

Social media usage as a predictor of students' academic performance, productivity and mental wellbeing



Abstract

The report compares GPA, productivity and mental wellness between university students that belong to different groups characterised by their level of social media usage. The focus of the study was to determine if student's social media usage could predict how well they perform academically, how productive they are and how well they perceive their current mental state to be. An online questionnaire was distributed and 112 responses were collected. Several statistical tests have been conducted including the chi-square test of independence and one-way ANOVA. The study revealed no associations between student usage of social apps and their GPA, productivity or mental wellness.

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1 Introduction

It can not be disputed that social media use has grown exponentially throughout the last decade. Despite the myriad of benefits brought about by social networking sites such as their facilitation of learning and contribution to knowledge acquisition (Yu et al., 2010), opportunity for engagement in reciprocally supportive relationships (Kingod et al., 2016) and provision of emotional, social, or experiential support (Patel et al., 2015), a large number of studies have also identified adverse effects of using social media platforms on users' health and various other aspects of their lives (e.g. Woods & Scott, 2016, Bekalu et al., 2019, Hettiarachchi, 2014).

The primary purpose of this report is to examine the relationship between the number of hours university students spend on social media and their GPA, level of productivity and self-perceived mental wellbeing. It poses the following hypotheses:

Hypothesis 1: Social media usage is a predictor of GPA.

Hypothesis 2: Social media usage is a predictor of Productivity.

Hypothesis 3: Social media usage is a predictor of self-perceived Mental wellbeing.

Section 2 lays out the study design which describes the sample, the variables and how they are collected. An analysis of the four hypotheses, which includes descriptive and inferential statistics, is provided in Section 3. Section 4 – Discussion – discusses the reliability and validity of the test results, the limitations of the study design as well as recommendations for future research projects. Section 5 concludes the report.

2 Study design

2.1 Sample

A survey questionnaire was used for this study and distributed online via email. The data were collected from a sample of college students at WSU and several other universities. The questionnaires were distributed over a period of 5 days starting 21 July to 25 July 2022.

The total sample size was 112. English was the language used in the questionnaire. Students were assured of anonymity and confidentiality, and participation was voluntary. The age of the participants ranged from 18 to 22+ with 56.25% being 19 years of age. Approximately 67% of the respondents were female. Facebook was the most commonly used social media application (97.3%), followed by YouTube (90.2%) and Instagram (89.3%).

2.2 Measures

2.2.1 Social media usage

Respondents were asked about the average number of hours spent using social media daily by choosing one from 5 options:

Figure 1. Question 4 from survey – Variable: Social media usage

10. How many hours do you spend on studying per day on average?

Less than 1 hour	3 - 4 hours	More than 6 hours
1 - 2 hours	5 - 6 hours	

2.2.2 GPA

Participants were asked to report their GPA from their latest semester by choosing one out of the options provided:

Figure 2. Question 5 from survey – Variable: GPA

10. How many hours do you spend on studying per day on average?

9.7 - 10.0 or 4.0	8.3 - 8.6 or 3.0	7.0 - 7.2 or 1.7
9.3 - 9.6 or 4.0	8.0 - 8.2 or 2.7	6.7 - 6.9 or 1.3
9.0 - 9.2 or 3.7	7.7 - 7.9 or 2.3	6.5 - 6.6 or 1.0
8.7 - 8.9 or 3.3	7.3 - 7.6 or 2.0	Below 6.5 or 0.0

2.2.3 Productivity

In addition to reporting their GPA, participants were asked how many hours they spend studying per day on average. The data from this question provides the basis for the first measure of productivity – the more hours spent studying, the higher the respondent's level of productivity is assumed to be.

Figure 3. Question 6 from survey – Variable: Productivity (measured by hours spent studying)

10. How many hours do you spend on studying per day on average?

- Less than 1 hour
 - 1 - 2 hours
 - 3 - 4 hours
 - 5 - 6 hours
 - 7 - 9 hours
 - More than 10 hours
-

The second measure of productivity was conducted by asking respondents if they thought social media use was adversely affecting their ability to complete schoolwork. They were asked to report how much they agree or disagree with the following statement with five choices ranging from "Strongly agree" to "Strongly disagree":

Figure 4. Questions 7 - 10 from survey – Variable: Productivity (measured by respondents' perceptions of their own productivity)

How strongly do you agree with these statements?

- 11. I have enough time to complete my homework and assignments recently.
 - 12. I tend to get things done on time recently.
 - 13. I tend to have difficulty concentrating when I'm studying/working recently.
 - 14. I have been spending time learning/working on things outside of school/university/work recently.
-

2.2.4 Mental wellbeing

Participants were asked if they thought social media use was adversely affecting their mental health. They were asked to report how much they agree or disagree with the following statement with five choices ranging from "Strongly agree" to "Strongly disagree":

Figure 5. Questions 11 - 14 from survey – Variable: Mental wellbeing

How strongly do you agree with these statements?

- 15. I tend to feel insecure from looking at friends and acquaintances' posts online recently.
 - 16. I am happy with myself and my life these days.
 - 17. I have had depressive/suicidal thoughts recently.
 - 18. I tend to feel isolated, lost, lonely or abandoned recently.
-

3 Analysis and results

In this section we conduct statistical tests to determine if the number of hours spent on social media has an association with students' GPA, productivity, mental health and sleep quality.

3.1 Hypothesis 1: Social media usage is a predictor of GPA

The independent variable - 'social media usage' – is an ordinal variable. The dependent variable - 'GPA' – is also an ordinal variable.

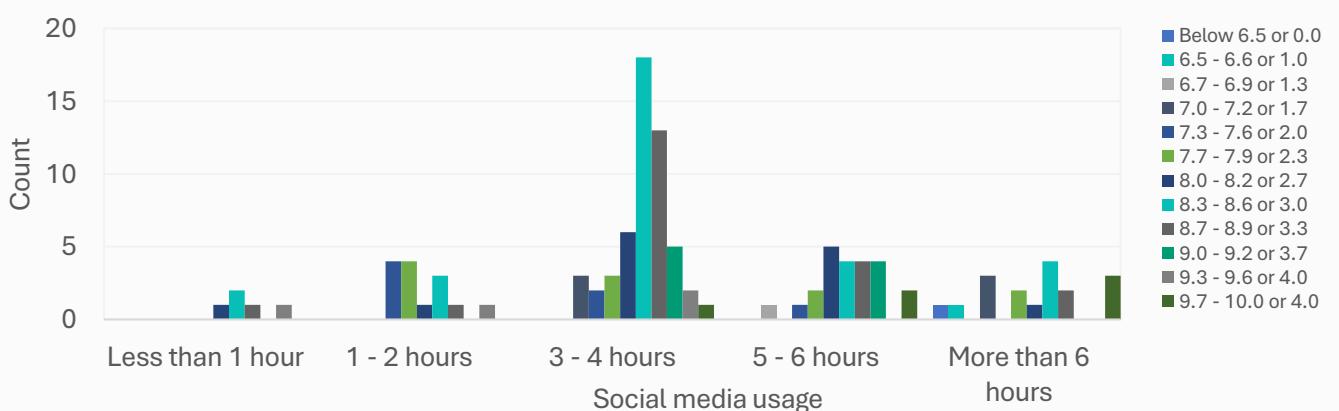
3.1.1 Descriptive statistics

Table 1. Cross tabulation: Social media usage vs. GPA

		Social media usage					Total
		Less than 1 hour	1 - 2 hours	3 - 4 hours	5 - 6 hours	More than 6 hours	
GPA	Below 6.5 or 0.0	0	0	0	0	1	1
	6.5 - 6.6 or 1.0	0	0	0	0	1	1
	6.7 - 6.9 or 1.3	0	0	0	1	0	1
	7.0 - 7.2 or 1.7	0	0	3	0	3	6
	7.3 - 7.6 or 2.0	0	4	2	1	0	7
	7.7 - 7.9 or 2.3	0	4	3	2	2	11
	8.0 - 8.2 or 2.7	1	1	6	5	1	14
	8.3 - 8.6 or 3.0	2	3	18	4	4	31
	8.7 - 8.9 or 3.3	1	1	13	4	2	21
	9.0 - 9.2 or 3.7	0	0	5	4	0	9
	9.3 - 9.6 or 4.0	1	1	2	0	0	4
	9.7 - 10.0 or 4.0	0	0	1	2	3	6
Total		5	14	53	23	17	112

Among the 112 respondents, 31 students achieve a GPA of 8.3 – 8.6 or 3.0 GPA, which accounts for the highest percentage of all students (27.7%). Almost half of the respondents (47.3%) reported using on average 3 – 4 hours of social media per day.

Figure 6. Bar chart: Social media usage vs. GPA bar chart



The data distribution is unimodal and slightly left-skewed. The largest group of respondents (18 students) are those who achieved a score of 8.3 – 8.6 or 3.0 GPA who also spend on average 3 – 4 hours a day on social media.

3.1.2 Inferential statistics

The **chi-square test of independence** was chosen to test Hypothesis 1. Prior to examining whether there is an association between two variables, the assumptions underlying the chi-square test of independence must be considered:

- Assumption 1: Two variables should be measured at an ordinal or nominal level (i.e., categorical data). Both variables are ordinal so assumption 1 is met.
- Assumption 2: Two variables should consist of two or more categorical, independent groups. The independent variable (social media usage) has 5 categorical, independent groups whereas the dependent variable (GPA) has 12 groups. Therefore, assumption 2 is also met.
- Assumption 3: Cochran's Rule - No more than 20% of the expected counts are less than 5. 55 cells (91.7%) have expected count less than 5 and therefore this assumption is NOT met.

Since assumption 3 would be violated if we proceed with the chi-square test of independence for the current data set, the categories must be collapsed and merged into a smaller number of groups to yield higher expected counts.

Table 2. Cross tabulation: Social media usage vs. GPA (collapsed)

		Social media usage			Total
		<1 – 2 hours	3 - 4 hours	5 – 6+ hours	
GPA	<6.5 - 7.9 or 0.0 - 2.3	8	8	11	27
	8.0 - 8.9 or 2.7 - 3.3	9	37	20	66
	9.0 - 10.0 or 3.7 - 4.0	2	8	9	19
	Total	19	53	40	112

After collapsing the data, 2 cells (22.2%) with expected count less than 5 remains which means the Cochran's rule still has not been strictly met. However, according to Minitab (2022), if either variable has only 2 or 3 levels, the validity of the results can be trusted if all cells have expected counts of at least 3 or all cells have expected counts of at least 2, and 50% or fewer of the cells have expected counts of less than 5.

As suggested by Table 3 below, the collapsed data set now meets both the requirements mentioned thus it can be said that the results from the use of the Chi-square test for this data can be trusted.

Table 3. Expected counts: Social media usage vs. GPA (collapsed)

		Social media usage			Total
		<1 – 2 hours	3 - 4 hours	5 – 6+ hours	
GPA	<6.5 - 7.9 or 0.0 - 2.3	4.58	12.78	9.64	27
	8.0 - 8.9 or 2.7 - 3.3	11.20	31.23	23.57	66
	9.0 - 10.0 or 3.7 - 4.0	3.22	8.99	6.79	19
	Total	19	53	40	112

Step 1. The hypotheses are:

H₀. GPA is independent of social media usage

H₁. GPA is dependent of social media usage

Step 2. Computation of chi-square test statistic and p-value

Table 4. Computation of Chi-square test statistic using SPSS

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.8631 ^a	4	.097
Likelihood Ratio	7.6722	4	.104
N of Valid Cases	112		

a. 2 cells (22.2%) have expected count less than 5. The minimum expected count is 3.22.

Step 3. Conclusion from chi-square test of independence

Since $p(.097) > \alpha(.05)$, we fail to reject the null hypothesis asserting the two variables to be independent of each other.

∴ At $\alpha = .05$, there is statistically significant evidence to show that respondents' social media usage and their GPA are independent.

3.2 Hypothesis 2: Social media usage is a predictor of Productivity

The independent variable - 'Social media usage' – is an ordinal variable.

The dependent variable - 'Productivity' – can be both ordinal and interval depending on the type of data collected. To reiterate (refer to section 3.2.3), there are two ways of measuring productivity:

1. Based on the number of hours spent on studying per day on average (question 10). We assume that the higher the number of hours, the higher the level of productivity. This is qualitative (ordinal) data.
2. Based on respondents' responses on a Likert scale regarding their perceptions towards their own time management (question 11-14). Given that all Likert items have been adjusted to positive framing, we assume that the more strongly the respondent agrees (hence a higher composite score), the higher the level of productivity. The composite score used to test the hypotheses are treated as quantitative (continuous) data here. The controversy and ambiguities regarding whether ordinal data from Likert responses, converted to numbers, can be treated as interval data will be discussed in the Discussion section (section 5.1).

3.2.1 Productivity is based on the number of hours spent studying

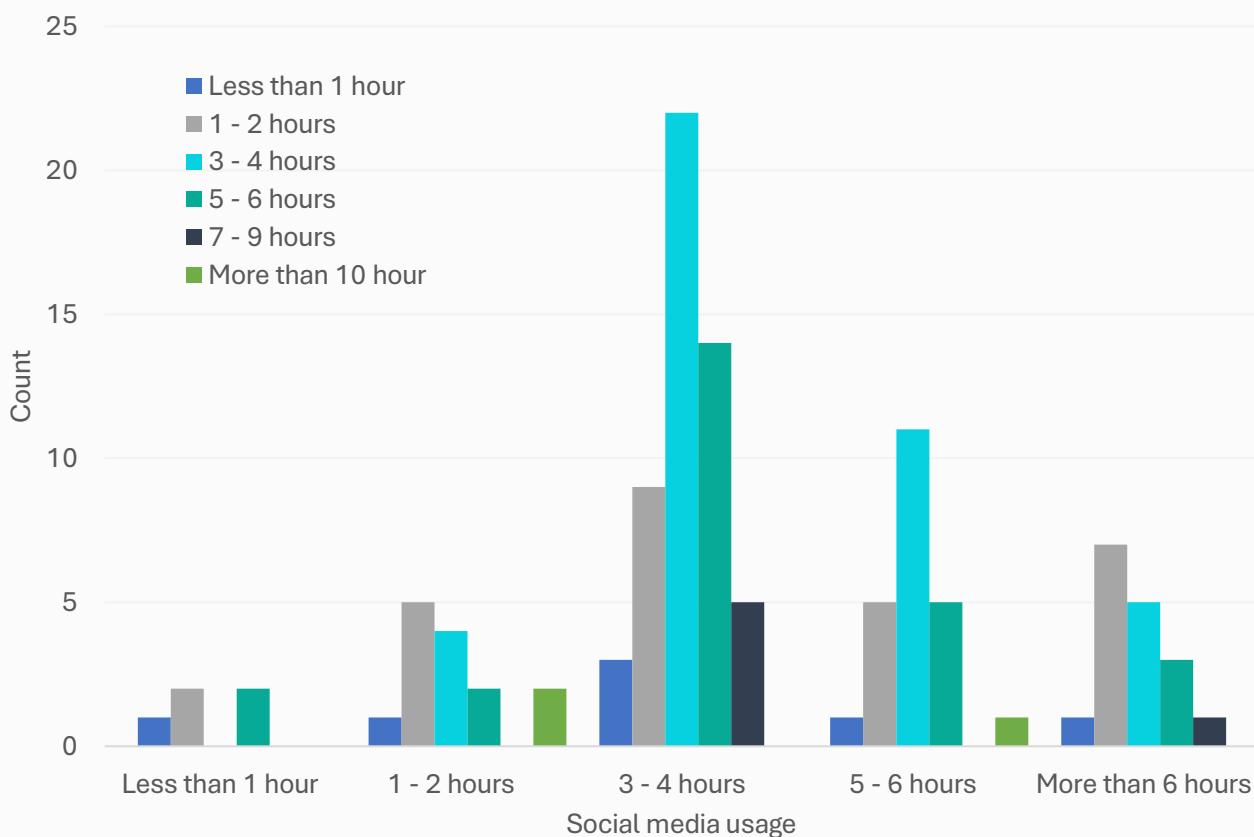
3.2.1.1 Descriptive statistics

Table 5. Cross tabulation: Social media usage vs. Hours spent studying

		Hours spent studying						Total
Social media usage	Hours spent studying	Less than 1 hour	1 - 2 hours	3 - 4 hours	5 - 6 hours	7 - 9 hours	More than 10 hours	
	Less than 1 hour	1	2	0	2	0	1	5
	1 - 2 hours	1	5	4	2	0	1	14
	3 - 4 hours	3	9	22	14	5	3	53
	5 - 6 hours	1	5	11	5	0	1	23
	More than 6 hours	1	7	5	3	1	1	17
Total		7	28	42	26	6	3	112

Among the 112 respondents, 42 students (37.5%) reported studying on average 3 – 4 hours every day, 25% said they spend 1 – 2 hours and 23.2% spend 5 – 6 hours on average.

Figure 7. Bar chart: Social media usage vs. Hours spent studying bar chart



The data distribution is unimodal and peaks at the 3 – 4 hours of social media mark. The largest group of respondents (22 students) are those who spend on average 3 – 4 hours a day on social media and also dedicate 3 – 4 hours to study every day.

3.2.1.2 Inferential statistics

Since the data faces a similar issue as the data set for Hypothesis 1 (22 cells (73.3%) have expected count less than 5), the groups will be collapsed as shown in Table 6:

Table 6. Cross tabulation: Social media usage vs. Hours spent studying (collapsed)

		Social media usage			Total
		<1 – 2 hours	3 - 4 hours	5 – 6+ hours	
Hours spent studying	<1 – 2 hours	9	12	14	35
	3 – 4 hours	4	22	16	42
	5 – 10+ hours	6	19	10	35
	Total	19	53	40	112

The **chi-square test of independence** was chosen to test Hypothesis 2. Prior to examining whether there is an association between two variables, the assumptions underlying the chi-square test of independence must be considered:

- Assumption 1: Two variables should be measured at an ordinal or nominal level (i.e., categorical data). Both variables are ordinal so assumption 1 is met.
- Assumption 2: Two variables should consist of two or more categorical, independent groups. Both variables have 3 independent, non-overlapping groups. Therefore, assumption 2 is also met.
- Assumption 3: Cochran's Rule - No more than 20% of the expected counts are less than 5. After collapsing, 0 cells (0.0%) have expected count less than 5. Assumption 3 is therefore also met.

Step 1. The hypotheses are:

- H₀. Productivity (measured by hours spent studying) is independent of social media usage
H₁. Productivity (measured by hours spent studying) is dependent of social media usage

Step 2. Computation of chi-square test statistic and p-value

Table 7. Computation of Chi-square test statistic using SPSS

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.5403 ^a	4	.236
Likelihood Ratio	5.7228	4	.221
N of Valid Cases	112		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.94.

Step 3. Conclusion from chi-square test of independence

Since $p(.236) > \alpha(.05)$, we fail to reject the null hypothesis asserting the two variables to be independent of each other.

∴ At $\alpha = .05$, there is statistically significant evidence to show that respondents' productivity as measured by the number of hours they spend studying and their social media usage are independent.

3.2.2 Productivity is based on respondents' perceptions of their own productivity

3.2.2.1 Descriptive statistics

In order for the data regarding respondents' attitude on productivity and time management to be interpreted in a meaningful way, the Likert responses must first be coded and a composite score be calculated. The steps were as follows:

Step 1. The four Likert items were number 1 to 4.

1. I have enough time to complete my homework and assignments recently.
2. I tend to get things done on time recently.
3. I tend to have difficulty concentrating when I'm studying/working recently.
4. I have been spending time learning/working on things outside of school/university/work recently.

Step 2. The responses for each item were coded using 1 - 5, with 1 being "Strongly disagree" and 5 being "Strongly agree".

Step 3. Since negative framing was used for item 3, the coding was reversed to 1 being "Strongly agree" and 5 being "Strongly disagree".

Table 8. Coded Likert items (with negatively framed item 3 recoded)

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Item 1	I have enough time to complete my homework and assignments recently.	1	2	3	4	5
Item 2	I tend to get things done on time recently.	1	2	3	4	5
Item 3	I tend to have difficulty concentrating when I'm studying / working recently.	5	4	3	2	1
Item 4	I have been spending time learning / working on things outside of school / university / work recently.	1	2	3	4	5

Step 4. A composite score was calculated for each respondent using the coded framework above. For example, if respondent 'A' is a highly productive individual then they would choose "Strongly agree" for Item 1, 2 and 4 and "Strongly disagree" for Item 3. As a result, their composite score would be

Composite score

$$\begin{aligned} &= (\text{score for item 1} + \text{score for item 2} + \text{score for item 3} + \text{score for item 4}) \div \text{total number of items} \\ &= (5 + 5 + 5 + 5) \div 4 = 5. \end{aligned}$$

For this report, the higher the composite score, the higher the respondent's productivity is implied to be.

Table 9. Descriptive statistics for the dependent variable (composites scores representing respondents' perceptions towards their productivity)

	N	Range	Mean	SD	Variance	Skewness	Kurtosis
Productivity composite scores	112	3.25	3.4531	.6265	.392	-.304	.246

The mean composite score of 112 respondents was 3.45 and the standard deviation was .6265. The lowest score was 1.75 and the highest was 5.

3.2.2.2 Inferential statistics

The **one-way ANOVA** was chosen to test for the relationship between productivity measured by respondents' perceptions and their social media usage. The assumptions underlying the test are as follows:

- Assumption 1: The dependent variable should be measured at the interval or ratio level. After converting the Likert responses to a composite score, the dependent variable can now be considered as an interval variable and the assumption is met.
- Assumption 2: The independent variable should consist of two or more categorical, independent groups. The social media usage variable has 5 groups that are non-overlapping and therefore this assumption is also met.
- Assumption 3: The data possesses independence of observations. When setting up the survey, it was made sure that the respondents can only choose ONE option out of all the options available for each question and this meant that no participants belonged to more than one group for each variable.
- Assumption 4: There should be no significant outliers. The IQR method was used to test for any extreme outliers as shown in table 10 below. It can be seen that no values from the dependent variable were above 5.5 or below 1.5625. Hence assumption 4 is met for this data set.

Table 10. Extreme upper and lower fences of the dependent variable (productivity composite scores)

	Range	Minimum	Maximum	IQR	Extreme upper fence	Extreme lower fence
Productivity composite scores	3.25	1.75	5	0.5625	5.5	1.5625

- Assumption 5: The dependent variable should be approximately normally distributed for each category of the independent variable. Two common tests for normality were considered: the Kolmogorov–Smirnov test and the Shapiro–Wilks test. Since the Shapiro–Wilks test was generally more powerful (Razali & Yap, 2011) it was used for this data set. The Sig. value is greater than 0.05 for all independent groups, we retain the hypothesis of normality, as shown in Table 11 below.

Table 11. Shapiro-Wilk test of normality for the dependent variable (productivity composite scores)

		Statistic	df	Sig.
Productivity composite scores	Less than 1 hour	.858	5	.222
	1 – 2 hours	.921	14	.229
	3 – 4 hours	.958	53	.061
	5 – 6 hours	.942	23	.201
	More than 6 hours	.896	17	.058

- Assumption 6: There needs to be homogeneity of variances. Three common tests were considered: Hartley Test, Levene test and Bartlett Test. Since the Hartley test works best when the number of samples drawn from each population is the same (Roscoe & Veitch, 2022) it was not used for this assumption. Thus, the Levene test and Brown-Forsythe test were used to test for homogeneity of variance (refer to Table 12). Since $p > 0.05$ for both tests, we retain the null hypothesis of equal variances.

Table 12. Levene and Brown-Forsythe tests for homogeneity of variances

	Levene statistic	df1	df2	Sig.	Brown-Forsythe statistic ^a	df1	df2	Sig.
Productivity composite scores	.139	4	107	.967	.706	4	32.661	.594

a. Asymptotically F distributed.

All assumptions of one-way ANOVA have been met and the steps for one-way ANOVA are as follows.

Step 1. The hypotheses are:

- H_0 . All group means are equal.
 H_1 . Not all group means are equal.

Step 2. Computation of the F statistic and p-value

Table 13. ANOVA for social media usage and productivity (using composite scores)

	Sum of squares	df	Mean square	F	Sig.
Between groups	1.303	4	.326	.825	.512
Within groups	42.264	107	.395		
Total	43.566	111			

Step 3. Conclusion from one-way ANOVA test

Since $p(.512) > \alpha(.05)$, we failed to reject the null hypothesis asserting all the group means to be equal.

∴ At $\alpha = .05$, there are no statistically significant differences in the level of productivity measured by respondents' perceptions between the 5 groups.

3.3 Hypothesis 3: Social media usage is a predictor of self-perceived Mental wellbeing

3.3.1 Descriptive statistics

The independent variable - ‘Social media usage’ – is an ordinal variable.

The dependent variable - ‘Mental wellbeing’ – are measured from respondents’ Likert responses and similar to Hypothesis, the data must be coded and converted into a more meaningful interval form using composite scores.

Table 14. Coded Likert items (with negatively framed item 2 recoded)

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Item 1	I tend to feel insecure from looking at friends and acquaintances' posts online recently.	1	2	3	4	5
Item 2	I am happy with myself and my life these days.	5	4	3	2	1
Item 3	I have had depressive / suicidal thoughts recently.	1	2	3	4	5
Item 4	I tend to feel isolated, lost, lonely or abandoned recently.	1	2	3	4	5

The higher the composite score, the lower the respondent’s mental health is assumed to be.

Table 15. Descriptive statistics for the dependent variable (composites scores representing respondents’ current mental health)

	N	Range	Mean	SD	Variance	Skewness	Kurtosis
Productivity composite scores	112	4.00	2.7232	.9446	.892	-.018	-.960

The mean composite score of 112 respondents was 2.72 and the standard deviation was .9446. The lowest score was 1 and the highest was 5.

3.3.2 Inferential statistics

The **one-way ANOVA** was chosen for this test. The underlying assumptions are considered below:

- Similar to the one-way ANOVA test conducted in section 4.2.2.2, assumption 1 (interval/ratio dependent variable), assumption 2 (more than 2 categorical, independent groups for the independent variable) and assumption 3 (independence of observations) are all met.

- Assumption 4: There should be no significant outliers. The IQR method was used to test for any extreme outliers as shown in table 16 below. It can be seen that no values from the dependent variable were above 5 or below 1. Hence assumption 4 is met.

Table 16. Extreme upper and lower fences of the dependent variable (productivity composite scores)

	Range	Minimum	Maximum	IQR	Extreme upper fence	Extreme lower fence
Mental wellbeing composite scores	4.00	1	5	1.5	8	-2.5

- Assumption 5: The dependent variable should be approximately normally distributed for each category of the independent variable. The Shapiro-Wilks test was used for this data set (refer to Table 17). Since the Sig. value is greater than 0.05 for all independent groups except the ‘3 – 4 hours’ group, another way of gauging normality is needed, such as normal Q-Q plots which will be provided in Appendix B. From the graphs, we can conclude that the data appears to be normally distributed as it follows the diagonal line closely and does not appear to have a non-linear pattern. Skewness and kurtosis statistics are also considered. According to George & Mallery (2010), “the values for asymmetry and kurtosis between -2 and +2 are considered acceptable in order to prove normal univariate distribution” while Hair et al. (2010) and Bryne (2010) argued for skewness between -2 to +2 and kurtosis between -7 to +7. The skewness and kurtosis statistics for our data set as shown in Table 15 were -.018 and -.960 respectively, which meant we can assume normality.

Table 17. Shapiro-Wilk test of normality for the dependent variable (productivity composite scores)

		Statistic	df	Sig.
Productivity composite scores	Less than 1 hour	0.915	14	0.184
	1 – 2 hours	0.966	53	0.135
	3 – 4 hours	0.887	23	0.013
	5 – 6 hours	0.927	5	0.573
	More than 6 hours	0.961	17	0.642

- Assumption 6: The Levene test and Brown-Forsythe test were used to test for homogeneity of variance (refer to Table 18) Since $p > 0.05$ for both tests, we retain the null hypothesis of equal variances.

Table 18. Levene and Brown-Forsythe tests for homogeneity of variances

	Levene statistic	df1	df2	Sig.	Brown-Forsythe statistic ^a	df1	df2	Sig.
Productivity composite scores	1.600	4	107	.180	1.123	4	34.502	.362

a. Asymptotically F distributed.

All assumptions of one-way ANOVA have been met and the steps for one-way ANOVA are as follows.

Step 1. The hypotheses are:

H_0 . All group means are equal.

H_1 . Not all group means are equal.

Step 2. Computation of the F statistic and p-value

Table 19. ANOVA for social media usage and mental wellbeing (using composite scores)

	Sum of squares	df	Mean square	F	Sig.
Between groups	4.890	4	1.223	1.389	0.243
Within groups	94.154	107	0.880		
Total	99.045	111			

Step 3. Conclusion from one-way ANOVA test

Since $p(0.243) > \alpha(0.05)$, we failed to reject the null hypothesis asserting all the group means to be equal.

∴ At $\alpha = 0.05$, there are no statistically significant differences in the respondents' self-perceived mental health between the 5 groups.

3.4 Summary of findings

The results from the three hypotheses are summarised below:

Table 20. Summary of hypotheses testing

Hypothesis	Conclusion
Hypothesis 1: Social media usage is a predictor of GPA	Respondents' social media usage and their GPA are independent.
Hypothesis 2: Social media usage is a predictor of Productivity	Respondents' productivity as measured by the number of hours they spend studying and their social media usage are independent.
Hypothesis 3: Social media usage is a predictor of self-perceived Mental wellbeing	There are no statistically significant differences in the level of productivity measured by respondents' perceptions between the 5 groups.

Based on the results of the tests conducted, the hypotheses have not been substantiated. The results suggested that how much time university students' spend on social media does not correlate with their academic performance, productivity or mental health.

4 Discussion

This section discusses a number of caveats relating to choosing the appropriate statistical tests which affects the validity of the test results, the limitations of the study design as well as recommendations for future research projects.

4.1 On the treatment of Likert responses as interval data

As mentioned in the report, there are concerns that need to be addressed regarding the appropriateness of converting Likert data into composite scores and subsequently using parameters (mean and standard deviation) and applying parametric tests onto the transformed data set (one-way ANOVA).

Figure 8. Likert scale used in the survey

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
<input type="radio"/>				

Strictly speaking, Likert-scale data is ordinal since it cannot be presumed that participants perceive the difference between adjacent levels to be equal. The Likert scales employed in the survey failed to show the relative magnitude and distance between the points in a quantitative manner as exemplified by asking, for example, whether the distance between “Agree” and “Disagree” is equal to “Neutral” and “Strongly Agree”. In other words, the points in Likert items violate the assumption of equidistance of interval data (Lantz, 2013).

However, technicalities aside, in the literature on the analysis and interpretation of data from Likert-type scales, the treatment of ordinal data as interval data has been subject to considerable debate (Brown, 2011). There is a large volume of published studies arguing that the Likert items should be considered as ordinal scales and be analysed accordingly (e.g., Kuzon et al., 1996; Coombs, 1960; Vigderhous, 1977; Jamieson, 2004; Knapp, 1990; Jakobsson, 2004). The other school of researchers and experts approach the issue from a different perspective, focusing more on the ability of Likert-scale data to capture complex, abstract and intangible concepts that are rather too challenging to be captured by a single survey item (e.g. Carifio & Perla, 2007, Boone & Boone, 2012). Rickards et al. (2012) recommends the use of composite scores by combining all the related items and generate a score for each respondent rather than a separate analysis of each individual question – a practice that we have employed in our analysis of students’ perceptions of their own productiveness (section 4.2.2) and mental wellness (section 4.3). According to Joshi et al. (2015), this score “shows a sensible realistic distance from the individual summative score of another individual; hence, can be labelled as ‘interval estimates’”. Several other studies have also supported treating Likert scales as interval data (e.g. Baggaley & Hull, 1983; Maurer & Pierce, 1998; and Vickers, 1999; Allen & Seaman, 1997).

4.2 Implications of findings

The results of the chi-square test of independence suggested that there is no association between students’ GPA and their social media usage. This partially aligns with a study by Lau (2017) which found that “using social media for academic purposes was not a significant predictor of academic performance as measured by cumulative grade point average”. However, Lau also argued that the use of social media for non-academic purposes is in fact detrimental to students’ academic performance. Our study did not test whether university’s students were using social media applications for academic-related purposes. The results refuted

research suggesting that increased social media usage adversely impacts students' academic performance (Wakil et al., 2018; Barton et al., 2021, Gloccheski, 2015).

Regarding students' productivity, the results of the chi-square test of independence for the first measure of productivity based on study time suggested that there is no association between students' GPA and productivity. The findings conflict with other studies suggesting that social media usage negatively affects task performance (Brooks, 2015; Qi, 2019).

There is significant evidence in the literature that provides evidence suggesting the link between depression and other mental illnesses to social media usage in young adults (e.g. Lin et al., 2016; Twenge et al., 2018; Primack et al., 2017). The results of our report, however, did not align with these findings. The study revealed that how the students surveyed felt did not correlate to how much they use social media.

4.3 Limitations and recommendations for future projects

The first limitation of this study is the selection bias. Almost all of the respondents were friends and colleagues who were notified of the survey through either social media messaging apps (e.g. Messenger, Instagram, etc.) or email, which meant that the majority of respondents are those that are already using social media and have access to Internet connection. Both methods of survey distribution filter out those who do not spend time regularly on social media messaging apps and those who do not have access to the Internet, thus reducing the external validity of the study i.e. our ability to extrapolate the results from the sample (respondents of this survey) to the target population (university students in general). For future projects, it is recommended that the methods of distributions be diversified, such as using printed handouts or asking students in face-to-face interviews.

Another problematic issue in this report was the difficulties involved with measuring complex, subjective concepts such as productivity and mental wellness. Consider productivity as an example, which was measured using 2 methods: based on the number of hours spent studying and respondents' perceptions expressed through their Likert-scale responses. The first measure of productivity is a relatively concrete, easy to quantify way of measuring productivity. However, based on the traditional and popular definition of "productivity" - "the rate at which a worker, a company or a country produces goods, and the amount produced, compared with how much time, work and money is needed to produce them" (Oxford University Press, 2022) – it can be seen that productivity is not characterised by achieving the highest outcome alone but rather doing so by also putting in the minimum amount of input or resources. This is evidenced in a considerable amount of literature which has suggested that test grades are not always positively correlated with study time and can be dependent on many other factors (e.g. Hammonds & Mariano, 2015; Huang, 2022, Young, 1998). The word "productivity" can also be defined as "the rate at which a person, company, or country does useful work" (Cambridge University Press, 2022), thus suggesting that aside from the time spent studying, another dimension that makes up productivity is the quality of the work being done as well. Mental wellness is another concept that is highly challenging to test for, since it can vary by significant degrees depending on short-term factors such as the current mood of the respondent, their physical state etc. To sum up, the hypotheses not being supported could be caused by the inability of the questions to capture the dimension of interest adequately and accurately. Addressing this issue is a highly challenging task and thus would require a more in-depth research on the concepts that we would like to study.

The third limitation of this study is the lack of an internal consistency reliability analysis. In the context of this report, this refers to an assessment of whether all items designed to test for a dimension (for example, productivity), are in fact, measuring that same construct (Rickards et al., 2012). Given that the nature of

intangible qualities is already complex as noted in the previous point, we further attribute our failure to substantiate the hypotheses to our inability to sufficiently gauge the extent to which the items on our scale are intercorrelated with one another. For example, it was not statistically proven that respondents choosing “Strongly agree” for the item stating “I have enough time to complete my homework and assignments recently.” will also be more likely to choose “Strongly Agree” to “I have been spending time learning/working on things outside of school/university/work recently.”, despite the fact that we assumed a priori that a productive person would choose so for both (i.e. they got a high composite score) (refer to Figure 4 below). A suggestion for our future project would be to conduct tests such as the Cronbach alpha or Kappa test of intercorrelation and validity and only decide to proceed with the inferential testing if the items have shown to be sufficiently correlated.

Figure 4. Question 11 - 14 from survey – Variable: Productivity (measured by respondents’ perceptions of their own productivity)

How strongly do you agree with these statements?

11. I have enough time to complete my homework and assignments recently.
 12. I tend to get things done on time recently.
 13. I tend to have difficulty concentrating when I'm studying/working recently.
 14. I have been spending time learning/working on things outside of school/university/work recently.
-

5 Conclusion

This study aims to examine the effects of social media usage on other aspects of university students. Three hypotheses were put forth, suggesting that social media usage is a predictor of GPA, productivity and mental wellness, respectively. The data did not substantiate any of the hypotheses after conducting statistical tests such as the chi-square test of independence and one-way ANOVA. This failure to support the hypotheses were attributed to three major limitations of the study, namely the selection bias, the framing of questions to measure complex qualities and the lack of testing for internal consistency. Recommendations for future projects include diversifying survey distribution methods, conducting more rigorous research on the topics and using tests for internal consistency.

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Appendices

Appendix A. Survey instrument

Statistics for Business | Group 3

Social media usage on academic performance, productivity & mental wellbeing

1 Firstly, how old are you? *

- 18 19 20 21 22+
-

2 Your gender is: *

- Male Female Other
-

3 Do you use any of these social media platforms?

- Facebook Instagram TikTok YouTube Twitter
 Snapchat WhatsApp WeChat Reddit Other
-

4 How many hours on average do you spend per day on social media?

- Less than 1 hour 1 - 2 hours 3 - 4 hours 5 - 6 hours More than 6 hours
-

5 What was your GPA last semester?

- 9.7 - 10.0 or 4.0 8.7 - 8.9 or 3.3 7.7 - 7.9 or 2.3 6.7 - 6.9 or 1.3
 9.3 - 9.6 or 4.0 8.3 - 8.6 or 3.0 7.3 - 7.6 or 2.0 6.5 - 6.6 or 1.0
 9.0 - 9.2 or 3.7 8.0 - 8.2 or 2.7 7.0 - 7.2 or 1.7 Below 6.5 or 0.0
-

6 How many hours do you spend on studying per day on average?

- Less than 1 hour 1 - 2 hours 8 - 10 hours
 5 - 6 hours 7 - 9 hours More than 10 hours
-

7 How strongly do you agree with these statements?

I have enough time to complete my homework and assignments recently.

1 2 3 4 5

Strongly disagree



Strongly agree

8 I tend to get things done on time recently.



9 I tend to have difficulty concentrating when I'm studying/working recently.



10 I have been spending time learning/working on things outside of school/university/work recently.



11 I tend to feel insecure from looking at friends and acquaintances' posts online recently.



12 I am happy with myself and my life these days.



13 I have had depressive/suicidal thoughts recently.



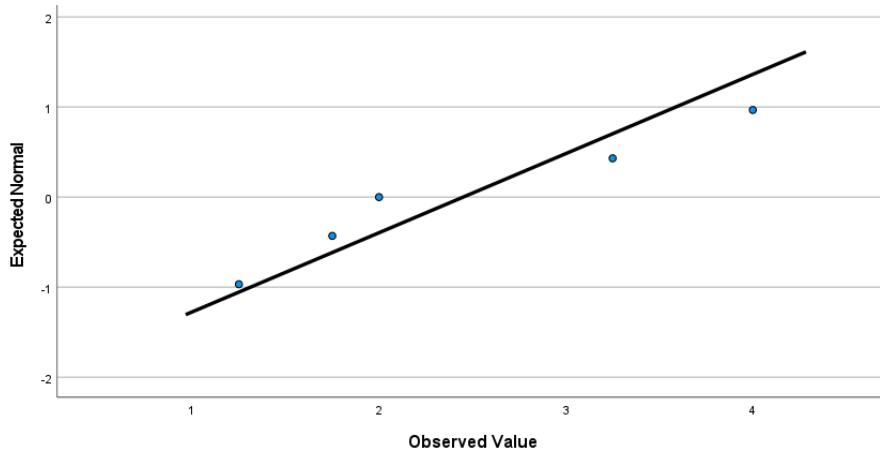
14 I tend to feel isolated, lost, lonely or abandoned recently.



Appendix B. Normal Q-Q plots to test for normality for Hypothesis 3

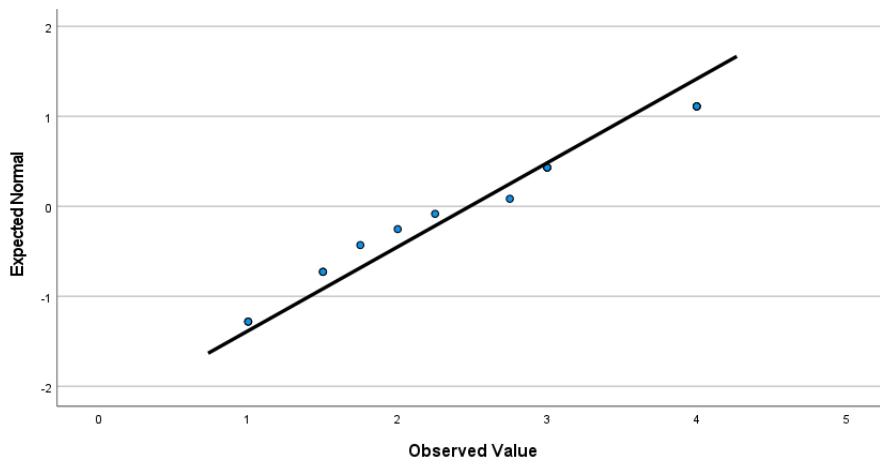
Normal Q-Q plot of variable ‘mental wellbeing’

For variable ‘social media usage’ = Less than 1 hour



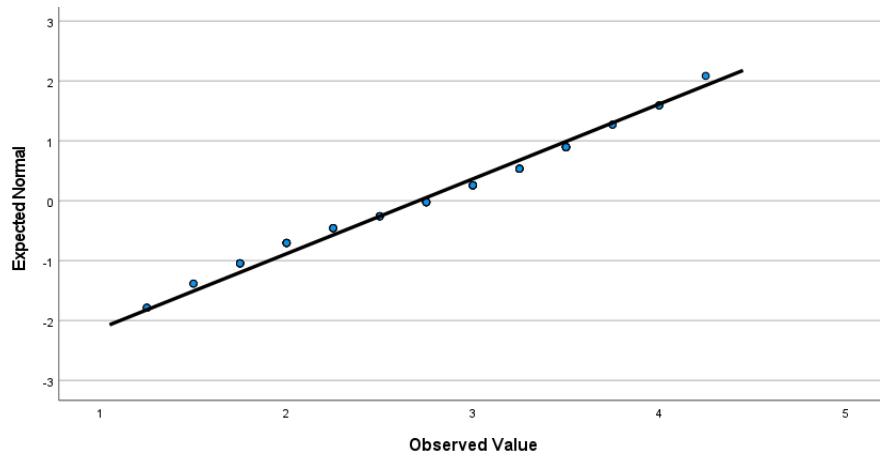
Normal Q-Q plot of variable ‘mental wellbeing’

For variable ‘social media usage’ = 1 – 2 hours



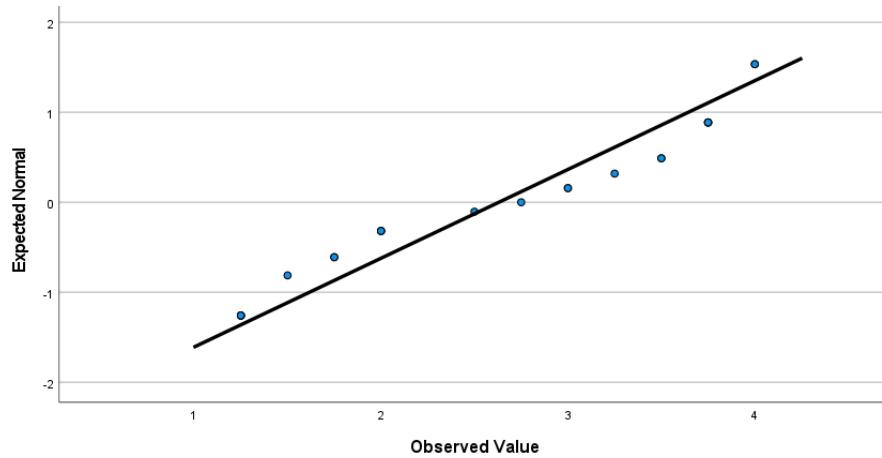
Normal Q-Q plot of variable ‘mental wellbeing’

For variable ‘social media usage’ = 3 - 4 hours



Normal Q-Q plot of variable 'mental wellbeing'

For variable 'social media usage' = 5 - 6 hours



Normal Q-Q plot of variable 'mental wellbeing'

For variable 'social media usage' = More than 6 hours

