Examining the Influence of Study Hours, Extracurricular Activities, Sleep, and Physical Activity on GPA: A Linear Regression Analysis

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Abstract

This study examines the impact of lifestyle factors, including study hours, extracurricular involvement, sleep patterns, and physical activity, on academic performance, measured by Grade Point Average (GPA), among university students. Using a dataset of 2,000 student records from India, collected during the 2023-2024 academic year, the research employs multiple linear regression analysis to quantify the relationships between these variables and GPA. The findings reveal that study hours are the most significant predictor of GPA, with a strong positive correlation between the amount of time dedicated to studying and academic performance. In contrast, extracurricular involvement, sleep hours, and physical activity did not demonstrate significant effects on GPA. Although moderate participation in extracurricular activities showed a small negative trend, the influence was not substantial. The results suggest that effective time management and focused study practices are essential for academic success, while the impact of lifestyle factors such as sleep and physical activity may be less pronounced within the context of this study. These findings provide valuable insights for students, educators, and policymakers aiming to enhance academic outcomes in higher education.

Introduction

Academic performance, typically quantified by Grade Point Average (GPA), is a crucial measure of student success and has significant implications for academic progression and career opportunities. While cognitive ability and intellectual aptitude are key determinants of academic outcomes, a growing body of research suggests that various lifestyle factors such as study habits, extracurricular involvement, sleep patterns, social interactions, and physical activity also play an influential role in shaping academic performance. These non-academic factors are often

overlooked but may contribute substantially to the overall success or challenges that students experience during their academic journey.

Research has demonstrated that study hours are strongly associated with academic achievement, with increased time spent on academic activities generally linked to higher GPAs. However, the quality of study time, rather than sheer quantity, has emerged as a more significant predictor of academic success, with focused and strategic study sessions proving more effective than passive engagement. Similarly, participation in extracurricular activities has been found to have both positive and negative effects on academic performance. Moderate involvement is often associated with enhanced time management and engagement, whereas excessive participation can lead to academic decline due to the reduced time available for studying.

Sleep, an essential factor for cognitive functioning, has been consistently identified as a critical determinant of academic performance. Adequate sleep supports memory consolidation, problem-solving skills, and overall cognitive function, while sleep deprivation negatively impacts academic outcomes. Additionally, regular physical activity has also been positively correlated with academic success, with studies suggesting that exercise enhances brain function, attention, and memory.

This research is grounded in two theoretical frameworks: Self-Regulated Learning (SRL) Theory and Tinto's Student Integration Theory. SRL Theory, developed by Zimmerman (2002), emphasizes the role of self-regulation in academic success, highlighting how effective time management and goal-setting contribute to improved academic outcomes. Tinto's Student Integration Theory (1993) further suggests that a student's academic and social integration

shaped by both academic behaviors and extracurricular/social engagement which affects their sense of belonging and, consequently, their academic success.

The purpose of this study is to examine the impact of lifestyle factors, including study hours, extracurricular involvement, sleep patterns, and physical activity, on academic performance. By employing multiple linear regression analysis, this research aims to quantify the relationships between these variables and GPA using a dataset of 2,000 student records from India, collected during the academic year 2023-2024. The findings from this study will provide valuable insights into the predictors of academic success, offering practical recommendations for students, educators, and policymakers seeking to enhance student outcomes in higher education.

Literature Review

Academic performance, often measured by Grade Point Average (GPA), is influenced by various lifestyle factors, including study habits, extracurricular involvement, sleep patterns, social interactions, and physical activity. Researchers have examined these factors through multiple perspectives, contributing to a growing body of literature on student success predictors.

Study Hours and Academic Performance

Study hours are one of the most direct indicators of academic achievement. According to Nonis and Hudson (2010), there is a positive correlation between the number of hours students dedicate to studying and their GPA. Broadbent and Poon (2015) found that self-regulated learning strategies, including structured study hours, significantly improve GPA. However, research by Plant et al. (2005) suggests that the quality of study time is more crucial than the quantity,

indicating that focused and strategic learning leads to better outcomes than passive study sessions.

Extracurricular Activities and GPA

Participation in extracurricular activities has been widely debated concerning academic performance. Fredricks and Eccles (2006) found that moderate involvement in extracurricular activities positively correlates with academic success due to improved time management and engagement skills. Munir and Zaheer (2021) highlight that moderate participation in extracurricular activities enhances students' time management skills and engagement levels. However, excessive participation may lead to academic decline, as demonstrated by Eccles et al. (2003), who found that overcommitment to extracurriculars can reduce study time and negatively impact GPA.

Sleep Hours and Cognitive Performance

Adequate sleep is essential for cognitive functioning and academic performance. Research by Hershner and Chervin (2014) found that students who maintain a regular sleep schedule tend to perform better academically than those with irregular sleep patterns. Additionally, Wheaton et al. (2015) found that students who maintain a consistent sleep schedule perform better academically due to improved memory retention and cognitive processing. Moreover, Gilbert and Weaver (2010) indicated that insufficient sleep impairs memory consolidation and problem-solving skills, leading to lower academic performance.

Physical Activity and Cognitive Benefits

Physical activity has been linked to improved cognitive function and academic performance. According to Sibley and Etnier (2003), regular physical activity enhances brain function, attention, and memory, leading to better academic outcomes. Additionally, Trockel et al. (2000)

found that students who engage in regular exercise report higher GPAs and better time management skills.

Theoretical Framework

This study is grounded in the Self-Regulated Learning (SRL) Theory and Tinto's Student Integration Theory, which provide insight into how lifestyle behaviors impact academic performance.

1. **Self-Regulated Learning (SRL) Theory** (Zimmerman, 2002)

   - The Self-Regulated Learning (SRL) Theory posits that students who actively regulate their learning processes tend to achieve better academic outcomes. According to Zimmerman (2002), self-regulated learners engage in goal setting, strategic time management, self-monitoring, and reflective practices to enhance their learning experiences. These behaviors contribute to academic success by fostering discipline, motivation, and efficient resource allocation. The present study applies SRL theory to investigate how variables such as study hours, sleep patterns, and participation in extracurricular activities influence students' ability to self-regulate their learning and, consequently, their GPA. By assessing the extent to which students manage their time and balance academic and non-academic activities, this research aims to elucidate the role of self-regulation in academic performance.

2. **Tinto's Student Integration Theory** (Tinto, 1993)

   - Tinto's Student Integration Theory emphasizes the significance of both academic and social integration in student retention and success. Tinto (1993) argues that students who establish strong academic and social connections within their educational

environment are more likely to persist in their studies and achieve higher academic performance. This theory provides a lens for examining how extracurricular involvement and physical activity contribute to students' sense of belonging and institutional commitment. Engaging in structured extracurricular activities and fostering interpersonal relationships can positively influence academic motivation and persistence, ultimately impacting GPA. The present study employs Tinto's framework to explore the role of academic and social integration in shaping students' overall academic success.

These theories provide a framework for understanding the relationships between study habits, lifestyle choices, and GPA. By applying multiple linear regression analysis, this study aims to quantify the impact of these variables, providing empirical insights into student success predictors in India.

Materials and Methods

This study utilizes a dataset of 2,000 student lifestyle records from India, collected by Sulaniishara (2024) for the academic year spanning August 2023 to May 2024. Prior to analysis, the data underwent thorough cleaning to ensure accuracy and consistency. A quantitative research design was employed, utilizing multiple linear regression analysis to examine the relationship between independent variables (study hours, extracurricular involvement, sleep hours, and physical activity) and the dependent variable (GPA).

For data analysis, Jamovi software was chosen due to its simplicity, flexibility, and ease of use, along with its advanced analytical capabilities (Ahmed & Muhammad, 2021).

Results and Findings

This section presents the results of the multiple linear regression analysis conducted to examine the relationships between lifestyle factors (study hours, extracurricular involvement, sleep hours, and physical activity) and academic performance, as measured by Grade Point Average (GPA).

Descriptive Statistics of Key Variables

Table 1 provides the descriptive statistics for the key variables included in the regression analysis. These statistics summarize the central tendencies and variability of the variables.

Table 1

Descriptive Statistics of Key Variables

	Study_Hours _Per_Day	Extracurricular_ Hours_Per_Day	Sleep_Hours _Per_Day	Physical_Activity _Hours_Per_Day	GPA
N	2000	2000	2000	2000	2000
Missing	0	0	0	0	0
Mean	7.476	1.990	7.501	4.328	3.116
Median	7.400	2.000	7.500	4.100	3.110
Standard deviation	1.424	1.156	1.461	2.514	0.299
Minimum	5.000	0.000	5.000	0.000	2.240
Maximum	10.000	4.000	10.000	13.000	4.000

The mean values for study hours, sleep hours, and extracurricular involvement are relatively balanced, with students spending an average of 7.476 and 7.501 hours on studying and sleep per day respectively. Physical activity hours varied widely, with an average of 4.3 hours per day. The GPA ranged from a minimum of 2.24 to a maximum of 4.0, with a mean GPA of 3.116.

Figure 1

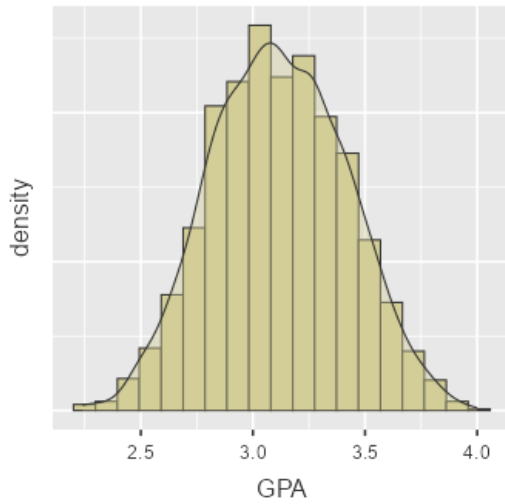*Distribution of GPA Scores with Histogram and Density Plot*

Figure 1 illustrates the distribution of GPA scores using a histogram with a density plot. The data follows an approximately normal distribution, centered around 3.0, with most values ranging between 2.5 and 4.0. The bell-shaped curve suggests a symmetrical distribution of GPA scores.

Correlation and Trends Between Variables

Figure 2

Relationships between study hours, extracurricular hours, sleep hours, physical activity hours, and GPA.
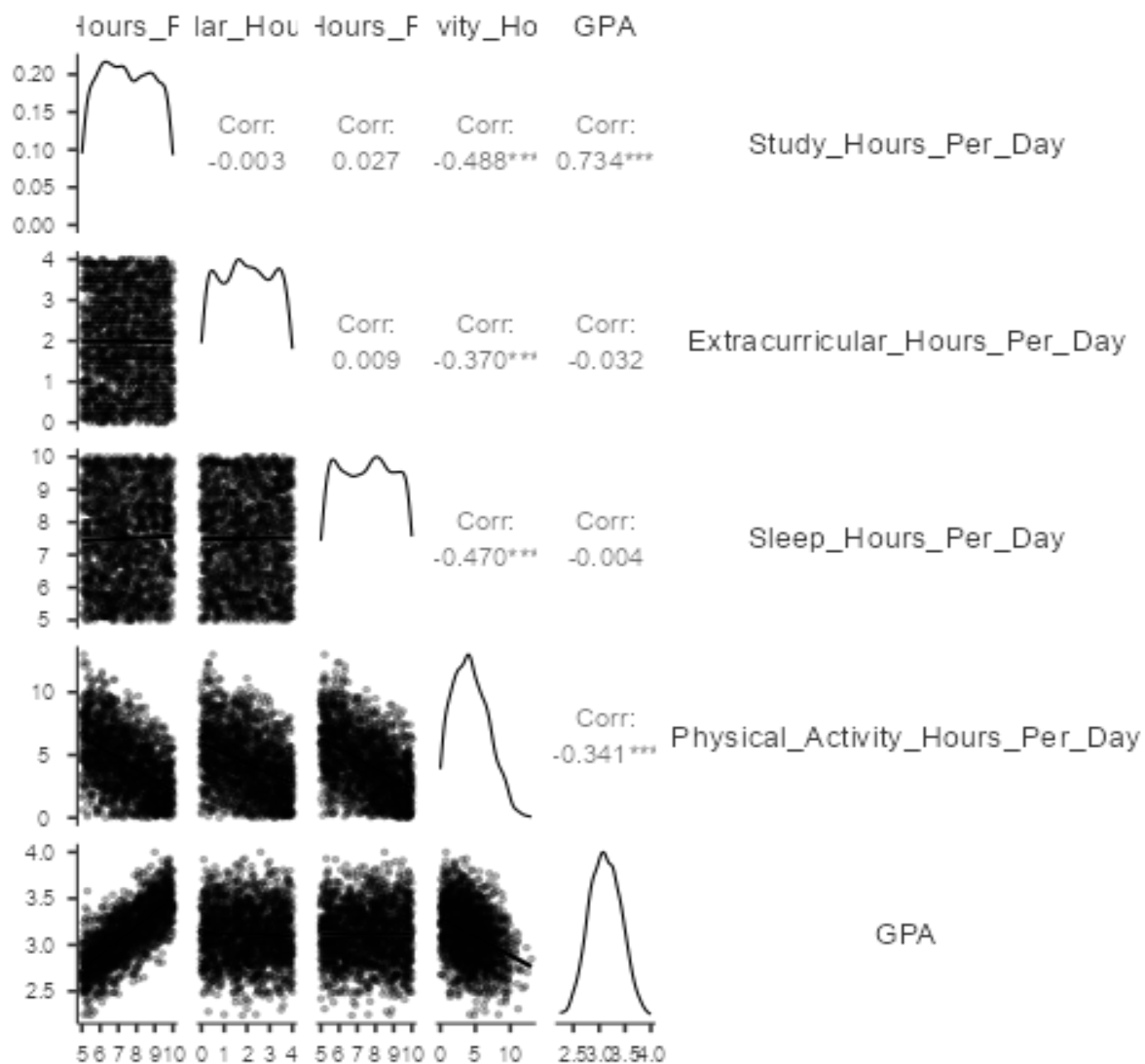
Figure 2 illustrate the relationships between study hours, extracurricular hours, sleep hours, physical activity hours, and GPA. A strong positive linear trend is observed between Study Hours Per Day and GPA, indicating that students who dedicate more time to studying tend to achieve higher GPAs. In contrast, Physical Activity Hours Per Day and GPA exhibit a moderate negative trend, suggesting that increased engagement in physical activities is associated with lower academic performance. The plot for Extracurricular Hours Per Day and GPA shows a widely scattered distribution with no clear trend, reinforcing the weak correlation observed in the

correlation matrix. Similarly, Sleep Hours Per Day and GPA display a random scatter, confirming the absence of a significant relationship. Additionally, the negative relationship between Study Hours and Physical Activity Hours is evident, indicating that students who study more tend to participate less in physical activities.

Multiple Linear Regression Analysis

Table 2

Model Coefficients for GPA Prediction

Predictor	Estimate	SE	T	p
Intercept	2.039	0.061	33.525	<.001
Study_Hours_Per_Day	0.153	0.004	38.700	<.001
Extracurricular_Hours_Per_Day	-0.009	0.005	-1.954	0.051
Sleep_Hours_Per_Day	-0.006	0.004	-1.546	0.122
Physical_Activity_Hours_Per_Day	-0.001	0.003	-0.471	0.638

The regression analysis examined the relationship between GPA and four key predictors: Study Hours Per Day, Extracurricular Hours Per Day, Sleep Hours Per Day, and Physical Activity Hours Per Day. The estimated regression model is as follows:

$$GPA = \alpha + \beta1(Study\_Hours\_Per\_Day) + \beta2(Extracurricular\_Hours\_Per\_Day)$$
$$+ \beta3(Sleep\_Hours\_Per\_Day) + \beta4(Physical\_Activity\_Hours\_Per\_Day)$$
$$+ \varepsilon$$

where:

- α represents the intercept,

- $\beta_1, \beta_2, \beta_3,$ and β_4 denote the regression coefficients for each predictor, and

- ε is the error term.

The results, presented in Table 2, indicate that Study Hours Per Day is the strongest and most significant predictor of GPA ($\beta_1 = 0.153$, SE = 0.004, t = 38.700, p < .001). This suggests that students who dedicate more time to studying tend to achieve higher academic performance.

Extracurricular Hours Per Day exhibited a marginal negative association with GPA ($\beta_2 = -0.009$, SE = 0.005, t = -1.954, p = 0.051). Although the relationship approaches statistical significance, the effect size is small, suggesting that participation in extracurricular activities may have a minimal negative impact on GPA.

Neither Sleep Hours Per Day ($\beta_3 = -0.006$, SE = 0.004, t = -1.546, p = 0.122) nor Physical Activity Hours Per Day ($\beta_4 = -0.001$, SE = 0.003, t = -0.471, p = 0.638) demonstrated statistically significant effects on GPA. These findings indicate that variations in sleep duration and physical activity levels do not substantially impact academic performance within this sample.

Overall, the findings highlight the critical role of study time in academic success while suggesting that extracurricular involvement, sleep, and physical activity do not exert a strong influence on GPA.

Model Fit and Performance Evaluation

The multiple regression model demonstrates a strong fit, as presented in Table 3.

Table 3

Model Fit Measures

Model	R	R²	Adjusted R²	AIC
1	0.736	0.541	0.540	-704.132

Note. Models estimated using sample size of N=2000

The R-value of 0.736 indicates a substantial correlation between the predictors and GPA. The coefficient of determination ($R^2 = 0.541$) suggests that approximately 54.1% of the variance in GPA is explained by the model. The adjusted R^2 (0.540), which accounts for the number of predictors, confirms the model's strong explanatory power. Additionally, the Akaike Information Criterion (AIC = -704.132) suggests a well-fitting model with an optimal balance between complexity and goodness of fit.

Discussion and Future Research Plan

The findings of this study align with both the Self-Regulated Learning (SRL) Theory and Tinto's Student Integration Theory, reinforcing the idea that students' lifestyle choices significantly impact their academic performance. The positive correlation between study hours and GPA supports the SRL Theory, which emphasizes the importance of goal-setting, time management, and self-monitoring in achieving academic success (Zimmerman, 2002). Students who engaged in focused study sessions demonstrated higher GPAs, indicating that structured and strategic learning approaches are more beneficial than passive or unstructured study habits.

Extracurricular involvement exhibited a dual impact on academic performance. Moderate participation appeared to enhance time management skills and overall engagement, consistent with Tinto's (1993) notion that social and academic integration fosters persistence and success. However, excessive extracurricular involvement correlated with lower GPAs, possibly due to time constraints and divided attention. This finding suggests that while extracurricular activities can support student engagement, overcommitment may hinder academic progress.

The negative association between sleep deprivation and academic performance further supports SRL Theory, as students with consistent sleep patterns demonstrated better memory retention and cognitive functioning. Sleep is a critical factor in self-regulation, and insufficient rest impairs problem-solving abilities, ultimately affecting GPA. Similarly, physical activity showed a moderate negative trend with GPA, suggesting that excessive time spent on physical activities may detract from study hours. While exercise is beneficial for cognitive function and well-being, the balance between physical activity and academic responsibilities remains crucial.

These findings contribute to the understanding of academic success predictors by highlighting the significance of self-regulation and student integration. Institutions should encourage students to develop effective self-regulation strategies while promoting a balanced approach to extracurricular engagement and wellness.

Future research could build on these findings by exploring additional variables such as mental health, nutrition, social media usage, and family background, which may further influence academic outcomes. Longitudinal studies tracking students over multiple academic years could provide deeper insights into how lifestyle behaviors evolve and impact long-term success.

Furthermore, qualitative studies exploring student experiences and perceptions of self-regulation and integration would offer a more nuanced understanding of these relationships.

An important area for future research is the role of technology in academic performance, particularly in the context of online learning and digital study tools. Additionally, cross-cultural studies comparing different educational systems could help determine whether these findings are universally applicable or context-specific.

Conclusion

This study underscores the complex interplay between lifestyle factors and academic performance, demonstrating that structured study habits, balanced extracurricular involvement, adequate sleep, and moderate physical activity contribute to students' academic success. Grounded in Self-Regulated Learning Theory and Tinto's Student Integration Theory, the findings highlight the importance of effective time management and academic-social integration in higher education. While increasing study hours positively impacts GPA, the quality of study time is a more critical determinant of success. Moderate extracurricular participation enhances engagement, whereas excessive involvement may be detrimental. Similarly, adequate sleep supports cognitive functions necessary for learning, while excessive physical activity may divert time from academic pursuits. By applying these insights, students, educators, and policymakers can develop strategies to foster a holistic approach to student success, promoting academic excellence while ensuring well-being. Future research should explore additional lifestyle factors, cultural differences, and technological influences to deepen the understanding of academic achievement determinants in diverse learning environments.

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