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Proceedings of the International Conference on Advanced Research in Education, Teaching, and Learning, Vol. 1, Issue. 1, 2024, pp. 13-25
DOI: https://doi.org/10.33422/aretl.v1i1.188

ISSN: 3030-0606 online

The Impact of Smartphones on the Academic Performance of University Students

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Abstract

Smartphones have become an important medium of connection and information. It is frequently used for social and academic purposes. This study examines the intricate relationship between smartphone usage patterns and academic performance among university students. Data was collected from 300 participants with the help of a Google survey form. Descriptive statistics, ANOVA (Analysis of Variance), factor analysis, and logistic regression were used for the analysis of data. The findings revealed that the majority of students spend 1-3 hours daily on their smartphones with social media emerging as the primary purpose for usage. Despite prevalent smart phone usages, students reported relatively high cumulative grade point averages (CGPAs), indicating positive academic achievement levels. However, the analysis also uncovered that smartphone usages, brings distractions while studying. Logistic regression analysis identified the significant predictors of CGPA, highlighting the importance of managing smartphone habits effectively. Multi-dimensional scaling (MDs) and factor analysis provided insights into the clustering of factors related to smartphone usage and academic performance. Overall, these findings underscore the need for targeted intervention to promote responsible smartphone usage habits and support academic success among university students.

Keywords: Academic Performance, Smartphones, University Students, Study Habits, Learning Environment

1 Introduction

Nowadays, smartphones are considered an integral part of everyone's daily life, and university students are no exception to it. Smartphones not only provide informational access to university students but also work as a major communication tool. However, concerns have emerged regarding the impact of Smartphone usage on academic performance. According to a study by Junco and Cotton, excessive smartphone usage among college students may lead to distraction, reducing the time for studying and academic activities (Junco & Cotton, 2012). Moreover, the constant notification and alert from social media platforms and messaging apps can disrupt their concentration during lectures and study sessions (Lepp et al., 2015). Previous research suggests that excessive smart phone usage also negatively affects sleep patterns, which in turn impair their cognitive and academic performance (Huang et al., 2020). Another study

highlighted that the blue light emitted by smartphone screens inhibits the production of melatonin, a hormone crucial for regulating sleep, thus, impacting the overall sleep quality (Chang et al., 2015). Similarly, those students, who excessively use smartphones are also prone to daytime fatigue and poor class attention, which in turn impact their academic performance (Ahmed et al., 2020).

In recent years, a new phenomenon of "phubbing," or phone snubbing, has gained the attention of researchers. In this behavior, individuals give more preference to online interaction rather than meeting face-to-face with each other. This behavior has negative implications for both interpersonal relations and academic engagements (Baranova et al., 2022). Subsequently, students with more engagement in phubbing not only miss fruitful collaborations with their peers but also hinder their academic progress as well (Chotpitayasunondh et al., 2016). Nevertheless, smartphones also play an important role in the academic success of students. Nowadays, mobile learning applications offer exciting new ways for students to access any kind of educational materials and other learning resources (Hwang et al., 2014). In addition, the ease of communication between relevant stakeholders helps in creating a conducive environment among instructors and students (Marquez, 2023). Although smartphones are instrumental these days in offering convenient and speedy access to university students, their potential negative implications also exist. Various studies have been carried out in the last couple of decades to establish the linkage between smartphone usage and its relevance with the academic performance of university students (Ceniza, et al., nd; Sharma, 2021; Vurdien, 2020). In a study conducted by Lazarotto et al., it was observed that students having excessive use of smartphones score poor grades sin their exams (Lazarotto Schroeder et al., 2023). Furthermore, it is found that the addiction to smartphones also decreases the academic engagement of university students (Agostini & Petrucco, 2023). Mitigating the negative impact of smartphones coupled with their potential benefits has created a unique type of challenge for all stakeholders to ensure the intelligent use of smartphones (Rosen et al., 2013). It not only improves the intellectual well-being of students but also saves them from unnecessary distractions (Kibona & Mgaya, 2015).

A tri-relation synergy is exists between smartphone usage, academic grades, and the mental well-being of students (Amin et al., 2024), in Aljomaa et al. (2016) identified an association between phone-related stresses and the poor grades of university students (Aljomaa et al., 2016). Moreover, numerous factors like fear of social media bullying, sleep disorders, and mental stresses are created due to excessive use of smartphone usage (Rosen et al., 2013; Aljomaa et al., 2016). It is imperative to foster a healthy environment in educational institutions, thus protecting the psychological well-being of students. In a nutshell, the intelligent and productive use of smartphones offers tremendous support to students, however, its excessive use can negatively impact their academic performance. A negative correlation between smartphones usage and academic achievement is also established by Liu et al. (2020) in their research on smart education. Despite numerous studies carried out in this area, it is imperative to conduct a study from a student's perspective to see the dominant patterns of smartphone usage.

1.1 Research Questions

The present study is carried out to investigate the following research questions:

1. What are the different kinds of phone usage patterns among university students?
2. Are these patterns related to their academic performance?
3. Is there any mediating factor/s between phone use and academic performance?

The objective of these questions is to explore different ways how university students use their smartphones and what are the potential impact of these patterns on their academic performance. The results of the study can be used by students as well as academic institutions to adopt responsible smartphone use.

1.2 Research Gap

Despite numerous researcher conducted in this area, it is required to develop a new understanding from student's perspective about this issue. The integration of both qualitative and quantitative methods combined with various ethnographic groups can give deeper insights to understand the intricacies of this issue. Moreover, it is vital to explore the role of any mediating factors influencing the relationship between these two domains.

2 Methodology

Data in the present research is collected with the help of a questionnaire comprising both inferential and ethnographic questions. A Likert-type scale ranging from 1 to 5 is offered to students to register their responses. Data was collected from 300 students studying in different academic years with the help of a Google survey link, Jamovi software is used for the analysis of different statistical tests. Afterward, different techniques like descriptive statistics, Regression analysis, and ANOVA **(**Analysis of variance**)** were used to carry out the analysis of data. By exploring these aspects comprehensively, the study aims to gain insights into the relationship between smartphone use and academic performance among university students.

3 Results & Analysis

The Cronbach's Alpha for the collected data is 0.313 for a set of 16 items, which indicates the internal consistency and reliability of the data. This suggests that the items can effectively measure the underlying construct and the data is credible enough for further analysis.

Table 1 indicates that the majority of respondents belong to the age group from 19-21 years, comprising 53% of the sample, followed by 22-25-year-olds at 38.7%. Only a small percentage, 6.3%, fall into the category of over 25 years, while 2% are under 18. Similarly, in terms of gender, the sample is predominantly male, accounting for 87.3%, while females make up only 12%. A negligible portion preferred not to disclose their gender. Regarding academic majors, the largest proportion, 81.3%, are enrolled in Engineering/Technology programs, followed by Social Sciences at 5%, and other majors at 8.3%. Third-year students constitute the largest group in terms of years of studying, comprising 49.3%, while the final-year students represent 25.3%. They are followed up by first, second-, and fourth-year students making up smaller proportions of the sample. These demographics provide valuable insights into the composition of the surveyed population, which can aid in tailoring interventions and strategies to address specific needs and preferences within different demographic segments.

Table 01: Demographic Profile of Participants

Demographic Characteristic	Frequency	Percent	Cumulative Percent
Age Group			
19-21	159	53	53
22-25	116	38.7	91.7
Over 25	19	6.3	98
Under 18	6	2	100
Gender			
Female	36	12	12
Male	262	87.3	99.3
Prefer not to say	2	0.7	100
Current Major			
Business	6	2	2
Engineering/Technology	244	81.3	83.3
Humanities	8	2.7	86
Natural Sciences	2	0.7	86.7
Other	25	8.3	95
Social Sciences	15	5	100
Year of Studying			
Final year student	76	25.3	25.3
First year student	13	4.3	29.7
Fourth year student	61	20.3	50
Second year student	2	0.7	50.7
Third year student	148	49.3	100
Total	300	100	100

Table 2 offers insights into various aspects of smartphone usage and its impact on academic performance among the surveyed individuals. On average, the majority of the students use their smartphones for approximately 1-3 hours daily. Social media with a mean value of 2.37 emerged as the primary purpose for smartphone usage, followed by communication and entertainment. The majority of respondents reported a current GPA above 3.5 with a mean of 1.02, indicating a relatively high academic achievement level. In terms of study habits, respondents rated predominantly as 'yes' means it affects their habits with a mean value of 1.19, although some acknowledged that their smartphone usage negatively affected their study habits. Despite this, opinions on the impact of smartphone use on academic performance are neutral as per our sample inferential analysis with a mean of 2.56. A considerable number of respondents experienced smartphone distractions while studying, highlighting a potential area for improvement in managing smartphone usage. Furthermore, factors influencing smartphone usage and academic performance included access to educational resources on smartphones and personal time management skills. Interestingly, while many respondents had consciously attempted to reduce smartphone usage to improve academic performance, opinions on the importance and effectiveness of university guidelines on smartphone usage were mixed. Similarly, the attitudes towards the potential influence of smartphones on education are positive with a mean of 1.28. Overall, these statistics give an insight into the relationships between

smartphone usage, study habits, and academic performance, reflecting diverse perspectives and experiences among the surveyed individuals.

Table 02: Inferential Analysis of smart phone Usage and Academic Performance Factors

Variable	Mean	Std. Deviation	Skewness	Kurtosis
Smartphone usage?	1.74	0.776	0.668	-0.49
Purpose of usage?	2.92	0.682	-0.979	1.846
Hours per day spend?	1.36	0.728	2.178	4.883
Apps often used?	2.37	0.828	0.251	-0.436
Current GPA	1.02	0.674	0.108	-0.405
Study habits?	1.19	0.876	-0.163	-1.155
Smartphone effect?	2.56	0.896	0.057	-0.647
Smartphone Impact?	2.92	1.289	-0.35	-1.145
Smartphone disturbance?	0.87	0.621	0.693	2.559
Factors influence?	2.04	0.936	0.483	-0.736
Consciously tried to reduce usage	1.29	1.075	0.636	-0.902
Universities guidelines	1.11	0.799	-0.157	-1.329
Guidelines impact?	1.31	0.704	-0.275	-0.616
Willing to follow?	1.11	0.804	-0.198	-1.425
Smartphones Influence?	1.28	0.687	-0.431	-0.848

Table 3 shows the ANOVA (Analysis of variance) results highlighting significant differences among people in terms of their responses, with a mean square value of 0.993 and a corresponding F-value. Within people, there are significant differences between items, as indicated by the mean square value of 134.352 and the associated F-value of 196.864. Tukey's estimate of power for achieving additivity is 1.472. Overall, these results suggest variability both between individuals and within items, highlighting the low complexity of the data.

Table 03: Analysis of Variance of Impacting Factors

Source	Sum of Squares	Df	Mean Square	F	Sig
Between People	285.905	288	0.993		
Between Items	2015.273	15	134.352	196.864	0
Residual	No additivity	1	9.799	14.403	0
Balance	4319	0.68			
Total	2948.227	4320	0.682		
Total	4963.5	4335	1.145		
Grand Mean					1.68

Table 4 shows the results of logistic regression, which indicates the coefficients and their standard errors for various predictors related to smartphone usage and its impact on academic performance. Smartphone usage shows a modest positive impact on CGPA, within the odd ratio of 1.083 (p= 0.672), indicating an 8.3% increase in the odds of having a higher CGPA for each unit, increase in smartphone usage frequency on the other hand. The purpose of usage shows a negative association, with add ratio of 0.699(p=0.075), suggesting a 30.1% decrease

in the odds of higher CGPA per unit increase in the purpose of smartphone use. Hours per day spent on smartphones demonstrates a positive association, with an odds ratio of 1.708 (p=0.04), indicating a 70.8% increase in the odds of higher CGPA for each additional hour spent daily on smartphones. Conversely, frequent app usage is negatively associated with CGPA, as reflected by an odd ratio of 0.577 (p=0.01), signifying a 42.3% decrease in the odds of higher CGPA per unit expansion rate in those apps. Study habits, smartphones effect on study habits, smartphone disturbance while studying, factors influencing smartphone usage, consciously trying to reduce, smartphone usage exhibit varying degrees of negative association with CGPA, indicated by their odds ratio below 1. These odds ratios suggest a decrease ranging from 27.7% to 77.1% in the odds of higher CGPA for each unit increase in these predictors.

On the other hand, adherence to the university guidelines, willingness to follow guidelines, and perceived smartphone influence demonstrate a strong positive associations with CGPA. For example, adherence to the university guidelines shows an odds ratio of 4.238 (p=0.031), indicating a 328.3% increase in the odds of higher CGPA per unit increase in adherence. Similarly, smartphone influence exhibits an odds ratio of 5.412 (p=0.023), suggesting a substantial 441.2% increase in the odds of higher CGPA per unit increase in perceived influence. The odds ratios provide a comprehensive understanding of how various factors related to smartphone usage can impact academic performance, highlighting both positive and negative associations with CGPA.

The overall findings of logistic regression show that the academic performance of students is impacted by smartphone usage, however, the impact is not the same and varies according to different factors.

Table 04: Coefficients of Logistic Regression Analysis

Dependent Variable = Current CGPA

Predictor	**Coeff**	**SE Coeff**	**P**	**Lower**	**Upper**	**Odds Ratio (OR)**
Const (1)	-0.707	1.096	0.519			
Smartphone usage?	0.083	0.196	0.672	0.74	1.6	1.083
Purpose of usage?	-0.356	0.2	0.075	0.47	1.04	0.699
Hours per day spend?	0.535	0.186	0.004	1.18	2.46	1.708
Apps often used?	-0.551	0.16	0.001	0.42	0.79	0.577
Study habits?	-0.323	0.15	0.032	0.54	0.97	0.723
Smartphone effect?	0.522	0.146	0.02	1.27	2.24	1.686
Smartphone Impact?	-0.001	0.101	0.991	0.82	1.22	0.999
Smartphone disturbance?	-0.545	0.211	0.01	0.38	0.88	0.581
Factors influence?	0.463	0.143	0.001	1.2	2.1	1.589
Consciously tried to reduce usage	-0.26	0.118	0.027	0.61	0.97	0.771
Universities guidelines	1.454	0.673	0.031	1.14	16.01	4.283
Guidelines impact?	-1.918	0.725	0.008	0.04	0.61	0.147
Willing to follow?	-1.35	0.671	0.044	0.07	0.97	0.259
Smartphones Influence?	1.688	0.744	0.023	1.26	23.26	5.412

SE=standard error

Table 05 highlights the results of factor analysis, giving us insights into the relationship between smartphone usage and student's academic performance. It shows a deep variation between usage patterns. The correlation between phone usage and the CGPA implies that their grades are impacted by their use habits. Any sort of distraction from smartphone notifications tend to disrupt student's concentration (R=-0.368). This suggests that any positive change in their habits can make a significant impact on their academic performance(R=-0.410).

Table 05: Factor Analysis (Factor Influencing Smartphone Usage and Academic Performance)

	Factors						
	1	**2**	**3**	**4**	**5**	**6**	***Uniqueness***
Smartphone usage?				0.51			0.3889
Purpose of usage?	0.76						0.4388
Hours per day spend?				0.52			0.6536
Apps often used?	0.64						0.5044
Current GPA					0.62		0.5538
Study habits?		1.0					-0.0034
Smartphone effect?						0.57	0.6311
Smartphone Impact?				0.30			0.7343
Smartphone disturbance?							0.8294
Factors influence?				-0.37			0.7570
Consciously tried to reduce usage							0.9012
Universities guidelines					-0.41	-0.37	0.6708
guidelines impact?						0.36	0.7694
Willing to follow?			0.41		0.30		0.7368
Smartphones Influence?			*0.75*				*0.3752*

Table 6 shows the multi-dimensional scaling (MDS) analysis that indicates differences among factors such as smartphone usage, study habits, and academic performance. The

analysis generated two dimensions (Dimension 1 and Dimension 2) to represent the similarities or dissimilarities between the stimuli. Dimension 1 appears to capture factors related to academic performance, "Impact of smartphone use on academic performance" and "Purpose of usage" has high positive scores on this dimension, indicating their strong association with academic performance. Conversely, stimuli like "Hours per day on smartphone"(r=0.4602) and "Smartphone disturbance(r=1.38) while studying" have negative scores on Dimension 1, suggesting they are inversely related to academic performance. Dimension 2 seems to reflect factors related to smartphone usage habits and guidelines. On the other hand, "Willing to follow guidelines on smartphone usage" (r= -0.654) and "Universities guidelines on smartphone usages" (r= -0.6323) have negative scores on Dimension 2, suggesting they are related to adherence to guidelines.

Table 06: Multidimensional Scaling Analysis of smartphones Usage, Study Habits , and Academic Performance

Stimulus Number	**Stimulus Name**	**Dimension 1**	**Dimension 2**
1	Current CGPA	1.1676	-0.2214
2	Smartphone disturbance	1.3772	-0.0953
3	Smart phone usage	0.0324	0.7739
4	Purpose of usage	-2.0901	0.1104
5	Hours per day	0.4602	-0.8713
6	Study habits	0.944	0.7684
7	Smartphone impact on study habits	-1.5752	0.8226
8	Impact of smartphone use on academic performance	-2.4719	-1.0333
9	Factors influences	-0.8077	1.0414
10	Universities guidelines	0.9333	-0.6323
11	Guidelines impact on academic performance	0.5487	0.0442
12	Willing to follow guidelines	0.9328	-0.654
13	Smartphones influence on education in developing countries	0.5487	-0.0533

Figure 01 illustrates the intricate relationship between Smartphone usage habits and academic performance, providing valuable insights into the complex interplay between these factors. Using a two-dimensional scatter plot, the analysis visualizes various aspects of smartphone use and academic outcomes. Each point on the plot corresponds to a specific factor, such as hours spent on smartphones, apps often used, and attitudes toward university guidelines. Each quadrant shows the cluster group's 1st quadrant study habits, guidelines, and academic performance. Similarly, this figure shows the different clusters which are essential to understand close factors that are affecting our concern variable such as current CGPA. The analysis offers valuable insights into patterns and clusters of related factors, informing targeted interventions and strategies for promoting healthy smartphone usage habits among students.

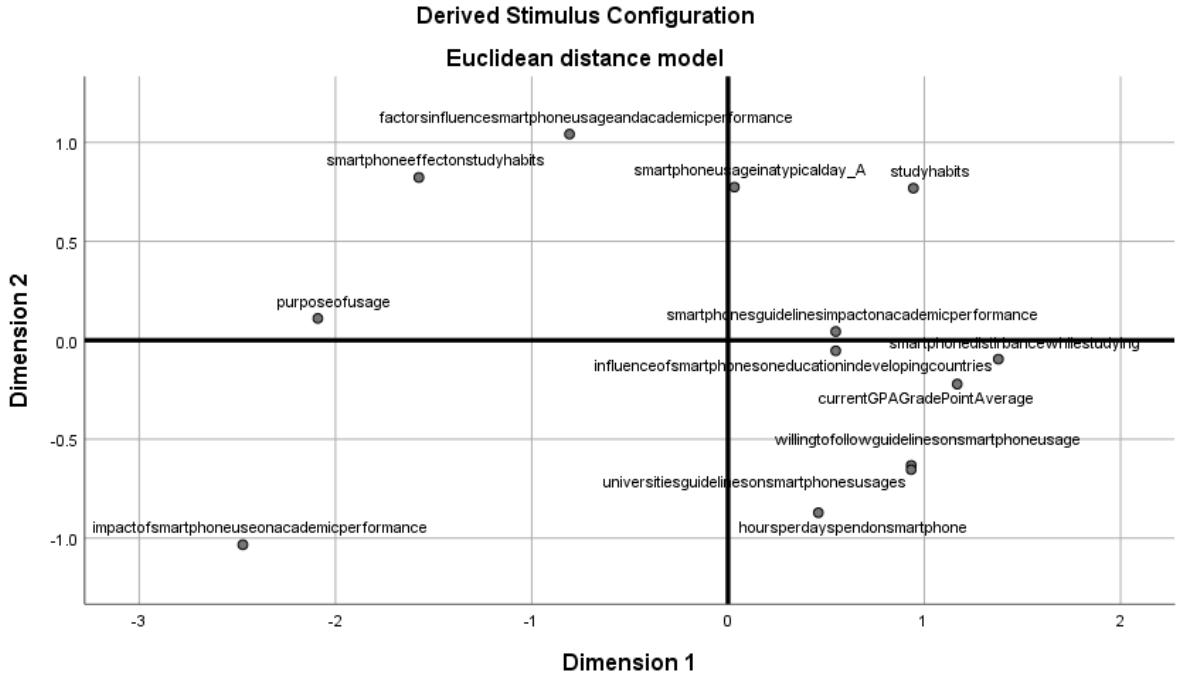

Figure 01: Smartphone Usage and Academic Performance: Discrimination Measures Between Groups

Table 07 shows different aspects related to smartphone usage and their mean values across two dimensions. For instance, when asked about how often they use their smartphones in a typical day, participants rated their usage slightly higher on Dimension 2 (impact of smartphone usage on academic performance), (Mean = 0.219) compared to Dimension 1 (frequency and intensity of smartphone use) (Mean = 0.066). Similarly, for smartphone usage, the mean score was higher on Dimension 2 (Mean = 0.229) than on Dimension 1 (Mean = 0.089). Interestingly, when it comes to the impact of smartphone use on academic performance, participants rated it lower on both dimensions, with slightly higher scores on Dimension 2 (Mean = 0.116) compared to Dimension 1 (Mean = 0.049). Overall, across all items, the mean scores were quite similar between the two dimensions, with Dimension 1 having a slightly lower overall mean (Mean = 3.747) compared to Dimension 2 (Mean = 3.573).

These measures provide insights into how different aspects of smartphone usage are perceived and experienced by individuals, helping to understand their overall attitudes and behaviors toward smartphone usage.

Table 07: Perception of Smartphone Usage and Related Factors across Two Dimension

Predictor	**Dimension 1**	**Dimension 2**	**Mean**
Smartphone usage in a typical day	0.066	0.219	0.142
Purpose of usage	0.089	0.229	0.159
Hours per day spent on smartphone	0.017	0.098	0.058
Apps often used	0.134	0.363	0.248
Current GPA	0.057	0.005	0.031
Study habits	0.505	0.089	0.297
Smartphone effect on study habits	0.861	0.251	0.556
Impact of smartphone usage	0.156	0.103	0.13
Smartphone disturbance while studying	0.049	0.116	0.083
Factors influencing smartphone	0.378	0.088	0.233

Predictor	Dimension 1	Dimension 2	Mean
Consciously tried to reduce smartphone usage	0.079	0.211	0.145
University guidelines on smartphone usage	0.037	0.175	0.106
Smartphones guidelines impact	0.342	0.36	0.351
Willingness to follow guidelines on smartphone usage	0.082	0.233	0.158
Influence of smartphones in developing countries	0.07	0.463	0.267
Active Total	3.747	3.573	3.66

Figure 02 shows discrimination measures which provide insights into the intricate impact between smartphone usage and academic success. Variables such as the impact of smartphones on study habits, adherence to university guidelines, daily hours spent using smartphones, and frequency of app usage are plotted. The proximity of points indicates clustering or groupings, with closer points sharing similar characteristics and those farther apart suggesting dissimilarities. Smartphone influences, universities, and hours spent on smartphones can be clustered in the same group as their arrow and close distance while Current GPA, smartphone disturbance, and Study habits can be clustered into the same group as their arrow indicating the same pattern.

Researchers and educators can utilize this graph to understand the impact of smartphone usage on study habits and academic outcomes, identify patterns, and make informed decisions regarding guidelines and interventions.

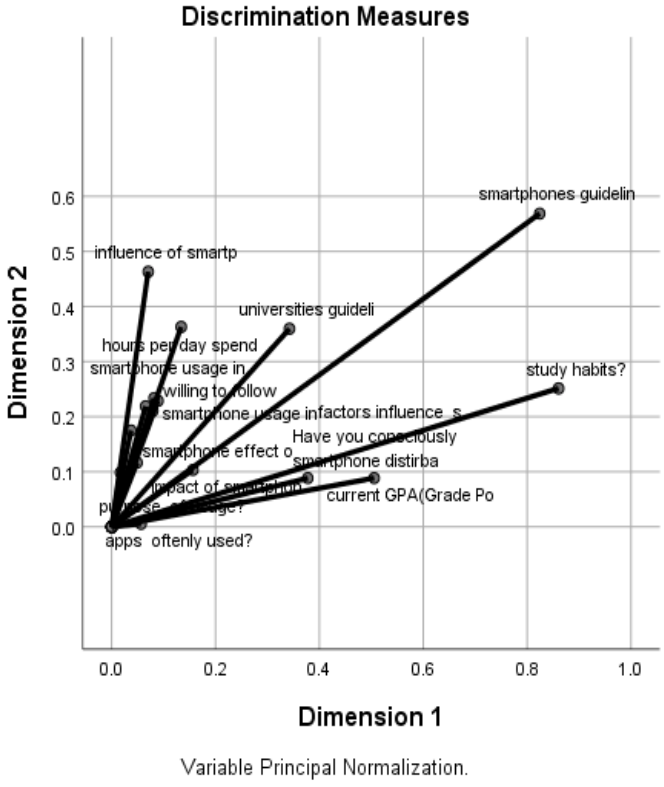

Figure 02: Discrimination Measure for measuring Association Among Factors Effecting Academic Performance and Smartphone usage

4 Discussion

The findings from the presented analysis highlight the intricate relationship between smartphone usage patterns and academic performance among the surveyed individuals. The statistics revealed that the majority of respondents spend approximately 1-3 hours daily (1.36) on their smartphones, with social media emerging as the primary purpose for usage. Despite this prevalent usage, respondents reported a relatively high current Grade Point Average (CGPA), indicating a positive academic achievement level (1.02). However, the analysis also uncovered that smartphone usage habits may negatively impact study habits, with many respondents acknowledging distractions while studying. Interestingly, opinions on the impact of smartphone use on academic performance were neutral overall, suggesting diverse perspectives among the sample. The logistic regression analysis further elucidated the relationship between smartphone usage factors and CGPA. Variables such as the hours spent on smartphones, study habits, adherence to university guidelines, and attitudes towards smartphones' influence on education in developing countries emerged as significant predictors of CGPA. For instance, spending more hours on smartphones was associated with a higher CGPA (0.535), while certain apps' frequent usage showed a negative association with academic performance. The logistic regression presents coefficients and their standard errors for various predictors related to smartphone usage and its impact on academic performance, with the dependent variable being CGPA, the coefficient for "hours per day spent on smartphone" is 0.535, suggesting that for each additional hour spent on a smartphone daily, CGPA tends to increase by a factor between 1.18 and 2.46. Multi-dimensional scale and factor analysis shows the association and clustering of different factors on academic performance while discrimination measures show the dissimilarities among different factors. Additionally, the analysis highlighted the importance of factors influencing smartphone usage and adherence to guidelines in managing smartphone habits effectively and potentially improving academic performance.

Most of the findings of the present study are in line with the results of other studies. For instance, some studies have found a negative correlation between smartphone usage and academic performance, attributing distractions from social media and notifications as detrimental factors (Owusu-Marfo et al., 2018; Rathakrishnan et al., 2021). Sapci et al reveal that students who make excessive use of phones even for their social connectivity can also negatively impact their academic performance (Sapci et al., 2021). However, some other studies report no strong association between phone usage and academic performance (Hasan et al., 2017; Cen et al., 2015). The findings of the present study reveal that more focused interventions should be adopted to mitigate the negative implications of smartphone usage besides creating a healthy environment in academic institutions.

5 Conclusion

The study has a useful contribution for both students and educational institutions to improve our understanding of the relationship between smartphone usage and their academic performance. It is observed in the study that student’s habits of phone use have a strong impact on their performance and academic grades. Similarly, excessive use of phones even for social connections also creates distraction for students, which ultimately leads to their poor academic performance. Proper identification of these relations can help all relevant stakeholders to refine their improvement efforts. Furthermore, university guidelines can be developed in the light of these findings fostering a conducive environment for both students and instructors. It is also concluded that instead of adopting a universal approach, it is better to develop a more focused and customized approach.

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