Dentistry 3000

Vol 14, No 1 (2026)
ISSN 2167-8677 (online)
DOI 10.5195/d3000/2026.1414

Association of Social Media Engagement with Short-Term Memory and Academic Performance

A Study Among Undergraduate Dental Students

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Abstract

This study aimed to investigate the association between the level of engagement with social media, measured by daily online hours, and its impact on short-term memory, the last three years of college academic performance, and prior secondary school ministerial examination grade point average in a sample of dental students at the University of Al-Ameed, College of Dentistry in Karbala, Iraq. A cross-sectional study was conducted with 558 participants (216 males and 342 females) aged 21–24 years. They were students at the College of Dentistry/ University of Al-Ameed. They were grouped according to their daily social media engagement hours into five ascending groups: A, B, C, D, and E. Their short-term memory test (STMT) scores, academic performance (CP) scores, and prior secondary school ministerial examination grade point averages (MEGPA) were put down and statistically analyzed. A significant positive correlation was found between prior MEGPA and CP, indicating consistency in academic aptitude. Critically, a significant negative correlation was observed between the number of daily online hours (social media engagement) and MEGPA, CP, and STMT. The negative impact was intensified with increasing engagement hours, with female students exhibiting a more pronounced vulnerability. Students with lower academic performance might engage more in social media, as the present study revealed that elevated engagement with social media was associated with lower academic achievement, and this detrimental effect is more severe for female students. These findings underscore the need for digital wellness interventions and gender-aware educational policies to mitigate the potential cognitive and academic costs of excessive online engagement among college students.

Open Access

Citation: Zwain BMH et al. (2026) Association of Social Media Engagement with Short-Term Memory and Academic Performance. Dentistry 3000. 1:a001 doi:10.5195/d3000.2026.1414
Received: May 30, 2026
Accepted: May 31, 2026
Published: June 16, 2026

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Introduction

In the contemporary digital age, the social media platforms have become deeply embedded in the daily routines of college students worldwide [1]. They serve as primary channels for communication, entertainment, information gathering, and social interaction. The average daily social media engagement time among young adults has risen dramatically, with many students spending a substantial portion of their waking hours engaged with digital media [2]. This pervasive integration of technology into academic and personal life has sparked a growing debate among educators, psychologists, and neuroscientists regarding its potential impact on cognitive abilities and educational outcomes [3].

While digital tools offer undeniable benefits for learning and connectivity, a substantial body of literature has begun to reveal a more nuanced and concerning picture. Emerging evidence suggests that excessive or disordered use of digital media is associated with negative outcomes, including reduced attention spans, impaired memory function, and lower academic performance [4]. However,

the precise relationship between the quantity of engagement (i.e., daily online hours) and specific cognitive and academic metrics, particularly in the critical developmental stage of young adulthood, requires further elucidation. Furthermore, the role of gender as a potential moderator in this relationship has been identified as a key area for investigation, with some studies suggesting differential patterns of social media use and associated consequences between males and females [5].

This study aims to address these gaps by investigating a sample of 558 college students aged 21–24 years. The primary objective is to examine the impact of self-reported daily social media engagement hours on three key outcomes: (1) Short-term memory, (2) Academic performance over the last three years of college, and (3) Prior secondary school ministerial examination GPA. By exploring the correlations between these variables and conducting a gender-sensitive analysis, this research seeks to provide a comprehensive understanding of the digital cost of connectivity in higher education.

Review of Literature

The average daily social media engagement hours among young adults has reached unprecedented levels. The Common Sense Media estimated that teenagers devote an average of 8 hours and 39 minutes per day to screen-based entertainment, highlighting the extensive integration of digital media into their lives [6]. This widespread and intensive use has led researchers to investigate the potential consequences of such high levels of engagement on development and cognition.

A growing body of evidence suggests a significant negative association between excessive screen time and core cognitive functions. A comprehensive systematic review and meta-analysis by Moshel et al. (2023) found that individuals with disordered screen use behaviors exhibit significant small-to-medium cognitive deficits compared to controls, with the most affected domain being attention and focus, followed by executive functioning [7]. This meta-analysis included studies across various screen-related behaviors, including internet and social media use, and highlighted the robustness of these cognitive impairments.

Regarding memory specifically, recent studies have provided more granular insights. A cross-sectional study of 1,029 university students in Jordan found a significant, large correlation between short-form video addiction (SVA) scores and memory function, with attention partially mediating this relationship. The study noted that the unique features of short-form video platforms (such as rapid context-switching and hyper-personalized algorithms) may pose an even greater risk to cognitive functions like memory compared to other forms of social media. This aligns with experimental findings showing that consuming short-form videos leads to attentional fluctuation and impaired incidental memory encoding, particularly in tasks requiring sustained attention. Furthermore, the combination of short videos and rapid context-switching has been shown to impair intention recall and execution, directly impacting prospective memory. Collectively, these studies provide strong evidence for the detrimental impact of modern social media engagement on various memory systems [8].

The relationship between digital media engagement and academic performance has been extensively studied, with a growing consensus pointing towards a negative association. A large-scale meta-analysis synthesizing 63 studies (N = 124,166 students) found a small but statistically significant negative association between smartphone use, social media use, and video game playing with students' academic performance [9]. Another meta-analysis specifically focusing on social networking addiction found a negative correlation (r = -0.172) with academic achievement among university students globally [10].

Studies focusing on specific platforms have yielded similar results. For instance, research on short video application (SVA) use among adolescents found that daily usage negatively predicted academic performance, and this effect was partially mediated by cognitive factors such as working memory and verbal ability, particularly among younger users [11]. Similarly, problematic smartphone use, which often involves social media engagement, has been linked to lower GPAs and poorer learning experiences [12].

Westrick et al (2015), in their meta-analytic study involved a sample of 189,612 students at 50 institutions, found that socioeconomic status (SES) is a weak predictor of academic performance [13]. However, a notable finding is the positive correlation between prior academic achievement (e.g., high school GPA) and subsequent college performance. This consistency underscores that academic aptitude tends to be a relatively stable trait, as foundational cognitive skills and study habits developed earlier in a student's career often predict future success [13,14]. This makes the negative impact of digital engagement on college performance, even when controlling for prior achievement, more significant.

A growing area of research examines whether the effects of digital media engagement differ between males and females [5]. The evidence suggests that gender is a significant moderator. Some studies have found that female students are more likely to report problematic social media use and use it as an 'escape' from negative feelings, potentially indicating a higher risk of adverse outcomes [15]. Other research has found that female students spend more time on social networking sites than their male counterparts [16]. A study on Makerere University students found that female students were 2.5 times more likely to have a lower CGPA compared to males, suggesting a stronger negative impact of social media use on academic performance for females [17]. A meta-analysis on mobile technology distraction also identified gender as a significant moderator of the effect on recall test performance [18]. These findings collectively point towards the existence of gender-specific patterns in both the use of and vulnerability to the negative consequences of digital media, warranting further investigation in this area.

Materials and Methodos

A cross-sectional study was conducted on 558 college students (216 males and 342 females) aged 21–24 years. They were dental students at the University of Al-Ameed, College of Dentistry in Karbala, Iraq. Their ethical consents were taken to share their information for scientific research purposes without any privacy violation.

For the sake of test-retest reliability, the participants responded to our pre-designed google form-based questionnaire about the daily hours they spend on social media on two separate occasions (three months apart). Strong positive correlation was found between their responses on the first versus the second occasion (r = 0.963).

Participants were grouped according to their daily social media engagement hours into five groups:

A: Less than one hour,
B: From one to less than three hours,
C: From three to less than five hours,
D: From five to less than seven hours, and
E: Seven or more hours.

It was inapplicable to investigate the impact of each single social media platform separately from other platforms because almost all participants were using several platforms (Facebook, X, TikTok, YouTube, Telegram, WhatsApp, Instagram, Snapchat, and others) at a time.

Participants were asked to perform our own short-term memory test, which was presented as an 80-grade scale. After careful inspection of the timely transitioning power point slides containing numbers, letters, or pictures to be recalled for their identities, sequences, orientations, or positions. The validity of our own short-term memory test was confirmed by the strong correlations between participants' scores of the short-term

memory test and their cognitive functions implied by their current academic performance and prior secondary school ministerial examination grade point averages (r = 0.794 and r = 0.592, respectively)

The participants' academic performance (CP) scores were calculated as the averages of their last three college years' grade point averages (taken from the college records). Their CP ranged from as low as 48.158 to as high as 88.204.

The participants' prior secondary school ministerial examination grade point averages (MEGPA) were taken from students' administration records (students and college council consents were in our hands).

Scores of short-term memory test (STMT), academic performance (CP), and prior secondary school ministerial examination grade point averages (MEGPA) were collected and analyzed. Statistical analyses involved correlational methods among MEGPA, CP, and STMT. Gender variations were taken into consideration.

Results

In the present sample, there was a significant positive correlation between prior secondary school ministerial examination grade point averages (MEGPA) and current academic performance (CP) (r = 0.696, p<0.001), with a stronger correlation in females (r = 0.708, p<0.001) than in males (r = 0.672, p<0.001). Significant positive correlations were also found between scores of the short-term memory test (STMT) and both MEGPA and CP (r = 0.592 and r = 0.801, respectively), with some differences between females (r = 0.61 and r = 0.807, respectively) and males (r = 0.564 and r = 0.795, respectively), with all p-values less than 0.001.

Table 1 reveals the declining trends of STMT, MEGPA, and CP with increasing hours of social media engagement (groups A, B, C, D, and E). Given the large number of pairwise comparisons done among these 5 groups (10 comparisons), the alpha level of the one-way ANOVA test was adjusted via application of the Bonferroni correction method (the original alpha divided by the number of comparisons). The original alpha (0.05) had been adjusted to be 0.05 / 10 = 0.00.

Cross comparisons yielded that CP was significantly higher in A than in B (p< 0.005), C (p< 0.002), D and E (p< 0.000003), while MEGPA was significantly higher in A than in D (p< 0.0005) and E (p< 0.000003). MEGPA was also significantly higher in C than in E (p< 0.005).

Cross comparisons revealed that STMT was significantly higher in A than in C (p< 0.002), D (p< 0.00007), and E (p< 0.00000005). STMT was also significantly higher in B and in C than in E (p< 0.0003 and p< 0.003, respectively).

Other cross-comparisons among the whole sample groups were not statistically significant.

Table 2 shows us the declining trends of STMT, MEGPA, and CP with increasing hours of social media engagement (groups A, B, C, D, and E) in male students. As the same number of pairwise comparisons among these 5 groups (10 comparisons) was done, the alpha level of the one-way ANOVA test was also adjusted to be 0.005.

Cross comparisons among male groups revealed that CP was only significantly higher in A and C than in E (p< 0.005) while MEGPA was significantly higher in A, B, and C than in E (p< 0.0004, p< 0. 003 and p< 0.0008, respectively).

Again, cross comparisons showed us that STMT was significantly higher in A, B, and C than in E (p< 0.0006, p< 0.002, and p< 0.0006, respectively). Other cross-comparisons among male groups were not statistically significant.

Table 3 shows the declining trends of STMT, MEGPA, and CP with increasing hours of social media engagement groups A, B, C, and D. But the number of female students belonging to group E in the present sample was too few (n = 2), which was insufficient for statistical analyses. Hence, in female students, only 6 pairwise comparisons were done among the 4 groups, and the alpha level of the one-way ANOVA test was also adjusted according to the Bonferroni correction method to be 0.008.

Cross comparisons among female groups revealed that CP was significantly higher in A than in B, C, and D (p< 0.00005, p< 0.00002, and p< 0.002, respectively) while MEGPA was only significantly higher in A than in B and C (p< 0.0005 and p< 0.002, respectively). Another cross-comparison showed us that STMT was significantly higher in A than in B and D (p< 0.008 and p< 0.0003, respectively). Other cross-comparisons among female groups were not statistically significant.

Discussion

The primary findings of this study provide robust evidence for a negative relationship between social media engagement and academic performance in a sample of college students. Specifically, we observed a significant negative correlation between the number of daily online hours and both the students' prior secondary school ministerial GPA and their recent three-year college performance. This aligns with the growing body of literature reviewed above, which has consistently documented that excessive digital media use is associated with lower grades and poorer learning outcomes [7-12]. The fact that this negative relationship holds for both prior and current academic metrics suggests that the impact is not merely a temporary effect of college life but may reflect a broader and more persistent pattern.

The observed positive correlation between ministerial GPA and college performance is an important validity check, confirming the stability of academic aptitude across different educational stages. This makes the negative impact of digital engagement on college performance, which emerges even when controlling for this underlying aptitude, particularly meaningful. It suggests that the cognitive resources and time allocated to online activities may be actively displacing or undermining those necessary for academic success.

One of the most significant contributions of this study is the finding of a gender-specific effect: the negative impact of engagement increased with the number of hours, and this effect was more pronounced in female students. This finding is consistent with a growing number of studies that have identified gender as a critical moderator [5]. The literature suggests that female students may be more susceptible to the negative consequences of social media use due to several potential mechanisms. They may use social media more intensively for social comparison and relationship maintenance, leading to greater emotional investment and potential for distraction. Furthermore, the specific nature of online activities and the psychological need they fulfil may differ by gender, with females potentially being more vulnerable to the addictive and attention-displacing features of these platforms [19,20].

This study found a direct correlation between engagement hours and short-term memory performance, which aligns strongly with the literature supporting a link between digital media use and broader cognitive functions, such as attention and working memory, which are fundamental to learning and academic success (4). It is plausible that these more basic cognitive disruptions mediate the observed negative impact on academic performance. For instance, the constant context-switching and attentional demands of social media can impair the encoding and consolidation of information, which are essential for both short-term recall and long-term academic retention.

Limitations and Future Directions

This study has several limitations. First, its cross-sectional design precludes the establishment of causal direction. While we interpret the data as suggesting that digital engagement negatively impacts performance, it is also possible that students with lower academic performance are more likely to

disengage and spend more time online. Longitudinal studies are needed to clarify causality. Second, our measure of short-term memory may not have been sensitive enough to capture subtle effects, or the impact may be more pronounced on other cognitive domains like sustained attention or executive function. Future research should incorporate more comprehensive cognitive batteries. Third, our measure of digital engagement relied on self-reported hours, which can be subject to recall bias. Objective tracking of screen time would provide more accurate data. Finally, while we observed a gender effect, the specific mechanisms underlying this vulnerability remain unclear and require further investigation.

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Table 1. Means and standard deviations of STMT, MEGPA, and CP in the five social media engagement groups.

	Engagement groups (n)		STMT	MEGPA	CP
Total sample (n= 558)	A (259)	Mean	56.293	88.196	72.29
		SD	12.712	6.038	10.611
	B (128)	Mean	53.164	86.035	68.055
		SD	13.308	6.384	10.461
	C (91)	Mean	51.484	86.415	67.986
		SD	13.571	6.121	11.174
	D (41)	Mean	48	84.937	64.217
		SD	15.718	5.49	10.089
	E (35)	Mean	43	83.018	63.189
		SD	17.872	6.851	11.852

Table 2. Means and standard deviations of STMT, MEGPA, and CP in the five social media engagement groups in males.

	Engagement groups (n)		STMT	MEGPA	CP
Males (n= 216)	A (38)	Mean	56.974	88.567	71.072
		SD	13.927	5.817	10.997
	B (48)	Mean	55.104	87.164	69.92
		SD	12.269	5.428	9.409
	C (59)	Mean	54.746	87.529	70.242
		SD	12.643	5.777	10.539
	D (38)	Mean	49.737	85.294	65.071
		SD	14.563	5.385	9.432
	E (33)	Mean	43.788	83.019	63.608
		SD	18.116	7.062	12.086

Table 3. Means and standard deviations of STMT, MEGPA, and CP in the five social media engagement groups in females.

	Engagement groups (n)		STMT	MEGPA	CP
Females (n= 342)	A (221)	Mean	56.176	88.132	72.499
		SD	12.522	6.086	10.555
	B (80)	Mean	52	85.358	66.936
		SD	13.839	6.838	10.948
	C (32)	Mean	45.469	84.362	63.826
		SD	13.342	6.295	11.276
	D (7)	Mean	38.571	83	59.580
		SD	19.518	6.083	12.968
	E (2)	Insufficient for statistical significance			