

The Cognitive Footprint Of Social Media: Effects On Attention, Verbal Fluency And Prospective Memory In Late Adolescents

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This study examined the impact of social media use on attention, verbal fluency, and prospective memory among late adolescents. A cross-sectional design with purposive sampling was used to collect data from 115 adolescents aged 15 to 18 years. Standardized tools including the Social Media Use Scale (SMUS), Digit Span Test, Controlled Oral Word Association Test (FAS Test), and Prospective Memory Concerns Questionnaire (PMCQ) were administered. Results indicated that higher social media use was significantly associated with greater self-reported prospective memory concerns, though no significant impairments were found in attentional or verbal fluency tasks. Findings suggest that while core attentional capacities remain stable, higher-order cognitive processes like strategic monitoring may be more vulnerable to digital distractions. Implications for educational strategies and mental health interventions are discussed.

Keywords: social media, attention, verbal fluency, prospective memory, late adolescents, digital distraction, executive function, cognitive load

Adolescence represents a critical period marked by significant neurobiological, cognitive, and socio-emotional transformations. During this stage, maturation of executive functions such as attention control, language processing, and memory organization is heavily influenced by both internal neurodevelopmental processes and external environmental factors (Blakemore & Mills, 2014). The prefrontal cortex, responsible for goal-directed behavior, working memory, and impulse regulation, continues to develop during adolescence, rendering individuals particularly sensitive to environmental inputs like social media (Giedd, 2015).

Social media platforms—Instagram, TikTok, WhatsApp, Snapchat—have become deeply embedded in adolescents' daily routines, reshaping communication, identity expression, and learning (Anderson & Jiang, 2018). While offering benefits such as connectivity and creative expression,

concerns remain about social media's potential cognitive costs, particularly given adolescents' ongoing neural development (Statista, 2023).

Digital technologies present a paradox: while they may enhance cognitive flexibility and information access, they may also encourage fragmented attention, superficial engagement, and reduced cognitive stamina. Attention, verbal fluency, and prospective memory—key executive functions—are increasingly scrutinized for their vulnerability to digital environments (Cain & Mitroff, 2011; Wilmer et al., 2017). However, the literature remains divided, emphasizing the need for empirical clarity regarding how varying types and intensities of social media use impact adolescent cognition.

Due to synaptic pruning and heightened neuroplasticity, adolescents are particularly responsive to habitual experiences, including regular digital media exposure (Best & Miller,

2010). Given the continued development of executive functions during this phase, understanding how social media habits interact with attention, verbal fluency, and prospective memory is not only academically pertinent but essential for informing educational, mental health, and policy interventions.

Attention, the mental process enabling focus on relevant stimuli, is perhaps the most impacted cognitive domain in digital contexts. Social media designs intentionally maximize user engagement through features like notifications and endless scrolling, encouraging rapid shifts of focus (Montag et al., 2019). Research by Uncapher et al. (2016) and Ophir et al. (2009) demonstrates that heavy media multitasking is associated with poorer sustained attention and impaired cognitive control. Moreover, adolescents frequently exposed to digital fragmentation may struggle to filter irrelevant stimuli, resulting in diminished attentional stability (Wilmer et al., 2017).

Conversely, some researchers suggest potential cognitive benefits. Strategic and mindful interaction with digital platforms may train selective and divided attention, particularly when adolescents engage with problem-solving or educational content (Cain & Mitroff, 2011). These conflicting findings highlight the need to account for individual cognitive baselines, usage quality, and contextual factors when assessing social media's impact on attention.

Verbal fluency, a measure of an individual's ability to generate words rapidly within specific prompts, is another domain of interest. Beyond linguistic competence, verbal fluency reflects broader executive functions, including cognitive flexibility and working memory (Shao et al., 2014). Digital communication often favors brevity, informality, and multimodality—emojis, abbreviations, memes—which may influence

linguistic development. Some studies argue that habitual use of abbreviated digital language correlates with reduced lexical diversity and syntactic complexity, potentially hindering traditional verbal fluency skills (Rosen et al., 2010; Subrahmanyam & Šmahel, 2011).

Carr (2010) further cautions that reliance on digital media might erode deep reading and writing capacities. However, other scholars contend that digital environments offer new forms of linguistic creativity and adaptability, especially among multilingual users engaging in code-switching and cross-cultural communication (Tagliamonte & Denis, 2008). These divergent perspectives necessitate empirical investigation into how different patterns of social media use—passive consumption versus active composition—relate to verbal fluency outcomes.

Prospective memory, the ability to remember future intentions, is crucial for academic achievement and daily functioning. High-frequency digital distractions have been linked to impaired prospective memory performance, as cognitive resources necessary for intention encoding and retrieval are depleted (Bailey et al., 2019; Dunning & Holmes, 2014). In experimental contexts, heavy social media users often demonstrate lower accuracy in prospective memory tasks, likely due to frequent attentional interruptions.

Nevertheless, social media platforms also offer cognitive support systems, such as digital reminders and notifications, that can aid prospective memory by serving as external cues (Sparrow et al., 2011). This duality raises complex questions: Does reliance on external aids weaken intrinsic memory systems, or is it an adaptive evolution in cognitive functioning? Context-specific studies are necessary to determine whether technological externalization

enhances or compromises adolescents' prospective memory development.

Importantly, not all social media usage is uniform. Passive scrolling is linked to cognitive fatigue and lower well-being, while active engagement (e.g., content creation, dialogue participation) may yield more positive cognitive and emotional outcomes (Orben & Przybylski, 2019; Valkenburg & Peter, 2011). Therefore, both the quantity and quality of social media interaction must be evaluated in understanding its cognitive consequences.

Given the ubiquitous role of social media in adolescent life, it is critical to discern practices that foster cognitive growth from those that impede it. The findings from this research could help educators tailor instruction for digitally immersed learners, assist mental health professionals in addressing media-related cognitive fatigue, and guide policymakers in developing balanced digital use policies.

This study aims to fill existing gaps by investigating the associations between social media use and three cognitive functions—attention, verbal fluency, and prospective memory—among late adolescents. Employing a cross-sectional design, the study will survey 115 participants using validated tools: the Digit Span Test for attention, the F-A-S Controlled Oral Word Association Test (COWAT) for verbal fluency, and the Prospective Memory Questionnaire (PMQ). Social media usage will be measured with the Social Media Use Integration Scale (SMUS) (Jenkins-Guarnieri et al., 2013).

The theoretical framework integrates Cognitive Load Theory (Sweller, 1988), positing that high-frequency media engagement imposes extraneous cognitive load, impairing attentional processes. The Theory of Media Multitasking (Ophir et al., 2009) further suggests that habitual multitaskers may suffer chronic attentional

deficits, though compensatory strategies may emerge in some cases.

Verbal fluency is framed through the Information Processing Theory of Language Development (Miller & Cuttler, 2004), acknowledging that frequent exposure to informal digital communication may reduce linguistic complexity but could also stimulate linguistic creativity. Prospective memory is conceptualized through the Multiprocessing Theory (McDaniel & Einstein, 2000), which emphasizes that constant digital engagement may disrupt strategic monitoring, yet facilitate cue-based retrieval.

Social media's role as a cultural artifact is interpreted through Vygotsky's Sociocultural Theory (Vygotsky, 1978), where digital interaction is seen as a double-edged sword—potentially scaffolding or impairing cognitive growth. Erikson's Psychosocial Theory (Erikson, 1968) is also pertinent, framing social media as a critical tool in adolescent identity formation, with implications for cognitive load and emotional regulation.

Finally, the dual-systems model of neurodevelopment (Steinberg, 2008) provides biological grounding, highlighting adolescents' heightened sensitivity to rewards and ongoing maturation of cognitive control. These intersecting theories collectively guide the hypotheses and interpretations of the present research.

Objectives

1. To investigate the relationship between social media consumption and attention levels among late adolescents.
2. To explore the influence of social media on verbal fluency in late adolescents.
3. To examine the effects of social media use on prospective memory in late adolescents.

Hypotheses

1. Higher social media usage will be associated with lower sustained attention performance.
2. Social media usage will show a negative correlation with verbal fluency task performance, as measured by standardized assessments.
3. Social media usage will be positively correlated with self-reported memory concerns, as reflected in PMCQ scores

Method

Sample:

The sample comprised 115 adolescents aged 15 to 18 years, selected using purposive sampling. Inclusion criteria included active social media usage and proficiency in English. Participants with diagnosed cognitive or neurological impairments were excluded.

Tool Description:

The Social Media Use Scale was developed by Tuck and Thompson in 2023 to address limitations of previous measures that primarily assessed frequency or dichotomized active versus passive social media engagement. The SMUS was constructed utilizing data from three developmental studies with college students and conceptualizes social media usage through four distinct dimensions: active voicing, active content seeking, passive browsing, and passive image managing. The scale comprises 17 items rated on a 9-point Likert scale, capturing self-reported frequency of these engagement patterns over the past week. The items were refined through qualitative interviews and psychometric evaluation, resulting in strong internal consistency (range: 0.75-0.86) and established construct validity via factor analysis. The SMUS has since been

employed in research linking specific usage patterns to variables such as self-concept clarity, depressive symptoms, and transitional life phases. The multidimensional structure of the SMUS facilitates more nuanced analysis of social media behaviors and their psychological correlates.

The Digit Span Test, developed by David Wechsler in 1955 as part of the Wechsler Adult Intelligence Scale, remains a widely used assessment tool for evaluating verbal attention and working memory. The task consists of two subtests: Digits Forward and Digits Backward. In the Digits Forward subtest, participants repeat digits in the presented order, which measures attention and short-term memory. The Digits Backward subtest requires participants to recall digits in reverse order, engaging working memory. The test is administered orally, with the sequence length increasing until the participant meets the failure criteria. Extensively standardized, the Digit Span Test demonstrates strong construct validity and is frequently employed in clinical assessments of cognitive decline, neurodevelopmental conditions, and acquired brain injuries. It exhibits high test-retest reliability and sensitivity to working memory deficits, making it a mainstay in neuropsychological assessment batteries.

The Controlled Oral Word Association Test (COWAT), commonly referred to as the F-A-S Test, was originally developed by Borkowski, Benton, and Spreen (1967) and incorporated into the Neurosensory Center Comprehensive Examination for Aphasia. It assesses phonemic verbal fluency by prompting individuals to generate as many words as possible beginning with the letters F, A, and S, each within a one-minute time limit. Rules exclude proper nouns, repetitions, and word derivatives. The test is administered orally in a distraction-free environment, following standardized instructions and procedures. Responses are

tallied to yield a total raw score across the three trials. Scoring is based on validated norms stratified by age, education, and language background. Higher educational levels are associated with greater word output. The COWAT is sensitive to executive dysfunction and is widely used in research and clinical settings to assess language generation and cognitive flexibility. It demonstrates good internal consistency and construct validity, particularly in populations with neurological and psychiatric conditions.

The Prospective Memory Concerns Questionnaire (PMC-Q) was designed to assess subjective concerns regarding prospective memory (PM)—the ability to remember future intentions. Developed using classical test theory and Rasch analysis, the scale captures perceptions of everyday memory failures and anxiety related to forgetting. Item development was informed by literature review and clinician-patient feedback. The PMC-Q includes three subscales: Forgetting Behaviors, Memory Concerns, and Retrieval Failures. Respondents rate items on a Likert-type scale from “never” to “always,” reflecting the frequency and impact of memory lapses. Psychometric validation yielded high internal consistency, with Cronbach’s alpha = 0.95 for the total scale, and 0.88–0.89 for subscales. Confirmatory factor analysis supported the three-factor model, with acceptable fit indices (RMSEA = 0.056, CFI = 0.915). The tool is applicable in both clinical and research contexts, particularly in populations with acquired brain injury, cognitive complaints, or neurodegenerative conditions. Scoring provides total and subscale indices, and normative data are available for comparative interpretation.

Procedure:

Ethical approval for the study was obtained from the Institutional Ethics Committee (IEC) of the investigators’ affiliated

university. The study comprised 115 adolescents between 15 and 18 years of age, selected through purposive sampling based on accessibility and relevance to the study objectives. Participants were included if they reported consistent use of social media platforms and demonstrated adequate English language skills to comprehend the administered tools. Individuals with reported or documented cognitive or neurological impairments were excluded to ensure clarity in assessing the targeted cognitive variables. A cross-sectional design was utilized to examine the associations between patterns of social media use and cognitive performance during late adolescence. The data collection phase was carried out over a five-month period, from January to May 2025.

The study was conducted in offline settings, specifically within private tuition centers and school environments, selected through purposive sampling. These locations were chosen to ensure direct access to the target population of late adolescents aged 15 to 18 years. Participants were identified based on age eligibility and their availability during the data collection period. Prior to participation, informed consent was obtained from the legal guardians of the students, in accordance with ethical standards for research involving minors. Additionally, assent was obtained from the participants themselves, indicating their voluntary agreement to take part in the study.

In accordance with ethical standards for research involving minors, written informed consent was obtained from the legal guardians of all participants. Additionally, written assent was secured from each participant, affirming their voluntary participation.

Data collection involved the administration of a combination of standardized self-report questionnaires and performance-based cognitive tasks. The Social Media Use Scale

(SMUS) and the Prospective Memory Concerns Questionnaire (PMC-Q) were administered in paper-and-pencil format, allowing participants to respond independently under researcher supervision in a quiet and distraction-free setting.

Cognitive assessment tasks were administered individually in a standardized manner following established protocols. The Digit Span Test (comprising Digits Forward and Digits Backward components) was conducted verbally, with the examiner reading out digit sequences at a consistent pace, and the participant required to respond immediately. The test followed standard administration and scoring procedures, as recommended in the test manual.

Similarly, the Controlled Oral Word Association Test (COWAT), using the letters F, A, and S, was administered to assess phonemic verbal fluency. Each letter trial was timed for one minute, during which participants were asked to produce as many unique, valid words as possible beginning with the specified letter, while adhering to the test's exclusion criteria (e.g., proper nouns, repetitions, and variants). The test administrator ensured procedural fidelity and neutrality throughout the task.

All assessments were conducted in individual sessions lasting approximately 40 to 50 minutes per participant. Data were anonymized and securely stored in accordance with institutional ethical guidelines.

Results

Table 1. Descriptive Statistics for Cognitive Measures and Social Media Use Variables

Variable	Subscale	N	Range	Minimum	Maximum	Mean(M)	Std.Deviation (SD)
Digit Span	SMUS	115	20.00	139.00	119.00	45.45	20.57
	IB	115	5.00	45.00	40.00	12.60	7.79
	CompB	115	3.00	45.00	42.00	10.03	8.11
	BB	115	3.00	38.00	35.00	8.29	6.87
	ConsB	115	2.00	39.00	37.00	14.53	8.70
	DSF	115	3.00	8.00	5.00	4.69	1.31
	DSB	115	2.00	7.00	5.00	3.16	1.00
	f-a-s test	115	6.00	40.00	34.00	22.48	8.45
	PMCQ	115	36.72	87.14	50.42	56.69	9.54
	FB	115	40.59	90.59	50.00	57.13	10.47
	MC	115	35.69	75.15	39.46	50.63	9.65
	RC	115	34.73	86.30	51.57	60.88	11.35

Note. DSF = Digit Span Forward; DSB = Digit Span Backward; FAS = Verbal Fluency; PMCQ = Prospective Memory Concerns Questionnaire; SMUS = Social Media Use Scale, IB = Image Based; CompB = Comparison Based; BB = Belief Based; ConsB = Consumption based; FB = Forgetting Behavior; MC = Memory Concerns; RC = Retrieval Cues.

Descriptive statistics (Table 1) summarized cognitive measures and social media use among 115 adolescents. The Social Media Use Scale (SMUS) total score indicated moderate variability in digital engagement. Among cognitive measures, participants showed typical short-term memory performance and moderate verbal fluency. Prospective memory concerns, assessed via PMCQ, showed moderate levels, particularly in retrieval cue concerns.

Table 2. Shapiro–Wilk Normality Test for Continuous Variables

Variable	W Statistic	p-value	Interpretation
SMUS	0.848	0.000	Not normally distributed
DigitSpanF	0.966	0.005	Not normally distributed
DigitSpanB	0.957	0.001	Not normally distributed
FAS Test	0.988	0.441	Normally distributed
PMCQ	0.962	0.002	Not normally distributed

Given the violation of normality assumptions, non-parametric tests were

Table 3. Spearman’s Correlations between Total Social Media Use and Cognitive Measures

		Age	SMUS	DigitSpanF	DigitSpanB	FAS Test	PMCQ
SMUS	Correlation	0.098	1.000				
	Sig.	0.295	-				
DigitSpanF	Correlation	-0.058	-0.093	1.000			
	Sig.	0.540	0.323	-			
DigitSpanB	Correlation	0.165	-0.066	0.645	1.000		
	Sig.	0.078	0.486	0.000	-		
FAS Test	Correlation	0.040	-0.196	0.165	0.184	1.000	
	Sig.	0.668	0.035	0.079	0.049	-	
PMCQ	Correlation	-0.017	0.256	-0.116	-0.042	-0.373	1.000
	Sig.	0.860	0.006	0.217	0.656	0.000	-

Note. N = 115. All coefficients represent Spearman’s ρ .

Quantile regression analysis showed that SMUS significantly predicted PMCQ scores ($B = 0.124, p = .023$), indicating greater

employed for subsequent analyses such as Spearman’s \tilde{r} and quantile regression, was justified. This methodological decision ensures robustness in detecting associations and effects not influenced by distributional assumptions.

Spearman’s correlations (Table 3) demonstrated a significant negative association between SMUS and verbal fluency ($\rho = -.196, p = .035$), and a positive association between SMUS and PMCQ scores ($\rho = .256, p = .006$). No significant correlations were found between SMUS and Digit Span scores.

Subscale analysis indicated that consumption-based and image-based SMUS subtypes correlated moderately with each other ($\rho = .333, p < .001$). Retrieval cue concerns were negatively correlated with Digit Span Forward ($\rho = -.292, p = .001$) and verbal fluency scores ($\rho = -.457, p < .001$), suggesting a potential cognitive vulnerability related to memory retrieval.

memory concerns with increased social media use. No significant effects of SMUS were found on Digit Span or FAS scores ($p > .05$).

Mann–Whitney U tests revealed a significant gender difference in Digit Span Forward scores ($U = 2.23, p = .026$), with males outperforming females. A marginally significant trend was observed for PMCQ scores ($U = -1.96, p = .051$), with females reporting higher memory concerns. No significant gender differences were found for SMUS, Digit Span Backward, or FAS scores.

Kruskal–Wallis tests showed no significant differences in SMUS or cognitive measures based on birth order, family type, or area of residence ($p > .05$ for all comparisons). Though participants from nuclear families reported slightly higher SMUS scores, this trend did not reach statistical significance.

Discussion

The present study explored the relationship between social media use and cognitive functions attention, verbal fluency, and prospective memory among late adolescents. Findings revealed a significant positive association between social media use and self-reported prospective memory concerns, while trends of negative associations with attention and verbal fluency were observed but did not reach statistical significance.

The findings partially supported the hypotheses proposed. Hypothesis 1, predicting a negative association between social media use and attention, was not supported, as no significant relationship was observed for Digit Span scores. Prior research has repeatedly linked heavy media multitasking with compromised selective attention and diminished task-switching ability (Ophir, Nass, & Wagner, 2009; Cain & Mitroff, 2011). However, the temporal context of data collection—conducted during an academic examination period—may have attenuated habitual usage patterns, thereby reducing observable attentional deficits (Rosen, Carrier, & Cheever, 2013).

Hypothesis 2, posited a negative relationship between social media use and verbal fluency; initial Pearson correlations supported this prediction, reflecting concerns that brief, informal digital exchanges undermine lexical diversity (Rosen et al., 2010; Carr, 2010). Nevertheless, these associations failed to remain significant under quantile regression analysis, implying that any impact on complex language retrieval is subtle and potentially moderated by individual differences in cognitive flexibility.

Hypothesis 3 was supported, as social media use showed a significant positive association with prospective memory concerns, both in correlation and regression models. The significant link between higher social media use and greater prospective memory concerns aligns with prior research emphasizing the vulnerability of future-oriented memory functions to digital distractions. McDaniel and Einstein's (2000) Multiprocessing Theory of Prospective Memory posits that strategic monitoring, essential for prospective memory, can be disrupted by high cognitive load environments. In line with this, Bailey et al. (2019) found that media multitasking impaired individuals' ability to retrieve intended actions, suggesting that the fragmented attention encouraged by social media platforms may compromise adolescents' prospective memory.

Although no significant relationship emerged between social media use and attentional performance, the observed negative trend is noteworthy. Previous studies by Ophir et al. (2009) and Cain and Mitroff (2011) demonstrated that frequent media multitasking was associated with reduced selective attention and cognitive control. The absence of significant findings in the present study could be attributed to contextual factors, particularly the timing of data collection during an academic exam season, which might have moderated

participants' typical digital behaviors and reduced distraction levels. Situational moderators such as academic stressors may have prompted participants to curtail digital engagement in favor of study, thereby mitigating distraction effects. This context-dependent variability underscores the importance of interpreting cross-sectional findings in light of temporal and environmental factors.

Verbal fluency, measured via the FAS test, also showed a non-significant negative trend with social media use. This reflects concerns raised by Rosen et al. (2010) and Carr (2010), who suggested that the brevity and informality of online communication may reduce lexical diversity and impair complex language processing. Uhls et al. (2014) further observed that adolescents with prolonged screen exposure exhibit alterations in narrative skills, although such effects typically emerge under sustained usage rather than episodic shifts. Although a significant negative correlation was initially observed, it did not sustain under quantile regression analysis, indicating that effects on verbal fluency may be subtle and moderated by other variables such as language habits or cognitive flexibility.

These results suggest that digital distractions may selectively affect higher-order memory monitoring processes rather than basic cognitive operations. The FAS test association indicates potential linguistic suppression due to social media's abbreviated communication styles. That these cognitive disruptions did not extend significantly to attention suggests resilience in core attentional capacities during adolescence.

Gender-based analysis showed that males outperformed females on Digit Span Forward tasks, while females reported greater memory concerns. These findings echo gendered differences in cognitive self-

appraisal and digital behavior patterns documented in prior research (Hadlington, 2015). It is plausible that gender-specific socialization patterns and usage styles may contribute to differences in cognitive self-perception and performance, particularly under digital influence.

Analyses of the SMUS subscales revealed that passive browsing, image-focused activities, and consumption-oriented engagement were most prominent. This pattern aligns with Orben and Przybylski's (2019) contention that the quality of social media interaction rather than total screen time drives cognitive effects. Moreover, higher scores on these visually oriented subscales were associated with increased prospective memory concerns, suggesting that passive scrolling may erode the strategic monitoring processes required for future intention retrieval, even when verbal processing demands are minimal.

In sum, the findings reinforce the view that while basic attentional processes may remain relatively stable under digital exposure, higher-order executive functions like prospective memory are more susceptible to disruption. This nuanced understanding contributes to a growing literature emphasizing the domain-specific effects of social media on adolescent cognitive development.

The divergence between objective cognitive measures and subjective memory concerns highlights the value of a multi-method approach. While core attentional capacity, as indexed by Digit Span, appears resilient to situational fluctuations, self-reported concerns capture metacognitive judgments and cultural narratives linking screen time with cognitive decline (Best & Miller, 2010; Uncapher, Thieu, & Wagner, 2016). This suggests that adolescents may be acutely aware of lapses in future planning even when routine attentional functions remain intact.

Theoretical integration with Cognitive Load Theory (Sweller, 1988) and Media Multitasking Theory (Ophir et al., 2009) further clarifies these findings. Cognitive Load Theory posits that extraneous information such as rapid notifications overloads finite working memory resources, undermining deep processing required for complex tasks. Meanwhile, habitual media multitasking fragments attention and reallocates resources away from strategic monitoring processes, offering a plausible mechanism for the observed increase in prospective memory concerns despite stable Digit Span performance.

Conclusion

The study concludes that social media engagement among late adolescents is differentially associated with discrete cognitive domains. Although no statistically significant associations emerged between Social Media Use Scale (SMUS) scores and measures of sustained attention (Digit Span) or phonemic verbal fluency (FAS), a clear, positive relationship was observed between heavier SMUS engagement and increased prospective memory concerns on the PMC-Q. This domain specific vulnerability aligns with the Multiprocessing Theory of Prospective Memory, which posits that resource demanding strategic monitoring processes are especially susceptible to cognitive load imposed by rapid task switching and digital distractions.

These findings suggest that interventions aimed at managing social media's cognitive costs should focus less on reducing overall screen time and more on strengthening strategic monitoring and intention retrieval skills by promoting mindful and strategic media use. For example, embedding external reminder systems, teaching intention cue encoding techniques, and structuring designated "tech free" study periods may help safeguard prospective memory without

discouraging adaptive uses of digital platforms.

In practical terms, the results highlight the importance of promoting mindful and strategic media use among adolescents. Educational programs aiming to enhance digital literacy and cognitive self-regulation could be valuable in navigating potential cognitive costs. Mental health practitioners should also consider evaluating digital habits when addressing complaints related to memory and attention difficulties among young clients.

However, several limitations in the study must be acknowledged. The cross-sectional design restricts causal interpretations. The timing of data collection during an exam season may have temporarily reduced typical social media engagement, possibly attenuating some associations. Additionally, reliance on self-report measures for digital habits introduces potential biases, and the sample's demographic homogeneity limits the generalizability of the findings.

The study potentially lays important groundwork for future research, which should address both methodological and conceptual extensions. A key recommendation is to pursue longitudinal or experimental designs to clarify causal pathways. For instance, tracking changes in cognitive performance following digital detox interventions or media literacy training could illuminate whether the observed relationships are reversible, cumulative, or dependent on exposure thresholds.

Future research should also aim to incorporate objective behavioral data such as app usage logs or screen-time trackers alongside self-report measures. This would enhance validity and allow for finer-grained distinctions between passive scrolling, active content creation, and social interaction all of which may carry different cognitive implications.

Additionally, individual differences deserve deeper exploration. Traits such as impulsivity, metacognitive awareness, sleep hygiene, or academic stress may moderate how social media affects cognitive functioning. Identifying these moderators can inform more tailored and effective cognitive or behavioral interventions. From an applied perspective, these findings support the need for educational and mental health interventions focused on digital awareness. Such efforts will further clarify the nuanced and evolving relationship between digital engagement and adolescent cognitive development.

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