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Self-Reported Executive Function as a Correlate of Academic Cyberloafing Among Medical Students: A Cross-Sectional Study Using a Culture-Centered Indonesian Measure

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Abstract: Digital distraction during lectures is a growing concern in medical education, yet the cognitive mechanisms behind academic cyberloafing remain poorly understood, particularly in Indonesia. Previous work has focused on self-control, fear of missing out, and smartphone habits, while executive function has rarely been examined with a culturally grounded instrument. This study aimed to determine the relationship between self-reported executive function (EF) and academic cyberloafing among medical students and to examine which EF domains are associated with it. A cross-sectional design was applied to 92 active medical students at a public university in Jakarta, recruited through convenience sampling with an online questionnaire. EF was measured with an Indonesian culture-centered self-report instrument comprising five domains, and cyberloafing with the 24-item Indonesian academic cyberloafing scale. Associations were tested using Spearman correlation, with Holm correction for domain-level tests. Overall self-reported EF was negatively and significantly correlated with cyberloafing ($\rho = -0.38$, 95% CI −0.55 to −0.18, $p < 0.001$), a weak association. Spiritual functioning showed the strongest association ($\rho = -0.40$), followed by planning and organization ($\rho = -0.28$); inhibitory control ($\rho = -0.22$, $p = 0.033$) was nominally significant but did not remain significant after Holm correction for multiple testing, whereas working memory and cognitive flexibility were not associated. Cyberloafing was generally low. These exploratory cross-sectional findings suggest that students who perceive stronger self-regulatory capacities report less nonacademic internet use during lectures. Domain-level findings, particularly for spiritual functioning, are tentative because domain-level reliability was low to moderate, and they need confirmation in future research.

Keywords: Self-Reported Executive Function, Cyberloafing, Medical Students, Self-Regulation, Digital Distraction

INTRODUCTION

Digital technology has become part of everyday academic life. Roughly two thirds of the world population now uses the internet (International Telecommunication Union, 2023), and in Indonesia internet users exceed 215 million, a penetration of about 78% (Asosiasi Penyelenggara Jasa Internet Indonesia, 2023). Online access supports learning, yet the same devices expose students to a constant stream of nonacademic content. Intensive smartphone use has been linked to changes in attention, memory, and self-regulation (Wilmer et al., 2017), and notifications alone have been shown to increase inattention and hyperactivity symptoms (Kushlev et al., 2016).

Cyberloafing refers to the deliberate use of the internet for nonacademic purposes during time meant for learning (Metin-Orta & Demirtepe-Saygılı, 2023). Akbulut et al. (2016) described five forms of this behavior: sharing, shopping, real-time updating, accessing online content, and gaming or gambling. It lies on a continuum from adaptive to maladaptive depending on frequency, duration, and context (Twum et al., 2021). Brief use outside class may even serve as recovery from academic strain (Wu et al., 2021), but nonacademic internet use during lectures has been associated with poorer learning and lower academic performance (Ravizza et al., 2017; Wu et al., 2021) and with lower cognitive engagement (Mihelič et al., 2022). Among medical students specifically, peer recognition has been identified as a key factor that sustains academic cyberslacking (Zhou et al., 2026), and fear of missing out predicts its occurrence in first-year students (Fitriani & Ardelia, 2026). In an Indonesian sample, 89.3% of students reported using the internet for nonacademic activities during lectures (Simanjuntak et al., 2019), which shows how widespread the behavior is.

Why do students engage in it despite heavy academic demands? Part of the answer may lie in executive function, the set of higher-order cognitive processes that allows people to control attention, inhibit impulsive responses, and regulate behavior toward goals. Its core components are inhibitory control, working memory, and cognitive flexibility (Diamond, 2013), supported by prefrontal and fronto-parietal networks (Friedman & Robbins, 2022). Because the prefrontal cortex matures until the mid-twenties (Casey et al., 2005) and reward-driven systems mature earlier (Steinberg, 2010), young adults can remain vulnerable to stimuli that offer immediate reinforcement, such as social media notifications. Executive function is especially relevant in medical education, where students must sustain attention over long sessions, absorb complex information, and reason clinically.

Existing evidence points in the same direction. Lower executive function and higher impulsivity have been reported among college students who are dependent on text messaging (Hayashi & Washio, 2020), and executive function is negatively related to social media addiction, with stress and negative affect acting as mediators (He & Li, 2022). Better self-reported executive function has also been associated with fewer psychological symptoms in students (Opaas et al., 2024). Research on cyberloafing itself, however, has concentrated on self-control, academic stress, and fatigue (Nweke et al., 2024; Zhou et al., 2021), on affect and coping (Demirtepe-Saygılı & Metin-Orta, 2021), and on norms and moral disengagement (Mihelič et al., 2022). Studies of executive function as a multidimensional construct in relation to academic cyberloafing are scarce.

This leaves two **research gaps**. First, executive function has rarely been examined as a neurocognitive correlate of academic cyberloafing in medical students, and almost no such work exists in Indonesia. Second, most executive function measures were developed in Western settings, whereas the Assessment of Executive Function in the Indonesian Context (AUFEI) was designed with a culture-centered approach and includes a spiritual functioning domain alongside the usual cognitive domains (Dewi et al., 2025). To the best of our knowledge, no study has related this instrument to cyberloafing. The **novelty** of this study therefore lies in testing, at the domain level, which components of a culturally grounded

executive function model are associated with academic cyberloafing in Indonesian medical students.

Based on this description, the research questions of this study are as follows. We hypothesized that higher executive function would be associated with lower cyberloafing.

1. What is the level of executive function among medical students?
2. What is the level of academic cyberloafing among medical students?
3. Is overall executive function related to academic cyberloafing?
4. Is each executive function domain (working memory, inhibitory control, cognitive flexibility, planning and organization, and spiritual functioning) related to academic cyberloafing?

Drawing on the role of executive function in directing attention and suppressing responses to irrelevant stimuli, the following hypotheses were tested, each expecting a negative association (higher self-reported EF, lower cyberloafing):

H1: Global EF is negatively associated with total academic cyberloafing.

H2a: Working memory is negatively associated with total academic cyberloafing.

H2b: Inhibitory control is negatively associated with total academic cyberloafing.

H2c: Cognitive flexibility is negatively associated with total academic cyberloafing.

H2d: Planning and organization is negatively associated with total academic cyberloafing.

H2e: Spiritual functioning is negatively associated with total academic cyberloafing.

The expected direction for the first four domains follows the established role of working memory, inhibitory control, cognitive flexibility, and planning in sustaining goal-directed attention (Diamond, 2013; Friedman & Robbins, 2022). For spiritual functioning, which is specific to the AUFEI framework, the expectation rests on its conceptualization as religious practice and values that support emotional control, self-regulation, and attention (Dewi et al., 2025); students reporting stronger spiritual functioning were therefore expected to regulate nonacademic internet use during lectures more effectively. This domain-level expectation is exploratory because no earlier study has related it to cyberloafing.

METHODS

This was a quantitative, analytic, cross-sectional study conducted at the Faculty of Medicine, Universitas Pembangunan Nasional "Veteran" Jakarta. Data were collected online through Google Forms between August and September 2026. The protocol was approved by the university's Research Ethics Committee (No. 215/VIII/2026/KEP, issued 3 August 2026). All participants gave electronic informed consent, participation was voluntary, and results are reported in aggregate form only.

The population comprised active medical students of the study program. Participants were recruited by convenience sampling: the online questionnaire was distributed through student groups, and students who completed it became potential participants. Eligibility was screened automatically in Google Forms and again during data cleaning, so that only respondents meeting the criteria were analyzed. Inclusion criteria were active student status, age 18–24 years, willingness to give informed consent, complete questionnaire responses, and good understanding of Indonesian. Students on academic leave, those who withdrew, those with a medical or psychological condition known to affect cognition significantly, and those with invalid responses (identical answers across all executive function items or a completion time under seven minutes) were excluded. The medical or psychological condition criterion was assessed by self-report within the Google Form, using the examples defined in the protocol (for example, severe sleep disorder, acute post-traumatic condition, or medication that affects attention). Respondents who reported such a condition while completing the form were immediately directed to the end of the form and did not complete the questionnaire. The

completion-time threshold was set above the 2-seconds-per-item minimum proposed for detecting insufficient effort responding (Huang et al., 2012), because the questionnaire asked about habits rather than knowledge, which makes completion time a usable indicator of careless responding (Leiner, 2019). The required sample size was calculated with G*Power (Faul et al., 2007) for a bivariate correlation with an expected effect size of $r = 0.30$, $\alpha = 0.05$, and power of 0.80, giving a minimum of 84 participants. The sample was increased by about 10% to a target of 92 to anticipate incomplete data. A total of 102 respondents opened the questionnaire. Ten were excluded: one was not an active student, five were aged 17 years (below the 18–24-year range), one did not complete the questionnaire, and three gave identical answers to all items. No respondent was excluded because of a medical or psychological condition. The final analytic sample comprised 92 respondents, equal to the planned target (Figure 1).

Executive function (EF) was assessed by self-report; throughout this article, EF refers to perceived, self-reported everyday executive functioning rather than performance on neuropsychological tests. It was measured with a behavioral self-report rating scale, an approach used to assess everyday executive functioning in higher education (Zamora-Lugo et al., 2025), namely the self-report version of the AUFEI (AUFEI-R), which was developed using a culture-centered approach for Indonesian adolescents and adults aged 13 years and above (Dewi et al., 2025). It contains 25 items across five domains of five items each: working memory, inhibitory control, cognitive flexibility, planning and organization, and spiritual functioning. Items are rated on a four-point scale (never to always), and unfavorable items are reverse-scored. Domain raw scores (5–20) are converted to standard scores (0–10) using the instrument's norm table, and the global executive function (Global EF) score is the mean of the five standard scores. Domains and Global EF are classified as not yet developed, beginning to develop, or well developed, and higher scores indicate better executive function. Its construct validity was established in the original validation through confirmatory factor analysis (Dewi et al., 2025). The original validation indicated lower reliability at the domain level, and domain scores are not yet used as stand-alone clinical profiles (Dewi et al., 2025); internal consistency in the present sample is reported in the Results.

Academic cyberloafing was measured with the Indonesian adaptation (Simanjuntak et al., 2019) of the scale developed by Akbulut et al. (2016). The 24 items cover sharing (9 items), shopping (3), real-time updating (5), accessing online content (5), and gaming or gambling (2), rated from 1 (never) to 5 (always). Total scores range from 24 to 120, with higher scores indicating more cyberloafing. Validity was established in the adaptation study, which reported factor loadings of 0.50–0.89 and a composite reliability of 0.871 (Simanjuntak et al., 2019). Reliability had been reported in earlier studies, and internal consistency in the present sample was additionally estimated with Cronbach's alpha (see Results). Total cyberloafing scores were classified into five equal-width categories of the theoretical range, from very low (≤ 43.2) to very high (> 100.8).

Data were analyzed with SPSS. Participant characteristics and scores are presented as frequencies, percentages, means, and standard deviations. Normality was checked with the Shapiro-Wilk test. Because the cyberloafing score was not normally distributed and the data derive from ordinal Likert scales, associations between Global EF or each domain and total cyberloafing were tested with Spearman's rank correlation (ρ), interpreted as very weak (0.00–0.19), weak (0.20–0.39), moderate (0.40–0.59), strong (0.60–0.79), or very strong (0.80–1.00). Two-tailed $p < 0.05$ was considered significant. Approximate 95% confidence intervals for ρ were obtained with the Fisher z transformation using the Bonett–Wright standard error (Bonett & Wright, 2000). Because five domain-level correlations were tested, p values were also adjusted with the Holm procedure (Menyhart et al., 2021), and adjusted values are reported alongside unadjusted ones. As sensitivity analyses, the Global EF–cyberloafing correlation was examined separately by sex, and a partial Spearman correlation controlling for sex was computed. Internal consistency was estimated with Cronbach's alpha and interpreted as low (<

0.60), moderate (0.60–0.69), acceptable (0.70–0.79), or good (≥ 0.80). All analyses were performed in SPSS; confidence intervals (Fisher z transformation) and Holm-adjusted p values were calculated manually from the SPSS output.

RESULTS AND DISCUSSION

Results

Participant characteristics

Of the 102 respondents who opened the questionnaire, 10 were excluded and 92 were analyzed (Figure 1). The 92 participants were aged 18 to 23 years (mean 20.24 ± 1.41), and 64 (69.6%) were female (Table 1). The largest age group was 21 years (43.5%). All participants were preclinical students.

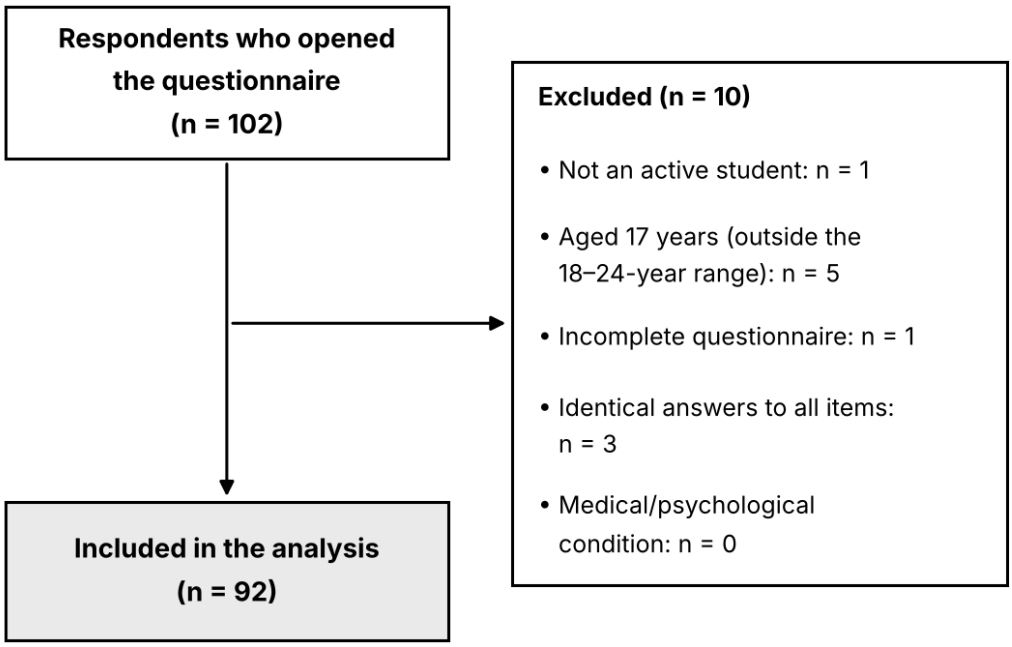


Figure 1. Flowchart of participant selection

Table 1. Characteristics of the participants (n = 92)

Characteristic	n	%
Age (years), mean ± SD	20.24 ± 1.41	
Age range (years)	18–23	
Age 18 years	19	20.7
Age 19 years	9	9.8
Age 20 years	10	10.9
Age 21 years	40	43.5
Age 22 years	13	14.1
Age 23 years	1	1.1
Female	64	69.6
Male	28	30.4
Stage of education: preclinical	92	100.0

Source: research data (2026). SD = standard deviation.

Executive function

Global EF averaged 5.63 ± 0.92 (range 3.60–8.20). Of the participants, 81 (88.0%) were in the beginning-to-develop category, 11 (12.0%) were well developed, and none were in the not-yet-developed category (Table 2). Working memory had the highest mean standard score (6.07) and spiritual functioning the lowest (5.47). Planning and organization had the smallest share of well-developed students (7.6%), whereas spiritual functioning had the largest (53.3%)

and inhibitory control had the largest share not yet developed (26.1%). The contrast for spiritual functioning (lowest mean but largest well-developed share) reflects the shape of its distribution rather than an inconsistency: its standard scores were widely dispersed (SD 1.99; range 0–10), clustered at 4 (n = 26) and at 6–7 (n = 38), with only 9 students at 5 and a small tail of 8 students scoring below 4. The median was 6 (IQR 4–7), which coincides with the cut-off for the well-developed category (≥ 6), so many students were classified as well developed, while the few very low scores pulled the mean down (Table 2).

Table 2. Executive function scores and category distribution (n = 92)

Domain	Mean ± SD	Range	Not yet developed, n (%)	Beginning, n (%)	Well developed, n (%)
Working memory	6.07 ± 1.05	4–9	0 (0.0)	53 (57.6)	39 (42.4)
Inhibitory control	5.62 ± 1.55	2–8	24 (26.1)	32 (34.8)	36 (39.1)
Cognitive flexibility	5.52 ± 1.55	1–10	17 (18.5)	59 (64.1)	16 (17.4)
Planning and organization	5.50 ± 1.59	3–10	10 (10.9)	75 (81.5)	7 (7.6)
Spiritual functioning	5.47 ± 1.99	0–10	8 (8.7)	35 (38.0)	49 (53.3)
Global EF	**5.63 ± 0.92**	**3.60–8.20**	**0 (0.0)**	**81 (88.0)**	**11 (12.0)**

Source: research data (2026). Scores are standard scores (0–10); Global EF is the mean of the five domain standard scores. Beginning = beginning to develop. Category cut-offs on the standard score (well developed ≥ / not yet developed <): working memory 7/4, inhibitory control 7/5, cognitive flexibility 7/5, planning and organization 8/4, spiritual functioning 6/4; for Global EF, well developed ≥ 6.7 and not yet developed < 3.4.

Academic cyberloafing

Total cyberloafing scores ranged from 28 to 82 (mean 47.34 ± 12.47), equivalent to 1.97 per item, or roughly “rarely” (Table 3). Sharing was the most frequent dimension (2.32 per item). Most students fell into the very low (n = 40; 43.5%) or low (n = 38; 41.3%) category, 13 (14.1%) were moderate, 1 (1.1%) was high, and none was very high.

Table 3. Academic cyberloafing scores by dimension (n = 92)

Dimension	Items	Range	Mean ± SD	Min–max	Mean per item
Sharing	9	9–45	20.90 ± 5.70	11–36	2.32
Shopping	3	3–15	5.37 ± 2.19	3–14	1.79
Real-time updating	5	5–25	8.73 ± 4.26	5–22	1.75
Accessing online content	5	5–25	8.84 ± 2.91	5–16	1.77
Gaming/gambling	2	2–10	3.50 ± 1.33	2–7	1.75
Total cyberloafing	**24**	**24–120**	**47.34 ± 12.47**	**28–82**	**1.97**

Source: research data (2026). Range is the theoretical range of the dimension score.

Relationship between executive function and cyberloafing

The Shapiro-Wilk test indicated non-normal distributions for the five domain scores (W = 0.876–0.947, all $p < 0.001$) and for total cyberloafing (W = 0.945, $p < 0.001$), whereas Global EF was normally distributed (W = 0.991, p = 0.798). Spearman correlation was therefore used. Global EF correlated negatively with cyberloafing ($\rho = -0.38$, 95% CI −0.55 to −0.18, $p < 0.001$), a weak association (Table 4). At the domain level, spiritual functioning ($\rho = -0.40$, $p < 0.001$) and planning and organization ($\rho = -0.28$, $p = 0.006$) were negatively related to cyberloafing, and both remained significant after Holm adjustment (adjusted $p < 0.001$ and $p = 0.026$, respectively). Inhibitory control ($\rho = -0.22$, $p = 0.033$) was nominally significant but did not remain so after adjustment (adjusted $p = 0.098$), while cognitive flexibility ($\rho = -0.14$, $p = 0.172$) and working memory ($\rho = 0.00$, $p = 0.994$) were not significantly related. Hypothesis H1 was therefore supported, as were H2d and H2e; H2b was supported only before adjustment, and H2a and H2c were not supported. In sensitivity analyses, the Global EF–cyberloafing correlation was similar in women ($\rho = -0.39$, $p = 0.001$, n = 64) and men ($\rho = -0.43$, $p = 0.023$, n = 28) and was unchanged after controlling for sex (partial $\rho = -0.39$, $p < 0.001$). Women and

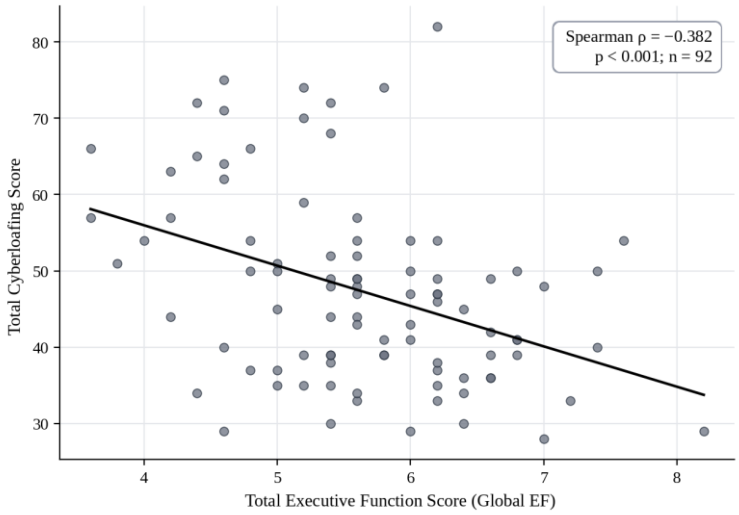
men did not differ significantly in Global EF (Mann–Whitney p = 0.101) or total cyberloafing (p = 0.744).

Table 4. Spearman correlations between executive function and cyberloafing (n = 92)

Variable	ρ	95% CI	p	Holm p	Strength	Decision
Global EF	**−0.38**	**−0.55 to −0.18**	**< 0.001**	**—**	**Weak**	**Significant**
Working memory	0.00	−0.21 to 0.20	0.994	0.994	Very weak	Not significant
Inhibitory control	−0.22	−0.41 to −0.02	0.033	0.098	Weak	Not significant after adjustment
Cognitive flexibility	−0.14	−0.34 to 0.06	0.172	0.344	Very weak	Not significant
Planning and organization	−0.28	−0.46 to −0.08	0.006	0.026	Weak	Significant
Spiritual functioning	−0.40	−0.56 to −0.20	< 0.001	< 0.001	Moderate	Significant

Source: research data (2026). Correlations are with total cyberloafing score; two-tailed α = 0.05. CI = 95% confidence interval (Fisher z transformation); Holm p = Holm-adjusted p value for the five domain-level tests.

The relationship between Global EF and total cyberloafing is shown in Figure 2.



Source: Research Results

Figure 2. Scatter Plot of Global Executive Function and Total Cyberloafing Scores

Internal consistency

Internal consistency in the present sample was acceptable for the AUFEI-R as a whole (Cronbach's α = 0.73, 25 items) and good for the total cyberloafing scale (α = 0.90, 24 items; Table 5). At the domain level, however, the five-item AUFEI-R domains showed low to acceptable coefficients (α = 0.49–0.70), with spiritual functioning the highest (0.70) and working memory the lowest (0.49). Among the cyberloafing dimensions, sharing (0.83), shopping (0.80), and real-time updating (0.88) were good, accessing online content was moderate (0.67), and gaming/gambling, which has only two items, was low (α = 0.25; inter-item r = 0.14). The low domain-level coefficients suggest that domain-level correlations are likely attenuated by measurement error and should be interpreted cautiously, in line with the fact that AUFEI-R domain scores are not yet used as stand-alone clinical profiles (Dewi et al., 2025).

Table 5. Internal consistency (Cronbach's α) of the instruments in this sample (n = 92)

Scale / domain	Items	Cronbach's α	Interpretation
AUFEI-R total (Global EF)	**25**	**0.73**	**Acceptable**
Working memory	5	0.49	Low
Inhibitory control	5	0.55	Low
Cognitive flexibility	5	0.62	Moderate
Planning and organization	5	0.53	Low
Spiritual functioning	5	0.70	Acceptable
Total cyberloafing	**24**	**0.90**	**Good**
Sharing	9	0.83	Good
Shopping	3	0.80	Good
Real-time updating	5	0.88	Good
Accessing online content	5	0.67	Moderate
Gaming/gambling	2	0.25	Low

Source: research data (2026). Interpretation: low < 0.60, moderate 0.60–0.69, acceptable 0.70–0.79, good ≥ 0.80. Unfavorable AUFEI-R items were reverse-scored before analysis.

Discussion

Levels of executive function and cyberloafing

Self-reported executive function in this sample was mostly in the beginning-to-develop category (88.0%), with no student classified as not yet developed. Because the AUFEI-R is a self-report rating scale, this reflects perceived everyday functioning rather than performance on neuropsychological tests, and should be read with that in mind. Planning and organization had the smallest share of well-developed students (7.6%), although spiritual functioning had the lowest mean score; the latter reflects a dispersed, partly bimodal distribution rather than uniformly low scores (see Results). Diamond (2013) describes planning as an applied skill that integrates working memory and inhibitory control in real situations, so it is more demanding than the basic components, and the dense schedule of medical school may make time management especially challenging, although this was not measured here. Cyberloafing was generally low, with 84.8% of students in the low or very low categories, yet every student reported at least some nonacademic internet use during lectures, which agrees with earlier Indonesian findings (Simanjuntak et al., 2019). Sharing, such as messaging and social media interaction, was the most common activity, consistent with its low effort and high social appeal (Akbulut et al., 2016). Self-reported cyberloafing may be underestimated because of social desirability (Akbulut et al., 2017).

Overall executive function and cyberloafing

Higher self-reported executive function was associated with less cyberloafing ($\rho = -0.38$, 95% CI −0.55 to −0.18, $p < 0.001$). This is consistent with the view that executive function helps people keep attention on goal-relevant tasks and suppress responses to irrelevant stimuli (Diamond, 2013; Friedman & Robbins, 2022). Students with better cognitive control are presumably better able to resist the pull of social media or entertainment during lectures. The direction agrees with studies linking heavy smartphone use to weaker attentional control (Wilmer et al., 2017), text-message dependency to lower executive function and higher impulsivity (Hayashi & Washio, 2020), and social media addiction to lower executive function (He & Li, 2022). It also fits findings that trait self-control buffers cyberloafing (Zhou et al., 2021). Given the cross-sectional design, causality cannot be inferred, and a reciprocal relationship is plausible, since frequent media multitasking may itself erode attention (Chen & Yan, 2016; Wilmer et al., 2017).

Executive function domains

Spiritual functioning showed the strongest negative association ($\rho = -0.40$). In the AUFEI framework this domain concerns religious practice and values that support emotional control, self-regulation, and attention (Dewi et al., 2025). This pattern is compatible with research linking religiosity to self-regulation (McCullough & Willoughby, 2009). However,

the present data cannot show that spiritual functioning acts through executive control. The association may also reflect general religiosity, conscientiousness, regular daily routines, or a tendency among students who endorse religious values to under-report behavior they consider undesirable (social desirability). The domain also has only five items, and its reliability (α = 0.70) was the highest of the five domains but still modest, so this finding should be replicated before firm interpretation. Planning and organization ($\rho = -0.28$) was also negatively associated and remained significant after Holm adjustment, in line with the roles of time management and impulse control in resisting digital distraction. Inhibitory control ($\rho = -0.22$) showed a weaker association that did not remain significant after adjustment and should be regarded as tentative. Cognitive flexibility was not significantly associated. Flexibility supports problem solving (Schäfer et al., 2024), but task switching triggered by impulse rather than by academic need is maladaptive, which may blur its relation to cyberloafing. Working memory showed no association ($\rho = 0.00$); one possible reason is the narrow spread of its scores (standard scores 4–9) in this academically selected group, and its low internal consistency in this sample (α = 0.49) may also have attenuated any association, although the data cannot confirm either explanation.

Novelty

The main finding is that the association between self-reported executive function and cyberloafing was not uniform across domains. It was clearest for spiritual functioning and planning and organization, weaker and not robust to correction for inhibitory control, and absent for working memory and cognitive flexibility. To our knowledge, this is the first study to relate the AUFEI-R, an instrument developed with a culture-centered approach, to academic cyberloafing. Including a spiritual functioning domain allowed this study to examine a self-regulation-related aspect that is not part of most executive function measures developed in Western settings. Because domain-level reliability was low to moderate and the design was cross-sectional and exploratory, these domain-specific findings should be treated as hypotheses for future research rather than as evidence that culturally specific domains are more important than cognitive ones.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Among 92 medical students, self-reported executive function was mostly at the beginning-to-develop level and academic cyberloafing was generally low. Higher overall self-reported executive function was weakly but significantly associated with lower cyberloafing, and spiritual functioning and planning and organization were the domains most clearly associated with lower cyberloafing, whereas the association for inhibitory control did not remain significant after correction for multiple testing. Students who report stronger self-regulatory capacities therefore tend to report less nonacademic internet use during lectures, although this exploratory, cross-sectional study cannot establish that executive function causes the difference. Findings at the domain level, particularly for spiritual functioning, are tentative and need confirmation with more reliable domain measures.

Limitations

The cross-sectional design prevents causal inference. Both variables were self-reported and collected in the same questionnaire, so common-method bias (shared method variance) may have inflated the observed correlation, and responses may also be affected by perception and social desirability bias. In addition, self-reported executive function tends to correlate only weakly with performance-based measures (Manuhuwa et al., 2024); the AUFEI-R therefore captures perceived everyday executive functioning rather than objectively measured executive performance, which is why the construct is referred to as self-reported EF throughout. The sample was obtained by convenience sampling from one program at one institution, with more

women than men, and only students willing to complete the questionnaire took part, so selection bias is possible and the findings cannot be generalized. All participants were preclinical students, so the findings may not apply to students in the clinical stage. The sample size was calculated for a Pearson correlation at r = 0.30, and the same target was used for Spearman's correlation, which may require a somewhat larger sample for the same power (Bonett & Wright, 2000); domain-level analyses were therefore adequately powered only for moderate effects. Each AUFEI-R domain has only five items, and internal consistency in this sample was low to moderate for the five-item AUFEI-R domains (α = 0.49–0.70) and for the two-item gaming/gambling dimension (α = 0.25), which probably attenuated correlations and limits domain-level interpretation; domain-level results should therefore be considered tentative. One planning item concerns time spent on social media or gadgets, which overlaps conceptually with cyberloafing and may inflate that correlation. After Holm adjustment for the five domain-level tests, the association for inhibitory control (unadjusted p = 0.033; adjusted p = 0.098) was no longer significant, whereas those for spiritual functioning and planning and organization remained significant. The findings should therefore be regarded as exploratory. Other determinants such as academic stress and smartphone use duration were not controlled because the analysis was limited to bivariate tests.

Recommendations

Students are encouraged to strengthen planning and time-management skills and to limit device notifications during lectures. Faculties may consider academic guidance or study-skills training that builds self-regulation. Future studies should use longitudinal or experimental designs, larger and more diverse samples, objective measures alongside self-report, psychometric re-evaluation of the AUFEI-R at domain level (for example, with longer or refined domain scales), and multivariable analysis that controls for academic stress and smartphone use.

Author Contributions

The first author was responsible for conducting the research, including research preparation, literature review, data collection, data analysis, interpretation of results, and manuscript preparation. The second author provided supervision and guidance as the first research supervisor, particularly in research design, methodology, and manuscript review. The third author provided additional supervision and academic guidance, contributing to the evaluation and revision of the manuscript. All authors have read and approved the final version of the manuscript.

AI Disclosure Statement

During the preparation of this manuscript, the authors used Gemini AI to assist with checking writing errors, identifying inconsistencies in the manuscript, translating the text from Indonesian into English, and providing suggestions for language and writing improvements. All AI-generated suggestions were carefully reviewed and evaluated by the authors. The authors made the final decisions regarding all revisions and take full responsibility for the content and accuracy of the manuscript.

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REFERENCES

Akbulut, Y., Dönmez, O., & Dursun, Ö. Ö. (2017). Cyberloafing and social desirability bias among students and employees. *Computers in Human Behavior, 72*, 87–95. https://doi.org/10.1016/j.chb.2017.02.043

Akbulut, Y., Dursun, Ö. Ö., Dönmez, O., & Şahin, Y. L. (2016). In search of a measure to investigate cyberloafing in educational settings. *Computers in Human Behavior, 55*, 616–625. https://doi.org/10.1016/j.chb.2015.11.002

Asosiasi Penyelenggara Jasa Internet Indonesia. (2023). *Survei penetrasi internet Indonesia 2023*. https://apjii.or.id/

Bonett, D. G., & Wright, T. A. (2000). Sample size requirements for estimating Pearson, Kendall and Spearman correlations. *Psychometrika, 65*(1), 23–28. https://doi.org/10.1007/BF02294183

Casey, B. J., Tottenham, N., Liston, C., & Durston, S. (2005). Imaging the developing brain: What have we learned about cognitive development? *Trends in Cognitive Sciences, 9*(3), 104–110. https://doi.org/10.1016/j.tics.2005.01.011

Chen, Q., & Yan, Z. (2016). Does multitasking with mobile phones affect learning? A review. *Computers in Human Behavior, 54*, 34–42. https://doi.org/10.1016/j.chb.2015.07.047

Demirtepe-Saygılı, D., & Metin-Orta, I. (2021). An investigation of cyberloafing in relation to coping styles and psychological symptoms in an educational setting. *Psychological Reports, 124*(4), 1559–1587. https://doi.org/10.1177/0033294120950299

Dewi, S. Y., Tanra, A. J., Frijanto, A., Prasetya, E. C., Rahmah, M., & Aulya, D. (2025). The development of AUFEI: Culture-centered executive function measurement tools for Indonesian children and adolescents. *International Journal of Neuropsychopharmacology, 28*(Suppl 2), ii148–ii149. https://doi.org/10.1093/ijnp/pyaf052.294

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*, 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175–191. https://doi.org/10.3758/BF03193146

Fitriani, B., & Ardelia, V. (2026). Fear of missing out (FoMO) dan cyberloafing dalam konteks adaptasi mahasiswa tahun pertama. *Character: Jurnal Penelitian Psikologi, 13*(1), 68–80. https://doi.org/10.26740/cjpp.v13n01.p68-80

Friedman, N. P., & Robbins, T. W. (2022). The role of prefrontal cortex in cognitive control and executive function. *Neuropsychopharmacology, 47*, 72–89. https://doi.org/10.1038/s41386-021-01132-0

Hayashi, Y., & Washio, Y. (2020). Text-message dependency, executive function, and impulsivity in college students: A cluster analysis. *Cyberpsychology, Behavior, and Social Networking, 23*(11), 794–799. https://doi.org/10.1089/cyber.2019.0743

He, Z., & Li, M. (2022). Executive function and social media addiction in female college students: The mediating role of affective state and stress. *The Journal of Genetic Psychology, 183*(4), 279–293. https://doi.org/10.1080/00221325.2022.2025757

Huang, J. L., Curran, P. G., Keeney, J., Poposki, E. M., & DeShon, R. P. (2012). Detecting and deterring insufficient effort responding to surveys. *Journal of Business and Psychology, 27*(1), 99–114. https://doi.org/10.1007/s10869-011-9231-8

International Telecommunication Union. (2023). *Measuring digital development: Facts and figures 2023*. https://www.itu.int/itu-d/reports/statistics/facts-figures-2023/

Kushlev, K., Proulx, J., & Dunn, E. W. (2016). "Silence your phones": Smartphone notifications increase inattention and hyperactivity symptoms. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. https://doi.org/10.1145/2858036.2858359

Leiner, D. J. (2019). Too fast, too straight, too weird: Non-reactive indicators for meaningless data in internet surveys. *Survey Research Methods, 13*(3), 229–248. https://doi.org/10.18148/srm/2019.v13i3.7403

Manuhuwa, D. M., Snel-de Boer, M., de Graaf, J. W., & Fleer, J. (2024). Combining performance-based and self-reported measures of executive functions: Are both meaningful in predicting study success in higher education students? *European Journal of Educational Research, 13*(4), 1647–1663. https://doi.org/10.12973/eu-jer.13.4.1647

McCullough, M. E., & Willoughby, B. L. B. (2009). Religion, self-regulation, and self-control: Associations, explanations, and implications. *Psychological Bulletin, 135*(1), 69–93. https://doi.org/10.1037/a0014213

Menyhart, O., Weltz, B., & Győrffy, B. (2021). MultipleTesting.com: A tool for life science researchers for multiple hypothesis testing correction. *PLOS ONE, 16*(6), e0245824. https://doi.org/10.1371/journal.pone.0245824

Metin-Orta, I., & Demirtepe-Saygılı, D. (2023). Cyberloafing behaviors among university students: Their relationships with positive and negative affect. *Current Psychology, 42*, 22–33. https://doi.org/10.1007/s12144-021-02374-3

Mihelič, K. K., Lim, V. K. G., & Culiberg, B. (2022). Cyberloafing among Gen Z students: The role of norms, moral disengagement, multitasking self-efficacy, and psychological outcomes. *European Journal of Psychology of Education, 38*, 1–23. https://doi.org/10.1007/s10212-022-00617-w

Nweke, G. E., Jarrar, Y., & Horoub, I. (2024). Academic stress and cyberloafing among university students: The mediating role of fatigue and self-control. *Humanities and Social Sciences Communications, 11*(1), 1–8. https://doi.org/10.1057/s41599-024-02930-9

Opaas, M., Wentzel-Larsen, T., Nissen, A., et al. (2024). Migrant students' self-reported executive function skills in relation to mental health, postmigration stress, and positive appraisals of self and the social context. *European Journal of Psychotraumatology, 15*(1), 2430923. https://doi.org/10.1080/20008066.2024.2430923

Ravizza, S. M., Uitvlugt, M. G., & Fenn, K. M. (2017). Logged in and zoned out: How laptop internet use relates to classroom learning. *Psychological Science, 28*(2), 171–180. https://doi.org/10.1177/0956797616677314

Schäfer, J., Reuter, T., Leuchter, M., & Karbach, J. (2024). Executive functions and problem-solving: The contribution of inhibition, working memory, and cognitive flexibility to science problem-solving performance in elementary school students. *Journal of Experimental Child Psychology, 244*, 105962. https://doi.org/10.1016/j.jecp.2024.105962

Simanjuntak, E., Fajrianthi, Purwono, U., & Ardi, R. (2019). Skala cyberslacking pada mahasiswa. *Jurnal Psikologi, 18*(1), 55–68. https://doi.org/10.14710/jp.18.1.55-68

Steinberg, L. (2010). A dual systems model of adolescent risk-taking. *Developmental Psychobiology, 52*(3), 216–224. https://doi.org/10.1002/dev.20445

Twum, R., Yarkwah, C., & Nkrumah, I. K. (2021). Utilisation of the internet for cyberloafing activities among university students. *Journal of Digital Educational Technology, 1*(1), ep2101. https://doi.org/10.21601/jdet/10912

Wilmer, H. H., Sherman, L. E., & Chein, J. M. (2017). Smartphones and cognition: A review of research exploring the links between mobile technology habits and cognitive functioning. *Frontiers in Psychology, 8*, 605. https://doi.org/10.3389/fpsyg.2017.00605

Wu, J., Mei, W., Ugrin, J. C., Liu, L., & Wang, F. (2021). Curvilinear performance effects of social cyberloafing out of class: The mediating role as a recovery experience. *Information Technology & People, 34*(2), 581–598. https://doi.org/10.1108/ITP-03-2019-0105

Zamora-Lugo, S., Reynoso-Alcántara, V., Sanchez-Lopez, J., Vergara-Lope, S., Ocampo-Gómez, E., García-Gomar, M. L., Torres-González, C., Avecilla-Ramírez, G. N., Carbajal-Valenzuela, C. C., Calderón, M., Vázquez-Moreno, A., Flores-González, R.,

Contreras-Ibáñez, C. C., Montero-Domínguez, F. Á., Mejía-Castillo, A. J., Abundis-Gutierrez, A., Sánchez-Cid, J. E., Osorio-Guzmán, M. I., García-Aguilar, G., Negrete-Cortes, A. J., … Cuevas-Ferrera, R. F. (2025). Assessing executive functioning in higher education: Development and structural validation of a new self-report scale. *Frontiers in Psychology, 16*, 1613290. https://doi.org/10.3389/fpsyg.2025.1613290

Zhou, B., Li, Y., Tang, Y., & Cao, W. (2021). An experience-sampling study on academic stressors and cyberloafing in college students: The moderating role of trait self-control. *Frontiers in Psychology, 12*, 514252. https://doi.org/10.3389/fpsyg.2021.514252

Zhou, J., Jin, L., & Hu, Y. (2026). From distraction to addiction? Understanding academic cyberslacking as a behavioral dependency among medical students. *Frontiers in Psychology, 16*, 1592370. https://doi.org/10.3389/fpsyg.2025.1592370