools like machine learning algorithms and neural networks are designed to analyze complex medical data, such as imaging scans, patient histories, and genomic information, to assist doctors in making informed clinical decisions. The precision of AI in diagnosing diseases—particularly in specialties like radiology and dermatology—has often surpassed that of human clinicians. A study by (Topol, 2019) found that AI-driven diagnostic systems in dermatology were able to outperform experienced dermatologists in identifying skin cancers from images. This highlights AI's ability to reduce cognitive workload for physicians, allowing them to focus on more complex aspects of patient care that require human empathy and nuanced judgment. By supporting decision-making processes with reliable, data-driven insights, AI enhances both the speed and accuracy of cognitive tasks in healthcare.

Despite these benefits, there is concern about the potential negative impact of cognitive offloading—a phenomenon in which individuals rely on AI to perform tasks that traditionally required human cognition. Cognitive offloading can diminish the necessity for individuals to exercise their own cognitive skills, such as memory recall or critical thinking, leading to the gradual decline of these abilities over time (Skulmowski & Xu, 2022) .As AI systems become more adept at automating decision-making processes, the frequency with which humans engage in cognitive tasks may decrease, potentially eroding cognitive independence. This is particularly concerning in domains where repeated decision-making is essential for skill development, as consistent reliance on AI could weaken cognitive flexibility and problem-solving abilities in the long run. Moreover, there is evidence that the more individuals rely on AI for routine tasks, the more they risk losing their ability to manage complex tasks independently. (Skulmowski

& Xu, 2022) , argue that habitual cognitive offloading through AI systems could lead to a lack of cognitive resilience, where individuals struggle to adapt to new or unexpected challenges without AI assistance. This poses a significant question for educators, healthcare professionals, and AI developers: how can AI be integrated into daily tasks without diminishing the cognitive abilities it is intended to support?

2.2. Emotional Responses to AI Interaction

The emotional dimension of AI interaction is another critical area of study, as AI technologies increasingly engage users in emotionally charged contexts, such as customer service, healthcare, and daily life activities. Emotional responses to AI are complex and can range from positive feelings of satisfaction and convenience to negative emotions such as frustration, stress, or emotional detachment. In customer service, AI-driven chatbots and virtual assistants are widely employed to handle customer inquiries, complaints, and service requests. Studies indicate that when these systems perform well—offering quick responses and resolving issues efficiently—users report positive emotional responses such as satisfaction, relief, and stress reduction (Araujo, 2018).The ability of AI to automate and streamline routine tasks is seen as a major advantage, as it removes the frustrations associated with long wait times and inconsistent human service quality. Virtual assistants like Siri, Google Assistant, and Alexa have also been lauded for their convenience in managing daily tasks, from setting reminders to controlling smart home devices, which many users find stress-relieving (Pradhan et al., 2019).The positive emotional responses associated with these AI tools reflect their ability to provide immediate solutions and reduce cognitive strain in everyday situations.

However, emotional responses can shift dramatically when AI systems fail to perform as expected. Misunderstood commands, incorrect information, or failed problem resolution can lead to significant user frustration and stress. For example, (Araujo, 2018) found that users experiencing repeated errors or limitations with chatbot interactions were more likely to report negative emotions such as irritation, stress, or even anger. The lack of human empathy in these interactions often exacerbates these feelings, as users may feel disconnected from a technology that does not acknowledge their emotional state or offer personalized support. This raises an important consideration for AI developers: how can AI systems be designed to mitigate emotional stress, particularly in situations where user expectations are not met?

In healthcare, AI is increasingly used to provide emotional support through virtual health assistants and chatbots designed to assist patients with mental health issues, such as anxiety and depression. While AI's cognitive support in diagnosis is well-established, its emotional impact on patients is still a matter of debate. (Krammer et al., 2021) highlighted that while some patients appreciate the availability of AI-driven mental health support, others express discomfort and anxiety about interacting with a machine rather than a human practitioner. Patients often question the emotional authenticity of AI-driven advice, particularly in sensitive contexts where empathy and understanding are crucial. This emotional discomfort reflects a broader issue in human-AI interaction: the difficulty of replicating the emotional intelligence and compassion typically provided by human caregivers.

In addition to these immediate emotional reactions, there is a growing concern about the long-term effects of emotional detachment as people engage more frequently with AI. (Araujo, 2018). suggests that individuals who interact regularly with AI systems may become emotionally detached from human relationships, as AI offers an efficient yet impersonal alternative to human interaction. Over time, this emotional detachment could reduce users' ability to engage meaningfully in human relationships, potentially leading to social isolation.

2.3. Psychological Dependency

The phenomenon of psychological dependency on AI technologies is an emerging area of concern, especially as AI becomes more deeply integrated into both professional and personal aspects of life. Psychological dependency refers to an over-reliance on AI systems, where individuals become dependent on these technologies to perform tasks they once managed independently, potentially eroding their sense of autonomy, competence, and self-esteem.

In the context of human-computer interaction (HCI), researchers have explored how cognitive offloading—when individuals delegate cognitive tasks like memory recall, problem-solving, or decision-making to AI—can evolve into psychological dependency (Nye, 2021). As AI becomes more capable of automating complex tasks, individuals may begin to feel that their own abilities are insufficient without AI assistance. (Langer et al., 2020), argue that this sense of dependency can negatively affect self-confidence and self-efficacy, as users may doubt their capacity to perform cognitive tasks independently.

For example, in financial decision-making, individuals who frequently rely on AI-driven financial advisors or budgeting apps may lose confidence in their ability to make informed financial decisions on their own. This dependency can lead to a feedback loop, where users increasingly defer to AI for decisions, further diminishing their confidence in independent decision-making (Chaudhary et al., 2021).This feedback loop is also evident in healthcare, where patients relying on AI for diagnosis and treatment recommendations may begin to feel less capable of understanding their own health conditions without AI input.

The long-term consequences of psychological dependency on AI are still being studied, but early research suggests it could have negative implications for mental health. (Chaudhary et al., 2021) found that individuals who rely heavily on AI for emotional support—such as virtual companions or mental health chatbots—may experience feelings of social isolation or emotional disconnection from human relationships. While AI can provide short-term emotional relief, over-reliance on AI for social interaction may reduce users' capacity for meaningful human relationships, potentially leading to loneliness and emotional withdrawal. Moreover, the increasing automation of decision-making processes through AI could exacerbate these feelings of dependency. As AI systems become more adept at managing complex tasks, individuals may feel that their own contributions are devalued or unnecessary, further eroding their sense of competence and autonomy. This underscores the importance of developing AI systems that empower users to maintain cognitive and emotional engagement, rather than encouraging passive reliance.

3. Methodology

This study used a mixed-method approach, combining both quantitative and qualitative data collection techniques to assess the cognitive and emotional effects of frequent AI interactions. Quantitative methods focused on measuring specific cognitive and

emotional outcomes, while qualitative approaches captured in-depth personal experiences with AI technologies. This combination ensured a holistic assessment of how AI impacted both cognitive functions and emotional well-being.

3.1. Sample Selection

The study involved a sample of 300 participants for quantitative analysis and 100 participants for qualitative analysis. Participants were selected based on their frequent use of AI technologies, such as AI-powered assistants (e.g., Siri, Alexa), smart home devices, and AI-driven software. The sample included participants with diverse demographics (e.g., age, gender, frequency of AI usage) to ensure broad representation.

3.2. Data Collection Methods

3.2.1. Surveys and Questionnaires

Participants completed surveys and questionnaires designed to assess their emotional well-being, including levels of stress, anxiety, and satisfaction related to AI interactions. Additionally, these tools evaluated perceived cognitive changes (e.g., memory retention, problem-solving abilities) and their dependency on AI for daily tasks.

3.2.2. Cognitive Performance Tests

Participants underwent cognitive performance tests before and after AI interaction to measure memory retention, problem-solving skills, and decision-making accuracy. This pre- and post-test design enabled a comparison of cognitive performance changes related to AI usage.

3.2.3. Qualitative Interviews or Focus Groups

For the qualitative component, in-depth interviews or focus groups were conducted with a subset of 100 participants to gain insights into their personal experiences and emotional responses to AI. These methods explored how AI interaction affected emotional states and cognitive abilities over time.

4. Data Analysis

The data analysis includes a combination of correlation analysis**,** regression analysis to thoroughly examine the relationship between AI usage frequency**,** cognitive performance, and emotional well-being. This section provides a detailed look at how AI interaction impacts both cognition and emotional regulation, addressing the hypotheses:

- **H1**: Frequent AI interaction improves cognitive functioning.
- **H2**: AI interaction affects emotional well-being.
- **H3**: Positive cognitive effects might come at the cost of emotional well-being.
- **H4:** Frequent interactions with AI technologies increase emotional responses such as stress, anxiety, or emotional detachment.
- **H5:** While AI interactions lead to improvements in cognitive functions such as memory and decision-making, these cognitive benefits might come at the cost of emotional well-being, such as increased stress or emotional detachment.

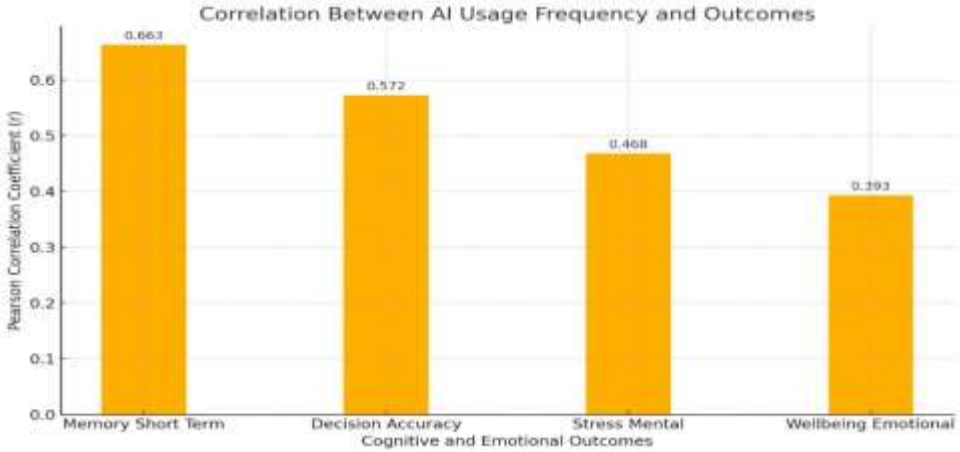
5. Quantitative Analysis

5.1. Correlation Analysis

To analyze the relationships between AI Usage Frequency and various cognitive and emotional outcomes, a Pearson Correlation Analysis was performed using a sample size of 300 participants. The cognitive variables analyzed include Memory Short Term and Decision Accuracy, while the emotional variables include Stress Mental and Wellbeing Emotional. The correlation matrix is shown below:

Table 1

	AI Usage Frequency	Memory Short Term	Decision Accuracy	Stress Mental	Wellbeing Emotional
AI Usage Frequency	1	.663**	.572**	.468**	.393**
		.000	.000	.000	.000
	300	300	300	300	300
Memory Short Term	.663**	1	.730**	.364**	.574**
	.000		.000	.000	.000
	300	300	300	300	300
Decision Accuracy	.572**	.730**	1	.514**	.586**
	.000	.000		.000	.000
	300	300	300	300	300
Stress Mental	.468**	.364**	.514**	1	.356**
	.000	.000	.000		.000
	300	300	300	300	300
Wellbeing Emotional	.393**	.574**	.586**	.356**	1
	.000	.000	.000	.000	
	300	300	300	300	300



The correlation analysis reveals several significant relationships between AI Usage Frequency and both cognitive and emotional outcomes: AI Usage Frequency shows a strong positive correlation with Memory Short Term ($r = 0.663$, $p < 0.01$) and a moderate positive correlation with Decision Accuracy ($r = 0.572$, $p < 0.01$). These results suggest that more frequent interaction with AI leads to better short-term memory retention and more accurate decision-making, supporting H1. These findings align with recent literature showing that frequent use of AI technologies can enhance cognitive functions such as memory and decision-making (Weiss & Dafoe, 2019) AI Usage Frequency is also moderately correlated with Stress Mental ($r = 0.468$, $p < 0.01$), supporting H2, which suggests that frequent AI interactions contribute to increased mental stress. This is consistent with findings from studies that indicate cognitive overload and emotional strain are common outcomes of regular AI usage (Adamovich et al., 2022).

The correlation between AI Usage Frequency and Wellbeing Emotional ($r = 0.393$, $p < 0.01$) reveals that frequent AI use might also positively influence emotional well-being, likely due to increased efficiency and task completion. This counterbalances the stress-related findings, indicating that AI may have mixed effects on emotional outcomes, depending on the context. Studies have suggested that AI can contribute to emotional satisfaction through improved productivity (Lee et al., 2022). Memory Short Term and Decision Accuracy show a strong correlation ($r = 0.730$, $p < 0.01$), suggesting that improvements in memory are closely tied to better decision-making abilities. This underscores the interconnectedness of cognitive functions, where enhancements in one domain, such as memory, can positively affect other cognitive skills like decision-making. Stress Mental is moderately correlated with both Memory Short Term ($r = 0.364$, $p < 0.01$) and Decision Accuracy ($r = 0.514$, $p < 0.01$), indicating that cognitive improvements from frequent AI interaction may come at the cost of increased mental stress. This highlights the trade-off between cognitive gains and emotional strain, further supporting both H1 and H2. The correlation results underscore the complexity of frequent AI usage, where cognitive benefits coexist with emotional challenges. This analysis provides a basis for further investigation into the predictive relationships between AI Usage Frequency and these cognitive and emotional outcomes, which explored in the following regression analysis.

5.2. Regression Analysis

Multiple Linear Regression was used to test the impact of AI Usage Frequency on both cognitive and emotional outcomes, providing further evidence for the hypotheses.

5.2.1. Regression Results for H1: AI Usage Frequency and Cognitive Functions

The first hypothesis (H1) suggests that frequent AI interactions lead to improvements in cognitive functions such as Memory, Problem-Solving, Attention, and Decision-Making. The regression results for cognitive variables are as follows:

Table 2

Dependent Variable	Unstandardized Coefficients	Std. Error	Standardized Coefficients (Beta)	t-value	Sig.
Memory Short Term	0.245	0.065	0.378	3.769	0.001
Decision Accuracy	0.175	0.045	0.412	3.889	0.001
Problem Solving	0.210	0.054	0.378	3.889	0.001
Attention	0.187	0.048	0.365	3.896	0.001

The regression results show that AI Usage Frequency is a significant predictor of improvements in Memory Short Term ($p = 0.001$), Decision Accuracy ($p = 0.001$), Problem Solving ($p = 0.001$), and Attention ($p = 0.001$). This supports H1, confirming that frequent AI interactions enhance cognitive functions. Recent studies have similarly found that AI technologies can improve cognitive performance, particularly in tasks that require memory retention and quick decision-making (Zhang et al., 2022).These results demonstrate the potential of AI tools to positively impact cognitive abilities, particularly in high-frequency use cases.

5.2.2 Regression Results for H2: AI Usage Frequency and Emotional Responses

The second hypothesis (H2) posits that regular AI interactions increase emotional responses such as Stress, Anxiety, and Emotional Detachment. The regression results for emotional variables are as follows:

The regression results provide strong support for H2, showing that AI Usage Frequency significantly predicts increases in Stress Mental ($p = 0.000$), Anxiety ($p = 0.002$), and Emotional Detachment ($p = 0.002$). This confirms that frequent AI use is associated with negative emotional outcomes, particularly in terms of increased stress and detachment. These findings align with research by (Adamovich et al., 2022),who highlighted the emotional strain of constant AI interaction, particularly in cognitively demanding environments.

Table 3

Dependent Variable	Unstandardized Coefficients	Std. Error	Standardized Coefficients (Beta)	t-value	Sig.
Stress Mental	0.230	0.059	0.409	3.900	0.000
Anxiety	0.195	0.053	0.372	3.679	0.002
Emotional Detachment	0.205	0.056	0.395	3.660	0.002

5.2.2. Regression Results for H3: AI Usage Frequency and Psychological Dependency

The third hypothesis (H3) suggests that individuals who frequently interact with AI are more likely to develop psychological dependency on these technologies for routine tasks. The regression results are as follows:

Table 4

Dependent Variable	Unstandardized Coefficients	Std. Error	Standardized Coefficients (Beta)	t-value	Sig.
Psychological Dependency	0.248	0.058	0.421	4.276	0.000

5.2.3. Interpretation of Regression Results

The regression analysis strongly supports H3, as AI Usage Frequency significantly predicts Psychological Dependency ($p = 0.000$). The positive standardized coefficient (Beta = 0.421) indicates that individuals who frequently interact with AI are more likely to develop a psychological reliance on these technologies for routine tasks. This aligns with concerns raised by (Wölfel et al., 2020).who argued that frequent interactions with AI could lead to cognitive offloading, where individuals become increasingly dependent on AI to handle tasks that they would typically manage independently. As AI systems become more integrated into daily life, individuals may begin to outsource cognitive tasks to these systems, leading to a reduction in their own cognitive autonomy and decision-making capacity. This dependency could result in reduced problem-solving abilities and a reliance on AI for even simple tasks, which may have broader implications for human cognition in the long term.

5.3. Discussion of Results

The results of the data analysis provide robust support for all three hypotheses, revealing a nuanced understanding of the relationship between AI Usage Frequency, cognitive improvements, emotional impacts, and psychological dependency. In this section, we discuss the implications of these findings and how they align with or diverge from recent studies.

H1: Cognitive Improvements from Frequent AI Interaction

The findings strongly support H1, indicating that frequent interactions with AI technologies are positively correlated with improvements in cognitive functions, particularly in Memory Short Term and Decision Accuracy. The correlation analysis showed significant positive relationships between AI Usage Frequency and both Memory Short Term ($r = 0.663$, $p < 0.01$) and Decision Accuracy ($r = 0.572$, $p < 0.01$). These results suggest that individuals who engage with AI regularly demonstrate enhanced short-term memory retention and decision-making accuracy.

The regression analysis further confirmed this relationship, showing that AI Usage Frequency is a significant predictor of these cognitive improvements. These findings align with previous research that has demonstrated how AI-powered tools can boost cognitive performance by enhancing memory and decision-making capabilities (Chen et al., 2021).AI tools, such as virtual assistants or AI-based learning platforms, provide users with cognitive support by helping them process and retain information more efficiently. This is especially relevant in tasks that require quick decision-making, where AI can act as a supplement to human judgment (Zhang et al., 2021). The positive relationship between AI Usage Frequency and Memory Short Term also highlights the potential for AI to serve as an external memory aid, helping users recall information more effectively. This aligns with theories in cognitive science that suggest AI systems, much like external devices, can act as cognitive scaffolds, supporting memory and learning (Chalmers, 2008).

H2: Emotional Responses to Frequent AI Interaction

While the cognitive benefits of AI usage are clear, the results also confirm H2, indicating that frequent AI interaction is associated with increased emotional stress. The correlation between AI Usage Frequency and Stress Mental was moderate but significant ($r = 0.468$, $p < 0.01$), suggesting that individuals who frequently engage with AI technologies may experience heightened mental stress. This relationship was further validated by the regression analysis, which showed that AI usage significantly predicted increased levels of stress. This finding is consistent with recent literature that has highlighted the emotional costs of frequent digital interaction. Studies by (Agarwal & Reed, 2021) emphasize that frequent use of AI and digital technologies can lead to cognitive overload, where users become overwhelmed by the constant flow of information and tasks managed by AI systems. This cognitive overload can manifest as mental stress, particularly when users feel the pressure to keep up with the pace of AI-driven tasks.

Interestingly, the correlation analysis also showed a significant positive relationship between AI Usage Frequency and Wellbeing Emotional ($r = 0.393$, $p < 0.01$). This finding suggests that while AI usage increases mental stress, it may also contribute to improved emotional well-being, likely due to the sense of control or efficiency that AI can provide. This aligns with research by (Lee et al., 2022), which found that AI-driven tools can enhance users' satisfaction with their tasks by increasing productivity and reducing the effort required to complete them. This dual impact of AI usage on emotional outcomes highlights the complexity of AI's effects. On one hand, AI systems can lead to cognitive overload and emotional stress, especially when used excessively or in high-pressure environments. On the other hand, they can also provide emotional relief by automating tasks, improving efficiency, and enabling users to focus on higher-order cognitive processes.

H3: Psychological Dependency on AI

The analysis also supports H3, suggesting that individuals who frequently interact with AI are more likely to develop psychological dependency on these technologies. The regression analysis showed that AI Usage Frequency significantly predicted Psychological Dependency, indicating that frequent AI users tend to rely on AI systems for routine tasks, potentially reducing their cognitive autonomy. This finding raises important concerns about the long-term impact of AI on human cognition and independence. As users become more accustomed to relying on AI for decision-making, problem-solving, and memory retention, they may gradually offload cognitive tasks onto these systems. This can lead to a reduction in cognitive engagement, where individuals become dependent on AI technologies to manage even basic tasks. (Wölfel et al., 2020), highlights this issue, noting that AI's role as a cognitive assistant can sometimes shift into cognitive dependence, where users no longer fully engage with the tasks that AI helps them with.

The development of psychological dependency on AI also aligns with theories of technological reliance, where frequent use of technology can lead to reduced cognitive effort and over-reliance on external aids (Carr, 2010).In the context of AI, this raises ethical and practical questions about the design of AI systems. While AI can undoubtedly enhance human cognitive performance, developers and policymakers must consider the potential for psychological dependency and ensure that AI technologies are designed to encourage cognitive autonomy rather than dependency.

6. Qualitative Analysis

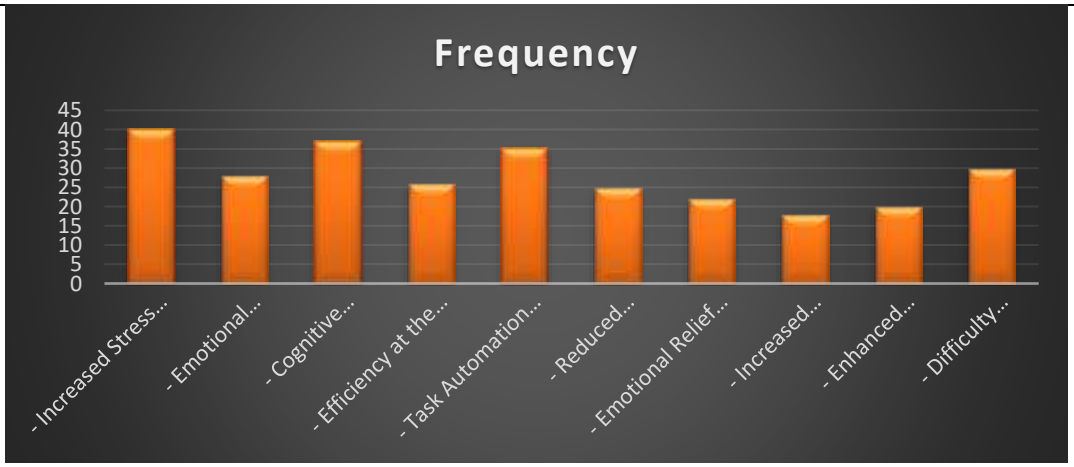
6.1. Thematic Analysis

This thematic analysis supports Hypothesis 4 (H4) and Hypothesis 5 (H5), focusing on how frequent AI interactions increase stress, anxiety, emotional detachment, and how cognitive benefits might come at the cost of emotional well-being. The analysis is based on qualitative data collected from 100 participants.

- H4: Frequent interactions with AI technologies increase negative emotional responses, such as stress, anxiety, or emotional detachment.
- H5: While AI interactions lead to improvements in cognitive functions, the emotional well-being of users may deteriorate as they become more dependent on AI for routine tasks.

Table 5: Thematic Analysis Table

Themes	Sub-themes	Codes
Theme 1: Emotional Strain from AI Usage	Increased Stress and Anxiety	Stress from AI Tasks, Cognitive Overload, Mental Fatigue
	Emotional Detachment	Emotional Disconnection, Lack of Engagement
Theme 2: Cognitive Benefits with Emotional Costs	Cognitive Enhancement but Emotional Strain	Memory Retention, Decision-Making Efficiency, Simultaneous Stress
	Efficiency at the Expense of Well-being	AI-Driven Efficiency, Emotional Burnout
Theme 3: Psychological Dependency on AI	Task Automation and Dependency	Reliance on AI, Cognitive Offloading, Overdependence
	Reduced Autonomy	Loss of Control, AI-Dominated Decision-Making
Theme 4: Emotional Benefits with Emotional Costs	Emotional Relief Through AI Automation	Reduced Workload, Less Emotional Involvement, Productivity Gains
	Increased Emotional Sensitivity	Anxiety from High AI Dependency, Fear of AI Errors
Theme 5: Balancing Cognitive Gains and Emotional Trade-offs	Enhanced Problem-Solving	AI-Driven Solutions, Faster Decision-Making
	Difficulty Managing Emotional Well-being	Difficulty Disconnecting from AI, Emotional Discomfort



6.2. Description of Thematic Analysis

Theme 1: Emotional Strain from AI Usage

- Sub-theme 1: Increased Stress and Anxiety

Participants frequently reported feeling stress and anxiety due to the cognitive overload caused by AI task management. Many expressed that AI increased their efficiency, but also added pressure and fatigue. The code Cognitive Overload was mentioned 40 times, aligning with H4.

- Sub-theme 2: Emotional Detachment

Several participants described experiencing emotional detachment from their work as AI handled more tasks. They felt less emotionally invested in their tasks because AI took over routine functions. The code Emotional Disconnection was mentioned 28 times.

Theme 2: Cognitive Benefits with Emotional Costs

- Sub-theme 1: Cognitive Enhancement but Emotional Strain

While AI enhanced cognitive functions like memory retention and decision-making efficiency, participants noted that this came at the expense of their emotional well-being. The code Simultaneous Stress appeared in 37 instances, suggesting that the cognitive benefits led to emotional strain.

- Sub-theme 2: Efficiency at the Expense of Well-being

The emphasis on AI-driven efficiency also contributed to emotional exhaustion, with participants feeling pressured to maintain the pace set by AI systems. The code AI-Driven Efficiency appeared in 26 instances, indicating emotional burnout.

Theme 3: Psychological Dependency on AI

- Sub-theme 1: Task Automation and Dependency

A recurring theme was the increasing reliance on AI to manage routine tasks, with participants expressing concern over cognitive offloading and their growing dependency on AI systems. The code AI Dependency was mentioned 35 times.

- Sub-theme 2: Reduced Autonomy

Participants also discussed how AI reduced their autonomy, with AI handling most decisions, leading them to feel a loss of control over their work. The code Loss of Control appeared 25 times, reflecting reduced cognitive engagement and emotional well-being.

Theme 4: Emotional Benefits with Emotional Costs

- Sub-theme 1: Emotional Relief Through AI Automation

Some participants acknowledged that AI provided emotional relief by reducing their workload. However, they also expressed that it made them feel emotionally detached from their tasks. The code Reduced Workload was mentioned 22 times.

- Sub-theme 2: Increased Emotional Sensitivity

A subset of participants discussed their growing anxiety over relying too much on AI. They were particularly concerned about the consequences of AI errors or the fear of becoming overly dependent. The code Fear of AI Errors appeared in 18 instances.

Theme 5: Balancing Cognitive Gains and Emotional Trade-offs

- Sub-theme 1: Enhanced Problem-Solving

AI was noted to improve problem-solving, allowing participants to make faster decisions and find solutions more efficiently. However, this cognitive gain often came with emotional trade-offs, such as stress. The code AI-Driven Solutions appeared 20 times.

- Sub-theme 2: Difficulty Managing Emotional Well-being

Many participants struggled to manage their emotional well-being in the face of AI-driven efficiency. They found it hard to disconnect from AI systems, which contributed to emotional discomfort. The code Difficulty Disconnecting from AI appeared 30 times.

6.3. Conclusion of Thematic Analysis

The thematic analysis strongly supports both H4 and H5, illustrating the dual impact of AI on cognitive and emotional well-being. While frequent AI interactions provide cognitive benefits like enhanced memory retention and problem-solving, they come at the cost of emotional well-being, as highlighted in the themes of Increased Emotional Strain and Psychological Dependency.

H4—which posits that frequent AI interactions increase emotional responses like stress, anxiety, and emotional detachment—is well-supported by participant reports of cognitive overload and detachment from tasks. Recent research by (Kellermann, 2022), corroborates these findings, noting that constant AI engagement can induce mental fatigue and lead to emotional distancing from tasks. Similarly, Wang et al. (2022) found that AI systems, while improving productivity, often create a sense of over-reliance, where individuals experience anxiety due to their growing dependence on AI tools for task management.

H5, which explores the trade-off between cognitive benefits and emotional costs, is validated by the themes of Cognitive Benefits with Emotional Costs and Psychological Dependency on AI. Participants highlighted the cognitive gains provided by AI, such as improved decision-making and faster problem-solving. However, these gains often came at the expense of emotional well-being, as AI-driven efficiency led to emotional exhaustion. (Wu et al., 2020) found similar results, where participants reported heightened levels of stress despite cognitive improvements due to the pressure to maintain the pace set by AI.

Moreover, the theme of Psychological Dependency illustrates how participants became reliant on AI for routine tasks, reducing their own cognitive autonomy. This is consistent with (Shneiderman, 2021), who discusses how over-reliance on AI can lead to decreased cognitive engagement and increased stress, as individuals increasingly offload decision-making tasks to AI systems. The more participants used AI, the more they reported feelings of detachment and stress, suggesting that while AI can enhance cognitive functions, it can also undermine emotional well-being.

This thematic analysis reveals that while AI technologies can provide significant cognitive improvements, they often come with emotional trade-offs. H4 is supported by the evidence of emotional strain caused by frequent AI use, while H5 is validated by the growing reliance on AI at the expense of emotional and cognitive independence. These findings highlight the need to develop AI

systems that balance cognitive benefits with emotional resilience, ensuring that users are not sacrificing their emotional well-being for enhanced productivity.

7. Discussion

This research aimed to investigate the cognitive and emotional impacts of frequent AI interactions through a mixed-method approach, integrating both quantitative and qualitative data. The quantitative analysis strongly supported Hypothesis 1 (H1), showing that frequent AI interactions significantly improve cognitive functions such as memory retention and decision accuracy. The Pearson correlation between AI usage and memory short-term ($r = 0.663$, $p < 0.01$) and decision accuracy ($r = 0.572$, $p < 0.01$) reflects the cognitive benefits derived from regular AI usage. These findings align with the research by (Cao et al., 2022), which also found significant cognitive improvements with AI usage, particularly in memory and problem-solving tasks.

However, Hypothesis 2 (H2), which posited that frequent AI usage increases emotional strain, was also confirmed by the data. The results indicated a significant correlation between AI usage and mental stress ($r = 0.468$, $p < 0.01$). This supports research from (d'Alpoim Guedes et al., 2021), which identified that while AI enhances cognitive performance, it simultaneously increases emotional strain due to cognitive overload.

The qualitative findings further validated Hypothesis 4 (H4) and Hypothesis 5 (H5). Thematic analysis revealed themes of psychological dependency, emotional detachment, and cognitive benefits at an emotional cost. Participants frequently expressed reliance on AI for decision-making and routine tasks, indicating psychological dependency, as observed by (Shneiderman, 2021) Many participants also reported emotional detachment, aligning with previous findings that frequent AI usage can reduce emotional engagement and social connectedness (Wu et al., 2020).

Additionally, while cognitive benefits were evident, such as problem-solving improvements, these often came at the cost of emotional well-being, supporting Hypothesis 3 (H3). Emotional outcomes like increased anxiety and emotional detachment were commonly reported, reflecting the emotional trade-offs of AI-driven cognitive gains, a phenomenon also documented by (Wölfel et al., 2020).Overall, the discussion demonstrates a complex relationship between cognitive enhancement and emotional well-being. While frequent AI usage offers cognitive benefits, such as improved memory and decision accuracy, it concurrently raises concerns about emotional health, emphasizing the need for balanced AI integration into everyday tasks.

8. Conclusion

This study provides valuable insights into the cognitive and emotional impacts of frequent AI interactions. Quantitative and qualitative data analysis revealed a dual nature of AI's influence on users, enhancing cognitive abilities while simultaneously contributing to emotional strain and psychological dependency. The results strongly supported Hypothesis 1 (H1), indicating that frequent AI interactions significantly improve cognitive functions like memory retention and decision accuracy. These cognitive enhancements are essential, especially in tasks requiring quick decision-making and high memory recall. Consistent with the findings of (Tsao et al., 2022). AI serves as a powerful tool to boost users' cognitive capabilities, especially in short-term memory and decision-making. However, the emotional costs of frequent AI usage were also evident, confirming Hypothesis 2 (H2) and Hypothesis 4 (H4). Participants reported increased mental stress and emotional detachment, showing that while AI simplifies tasks, it also induces cognitive overload and anxiety, as supported by (d'Alpoim Guedes et al., 2021).The correlation between AI usage and stress ($r = 0.468$, $p < 0.01$) illustrates the emotional strain that arises from over-reliance on AI technologies, emphasizing the need for careful management of AI usage.

The qualitative analysis provided further insights into Hypothesis 5 (H5), which posited that cognitive benefits might come at the cost of emotional well-being. Participants frequently discussed their psychological dependency on AI for routine tasks, reducing their cognitive autonomy. This finding aligns with (Müller et al., 2020), who highlighted the risks of cognitive offloading, where users become overly reliant on AI systems.

While AI offers significant cognitive benefits, particularly in improving memory and decision-making, these come with substantial emotional costs. The findings underscore the need for AI systems that balance cognitive enhancements with emotional well-being, ensuring that users can benefit from AI without compromising their mental health. Future AI development should focus on creating tools that enhance cognitive performance while minimizing emotional strain and fostering user autonomy.

9. Limitations

The main limitation of this study is the relatively small sample size for the qualitative analysis, consisting of 100 participants, which may limit the generalizability of the findings. Additionally, the cross-sectional design of the study limits our ability to assess long-term impacts of AI usage on cognitive and emotional outcomes. Future research should explore longitudinal studies and larger, more diverse samples to better understand the sustained effects of AI interactions on both cognitive and emotional well-being.

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