UTM

UNIVERSITI TEKNOLOGI MALAYSIA

PROBABILITY & STATISTICAL DATA ANALYSIS

SEMESTER II 2020/2021

SECI2143-05

GROUP PROJECT 1

NAME OF STUDENTS	MATRIC NO.
BRENDAN DYLAN GAMPA ANAK JOSEPH DUSIT @ DUSIT	A20EC0021
HAFIY HAKIMI BIN SAIFUL REDZUAN	A20EC0040
MOHAMAD HAZIQ ZIKRY BIN MOHAMMAD RAZAK	A20EC0079
AUM JEEVAN A/L AUM NIRANGKAR	A20EC0017

LECTURER: DR. NOR AZIZAH BINTI ALI

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INTRODUCTION

In today's world, music has impacted everyone's life bringing joy, laughter as well as other benefits. Music is very important to all humans as it provides many benefits like raising someone's mood, getting them excited as well as making them calm and relax. Music is very well known to stimulate a person's mind for the better. Research have shown how music provides vital positive effects on a human body and brain. Music is known to activating both left and right parts of the brain at the same time.

In this case study, a research is conducted to study the statistics of effect of music on a student's studying routine. The purpose of this study is to measure the preference of student on how music affects their study life. The data collected will also prove whether the theory that music helps improve your grades is true or false. This project is carried out by four software engineering students from University Technology Malaysia (UTM).

METHODOLOGY

The method we used to collect the data we needed was in the form of an online survey using Google Form and we shared it in all UTM student groups we are in and other university groups that we can find. This is because our survey is only towards only university students in Malaysia. In the end, our team has gathered **118 respondents** via the survey form distributed in Google Form. The data is interpreted and analysed using RStudio and Microsoft Excel to give us a visual representation of our data and findings.

Objectives	Variables related	Data Description
To measure the student's basic details and study routines	Quantitative	Bar chart, boxplot, Pie chart, frequency distribution
To collect data about student's info on music streaming time, opinions, and agreements on music effects towards studying.	Qualitative, Quantitative	Pie chart, stem and leaf graph, bar chart, histogram

Table 1: The method of Data Analysis for Each Objectives

DATA COLLECTION

Description

Population : University Students in Malaysia

Sample : 118 students

Data Description :

Variables	**Types of Variables**	**Level of measurement**
Gender	Qualitative	Nominal
Age	Quantitative	Nominal
Faculty	Qualitative	Nominal
Year of Study/Level of education	Qualitative	Nominal
How interested are you in music?	Qualitative	Ordinal
What genres do you listen to?	Qualitative	Nominal
What is your main music streaming platform?	Qualitative	Nominal
Streaming Time (hours per week)	Quantitative	Ratio
Do you listen to lyrical music or non-lyrical music?	Qualitative	Nominal
How long do you generally study a day?	Quantitative	Interval
What time of the day do you usually study?	Qualitative	Nominal
Do you listen to music while studying?	Qualitative	Nominal
Which type of music (lyrical or non-lyrical) helps you to study better?	Qualitative	Nominal
Have your grades for exams or quizzes improved when studying with music?	Qualitative	Ordinal
Does music put you in a good mood when studying?	Qualitative	Nominal
Do you agree that music can help improve your memory power and focus span?	Qualitative	Ordinal
Do you agree that music can reduce stress and anxiety while studying?	Qualitative	Ordinal
In your opinion, does music bring more negative or more positive benefits to your studying routine?	Qualitative	Ordinal

Table 2: The description of the Data Collection

DATA ANALYSIS AND DISCUSSION

Section 1: Respondent's Basic Information

3.1.1 Gender

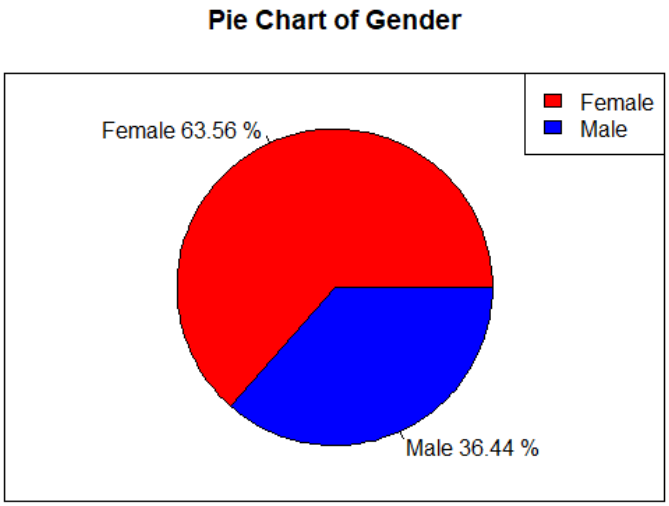

Figure 1: Pie chart for Percentage of Male and Female Answering the Survey

The pie chart above portraits the percentage of male and female answering the survey. From there we can tell that 63.56% of our respondents (75 people) are female whereas 36.44% of the rest of the respondents are male (43 people).

3.1.2 Age

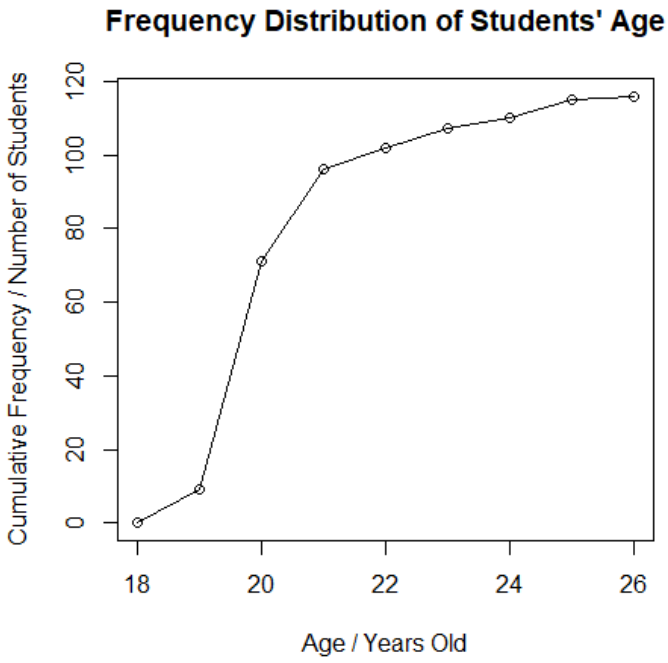

Figure 2: Frequency Distribution of Students' Age

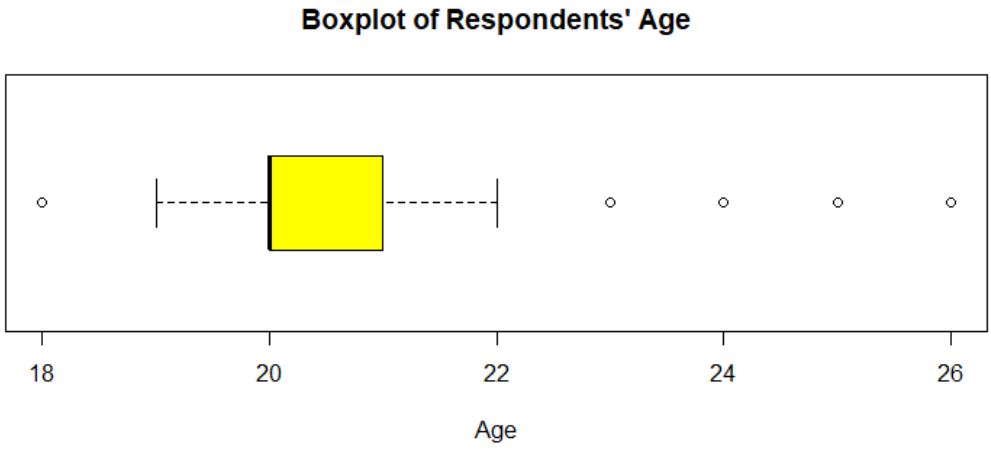

Figure 3: Boxplot of Students' Age

18	18	19	19	19	19	19	19	19	19	19	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
20	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
21	21	21	21	21	21	21	21	22	22	22	22	22	22	23	23	23	23
23	24	24	24	25	25	25	25	25	26								

Table 1: Ungrouped Data for Respondent's Age

$$First\ quartile\ \ (25th\ percentile) = \frac{25}{100} \times 118 = 29.5 \approx 30.0$$

$$Y[30] = 20$$

$$Q_1 = 20$$

$$Second\ quartile\ (50th\ percentile) = \frac{50}{100} \times 118 = 59$$

$$\frac{Y[59] + Y[60]}{2} = \frac{20 + 20}{2} = 20$$

$$Q_2 = 20$$

$$Third\ quartile\ (75th\ percentile) = \frac{75}{100} \times 118 = 88.5 \approx 89$$

$$Y[89] = 21$$

$$Q_3 = 21$$

$$Interquartile\ range\ (IQR) = Q_3 - Q_1$$

$$= 21 - 20$$

$$= 1$$

Outliers

$Lower\ limit$:

$Q_1 - 1.5 \times IQR$

$= 20 - 1.5 \times 1$

$= 18.5$

Upper limit:

$Q_3 + 1.5 \times IQR$

$= 21 + 1.5 \times 1$

$= 22.5$

$\therefore [18.5,22.5]$

Outliers: 23, 24, 25, 26

According to the boxplot and frequency distribution above for 118 respondents' age, it shows that first quartile is 20, median is also 20 and third quartile is 21 meanwhile the interquartile range is 1. The mean for the age of respondents is 20.69. The youngest respondent is 18 years old while the oldest age of respondents is age 26. The limits are $[18.5,22.5]$ .Thus, the outliers are 23, 24, 25, 26. Hence, it is clear that most of our respondents are around 20 years old with frequency of 62.

```
The decimal point is at the |

18 | 00
19 | 000000000
20 | 00000000000000000000000000000000000000000000000000000000000000000000
21 | 000000000000000000000000
22 | 000000
23 | 00000
24 | 000
25 | 00000
26 | 0
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Figure 4: Stem and leaf for ages of 118 students

This stem-and-leaf plot has a key of 18/0. A total of 118 respondents in this survey, 2 of them aged 18, 9 of them aged 19, 62 of them aged 20, 25 of them aged 21, 6 of them are aged 22, followed by 5 23-year-olds, 3 24-year-olds, 5 25-year-olds, and lastly 1 26-year-old respondent. We can conclude that most of the respondents are 20-year-old students with 62 respondents and the lowest is the 26-year-old with only 1 respondent.

3.1.3 Students' Faculty

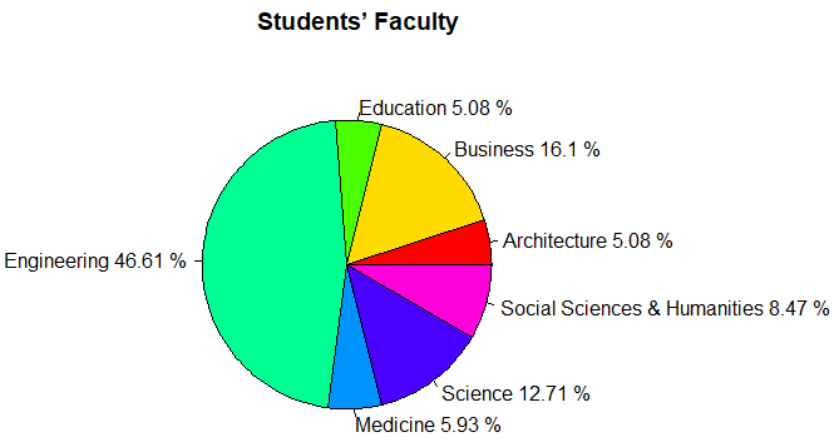


Figure 5: Pie Chart of Students' Faculty

The pie chart above shows which faculty the students are form. The majority of the respondents are from Faculty of Engineering (55 students - 46.61%), followed by Faculty of Business (19 students – 16.10%), Faculty of Science (15 students - 12.71%), Faculty of Social Sciences & Humanities (10 students – 8.47%), Faculty of Medicine (7 students – 5.93%), and lastly Faculty of Education and Faculty of Architecture share the same lowest number of respondents which are each 6 respondents (5.08% each). The respondents are mainly from Faculty of Engineering which is mainly due to us sharing our survey to engineering WhatsApp groups.

3.1.4 Year of Study/Level of Education

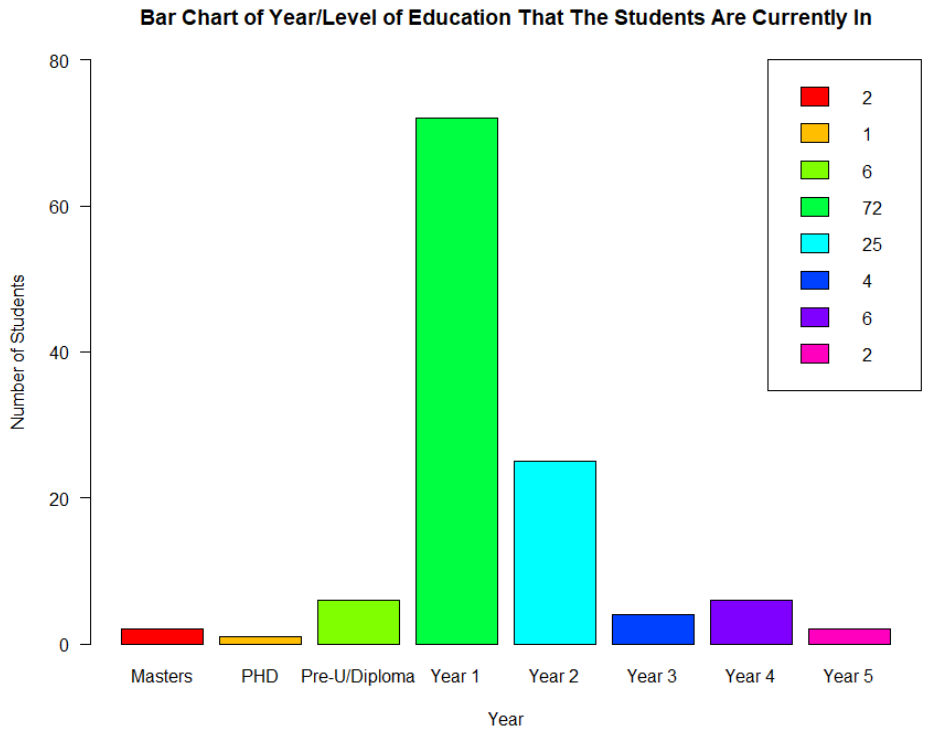


Figure 6: Bar Chart for Year/Level of Education That the Students Are Currently In

This figure above shows the year of study or the level of education that the respondents are from. The choices are Pre-U/Diploma, Year 1, Year 2, Year 3, Year 4, Year 5, Masters, and PHD. It can be seen that Year 1 has the highest number of respondents with 72 responses. This is followed by Year 2 (25 respondents), Pre-U/Diploma & Year 4 (6 each), Year 3 (4 respondents), Year 5 & Masters (2 each), and lastly PHD with only 1 respondent.

Section 2: Music interest among the respondents

3.2.1 Interest in music

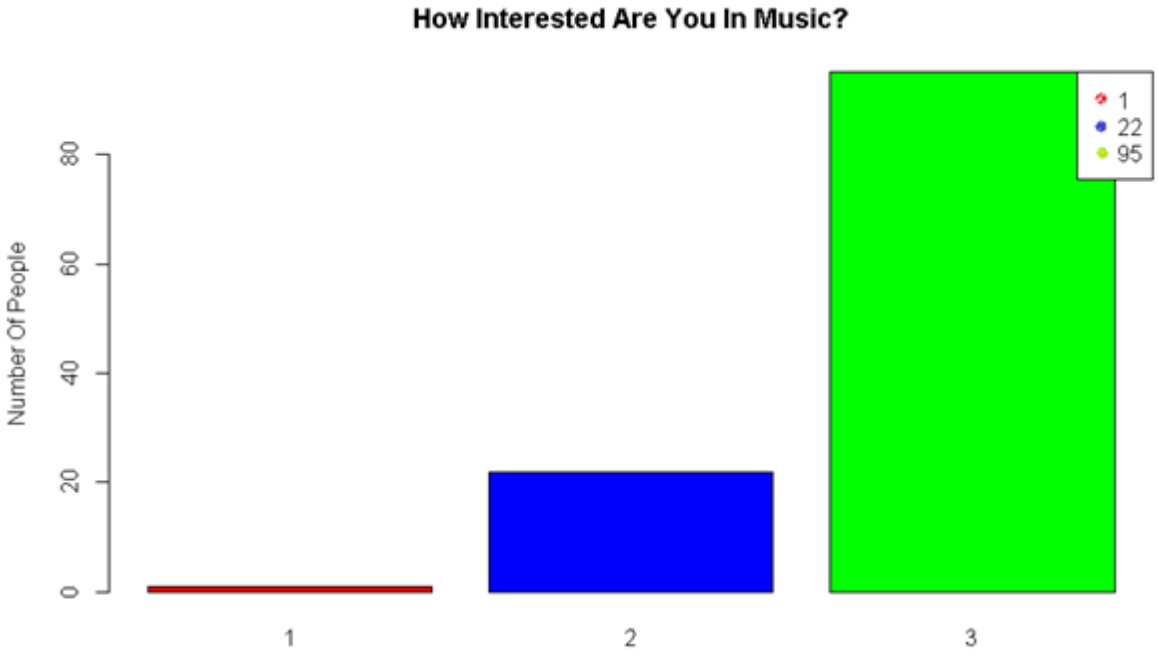


Figure 7: Bar plot of respondent interest in music

According to the figure above shows the respondent's interest in music. The 3 categories are "1=Not interested", "2=Average" and "3=Interested". The category with the highest number of respondents that is 95 is the 3rd category with the percentage of 80.51% whereas the category with the lowest number of respondents is the 1st category with a percentage of 0.85%. As a conclusion, majority of respondents are interested in music. As expected, most of our respondents have deep interest in music either they are musician, taking musical degree in university or just a casual listener.

3.2.2 Preferred genre of music

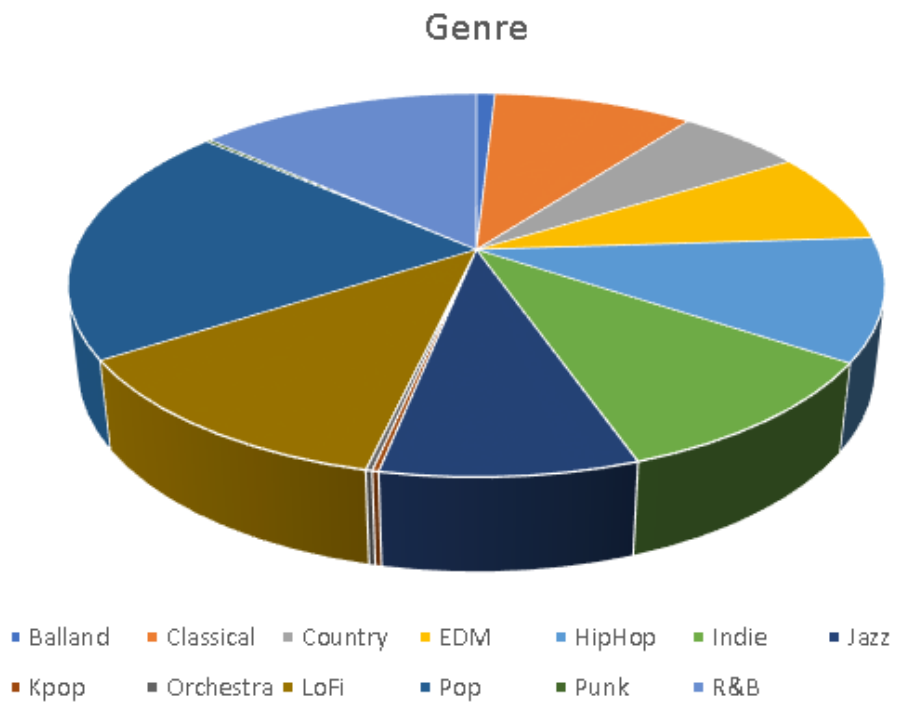


Figure 8: 3D Pie chart of preferred genre of music

The genre 3D pie chart shows that majority of respondents enjoy pop genre of music outnumbering other genres at 18.94%. The second highest percentage is lo-fi genre at 11.41% followed by R&B at 12.42%. During this study, it was also found that hip-hop and Indie have an equal percentage which is 9.57%. The lowest percentage for genre is 0.2% for K-pop, orchestra and punk. In conclusion, a very minority of respondents admire K-pop, orchestra and punk whereas a large number of respondents prefer pop in the music field.

3.2.3 Preferred streaming platform

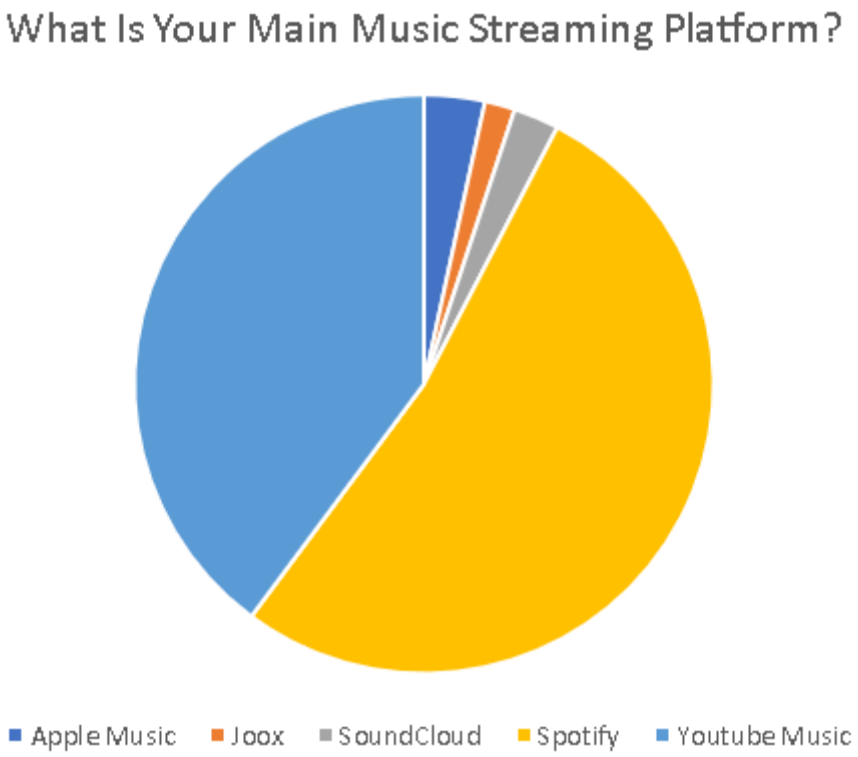


Figure 9: 2D Pie chart of preferred music streaming platform

The 2D pie chart shows the main music streaming platform used by respondents. The majority of respondents prefer Spotify over Apple Music, Joox, Soundcloud and YouTube Music. This is proven as Spotify is leading with a percentage of 52.54%. The following preferred music streaming platform is YouTube Music 39.83%. Apple Music holds a percentage 3.39% as not all respondents own an Apple device followed by SoundCloud at 2.54%. The least preferred streaming platform for music is Joox at a percentage of 1.69%. In conclusion, majority of respondents prefer Spotify as it is easily accessible, offers good quality of music as well as discount for packages.

3.2.4 Preferred type of music

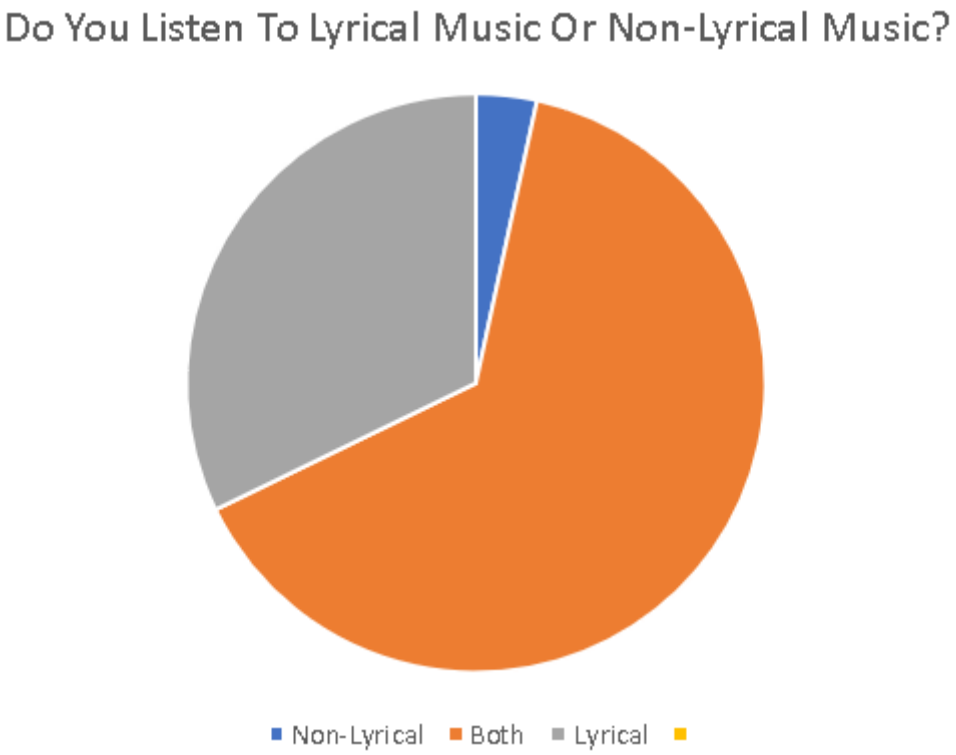


Figure 10: 2D Pie chart of type of music

Based on the pie chart below, it shows the type of preferred music by respondents which is either lyrical music or non-lyrical music. The figure above shows that most respondents prefer both lyrical and non-lyrical music as it has the highest percentage of 64.4%. Next, 32.2% of respondents prefer lyrical music. Lastly as proven, 3.39% of respondents prefer non-lyrical music.

3.2.5 Music streaming time

Stem	Leaf
0	1 1 1 1 1 1 1 1 1 1 1 1 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 5 5 5 5 5 5 5 5 5 5 5 5

Figure 11: Stem and leaf of music streaming time per week

Figure 11 portrays the music streaming time of respondents with a key 01. Based on the stem and leaf, a significant number of respondents which is 34 (28.81%) stream music up to 3 hours per week. Not far comes in 2nd highest which is up to 5 hours at 25.42%. This is then followed by 27 respondents (22.88%) streaming music for 10 hours and 14 respondents (11.86%) streaming music for 15 hours. The lowest number of respondents which is 13 (11.02%) voted for 1 hour of streaming time.

Section 3: The students' studying routine in correlation with their music type.

3.3.1 Studying time

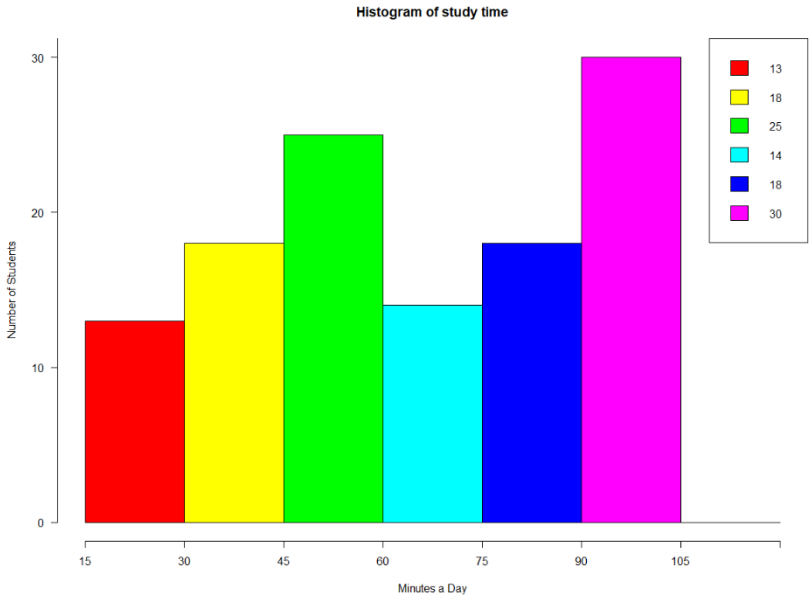


Figure 12: Histogram of study time by the students

Class Interval (Minutes)	Midpoint (X_i)	Frequency (f_i)	Relative Frequency	Cumulative Frequency	$(x_i - \overline{x})$	$f.(x_i - \overline{x})^2$	$f.(x_i - \overline{x})^3$
15-30	23	13	0.11	13	-42.203	23154.21	-977177.20
31-45	38	18	0.15	31	-27.203	13320.06	-362345.53
46-60	53	25	0.21	56	-12.203	3722.83	-45429.70
61-75	68	14	0.12	70	2.797	109.53	306.34
76-90	83	18	0.15	88	17.797	5701.20	101464.22
91-105	98	30	0.25	118	32.797	32269.30	1058336.11
Total		118	0.99		-28.218	78277.13	-1177345.76

Table 2: Study time by the students

Mean

$$\bar{x} = \frac{\sum_{i=1}^{h} f_i X_i}{N}$$

$$= \frac{23(13) + 38(18) + 53(25) + 68(14) + 83(18) + 98(30)}{118}$$

$$= 65.203$$

Median

$118 \div 2 = 59^{th}\ place$

$$median = L + \frac{\frac{N}{2} - cf_p}{f_{med}}(W)$$

$$= 60.5 + \frac{59 - 56}{14}(15)$$

$$= 63.71$$

Mode

$class\ with\ the\ highest\ frequency\ =\ (91 - 105)(30\ votes)$

$where,$
$f_0 = 18$
$f_1 = 30$
$f_2 = 0$

$$mode = l + h \times \frac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)}$$

$$= 90.5 + 15 \times \frac{(30 - 18)}{(2(30) - 18 - 0)}$$

$$= 94.79$$

Standard deviation

$$\sigma = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n - 1}}$$

$$= \sqrt{\frac{78277.13}{118 - 1}}$$

$$= 25.87$$

Skewness

$$skewness = \frac{\sum(x_i - \bar{x})^3}{(n-1) \cdot \sigma^3}$$

$$= \frac{-1177345.76}{(118-1) \cdot (25.87)^3}$$

$$= -0.581$$

Kurtosis

$$kurtosis = \frac{\sum(x_i - \bar{x})^4}{(n-1) \cdot \sigma^4}$$

$$= \frac{13(-42.203)^4 + 18(-27.203)^4 + 25(-12.203)^4 + 14(2.797)^4 + 18(17.797)^4 + 30(32.797)^4}{(118-1) \cdot (25.87)^4}$$

$$= 1.682$$

Figure 10 represents the histogram of study time done by the students. Based on this information, we managed to obtain the value for mean, median, mode, standard deviation, skewness and the kurtosis. Our mean result determines that average time for students to study is 65.203 minutes in a day. This allows us to understand that the graph distribution is on positive side of the graph.

As for median, we managed to obtain the value of 63.71 minutes which is slightly lower than the mean. This gives us a lead that the median of the histogram in Figure 10 has high potential to be negatively skewed. Since the mode is 94.79 minutes, it shows that the class interval 90 minutes to 105 minutes has the highest frequency. Hence, we can conclude that the order of mean, mode and median should be:

$$median < mean < mode$$

Since the value of standard deviation is 25.87, we can see that the average study time it is smaller and also quite disperse from the mean value. From this, we can determine the skewness of the histogram where we managed to obtain the value of -0.581 . The negative value of skewness clearly shows that it is **negatively skewed** and points in the negative direction. In terms with our study, we believe that negative skewed means most students have high tendency to study in a long time without considering any presence of music yet. Moreover, the kurtosis value of 1.682 defines that the data distribution in Figure 10 is **platykurtic**. Therefore, we can already assume that its normal distribution graph has shorter and thinner tails with the broader central peak.

3.3.2 Time of the day study

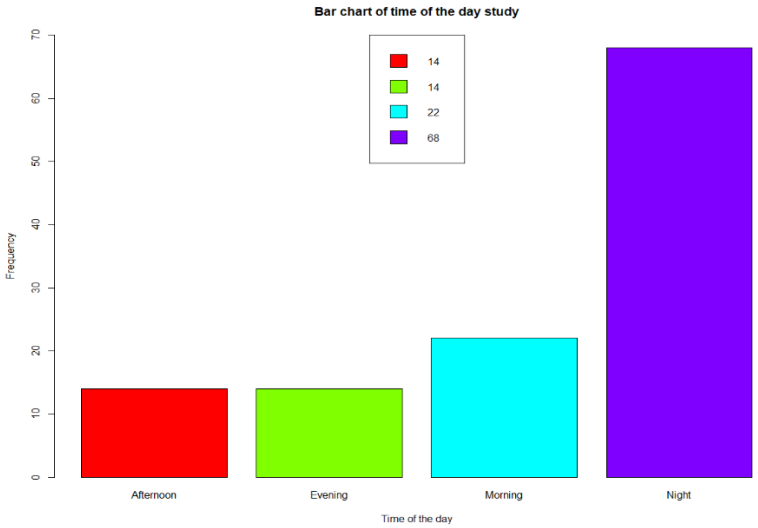


Figure 13: Bar chart for time of the day study

Figure 11 represents the bar chart for the time of the day study preferred by the students. Time of the day that we have provided are morning, evening, afternoon and night. Dawn is still considered as morning while dusk we categorises it as evening. Based on the result obtained, we can see that most students are all-nighters with 68 votes followed by early-bird students with 22 votes. Unfortunately, the votes for afternoon and evening are balanced with 14 each. This means that we cannot determine which category has the lowest absolute votes. Based on our analysis, we believe that the students within our sample mostly study longer than 90 minutes at night based on the histogram in Figure 10 and also bar chart in Figure 11.

3.3.3 Students' option to listen to music when studying.

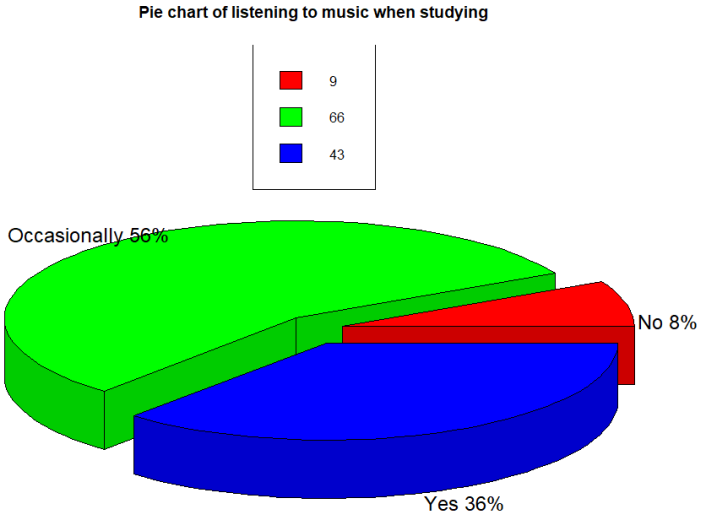


Figure 14: 3D Pie chart for option listening to music while studying.

Figure 12 displays the pie chart for music option when studying done by the students. Based on the outcome, the highest votes goes to occasionally category with 56% (66 votes) followed by yes with 36% (43 votes) and lastly, no with 8% (9 votes). Based on our study, we defined the category occasionally as to listen music whenever they want to. This means that they only listen when studying on certain subjects or assignments and sometimes not at all. With this outcome, we can conclude that the students from our sample are mostly balanced and has variety of options when it comes to study with the presence of music.

3.3.4 Type of music that helps to study better.

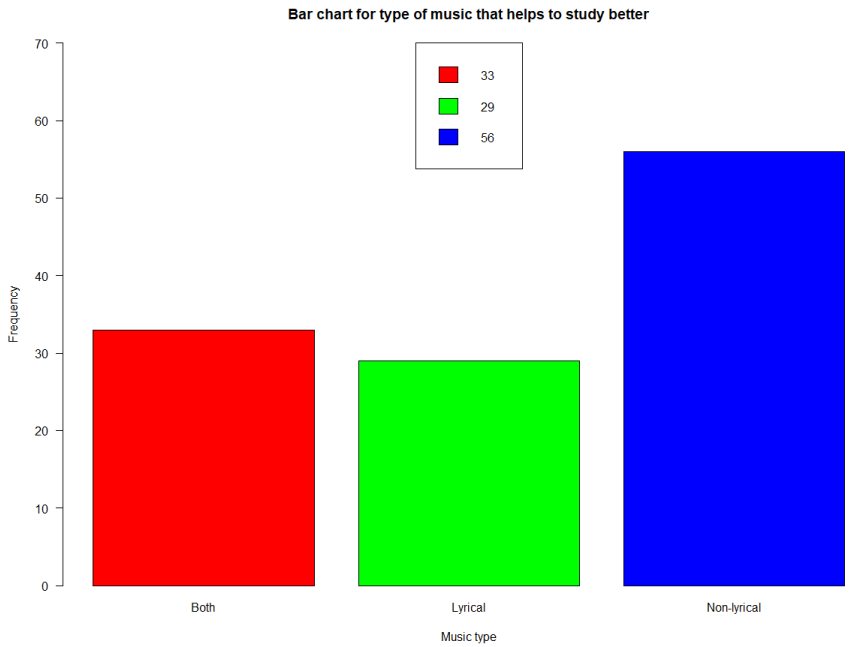


Figure 15: Bar chart for type of music that helps students to study better.

Figure 13 represents a bar chart to indicate which music type is preferred when the students study. Based on the result, the votes for non-lyrical is the highest (56) followed by both (36) and lyrical (29). Before the study begins, we have defined that non-lyrical is the music without any presence of singers and mostly focused on melody with a more complex music score such as orchestra. As for lyrical, we defined it as the singer's voice is the main attraction of the music based on our study. To conclude, non-lyrical music seems to help our respondent study better compared to lyrical and both.

3.3.5 Grade changes after studying with music.

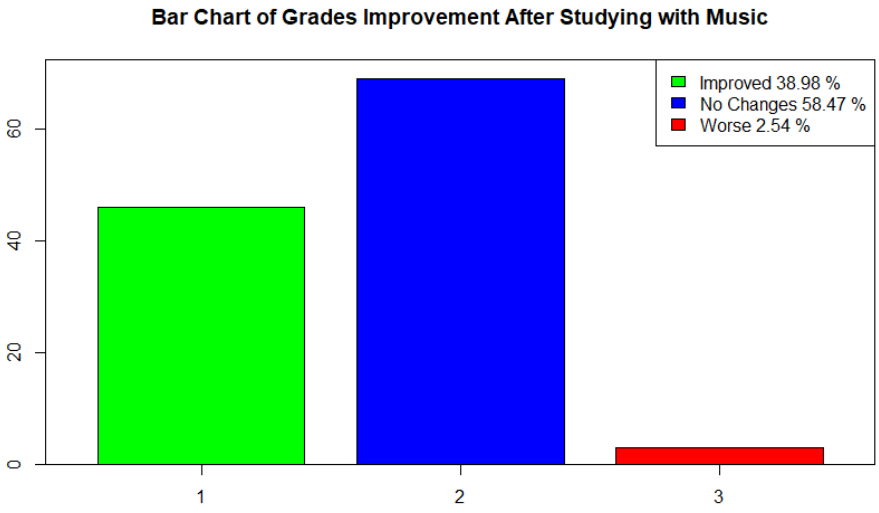


Figure 16: Bar Chart of Grades Improvement After Studying with Music

Figure 13 represents a bar chart to show grades improvement among students after studying while listening to music. According to the table, majority of the students with the percentage of 58.47% voted for no changes as in there are no difference in grades they achieved before and after they started studying with music. While a quite large percentage of them voted for grades improvement which around 47 students. Lastly, only a significantly low percentage of students said that their grades worsen when they studied with music on.

3.3.6 Music puts you in a good mood.

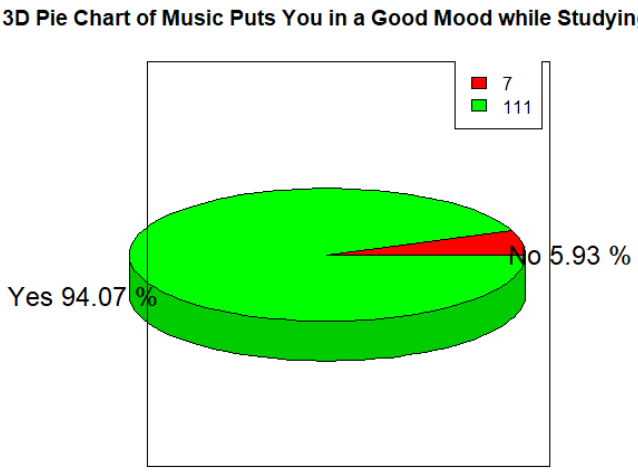


Figure 17: 3D Pie Chart of Music Puts You in a Good Mood while Studying

Figure 15 shows results of the question does music puts you in a good mood while you are studying. As referring to the pie chart, a total of 94.07% of students voted for yes, music does puts them in a good mood while studying which brings to a total of 111 students. While on the other hand, only 5.93% of students answered no, music does not which consists of 7 students.

3.3.7 Music improves memory power and focus span.

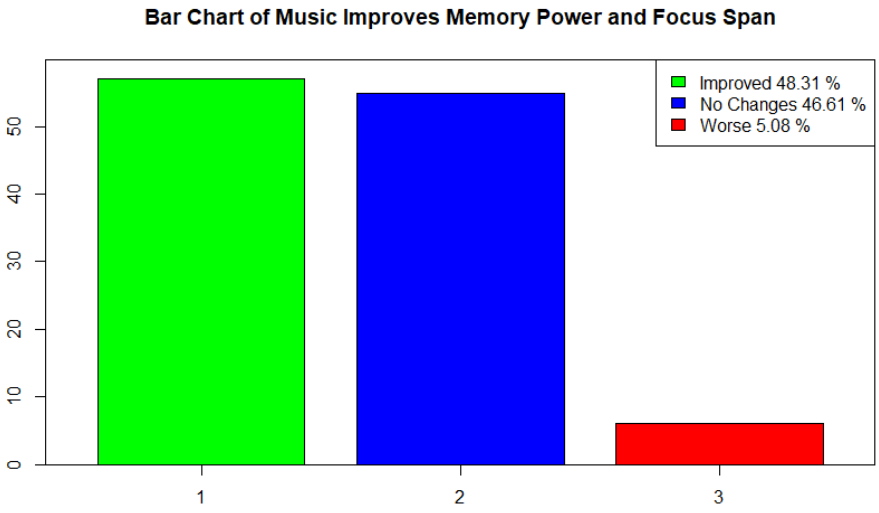


Figure 18: Bar Chart of Music Improves Memory Power and Focus Span

Figure 16 represents the bar chart of whether music improves memory power and focus span question. According to the bar chart, almost half of the respondents said that music does improve their memory power and focus span with 48.31% of the students which around 57 of them. Meanwhile, 46.61% (55 students) of the students responded to music does not bring any changes in this term. Another 5.08% of the respondents said that music actually makes their memory power and focus span worse which only around 6 students.

3.3.8 Music reduces anxiety and stress.

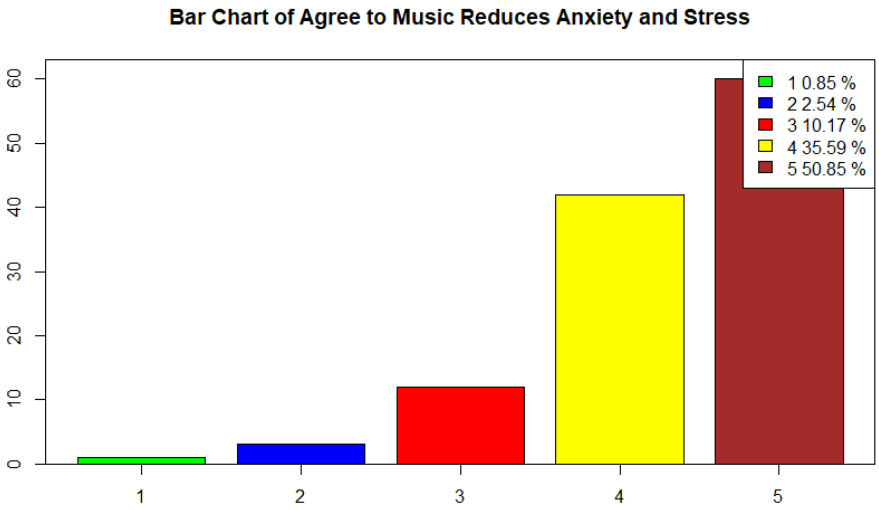


Figure 19: Bar Chart of Agree Music Reduce Anxiety and Stress

Figure 17 is the bar chart of the question does the students agree that music reduces their anxiety and stress. For this question, we gave the respondents a scale from 1-5 with 1 being the least agree and 5 being the most. According to the chart, less than 1% of the students voted for 1 which only 1 student, while around 2.54% (3 students) of them voted 2, then there are 10.17% (12 students) of the respondents chose number 3 on the scale. Meanwhile, an approximate 35.59% of the students voted 4 on the scale, consists of 42 students which also a huge difference from the scale 3. Lastly, an astounding 60 students responded to 5, which they most agree that music reduces anxiety and stress to them.

3.3.9 Music brings benefits to study routine.

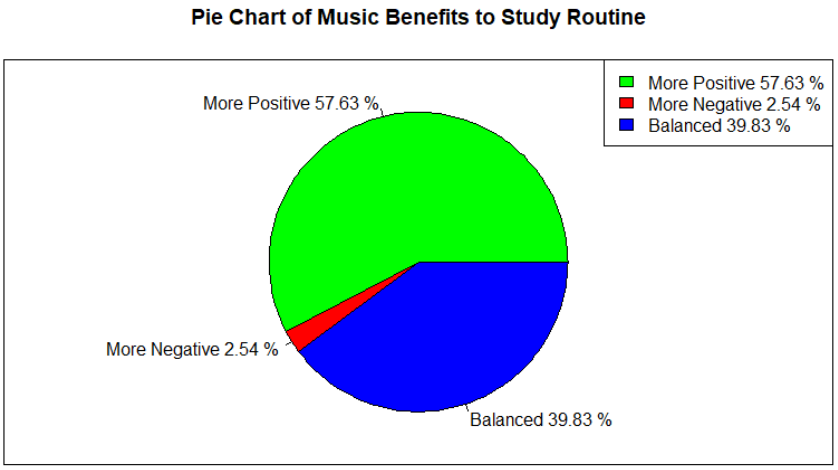


Figure 20: Pie Chart of Music Benefits to Study Routine

For our last question, which what benefit music brings to students' study routines, we are representing the results using a 2D pie chart. Among all the respondents, 57.63% of them which consists of 68 students said that music brings more positive benefits to their study routine. While a quite large amount of them, around 39.83% (47 students) voted for balanced benefits were given to their study routine from music. Only 2.54% of the respondents said that music brings more negative benefits to their study routine which consists of 3 students.

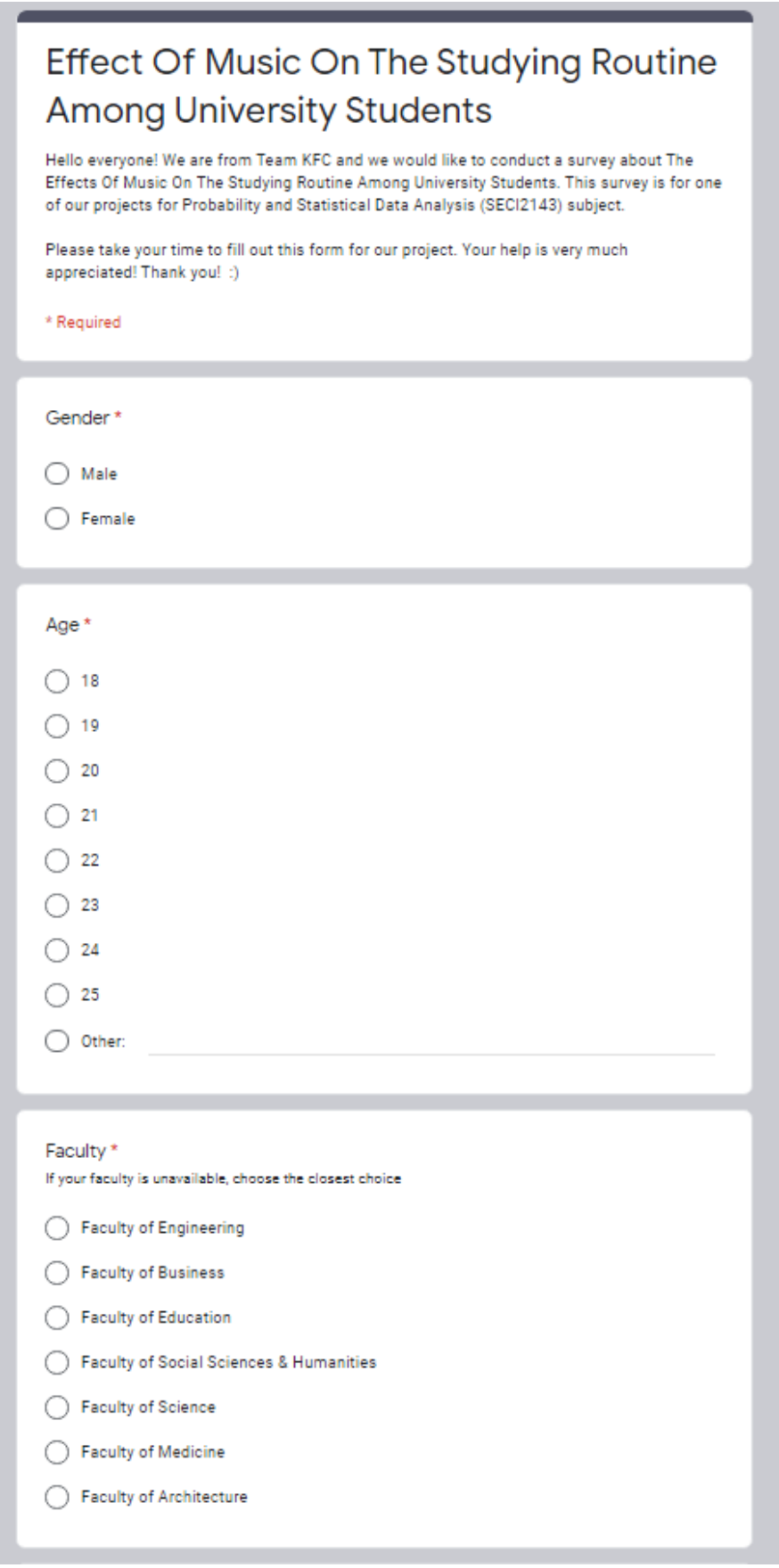
CONCLUSION

Our study regarding the effect of music on studying routine by the university students has brings a lot of benefits to the future. We can see that the music choice preferred by each individual play a strong role to help them focus either revising or learning new knowledge. The music they chose should decrease the anxiety and stress they gained from the studying period. Moreover, the manipulation of the music itself could enhance their memory power and focus span which we assume that music accompanies people to pay more attention on what they are doing.

To conclude, we believe our study comes with a massive bias such as not specifying the students' sample in detail as we decided to make it general for everyone between the age of 18 to 26 years old to answer the survey. Furthermore, we could not identify the respondents either they are full-time or part-time students since we did not include that kind of question in the survey. Consequently, the music may or may not become the priority in terms of enlightening the studying pressure alone. It may reduce the pressure at their working place as well.

In order to prevent these kinds of situations from occurring again, it is important to specify the sample for a certain study such as that survey is only for students who studies in our university. This is to allow much easier control of any data manipulation in the survey. We also think that we should expand the age of our respondent because we might want to consider students who are older than 26 years who are still taking degree in Year 1 and other categories. This is because their perception about music that improves studying routine may differ due to their level of maturity with year enrolled as the constant variable. Hence, we believe that our study is a success and our hypothesis is proven true where the presence of music has improved the students' studying routine.

APPENDIX



Effect Of Music On The Studying Routine Among University Students

Hello everyone! We are from Team KFC and we would like to conduct a survey about The Effects Of Music On The Studying Routine Among University Students. This survey is for one of our projects for Probability and Statistical Data Analysis (SECI2143) subject.

Please take your time to fill out this form for our project. Your help is very much appreciated! Thank you! :)

* Required

Gender *

- ◯ Male
- ◯ Female

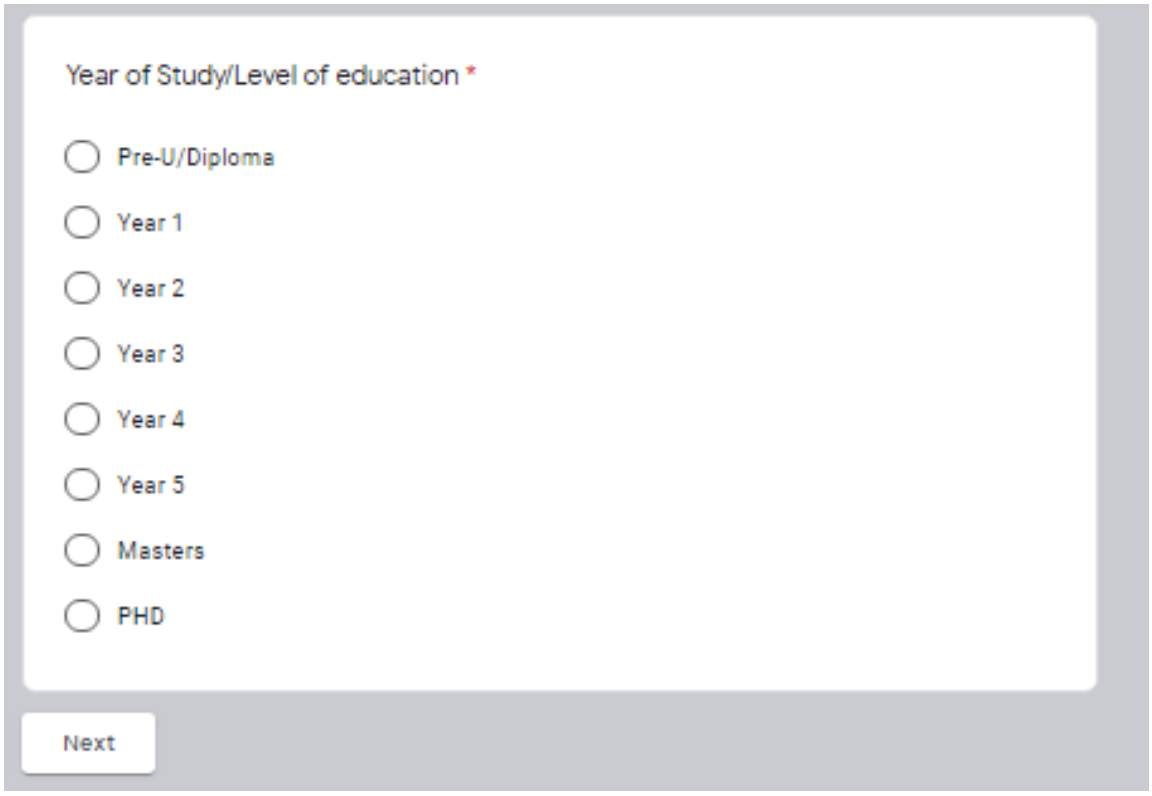
Age *

- ◯ 18
- ◯ 19
- ◯ 20
- ◯ 21
- ◯ 22
- ◯ 23
- ◯ 24
- ◯ 25
- ◯ Other: _____

Faculty *

If your faculty is unavailable, choose the closest choice

- ◯ Faculty of Engineering
- ◯ Faculty of Business
- ◯ Faculty of Education
- ◯ Faculty of Social Sciences & Humanities
- ◯ Faculty of Science
- ◯ Faculty of Medicine
- ◯ Faculty of Architecture


Year of Study/Level of education *
Pre-U/Diploma
Year 1
Year 2
Year 3
Year 4
Year 5
Masters
PHD
Next

PART A

Music Interests

How interested are you in music? *

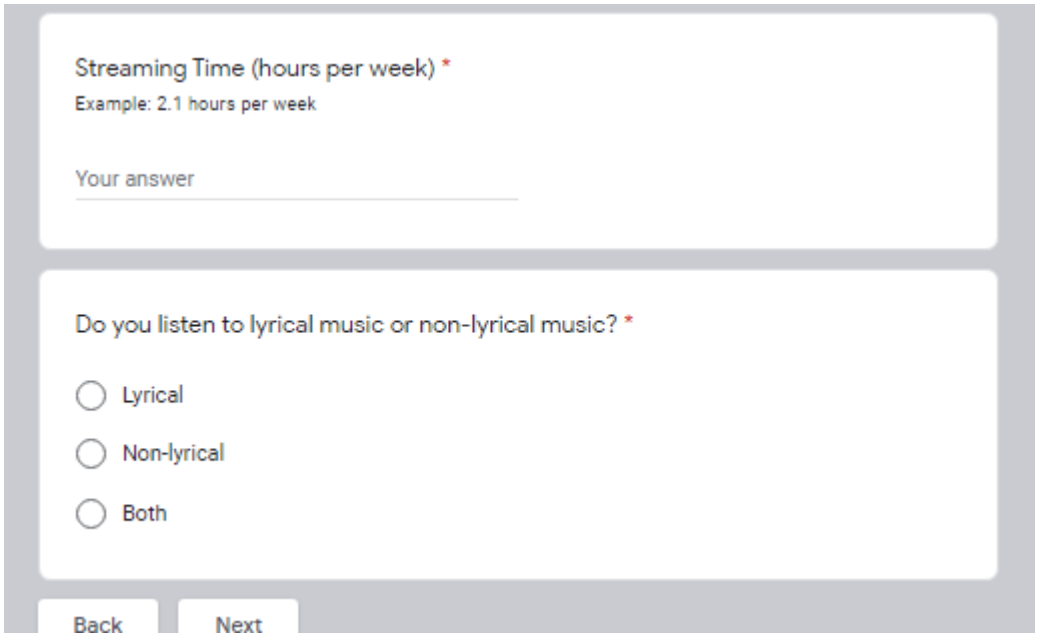
	1	2	3	
Not interested	◯	◯	◯	Interested

What genres do you listen to? *

- ☐ Pop
- ☐ Country
- ☐ Indie
- ☐ Classical
- ☐ Jazz
- ☐ Rock
- ☐ R&B
- ☐ EDM/Electronic
- ☐ Lo-fi
- ☐ Hip-Hop/Rap
- ☐ Other: _____

What is your main music streaming platform? *

- ◯ Spotify
- ◯ Apple Music
- ◯ Youtube Music
- ◯ Joox
- ◯ Soundcloud
- ◯ Other: _____


Streaming Time (hours per week) *
Example: 2.1 hours per week
Your answer
Do you listen to lyrical music or non-lyrical music? *
Lyrical
Non-lyrical
Both
Back
Next

PART B

Study Routine

How long do you generally study a day? *

- ◯ Less than 30 minutes a day
- ◯ 31-45 minutes a day
- ◯ 46 - 60 minutes a day
- ◯ 61 - 75 minutes a day
- ◯ 76 - 90 minutes a day
- ◯ Over 90 minutes a day
- ◯ Other: _____

What time of the day do you usually study? *

- ◯ Morning
- ◯ Afternoon
- ◯ Evening
- ◯ Night

Do you listen to music while studying? *

- ◯ Yes
- ◯ Occasionally
- ◯ No

Which type of music (lyrical or non-lyrical) helps you to study better? *

- ◯ Lyrical
- ◯ Non-lyrical
- ◯ Both

Have your grades for exams or quizzes improved when studying with music? *

- ◯ Improved
- ◯ No changes
- ◯ Worse

Does music put you in a good mood when studying? *

- ◯ Yes
- ◯ No

Do you agree that music can help improve your memory power and focus span? *

- ◯ Improved
- ◯ No changes
- ◯ Worse

Do you agree that music can reduce stress and anxiety while studying? *

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

In your opinion, does music bring more negative or more positive benefits to your studying routine? *

- ◯ More positive
- ◯ More negative
- ◯ Balanced

Back Submit