



ASSOCIATION BETWEEN EDUCATIONAL AND NON-EDUCATIONAL SMARTPHONE APP USE, TIME MANAGEMENT SKILLS, AND GPA IN UNIVERSITY STUDENTS

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ABSTRACT

This research paper investigates the impact of smartphone use on time management and academic performance among students in higher education institutions. With smartphones becoming an integral part of everyday life, their potential to enhance or diminish academic performance is becoming increasingly important. The study surveyed undergraduate students (N = 170) and collected data on their smartphone usage patterns, time management skills, and academic performance (GPA). In addition to survey responses, smartphone usage tracking applications were used to obtain more objective measures of time spent on educational and non-educational applications. The findings indicate a markedly negative relationship between non-educational app use (e.g., social media, entertainment) and academic performance, suggesting that the time spent on these apps is associated with lower GPA scores. On the other hand, time management skills were observed to have a positive impact on academic performance, mitigating the negative influence of smartphone distractions. Although the educational use of apps showed a weak positive correlation with GPA, this correlation was not significant. The study discusses the role of time management in mitigating digital distractions and suggests that strengthening students' time management skills may help improve academic outcomes by enabling more effective and purposeful smartphone use.

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1 INTRODUCTION

Smartphones are part of everyday life, and university students are the group that uses them the most (Hossain & Ahmed, 2016). These gadgets are not only devices for communication and entertainment; they are also used as platforms for education (Sofi-Karim et al., 2023). Nevertheless, the effects of smartphone use on students' academic achievement and time management are a controversial issue (Troll et al., 2021). Although smartphones can be used in the learning process through educational applications, overuse of social media or entertainment applications can lead to time displacement, which can negatively affect students' academic results (Anshari et al., 2017). In this research, the author intends to examine the dual role of smartphones in students' academic lives and investigate how their use affects time management and academic outcomes (Liu et al., 2022).

With the growing popularity of courses, extra-curricular activities, and personal lives among the students managing time has become the key to academic success (Premnath et al., 2024). Given their widespread access, smartphones can either enhance or undermine this ability, depending on how students use them (Hidayat-Ur-Rehman, 2024). Educational software such as e-readers, academic planners, and other productivity applications can help students keep track of their studies (Ahlroos & Hahto, 2012). Non-educational apps, such as social media and gaming applications, can, on the other hand, be a distractor, prompting people to procrastinate and spend their time inefficiently (Moe, 2024). The growing use of smartphones in the academic and personal spheres underscores the need for new research on the impact of these devices on students' academic performance (Kates et al., 2018).

Recent meta-analyses have highlighted the detrimental effects of smartphone use on academic performance, particularly through distractions such as social media and entertainment apps (e.g., Kates et al., 2018; Sunday et al., 2021). Longitudinal studies have shown that the impact of smartphone use on academic outcomes is influenced by both usage patterns and individual factors, such as time management skills and study habits (Hattie et al.,

2023). However, most of these studies have focused on short-term, cross-sectional data or single-app use, with limited insights into the broader implications of smartphone usage across different app categories (e.g., educational vs. non-educational). Therefore, further empirical research is needed to better understand how different types of smartphone applications interact with students' time management behaviors and academic outcomes.

The study will examine the multifaceted association among smartphone use, time management, and academic achievement among higher education students. Evaluating the time spent on different applications and correlating it with self-reported grades, this paper will contribute to the discussion of the effect that smartphones have on students' ability to handle their academic duties in the most efficient way (Sapci et al., 2021). The results will be used to identify methods students can use to maximize their smartphone use to achieve better grades without hindrance or distraction.

1.1. Objectives

The main objective of this study is to examine how different patterns of smartphone use relate to university students' academic performance and time management skills.

- To examine the relationship between the time spent on educational and non-educational apps on a smartphone and the academic results of students.
- To examine the role of time management skills in mediating the relationship between smartphone usage and students' academic performance.

1.2. Research Questions

In designing this study, we were guided by the following research questions:

- RQ1.** How does the amount of time spent on educational versus non-educational smartphone apps correlate with students' academic performance (GPA)?
- RQ2.** What role do time management skills play in mediating the relationship between smartphone usage and academic performance?

2 METHODOLOGY

This study employs a cross-sectional quantitative research design to examine the relationship between smartphone usage, time management skills, and academic performance among university students, as commonly applied in similar studies (Arumugam et al., 2020; Fryer et al., 2018).

2.1. Research design

The research design used in the study is a cross-sectional survey, which is best suited to capturing a snapshot of students' smartphone use, time management habits, and academic performance at a given moment (Connelly, 2016). The benefit of the design is that it enables the efficient exploration of the relationship between variables without the need to track them over a long period. The cross-sectional research design is well-suited to examining the current state of smartphone use and its relationship to students' academic performance. The approach will allow the researcher to measure smartphone use, analyze time management behavior, and correlate these behaviors with academic performance within a single study. Additionally, the design permits comparisons between learners using educational applications as their major and those using entertainment-centered applications, providing information as to the impact of the various types of smartphone applications on academic success.

2.2. Participant selection

The target participants in this study will be undergraduate students studying in a large university, and the sample will be heterogeneous in terms of academic disciplines (e.g., STEM, humanities, social sciences) and year levels (freshman to senior). This heterogeneity is necessary to understand how smartphone use patterns may differ across the spheres of study and academic experience levels. Stratified random sampling will also be used to ensure that the sample includes students from diverse departments and thus covers the student population. Through stratified sampling, we will obtain a sample that is more representative of the student body as a whole, thereby enhancing the external validity of the results. A total of 250 undergraduate students were invited to participate in the study. Of these, 220 students completed the

online survey, and 180 participated in the smartphone-tracking phase. The final analytic sample included 170 students who provided complete data for both the survey and smartphone tracking. This sample size was deemed adequate for the statistical analyses conducted in this study.

The survey response rate was 88% (220 out of 250 students). Participants were eligible if they were full-time undergraduate students at Southwest University, China. Exclusion criteria included students under 18 years of age, enrolled in part-time programs, or who had previously participated in a similar study within the last 6 months. The final sample was stratified by academic discipline and year of study. The demographic breakdown is as follows: 40% of participants were from STEM disciplines, 35% from humanities, and 25% from social sciences. In terms of year of study, 20% were freshmen, 25% were sophomores, 30% were juniors, and 25% were seniors.

Although a formal statistical power analysis was not conducted, the final sample size of 170 participants is generally considered adequate for regression-based analyses with several predictors. Previous methodological guidelines suggest that samples exceeding 150 observations are typically sufficient for detecting medium-sized effects in multiple regression models (Zimmer, 2023).

Table 1. Participant Selection

Step	Number (n)
Initial recruitment	250
Survey Completion	220
Smartphone tracking consent	200
Data used for analysis	170
Exclusions	30

2.3 Data Collection Methods

Two main data collection tools will be used: surveys and smartphone usage tracking.

Instrument Survey: An online survey will be used to collect self-report data from participants. The survey will cover smartphone use, time management, and academic performance. In

particular, the questions will ask participants to discuss their daily smartphone behaviors, including the time they spend on educational and non-educational applications. The students' time management skills will also be evaluated through the survey, including how frequently they set goals, use planners, or schedule study sessions. Academic performance will be evaluated using self-reported GPA or recent exam grades. Time management behavior will be assessed using Likert-scale items, and questions regarding smartphone usage will determine how much time a person spends on various applications each day.

To classify apps as educational or non-educational, a two-step process was employed. Initially, the researcher Sohlab Ullah reviewed the most frequently used apps reported by survey participants. Apps were classified into two categories based on their primary function: Educational apps included tools designed for academic purposes, such as e-learning platforms, academic planners, and research tools (e.g., BiliBili, XueXiQiangGuo, Zhihu). Non-educational apps encompass apps primarily used for social media, entertainment, or general communication (e.g., WeChat, Douyin, QQ).

To ensure reliability, a second rater, Marwa Zaib, independently classified the apps for a subset of participants. The interrater reliability was calculated using Cohen's kappa ($\kappa = 0.85$), indicating strong agreement between raters.

Time management skills were assessed using a self-report questionnaire adapted from the Time Management Behavior Scale (TMB) by Britton & Tesser (1991). The scale comprises 10 items that assess various aspects of time management, including goal setting, planning, prioritizing tasks, and using a study schedule. Example items include: "I regularly set specific goals for my academic work." "I make detailed plans for studying before an exam."

Responses were measured on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The internal consistency of the scale was assessed using Cronbach's alpha, which yielded $\alpha = 0.87$, indicating good reliability in measuring time management skills among participants.

Academic performance was measured using self-reported GPA. Participants were asked to indicate their cumulative GPA on a 4.0 scale, based on their most recent academic records. While self-reported GPA is commonly used in educational research, we acknowledge that there may be some reporting bias. Verification of self-reported GPA against official university records was not feasible due to data privacy restrictions in China. Therefore, the potential limitations of self-reported GPA, such as social desirability bias or inaccurate recall, should be considered when interpreting the results. Future studies may seek to verify GPA through institutional records or use more objective performance metrics, such as course grades.

Smartphone Usage Tracking Participants were asked to install a smartphone usage-tracking application (RescueTime or ScreenTime) for a period of one week in addition to completing the survey. A seven-day tracking period was used to capture both weekday and weekend smartphone usage patterns while minimizing participant burden. These applications will be able to gather objective information about the screen time of the participants (i.e., the time spent on educational apps (e.g., e-learning platforms, productivity tools) and non-educational apps (e.g., social media, entertainment). This method will provide more precise, real-time information on students' smartphone use and reduce potential bias in self-reported data.

2.4 Variables

This paper will examine several important variables related to smartphone use, time management, and academic achievement.

Independent Variable: Smartphone usage patterns will be the major independent variable. This will be quantified in terms of the time that students are on educational and non-educational applications. The distinction between these two app categories is critical to understanding the effects of smartphone apps on academic achievement.

Dependent Variables: Academic performance (GPA) was treated as the primary dependent variable, while time management skills were examined as a mediating variable in the relationship between smartphone usage and

academic performance. Academic performance will be measured using self-reported GPA or exam scores. Self-reports of using time management tools, goal-setting behavior, and study habits will be used to measure time management skills. Control Variables: A number of control variables will be incorporated to account for potential confounding variables. These will include demographic factors (e.g., age, gender, year of study), study habits (e.g., time spent studying), and access to technology (e.g., access to personal computers or tablets). Adjustment of these factors will aid in identifying the effects of smartphone use on the dependent variables.

2.5 Data Analysis

Data analysis will use a combination of descriptive statistics, correlation analysis, and regression analysis to examine the relationships among smartphone usage, time management skills, and academic performance (Franzese & Iuliano, 2018; George & Mallery, 2018; Sarstedt & Mooi, 2018). Descriptive Statistics: To summarize the data, the initial analysis would involve the descriptive statistics. This will involve the average time spent in various types of apps, the frequency of time management behaviors, and the distribution of academic performance (GPA or exam scores). Correlation Analysis: Pearson's correlation coefficient will be employed to determine the relationships among smartphone usage (educational and non-educational) and academic performance, as well as between time management skills and academic performance. This will help determine whether these variables are directly related. Multiple Regression Analysis: Multiple regression will be used to investigate the relationship between smartphone use and academic performance, with time management skill being the controlling factor. This will enable the researcher to establish the predictability of smartphone use on academic performance regardless of time management abilities. Mediation Analysis: To examine the mediating effect of time management skills on the relationship between smartphone use and academic performance, a mediation analysis will be conducted using bootstrapping. This analysis will help understand whether the influence of smartphone use on academic performance can be

partly attributed to students' time management skills.

2.6 Ethical Considerations

The study was approved by the Ethics Committee at Southwest University, with reference number JPM-A-33161. Approval was granted on 20-08-2025. Informed consent was obtained from all participants prior to data collection. Participants were fully informed about the study's purpose, the voluntary nature of their participation, and their right to withdraw at any time without penalty. Consent was obtained electronically, and participants were required to acknowledge their agreement before proceeding with the survey.

Data were securely stored on password-protected servers at Southwest University, with personal identifying information removed to ensure participant anonymity. Smartphone usage data were collected for 1 week using an app, and participants were informed that the data would be anonymized and stored securely. They could review and delete their tracked data at any time during the study in the tracking app. Additionally, participants could withdraw from the study and request that their data be deleted at any point without consequence.

2.7 Data Availability

The deidentified data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to ethical and institutional guidelines.

2.8 Limitations

Although the study's design is rigorous, it has several limitations that should be considered. First, there is a potential for bias when self-reported data are used to measure academic performance and time management skills, as participants may exaggerate their academic success or underestimate their smartphone use. Second, the tracking period for smartphone use (one week) might not accurately reflect long-term patterns, which can fluctuate within a semester. Finally, the research will be conducted at a single university, thus limiting the generalizability of the results to other student groups. To ascertain the results, future studies can be enhanced by having a larger, more varied sample of universities.

The tracking period for smartphone usage was limited to one week. While this provides a snapshot of students' smartphone habits, it is important to note that smartphone use may vary over time, especially during high-stress academic periods such as midterms or exams. The tracked week may not fully capture students' typical usage patterns, as students tend to increase non-educational app use during stressful periods, potentially leading to a temporary increase in distractions. Future studies should consider longer tracking periods, preferably spanning different academic phases (e.g., before exams and during the semester), to better understand how smartphone use evolves across time and its varying impact on academic performance.

3 RESULTS

The data analysis findings are outlined below, and the descriptive statistics, correlation analysis, multiple regression analysis, and mediation analysis conducted in this case are explained. The

main objective was to examine the relationships among smartphone behavior, time management, and academic performance among university students.

3.1. Descriptive Statistics

The most important variables were initially described, i.e., smartphone usage, time management skills, and academic performance. Table 2 below summarizes the mean scores of each variable. The mean time spent on non-educational applications (e.g., social media, entertainment) was considerably more ($M = 3.1$ hours per day, $SD = 1.2$) than the time spent on educational applications ($M = 1.1$ hours per day, $SD = 0.8$). Students scored moderately on time management ($M = 3.4$, $SD = 0.7$) and had an average self-reported GPA of 3.3 ($SD = 0.5$).

While statistical significance was found for several variables (e.g., non-educational app usage and GPA), it is also important to consider the practical significance of the effect sizes.

Table 2: Descriptive Statistics for Smartphone Usage, Time Management, and Academic Performance

Variable	Mean	Standard Deviation	Minimum	Maximum	N=170
Total Smartphone Usage (hrs/day)	4.2	1.3	1.0	8.0	170
Educational App Usage (hrs/day)	1.1	0.8	0.0	3.5	170
Non-Educational App Usage (hrs/day)	3.1	1.2	0.5	7.5	170

Source: Authors' calculations

For example, the regression analysis indicated that non-educational app usage accounted for 5% of the variance in GPA (adjusted $R^2 = 0.05$), which, while statistically significant, indicates a relatively modest explanatory power in predicting academic performance. Similarly, time management skills explained 7% of the variance in GPA, underscoring their role as an important factor associated with students' academic outcomes. These effect sizes indicate that although smartphone use has a measurable impact on academic outcomes, other factors, such as time management, play a more substantial role in shaping students' academic performance.

3.2. Correlation Analysis

Pearson correlation coefficients were used to examine relationships among smartphone use, time management, and academic performance. Non-educational app use, as indicated in Table 2, was strongly negatively associated with GPA ($r = -0.45$, $p < 0.01$), with increased time spent on non-educational apps. Conversely, the educational use of applications showed a low, positive, moderate relationship with GPA ($r = 0.20$, $p < 0.05$), suggesting a small yet significant relationship between hours spent using educational applications and GPA. Furthermore, time management skills were significantly positively correlated with GPA ($r = 0.40$, $p = 0.01$),

indicating that students with stronger time management skills tended to report higher academic performance.

3.3 Multiple Regression Analysis

To test the predictive relationship between smartphone usage and academic performance, while controlling for time management skills, a multiple regression analysis was performed. The dependent variable was GPA, and the independent variables were total smartphone usage, educational app use, non-educational app use, and time management skills. Table 3 gives

the results of the regression analysis. In the regression analysis, the R^2 and adjusted R^2 values were reported to assess the explanatory power of the model. The standard errors for the regression coefficients, along with 95% confidence intervals (CIs) for each coefficient, were calculated to assess the precision of the estimates. Table 4 presents the results of the multiple regression analysis. The p-values associated with each predictor were also reported to test the significance of each relationship.

Table 3: Pearson Correlations Between Smartphone Usage, Time Management, and GPA

Variable	Total Smartphone Usage	Educational App Usage	Non-Educational App Usage	Time Management Skills	GPA
Total Smartphone Usage	1.00	0.45*	0.73**	-0.22*	-0.35**
Educational App Usage	0.45*	1.00	0.20	0.38**	0.20
Non-Educational App Usage	0.73**	0.20	1.00	-0.25*	-0.45**
Time Management Skills	-0.22*	0.38**	-0.25*	1.00	0.40**
GPA	-0.35**	0.20	-0.45**	0.40**	1.00

Note: * $p < 0.05$, ** $p < 0.01$ N=170

Table 4: Multiple Regression Analysis Predicting GPA

Predictor	Unstandardized Coefficients (B)	Standardized Coefficients (β)	t-value	p-value
Constant	3.82		19.35	< 0.001
Total Smartphone Usage (hrs/day)	-0.11	-0.25	-3.21	0.002
Educational App Usage (hrs/day)	0.15	0.12	1.48	0.141
Non-Educational App Usage (hrs/day)	-0.22	-0.38	-4.01	< 0.001
Time Management Skills	0.20	0.31	3.77	< 0.001

Note: N=170

Given the high correlation between total smartphone usage and non-educational app usage ($r = 0.73$, $p < 0.01$), we assessed multicollinearity using Variance Inflation Factors

(VIFs). The VIF for total smartphone usage was 3.22, and for non-educational app usage, it was 3.51, indicating moderate collinearity ($VIF > 5$ would suggest problematic multicollinearity).

While these VIFs do not suggest severe multicollinearity, alternative models excluding total smartphone usage or using residualized predictors were tested to ensure robustness.

To test the robustness of the findings, alternative models were estimated by excluding total smartphone usage or using residualized predictors for non-educational app usage. These alternative models yielded similar results, suggesting that the main findings are robust to these specifications.

Additionally, sensitivity analyses were conducted to assess the influence of outliers or influential cases using Cook's distance. No individual cases were found to unduly influence the regression results, confirming the stability of the findings.

3.4. Mediation Analysis

To further investigate the correlation between smartphone use and academic performance, we conducted a mediation analysis to determine whether time management skills mediated the effect of smartphone use (specifically non-educational apps) on GPA. The mediation analysis results showed that time management skills significantly mediated the correlation between non-educational app use and GPA. In particular, the use of non-educational apps had adverse effects on time management skills, leading to poor academic performance. This result underscores the importance of time management as one way smartphone use can affect academic achievement.

The indirect effect of non-educational app usage on GPA through time management skills was assessed using bootstrapping with 5,000 bootstrap samples. The indirect effect estimate was -0.05, with a 95% bootstrap confidence interval (CI) ranging from -0.09 to -0.01, indicating a significant mediation effect. Control variables (e.g., academic discipline, year of study) were included in all paths of the mediation model to adjust for potential confounders.

To test the robustness of our findings, we ran alternative models with and without control variables (e.g., academic discipline, year of study). The results showed that the key relationships between non-educational app usage and GPA remained consistent, regardless of the inclusion of control variables. Additionally, we

tested alternative operationalizations of app usage by calculating the proportion of total smartphone time spent on non-educational apps. The results were similar, suggesting that the findings are robust to different ways of measuring smartphone usage.

The findings of the current research provide strong evidence on the effects of smartphone use on academic performance and the mediating role of time management skills. The results indicate that increased use of non-educational applications is associated with lower GPA, whereas greater time management skills are a positive factor in academic success. These findings highlight the need for time management skills to reduce the negative impact of smartphone distractors on academic performance.

4 DISCUSSION

This research finds a significant correlation between smartphone use and university students' academic performance. The results revealed a negative relationship between the time spent on non-educational smartphone applications (e.g., social media, entertainment) and GPA. This suggests that increased use of non-educational apps is associated with lower academic performance. This finding aligns with the existing literature, which underscores the detrimental effects of smartphone distractions on students' ability to focus on academic tasks (Junco, 2015). Additionally, the research suggests that students who spent more time on non-educational apps reported lower time management effectiveness, which in turn correlated with their academic performance (Lugar et al., 2020). This emphasizes that smartphone usage, particularly for non-educational purposes, can disrupt academic focus and hinder effective time management, both of which are crucial to academic success.

In contrast, the study also found a weak, albeit positive, correlation between the use of educational apps and GPA. While the regression analysis did not show a significant predictive relationship, this suggests that educational apps may support academic activities to some extent (Khasawneh & Khasawneh, 2023). However, the lack of a strong effect suggests that using these apps alone is insufficient to produce significant

academic improvements. Instead, the effectiveness of these tools likely depends on how actively and strategically students engage with them, as well as on their ability to balance study time with leisure activities. This indicates that the activity of students using these instruments, including the vigour with which they use the apps, their learning routines, and their capacity to juggle between studying and non-studying actions, can be considered more significant determinants of academic achievement (Alruthaya, 2025).

The findings further emphasize the moderating role of time management skills in the relationship between smartphone use and academic performance. Students with stronger time management skills were better able to mitigate the potential negative impact of smartphone distractions. This corroborates previous research suggesting that students who are skilled at time management are more likely to succeed academically, especially in environments with prevalent digital distractions (Zimmerman, 2000). Thus, time management skills may be an essential intervention point for helping students balance their academic responsibilities with smartphone use.

Although the results provide valuable insights, the study's cross-sectional design limits causal inference. Reverse causality could be an alternative explanation; for instance, students with lower academic performance may turn to non-educational smartphone apps to cope with stress or avoid academic work. Furthermore, other factors such as motivation, mental health, and personal habits were not measured but may also contribute to both smartphone usage patterns and academic performance. Future research using longitudinal designs would be beneficial for

establishing the directionality of these relationships and for examining how smartphone usage influences academic outcomes over time.

5 CONCLUSION

This research suggests that non-educational smartphone app use is correlated with lower academic performance, with a significant association between increased use of social media and entertainment apps and reduced GPA. Better time management skills were found to help mitigate these negative effects, suggesting that students who manage their time effectively can reduce the risk of smartphone distractions hindering their academic success.

However, the study's cross-sectional nature prevents causal conclusions, and reverse causality remains a potential alternative explanation. Future research employing longitudinal designs is needed to explore whether smartphone usage patterns lead to changes in academic performance over time or whether other factors, such as motivation and mental health, play a more significant role in shaping academic outcomes.

While educational apps showed a weak correlation with GPA, their use was insufficient to produce significant academic improvement. This indicates that the effectiveness of educational apps is likely influenced by students' engagement and how well these tools are integrated into their broader study habits. Further studies should investigate how the use of educational apps, in combination with strong time management practices, may improve academic performance in the long term.

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