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Role of Screen Time in Memory Impairment and Academic Achievement among University Students

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ABSTRACT
The current research was done to investigate how screen time contributed to the impairment of memory and academic performance among college students. The study adopted a quantitative and cross-sectional correlational study design. The sample size was 250 university students who are aged between 18 and 25 years and the sample was chosen using convenience sampling. The demographic information sheet, self-reported screen time (in hours), Everyday Memory Questionnaire-Revised (EMQ-R) to test memory impairment, and self-reported CGPA as a metric of academic success were used to gather the data. The findings illustrated that the screen time had a significant and positive correlation with memory impairment, $r(248) = .923$, $p < .001$ and an insignificant negative correlation with academic achievement, $r(248) = -.928$, $p < .001$. Also, memory impairment was reported as relatively negatively correlated with CGPA, $r(248) = -.866$, $p < .001$. Regression analysis also showed that screen time made a significant prediction of memory impairment ($R^2 = .851$) and academic achievement ($R^2 = .861$). The independent samples t-test did not indicate any gender differences between the variables of the study. The results are that excessive screen time can have a negative effect on cognitive functioning and academic performance in university students. The research paper indicates that there is need to monitor the use of screens to improve memory performance and educational achievement. Although these relationships have not been investigated in a longitudinal research design with objective measures before, it is advised that future research should address such relationships.

Introduction

The academic and social environment of university students has undergone fundamental changes due to the exceptional growth of digital technology which has occurred during the last ten years. Digital devices such as smartphones and laptops and tablets and other devices now function as essential tools which support educational activities and communication needs and entertainment activities during the student's daily life. University students now spend more time watching screens because higher education institutions use online platforms and digital submission systems and virtual classes and digital materials. People can access information and study material in new ways because of technological progress but research shows that watching screens for long periods negatively impacts their cognitive abilities and school success. University students show increasing worry about how continuous screen usage affects their memory capacity and academic performance.

Screen time refers to the total time people spend using digital devices which include

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smartphones and computers and televisions and tablets (Twenge & Campbell, 2018). University students use screen time to measure their time spent on academic tasks which include attending online lectures and completing assignments and conducting research as well as their time spent on social media and streaming media and gaming and web browsing. The use of academic screens helps students learn better while students who use screens for entertainment purposes or watch screens for long periods experience negative effects on their mental abilities and psychological health. The way people access screens which includes their selection of content and their reasons for using screens will affect how their mind processes information.

Memory impairment describes the condition where people experience difficulties with their ability to memorize information because of problems with the three stages which include encoding and storage and information retrieval (Baddeley, 2012). Memory functions as a basic element that supports academic learning and reading comprehension and the methods used to assess student performance. Working memory functions as a restricted capacity system which stores information for short periods because it enables users to process and handle data (Baddeley, 2000). Long-term memory provides people with the ability to store knowledge and their acquired information for extended periods. Academic success needs students to develop efficient systems which enable them to manage their focus and their ability to remember information while their brain processes information to form permanent memories. Any factor that disrupts these cognitive processes will lead to a reduction in study efficiency and academic performance.

Academic achievement refers to measurable educational outcomes, which educational institutions use to assess student performance through grade point average (GPA), examination scores, academic standing, and overall academic achievement (York et al., 2015). Multiple cognitive and behavioral and environmental factors together affect academic performance in higher education institutions. The primary predictors of academic success include memory functioning and attentional control and time management and self-regulation skills. The process of understanding academic performance differences among university students requires researchers to identify external factors that disrupt cognitive abilities.

Many studies have investigated how excessive digital media exposure affects human cognitive abilities. Research shows that extended screen time especially through media multitasking leads to diminished attention span and decreased working memory capacity (Ophir et al., 2009). People who switch between digital tasks show decreased cognitive control abilities and struggle to ignore nonessential information. Memory consolidation weakens due to interruptions in the encoding process caused by fragmented attention. Uncapher et al. (2017) showed that heavy media multitaskers tested worse on memory tasks than light multitaskers demonstrating that persistent digital interruptions cause genuine cognitive impairments..

People develop memory problems from screen time because their brain capacity becomes full through watching screens. The Cognitive Load Theory explains that humans can only maintain a specific volume of information in their working memory which causes their learning capacity to decrease when they receive extra stimuli that surpass this threshold (Sweller, 1988). The digital world delivers content that users need to watch which keeps changing while showing high-intensity elements that compete for their focus. The combination of notifications and hyperlinks with advertisements and multimedia inputs produces extra cognitive load which prevents users from achieving deep processing and long-term memory retention. Excessive screen time leads to cognitive system overload which stops humans from gaining any valuable learning

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experiences.

The connection between screen time and memory problems exists because sleep disruption acts as a second pathway. Digital devices emit blue-wavelength light which causes two problems by decreasing melatonin production and extending bedtime and which results in worse sleep conditions (Chang et al., 2015). Sleep serves as an essential function for memory consolidation because it helps to stabilize newly learned information and makes that information available for permanent storage (Diekelmann & Born, 2010). University students frequently report late-night screen usage for both academic and recreational purposes which may compromise sleep duration and quality. Academic performance suffers because chronic sleep deprivation leads to two consequences which are impaired attention and reduced working memory efficiency.

Researchers have conducted studies to investigate whether screen time directly affects students' academic performance. The study by Lepp et al. (2015) found that college students who used smartphones excessively ended up with lower GPAs because their device usage interrupted their study time and academic concentration. The research conducted by Twenge et al. (2018) established a connection between increased recreational screen time and decreased academic performance in both adolescents and young adults. The research conducted by Rosen et al. (2013) showed that people who spend excessive time on social media platforms develop procrastination habits which decrease their ability to focus during lectures and their willingness to study. People need to understand that all screen time activities bring negative consequences because educational materials and planned digital interactions can help students achieve academic success when they are used for specific purposes.

The theoretical context of the study is a combination of two basic theories that comprise Information Processing Model and Cognitive Load Theory. The model of Information Processing presents memory as a three part system that comprises of sensory memory, shortterm or working memory, and long term memory Atkinson and Shiffrin(1968). Learning effectively needs long-term attention on information as sensory information transfers into the working memory then transferred in to consolidate in the long-term memory through rehearsal and elaboration. The availability of digital interruptions generates constant interruptions that render people with difficulty in keeping their focus. This disruption pattern causes problems that interrupt with the formation of new memories and reduce memory storage.

The cognitive load theory reveals that any digital stimuli that are above their capacity will interfere with the learning processes as they pass the limits of the human working memory capacity (Sweller, 1988). The cognitive load of students who must deal with various academic tasks in the presence of digital distractions becomes higher, and they are not able to process the necessary educational material. The extended divided attention period as at the moment of the practice will result in students having actual memory deficiencies as well as memory problems that will impact their performance academically.

The current studies fail to show full comprehension of the implications of using digital media on cognitive skills since researchers have not concluded the impact of digital media. The research studies have mostly been focused on the study of the adolescents and only few research studies have been done on university students of the developing countries which today are experiencing rapid development in digital infrastructure. The

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connection of screen time and memory impairment with academic performance necessitates researchers to carry out an in-depth study that employs a single research framework.

The connection between screen time and cognitive and academic outcomes should be immediately studied due to the current prevalence of digital technology in universities and the use of memory as the primary factor of academic success. The research will seek to establish whether excessive screen time by students creates memory issues that cause poor performance in school since the results will help in guiding the teachers, policymakers, mental health specialists and students. The aim of the current research is thus to investigate how screen time affects memory deterioration and educational success among college students, as it is a contribution to the existing literature on computer behavior and cognitive well-being.

Rationale of the Study

The high rate of using digital devices by the university students has brought significant transformations in the way they learn and communicate and in the activities they carry out in their day to day lives. The researchers discovered technology enhances use of learning materials and allows students to learn at their pace although this aspect is associated with escalating concerns regarding the cognitive impacts.University students face a greater danger of excessive screen time because their academic work and need to connect with others and their desire to watch entertainment content. Higher education institutions use digital technology throughout their programs, but research on how this technology affects students' memory and academic performance remains limited and sometimes shows conflicting results.

Memory processes especially working memory and long-term memory consolidation serve as fundamental components for academic learning (Baddeley, 2012). Students who succeed academically need to develop skills for encoding information and storing it while also retrieving and applying that knowledge. The Information Processing Model Atkinson Shiffrin 1968 shows that learners need to maintain their focus while they work without interruptions in order to move information from their short-term memory into long-term storage. Digital environments create conditions which encourage users to perform multiple tasks at once while they continuously shift their focus and process information in broken segments according to Ophir et al 2009. The identified patterns make it harder for users to create deep memory traces because they disrupt the process through which users develop memory systems.

Cognitive Load Theory (Sweller, 1988) establishes that working memory has restricted storage capabilities. The constant flow of digital notifications and simultaneous media usage creates an excessive cognitive burden which decreases students' capacity to process academic material. The practice of cognitive overload over an extended period results in both memory complaints from patients and actual decline of their mental abilities. Multiple studies have shown a link between excessive media consumption and attention problems (Uncapher et al. 2017) but only a few studies have investigated the combined effects of screen time and memory deficits on academic performance using a comprehensive framework.

The essential requirement of this research demands indirect pathways to be examined as a fundamental aspect. The research established a connection between nighttime screen time and sleep problems which occurred because of people looking at screens and becoming mentally active due to blue light (Chang et al., 2015). Sleep functions as an

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essential process which enables memory consolidation while restoring cognitive abilities (Diekelmann & Born, 2010). The academic performance of students will be negatively affected because excessive screen time leads to sleep problems which result in memory loss.

International research has started to solve these problems yet there is a shortage of studies which focus on these factors that affect university students in developing countries. The different cultural and educational and technological systems present in different populations will create distinctions in their screen time behavior and academic performance expectations. The local university environment requires researchers to study how screen time affects memory loss and academic performance because this research needs to be done at this moment.

The existing study is present in order to understand whether screen time is a lifestyle measure or rather a cognitive factor that influences the memory functionality and educational achievement. The study integrates a cognitive theory and empirical research to give more comprehensive information regarding the impact of digital activities on the cognitive processes and academic performance. The research will explore further the impact of digital activities on cognitive functions and academic success by integrating the cognitive theory and the empirical research methods.The research found that digital device usage affects students' cognitive abilities and academic success through its impact on their study habits and social interactions. The research demonstrates how screens determine computerized device usage patterns which subsequently influence students' academic performance.

Significance of the Study

The current research study provides theoretical and empirical and educational and practical value to multiple fields of study. The study demonstrates how the Information Processing Model (Atkinson and Shiffrin,1968) and Cognitive Load Theory (Sweller,, 1988) model digital environments through their theoretical framework. The digital design frameworks which were developed before the digital age still maintain their capacity to describe how excessive screen time leads to working memory overload and encoding process interruptions. The research establishes a new cognitive understanding of how digital media impacts learning and memory through its investigation of these particular relationships.

The study provides empirical evidence to fill a research gap by studying screen time together with memory impairment and academic performance in one unified framework. Existing research predominantly investigates psychological well-being and academic performance across various domains (Twenge et al. 2018) while only a few studies investigate memory functioning as a specific cognitive mechanism. The study provides new knowledge about potential relationships representing either mediation or prediction through its combined investigation of these two variables.

The study characterizes information about university students, which is present since the area of digital cognition research is inclined to ignore this particular segment of the academic community that studies adolescents. Academic strains of students in universities pose specific difficulties that force them to sustain their memory and ability to control their minds over long periods of time. The findings of the research will influence the policy formulation in the digital learning environment by the educational institutions. The teaching industry in colleges and universities has shifted towards relying

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on the Internet, online courses, and flipped learning courses and platforms of digital or online assignments.

The study investigates the impact of screen time on memory and academic outcomes to develop guidelines of digital use and screen time management applications and mental health services. The research is of practical benefit to the students since they can learn the intellectual hazards of overindulging screens. The study result will aid mental health practitioners and academic counselors and educators to design programs that will train students on skills of digital self-control and time management and sleep hygiene skills. The detection of significant correlations among variables will allow the organizations to create preventive strategies that will make people develop more positive digital habits and attain improved academic outcomes. The growing global reliance on technology demands the educational facilities to learn the cognitive impact of the technology that will enable them to formulate their long-term educational plans and assist their students in maintaining their mental health.

Objectives

The current investigation is intended to discuss the impact of screen time on memory loss and academic performance of college students. The targeted objectives are as follows:

To examine the influence of screen time on the deterioration of memory among the university students.

To explore the impact of screen time on academic performance of university students.

To examine the hypothesis that memory impairment is a mediator variable in between screen time and academic achievement.

Hypotheses

University Students will have more loss of memory due to extended screen time.

University Students that will spend more time on screens will be less successful in their studies.

University Students who have memory loss will be subjected to obstacles which will not help them to excel academically.

METHODOLOGY

Research Design

The research design employed in this study was a quantitative and cross-sectional correlational study in order to investigate the effects of screen time on memory impairment and academic achievement among university students. The fact that a correlational design allows the investigation of the relationship between variables with no experimental control and empowers the evaluation of predictive association between screen time, memory impairments, and academic performance made it a fitting design.

Participants

In this research, the methodology used was quantitative and cross-sectional correlational study design to determine the impact of screen time on learning issues and academic achievement among university students. The correlational design was chosen as it allows for the analysis of connections between variables without the need for experimental control, while also enabling the evaluation of predictive associations between screen exposure, memory difficulties, and educational results.

Instrument

Academic achievement was measured through previous CGPA of the participants. **Screen time** was measured in hours. **Everyday Memory Questionnaire – Revised (EMQ-R, 13 items; Royle & Lincoln,**

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2008)

Everyday Memory Questionnaire–Revised (EMQ-R) developed by Royle and Lincoln is a self-report questionnaire assessing subjective memory failures occurring in everyday situations. Such memory failures commonly involve forgetting appointments, losing objects, or failing to remember recent events. Scoring yields a total sum of 13 items with 5 choice points (from 0 "not at all" to 4 "very often") ranging from 0 to 52. Possible applications of this scale include not only clinical populations but also non-clinical settings. We found this measure to have adequate reliability and validity, with factors corresponding to retrieval and attentional failures

Procedure

Sample of the study comprised of students of the University of Gujrat. The data was collected with the help of a set of standardised tools. A demographic information sheet was developed for the collection of demographic information. The demographic information sheet consisted of questions about the age, gender, degree programme, semester of the students and their average daily screen time. In addition, the students were required to inform the researcher about the devices they usually use and the purpose of their screen use that is whether it is for academic or for entertainment purposes. The permission of the University administration was sought before collecting the data of the students. A total of 250 students were selected for the study. The data was collected from the students on a random basis and on the availability of the students. The researcher explained to the students the procedure of filling the questionnaire to clarify any ambiguity. In case of ambiguity, the ambiguity was cleared by the researcher in such a way that it did not influence the content of the response. On an average, the students required 5-10 minutes to fill the survey instrument.

Ethical Consideration

All ethical considerations were adhered to throughout the study. Participants were fully explained the purpose of the research and provided with a written informed consent prior to data collection. Participation was voluntary and participants had the right to withdraw at any time and were fully informed of this right. The researcher took all steps possible to maintain the privacy and anonymity of participants. No personal information was collected and the unanalyzed data were stored in a secure encrypted folder to be used solely for academic and research purposes. The data has been presented in summary form only and not in its entirety to ensure the anonymity of all participants. No personal information has been used or included in any academic publication or presentation arising from this study.

Results

Table 1: Psychometric Properties of the Scales

Scale	No. of items	α
EMQ	13	0.798

The analysis contained 250 cases in total, and there were no missing data points, indicating a complete dataset appropriate for statistical analysis. Cronbach's alpha was used to evaluate the Everyday Memory Questionnaire's (EMQ) internal consistency. The scale has acceptable to good internal consistency and reliably assesses reported memory

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impairment, according to the results, which showed good reliability with α =.798

Table 2: Pearson correlation between memory impairment, academic achievement, and screen time

	Variables	1	2	3
1	Memory Impairment	--		
2	Academic Achievement	-.866**	--	
3	Screen Time	.923**	-.928**	--

The links between EMQ scores, screen usage, and academic accomplishment were investigated using Pearson product-moment correlation analysis. Strong and statistically significant correlations between all variables were found in the results. Higher screen time is linked to more memory impairment, according to a robust and positive correlation between EMQ scores and screen time ($r(248) = .923$, $p < .001$). Furthermore, there was a high and negative correlation between EMQ scores and CGPA ($r(248) = -.866$, $p < .001$), indicating that poorer academic achievement is linked to greater memory impairment. Additionally, there was a significant negative association between screen time and CGPA ($r(248) = -.928$, $p < .001$), suggesting that more screen time is linked to poorer academic performance.

Table 3: Mean comparison of male and female participants on memory impairment, academic achievement, and screen time

Variables	Males		Females				
	M	*SD*	*M*	*SD*	*t*(250)	*P*	Cohen's *d*
Screen Time	5.09	2.12	5.28	2.06	-.69	.492	-.087
Academic Achievement	4.75	.532	2.68	.511	1.30	.195	.164
Memory Impairment	5.56	9.32	23.96	8.99	-1.47	.144	-.186

Gender differences in EMQ scores, CGPA, and screen time were examined using independent samples t-tests. The findings showed no statistically significant gender differences in screen time ($t(248) = -0.69$, $p = .492$), CGPA ($t(248) = 1.30$, $p = .195$), or EMQ scores ($t(248) = -1.47$, $p = .144$). Furthermore, all factors had minor impact sizes (Cohen's d varied from −0.19 to 0.16), suggesting that the practical differences between male and female participants were insignificant.

Table 4: Linear regression analysis of screen time on memory impairment

Variables	B	SE	β	p	95% CI
(Constant)	2.189	0.600	—	< .001	[1.01, 3.36]
Screen Time	4.041	0.107	.923	< .001	[3.83, 4.25]

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R^2	.851

To determine if screen time predicts memory deterioration, a basic linear regression analysis was performed. The model explained 85.1% of the variance in EMQ ratings (R^2 =.851) and was statistically significant (F(1, 248) = 1419.58, p <.001). A significant positive predictor of memory impairment was found to be screen time (β =.923, t(248) = 37.68, p <.001). These findings suggest that higher levels of perceived memory problems are linked to increases in screen use.

Table 5: Linear regression analysis of screen time on academic achievement

Variables	B	SE	β	p	95% CI
(Constant)	3.931	0.033	—	< .001	[3.86, 3.99]
Screen Time	–.231	0.006	–.928	< .001	[–0.24, –0.21]
R^2	.861				

➢ To find out if screen time predicts academic success, a second regression study was carried out. The model explained 86.1% of the variance in CGPA (R^2 =.861) and was statistically significant (F(1, 248) = 1531.90, p <.001). Academic achievement was established to be highly associated with screen time (248 = −.928) = -39.14) = -.001) indicating that increased screen time is associated with a reduced CGPA.

Discussion

The aim of the current study was to investigate the effects of screen use in memory loss and academic performance among university students. In the study, the conclusions were that the more the screen was used, the worse was the academic performance and the more there was impairment of the memory. This is congruent with the existing studies, which show that the overuse of digital devices can negatively influence academic performance and cognitive abilities. Multitasking and high frequencies of attentional shifts are characteristic of increased screen time and can potentially overload working memory capacity and disrupt the ability to encode information (Ophir et al., 2009). Cognitive Load Theory (Sweller, 1988) explains that when there is too much outside stimulation to the mind, it may overstudy the available cognitive resources hence lowering the effectiveness of the memory processes. This theoretical point is aligned to the present findings where students who had heavier screen time are more prone to everyday memory impairment. The research also found out that there was a negative relationship between the academic achievement and the screen time, and thus, the higher the kids spend on the screens the lower their CGPAs tend to be. This conclusion is backed by the previous research (Lepp et al., 2015) that shows that overuse of smartphones and other digital devices might reduce the time spent on academic activities, distract more, and promote procrastination. Moreover, the overuse of screens may complicate the concentration in the study periods, which eventually may affect the learning process. It was also found out that academic accomplishment and memory impairment were negatively related, and this means that children who report higher memory problems perform worse in academics. The academic performance may be directly affected by any compromise of the memory functioning since memory is pivotal in the learning, remembering and retrieving academic materials. This finding concurs with the

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Information Processing Model (Atkinson and Shiffrin, 1968) that emphasizes the importance of effective encoding and storing processes to the success of learning. Comprehensively, the findings suggest that screen time can directly and indirectly affect academic achievement through the influence on the memory performance. Screen overuse might result in cognitive overload, lack of attention and memory lapse by students leading to worse grades.

Limitations of the Study

There are several limitations that are found in the present study but must be considered despite its contributions. To begin with, causal correlations between variables are more challenging to establish in case of cross-sectional research approach. Despite the demonstrations of correlations, one cannot make the conclusion that screen time is a direct cause of memory loss and poor academic performance. Second, the two possible sources of bias of response in self reports used to collect the data are social desirability and the incorrect measurement of screen time and academic achievement. There is a likelihood that the participants misreported or underreported their behavior. Third, the convenience sampling technique limits the generalization of the results. The sample size was also restricted to students of a specific college setting and therefore may not be a true reflection of all students. Moreover, instead of applying objective cognitive testing, a subjective measure of memory impairment was applied. However, self-report measures might not be very demonstrative of actual memory performance, despite providing valuable data concerning perceived challenges.

Implications of the Study

The implications of the conclusions of the current study are substantial both in theoretical terms, as well as in terms of instruction and practice. The theoretical perspective of the study justifies such cognitive theories as the Information Processing Model and Cognitive Load Theory by demonstrating the possibility of the negative influence of excessive screen time on the learning process and memory processes. The results indicate the need to make colleges promote responsible and balanced use of digital technologies through the educational lens. Educational institutions can develop awareness programs to educate students on the potential adverse impact of a large amount of screen time on their cognitive functions and academic outcomes. In practice, the findings revealed that students need to be encouraged to adopt effective time management strategies and eliminate unnecessary screen time particularly when studying. Interventions that are focused on enhancing digital self-regulation, memory methods, and concentration can be used to improve academic performance. Academic counselors and mental health professionals can also use these findings to assist students to develop superior study skills and coping strategies that lessen cognitive overload and enhance the effectiveness of learning.

Conclusion

Overall, this paper has examined the impacts of screen time on memory and academic performance of university students. The findings demonstrated that the more the screen is used, the worse the academic performance and the greater the impairment of the memory. What is more, negative interrelation among academic achievement and memory impairment was found, indicating that memory is a very important factor of learning. The paper highlights the necessity of regulating screen time in learning settings and the necessity of gaining more knowledge on its effects on brain. Although digital technology

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continues to play a significant role in the modern day education, excessive consumption of it can be detrimental to academic success and cognitive ability. In order to take a deeper look at these links and develop effective intervention methods, the use of objective measures and long-term approaches should be used in future research works.

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