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A Study on the influence of Internet Use on Students' Attention, Learning and Brain Rewiring

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Abstract: In today's fast-paced world, all kinds of information are available at our fingertips. Digitalization serves as both a reward and a curse for humanity. After the global pandemic, communication methods, especially in the education sector, changed drastically. Nowadays, students are introduced to the internet at an early age, which is a concern for parents. The use of mobile phones has become an important aspect of parenting. The way we use the internet and the type of information we consume have a strong influence on our thinking, attitude, personality, and behavior. Therefore, maintaining a disciplined routine with screens is important. Students today are highly dependent on the internet and can hardly spend a minute without it. The purpose of the study was to understand the effect of the internet on attention, learning, and cognitive flexibility among students. Excessive use of Instagram and short videos such as Reels and Shorts is associated with problems in attention, as these platforms contribute to shorter attention spans and reduced ability to sustain focus. This affects time management and learning efficiency. Cognitive flexibility can develop in both positive and negative ways. The internet also has a significant impact on brain's rewiring, also known as neuroplasticity, as our online habits continuously reshape neural pathways related to attention and emotion. Regular undisciplined internet use can alter brain functions, leading to reduced focus and impaired cognitive control. The study included 33 university students between the ages of 17 and 25. Standardized psychological scales were administered to measure the effect of the internet on attention, learning and cognitive flexibility. The study revealed a positive relationship between attention and learning, which is significant. As students' attention levels increase, their learning performance also improves. Conversely, lower attention levels are associated with poorer learning outcomes. The study found

a non-significant positive relationship between internet use and attention, and a negative but non-significant relationship between internet use and learning. These findings suggest that while internet use may influence students' cognitive processes, the effects are not conclusive, indicating the need for further research.

Keywords : *Internet Use, Attention, Learning, Brain Rewiring, Cognitive Flexibility*

1. Introduction

"*The Internet gave us access to everything; but it also gave everything access to us*"

- James Veitch

We are living in an era where life without phones seems impossible. In every field, technological knowledge has become essential. Humans have also grown emotionally dependent on artificial intelligence. It is ironic that beings once known for their social nature are now losing interest in face-to-face conversations. Many young people mask their true personalities to fit into society or to avoid judgment on social media. People are easily influenced by what they see online, often accepting information or opinions without questioning them. Empathy and concern for others are fading, and as a result, students often isolate themselves, which can harm their mental health and overall well-being. Excessive dependence on the internet also negatively affects practical learning. Limited interaction with teachers and the absence of proper mentorship have become major obstacles to students' academic growth. Therefore, it is essential for students to manage their screen time responsibly and practice self-discipline. Even though technology has reduced physical distance, it's a fact that our hearts and minds have grown farther apart, which is sad.

According to an overview given by Spada (2014), problematic internet use leads to negative life consequences. There are several studies which support the statement that there are high comorbidity rates between problematic internet use (PIU) and psychiatric disorders. To treat this problem, both psychotropic medications and cognitive behavioural therapy are necessary. Since, there is a lack of establishment in the prevalence of PIU in the general population, more research is needed on areas which remain unclear and contribute to the prognosis of PIU.

Aboujaoude (2010) conveyed in his study that problematic internet use (PIU) has high comorbidity rates with mood disorders and, among younger individuals, attention-deficit/hyperactivity disorder. Cognitive-behavioral therapy and selective serotonin reuptake

inhibitors have shown potential in addressing problematic Internet use, though detailed clinical guidelines remain to be established through further research. Since the effects of the internet on our psychology remain understudied, more research is needed into the pathophysiology, epidemiology, natural course, and treatment of problematic Internet use.

According to an article published by Al Jazeera (2025), research findings revealed that young adults are significantly less happy than previous generations, largely attributed to the increased use of social media. The study, conducted across six English-speaking countries, included adolescents and young adults aged 12 to 25. Internet use is not the only factor contributing to this decline in happiness; loneliness and economic instability also play significant roles. To reverse this trend, further research into the underlying causes and potential interventions is necessary.

The purpose of this study is to explore the interrelationship between internet use, attention, learning, and cognitive flexibility among college students. By examining findings from current research and existing literature, it seeks to inform strategies that foster healthier digital habits among youth, enhance cognitive performance by minimizing distractions, and promote a balanced digital lifestyle that supports mindfulness, reduces digital fatigue, and improves the overall well-being of individuals.

Internet Use

According to Shaw and Black (2008), internet addiction is defined as "excessive or poorly controlled preoccupations, urges or behaviors regarding computer use and internet access that lead to impairment or distress."

According to Young (1998), internet use refers to "the amount of time spent online for various purposes such as communication, entertainment, or information-seeking, measured in hours per day or week." Young developed the Internet Addiction Test (IAT), the most widely used tools for assessing problematic or excessive Internet use.

Firth et al. (2020) conducted a research study on the impact of internet use on memory and attention processes. They focused on two areas: first, the individual- and population-level implications for attention processes, and second, the neurobiological drivers underpinning internet usage and memory. The study described the implications of the internet for cognition, assessed potential mechanisms linking brain structure to cognition, and elucidated how these mechanisms

influence behavior. However, the effects of internet use on the brain were not yet fully understood.

According to a study by Chen et al. (2014), academic self-efficacy serves as a mediator for both general and professional internet use. The study sampled 212 high school students in Taiwan. The survey data indicated an indirect positive effect on students' academic performance when they used the internet. However, internet use did not have a significant direct impact on students' learning performance. The study also found that internet anxiety moderates the relationship between academic self-efficacy and learning performance. Specifically, this relationship was stronger among students with low internet anxiety, resulting in enhanced learning performance.

Sagar and Enes (2021) conducted a study to examine how cognitive flexibility and self-control variables predict the social media addiction levels of university students. The study sampled 230 males and 259 females from different universities in Turkey. The average age group of the sample was 20-21 years old. Standardized scales like Social Media Addiction Scale, Cognitive Flexibility Inventory, Self-Control Scale and Personal Information Form were used for the data collection. The study revealed that the variables, cognitive flexibility and self-control significantly predicted social media addiction.

Attention

The average human attention span has decreased to just 8.25 seconds, shorter than that of a goldfish, which is around 9 seconds. This decline is largely due to the growing presence of digital distractions, including social media and constant notifications. Krauzlis et al. (2023) defined attention as "the set of evolved brain processes that leads to adaptive and effective behavioral selection" They understood the term based on biological and neural mechanisms.

The American Psychological Association (2018) defined attention as "a state in which cognitive resources are focused on certain aspects of the environment rather than on others and the central nervous system is in a state of readiness to respond to stimuli." Attention can be captured by qualities of stimuli in the environment, such as intensity, movement, repetition, novelty, and contrast.

Marin et al. (2021) conducted a systematic review on internet addiction and attention in adolescents. They performed a comprehensive search using PubMed, Web of Science, and PsycINFO. The aim of the study was to identify empirical research assessing internet addiction (IA) and to determine which variables are related to IA in adolescents, including the major

cognitive function-attention. Studies were selected based on specific inclusion and exclusion criteria, and a total of 44 studies were analyzed independently. The most used tool to assess internet addiction was Young's Internet Addiction Test. The review also noted that variables such as depression, body weight, aggressiveness, and sleep patterns were examined across several studies.

Reynolds and Shirey (1988) conducted a research study on the role of attention in studying and learning. The chapter emphasized the importance of attention in effective studying and learning. Traditional study skills research has focused more on strategies like note taking or summarizing rather than the mental processes behind studying. The underlying cognitive processes, such as identifying important information, allocating attention, and monitoring comprehension are crucial for meaningful learning. Traditional approaches have been less successful in improving learning outcomes. Study techniques like underlining, outlining, and summarizing are useful only after these cognitive processes have been properly engaged. Effective studying therefore requires understanding and managing how attention and comprehension processes operate, not just applying surface-level study strategies.

Logue and Gould (2014) conducted a study on the neural and genetic basis of executive function, including attention, cognitive flexibility, and response inhibition. The aim of the study was to understand the multiple cognitive processes that regulate higher mental functions. Some of the key processes involved in executive function are impulse control, cognitive flexibility, attention, and memory. These functions are primarily controlled by the prefrontal cortex, and neurotransmitter systems play an important role in regulating them. In the study, the researchers examined the influence of dopamine, norepinephrine, serotonin, and acetylcholine on measures of executive function such as attention, cognitive flexibility, and impulse control. Furthermore, they reviewed the effects of polymorphisms in genes associated with these neurotransmitter systems on these aspects of executive function. The study concluded that both neural and genetic factors significantly contribute to individual differences in executive functioning.

Learning

Harel and Koichu (2010) defined learning as "a multi-dimensional and multi-phase phenomenon occurring when individuals attempt to solve what they view as a problem."

According to Pavlov (1927), learning is "the process by which a neutral stimulus becomes capable of eliciting a response that was originally produced by another stimulus, through repeated

pairings." This process, known as classical conditioning, demonstrates how associations are formed through repeated pairings of stimuli.

A study was conducted by Ruzgar and Selver (2005) on the purpose of internet usage and learning via the internet. The study sampled 720 students and revealed that the future of education would change, with students having greater exposure to the internet than ever before and taking courses via online platforms. Additionally, fifty percent of the students believed that their grade-point averages (GPAs) would improve if they had internet access at home.

Attention can be viewed as a mechanism for active learning and uncertainty reduction, as suggested by studies in animal and machine learning. Integrating these perspectives can enhance our understanding of visual attention and oculomotor control. The brain must not only process visual information but also evaluate its significance and uncertainty. This evaluation involves building internal models, and generating emotional biases, which are tightly linked with attention mechanisms. By studying the oculomotor system through this lens, we can gain insights into the cellular and cognitive substrates of attention and related high-level functions (Gottlieb, 2012).

Wang and Jou (2020) studied the influence of mobile learning (ML) flipped classrooms on the emotional learning and cognitive flexibility of students with different levels of academic achievement. The study employed both qualitative and quantitative methods and found that ML-based flipped classrooms positively affected students' self-directed learning and self-efficacy. The approach had a greater impact on improving low achievers' intrinsic goals, metacognition, and resource management compared to middle- and high-achieving students. The results further indicated that flipped classrooms provided low achievers with the freedom to be more self-directed, enhancing their cognitive flexibility and, consequently, improving their academic achievement.

Cognitive Flexibility

According to Magnusson and Brim (2014), cognitive flexibility is defined as "the ability to switch between thinking about different concepts or to simultaneously consider multiple concepts, and it involves adapting behavioral responses based on situational context."

According to Scott (1962), cognitive flexibility is defined as "the readiness with which a person's concept system changes selectively in response to appropriate environmental stimuli; it is assessed by inviting the subject to expand the groups he or she has created in the original sorting

task."

According to a research study conducted by Celebi et al. (2025), high levels of mindfulness, cognitive flexibility, and psychological well-being were associated with decreased levels of problematic internet use. The study sample consisted of 405 participants, the majority of whom were female (73.1%). The findings revealed significant positive relationships between mindfulness, cognitive flexibility, and psychological well-being. Similarly, a positive relationship was observed between cognitive flexibility and psychological well-being. In contrast, negative and statistically significant relationships were found between problematic internet use and mindfulness, cognitive flexibility, and psychological well-being. The researchers suggested that clinical psychologists and counselors could incorporate therapeutic techniques that enhance mindfulness and cognitive flexibility when working with clients presenting with internet addiction or problematic internet use.

Figueroa (2014) conducted a study to uncover the relationship between cognitive flexibility and sustained attention. To assess cognitive flexibility, the Youmans Cognitive Flexibility Puzzle was used. Twenty-nine undergraduate students from George Mason University participated in this study. The results revealed a significant positive correlation between cognitive flexibility and sustained attention, suggesting that individuals with higher flexibility maintained focus more effectively. These findings indicate that cognitive flexibility may play an important role in supporting sustained attentional control.

For a student, reading is an essential skill as it not only broadens knowledge but also improves understanding, sharpens critical thinking, and enriches vocabulary. Perdue et al. (2022) conducted a systematic review and meta-analysis of brain changes associated with reading intervention. The study reviewed 29 neuroimaging studies and reported evidence of changes in activation, connectivity, and structure within the reading network, as well as in the right hemisphere, frontal, and subcortical regions. Additionally, the study proposed that brain changes in response to intervention should be considered in terms of interactions among distributed cognitive, linguistic, and sensory systems.

1.1 *Purpose*

The purpose of the research is to study The Effects of Internet on Attention, Learning, and Cognitive Flexibility Among the Students.

1.2 *Hypothesis*

H1: There will be a significant relationship between internet use and attention among students.

H2: There will be a significant relationship between internet use and learning among students.

H3: There will be a significant relationship between internet use and cognitive flexibility among students.

2. Method

2.1 *Sample*

A total sample of 33 young adults in the age range of 17 to 25 was collected from Chandigarh, India.

2.2 *Measures*

Internet Addiction Test–Short Form (IAT-SF): The Internet Addiction Test–Short Form (IAT-SF) was developed by Pawlikowski, Altstötter-Gleich, and Brand (2013), as an abridged version of Young's (1998) original Internet Addiction Test. The short form consists of 7 items that assess the degree of problematic internet use and its interference in daily life. Each item is rated on a five-point Likert scale ranging from Never (1), Rarely (2), Sometimes (3), Often (4), to Always (5). The scoring is done by simple summation, with higher scores indicating greater levels of internet addiction. The items capture dimensions such as loss of control, preoccupation, neglect of work or social life, and emotional distress related to internet use.

Mindful Attention Awareness Scale–Short Form (MAAS–SF):The Scale was developed by Brown and Ryan (2003) and later adapted into shorter versions. The 6-item short form measures the frequency of open or receptive awareness of and attention to present-moment experiences. Each item is rated on a six-point Likert scale ranging from Almost Always (1), Very Frequently (2), Somewhat Frequently (3), Somewhat Infrequently (4), Very Infrequently (5), to Almost Never (6). Scoring is done by computing the mean of all items; higher scores indicate greater mindfulness. The items represent aspects such as attention, awareness, and consciousness of current experience in daily life.

***Self-Regulated Learning Skills Scale–Short Form (SRL-SS)*:** The scale was adapted from

Zimmerman and Martinez-Pons' (1986) conceptualization of self-regulated learning and later shortened by Toering et al. (2012). The short form consists of 8 items assessing students' use of goal setting, planning, self-monitoring, self-evaluation, and effort regulation strategies in learning contexts. Each item is rated on a five-point scale, ranging from Never (1), Rarely (2), Sometimes (3), Often (4), to Always (5). Scores are obtained by summing the items or averaging them; higher scores indicate a greater degree of self-regulated learning.

Cognitive Flexibility Scale (CFS): The Scale was developed by Martin and Rubin (1995) to assess an individual's ability to adapt their cognitive processing strategies to face new and unexpected conditions. The scale contains 12 items, each rated on a six-point Likert scale ranging from Strongly Disagree (1), Disagree (2), Slightly Disagree (3), Slightly Agree (4), Agree (5), Strongly Agree (6) Scoring involves summing all item scores; higher totals indicate greater cognitive flexibility. The items reflect three major dimensions of cognitive flexibility: awareness of alternatives, willingness to adapt, and self-efficacy in being flexible.

2.3 *Procedures*

Participants were informed about the study's purpose and objectives and assured of confidentiality and voluntary participation. Informed consent was obtained before data collection. The online survey, administered via Google Forms was taken for convenience. The questionnaire included standardized measures of internet use, attention, learning and cognitive flexibility. Participants were asked to respond to the questions as truthfully as possible. After completion, they were thanked for their participation, and any queries were addressed.

3. Analysis of Data

Results

Table 1: *N, Mean and Standard Deviation*

	Internet Use	Attention	Learning	Cognitive Flexibility
N	33	33	33	33
Mean	18.7	3.70	6.84	52.3
Median	18.0	3.67	6.89	52.0
Standard deviation	3.98	1.15	1.35	7.51

Table 2: *Correlation between Internet Use, Attention, Learning and Cognitive Flexibility*

	Internet Use	Attention	Learning	Cognitive Flexibility
Internet Use	—			
Attention	0.025	—		
Learning	-0.207	0.314*	—	
Cognitive Flexibility	-0.208	0.125	0.233	—

Note. * p < .05, ** p < .01, *** p < .00

4. Discussion of Results

The objective of the study was to understand the relationship between internet use, attention, learning and cognitive flexibility.

The results indicate a significant positive relationship between learning and attention ($r = 0.314$, $p < 0.05$), suggesting that higher attention levels are associated with better learning outcomes. This implies that as students become more attentive, their ability to learn and perform academically tends to improve. The results revealed a positive but non-significant relationship between internet use and attention($r=0.025$), suggesting that although students who use the internet more frequently may show slightly higher levels of attentional engagement, this effect is not strong enough to be statistically confirmed. This could imply that internet use alone does not substantially enhance or impair students' ability to focus; rather, the quality and purpose of internet engagement may play a more decisive role.

Additionally, the study found a negative but non-significant relationship between internet use and learning($r=-0.207$), indicating that higher internet use may be associated with slightly lower learning outcomes, but this relationship was not statistically meaningful. This finding aligns with earlier research indicating that excessive internet use may cause distraction and cognitive overload, reducing learning efficiency. However, the non-significant result suggests that factors like study habits, self-regulation, and the nature of online activities may better explain this relationship. The relationship between internet use and cognitive flexibility is negative and non-significant($r=-0.208$). This means, as cognitive flexibility tends to decrease, internet use increases.

According to a study by Rosen et al. (2011) students who frequently engaged in off-task

technology use, e.g., texting or checking online content during study sessions, showed poorer academic performance and reduced attention. Frequent interruptions from digital media created cognitive overload and disrupted sustained concentration, leading to lower learning efficiency. Overall, the findings suggest that internet use has a complex and nuanced impact on students' cognitive functioning. While it may offer educational benefits when used purposefully, unstructured or excessive use could hinder concentration and learning. Further research with larger, more diverse samples and experimental designs is recommended to explore these relationships more deeply.

5. Conclusion

The present study examined the relationship between internet use, attention, learning and cognitive flexibility. According to a review article, one of the risks of internet use is that it can hinder the healthy growth and development of children and youth and negatively impact overall health when sedentary behavior dominates daily life. Prolonged sedentary behavior, even when combined with adequate physical activity, can still compromise optimal health outcomes. Furthermore, difficulties in accurately measuring total screen time, due to multitasking and reliance on outdated tools, further complicate understanding its health implications. On the other hand, screen-based technology offers significant benefits, including convenience, access to information, opportunities for learning, entertainment, and social connection, as well as the potential for innovative tools that can support physical activity and health interventions. Thus, while screens are pervasive and provide numerous advantages, balancing their use with active behaviors is essential to maximize health and minimize harm (LeBlanc et al., 2017).

The use of the internet has both advantages and disadvantages. Like a coin with two sides, its impact can vary from person to person. It can be positive, providing opportunities for learning and connection, or negative, potentially causing harmful consequences. Students need to be responsible for how they use social media, as even a simple careless mistake can have serious, life-changing effects. To limit screen time, students can set daily usage limits, take regular breaks from screens, engage in physical activity, use apps to monitor their time online, prioritize face-to-face interactions, and focus on offline hobbies. By managing their screen use responsibly, students can enjoy the benefits of the internet while minimizing its risks. Internet use can enhance attention by

providing engaging and interactive content that keeps users focused. It supports learning by offering instant access to information, educational resources, and collaborative tools. Additionally, navigating diverse online tasks can improve cognitive flexibility, helping individuals adapt to new information and switch between different problem-solving strategies. Ultimately, we are the ones who decide how to shape our minds by choosing what to consume and what to avoid on social media.

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