Exploring the impact of Daily Commute Duration on University Students' Academic Performance

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(IT1212)

Probability and Statistics

P.A.M.K.R Rathnayaka
(SA23636606)

Student Details (Student should fill the content)	
Name	P.A.M.K.R Rathnayaka
Student ID	SA23636606

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Declaration

I certify that the attached material is my original work. No other person's work or ideas have been used without acknowledgement. Except where I have clearly stated that I have used some of this material elsewhere, I have not presented it for examination / assessment in any other course or unit at this or any other institution

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Abstraction

This study examines the impact of daily commute duration on the academic performance of university students. With the increasing urbanization and expansion of educational institutions, students often face extended travel times to attend classes. This research aims to analyze how commute duration affects students' GPA, attendance, and overall academic engagement. Using a combination of survey data and statistical analysis, the study identifies key correlations between travel time and academic outcomes. Findings suggest that prolonged commute durations can negatively impact academic performance due to factors such as fatigue, reduced study time, and increased stress levels. The study highlights the importance of efficient transportation solutions and flexible academic schedules to enhance student productivity.

Declaration

I am P.A.M.K.R Rathnayaka, a student of SLIIT City University currently enrolled in the module Probability and Statistics, declare that this report on “Exploring the impact of Daily Commute Duration on University Students' Academic Performance” is an original work created as part of the continuous assessments for the module. The data used in this report are not original but have been appropriately acknowledged with utmost respect to their original sources. Additionally, I assure the confidentiality and anonymity of the data collected from students for this research, and they will not be used beyond the scope of this study. Furthermore, I alone bear full responsibility for any impacts or outcomes resulting from this report.

Acknowledgment

In preparing this report titled *"Exploring the impact of Daily Commute Duration on University Students' Academic Performance,"* I extend my heartfelt appreciation to Mr. Chamith Jayasinghe, the lecturer in charge of the Probability and Statistics module. His expert guidance and insightful knowledge provided the essential foundation for this research from its inception. I am also deeply grateful to the students of SLIIT City University who participated in the survey, offering valuable and precise data that was crucial to the success of this study. This research would not have been complete without the encouragement, support, and assistance of everyone who contributed along the way, and I sincerely appreciate each individual for their role in this academic endeavor.

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Chapter 1 Introduction

1.1 Background

"Daily Commute Duration" refers to the total time that university students spend traveling from home to campus and back each day a factor that, despite its significance, often receives little attention when considering academic performance. Extensive research has demonstrated that prolonged commutes can contribute to a range of adverse effects, including increased stress, heightened fatigue, reduced study time and diminished engagement in classroom activities. These factors, cumulatively, can hinder students' ability to perform at their highest academic level. Multiple causes contribute to the prevalence of extended commute times. Challenges such as limited transportation options, urban traffic congestion, and the distance between students' residences and campus further exacerbate the issue. For instance, a student residing far from campus may spend a significant portion of each day in transit, inadvertently cutting into time that could be dedicated to studying or rest. In some cases, the challenges of commuting are not entirely voluntary; instead, external conditions compel students to endure lengthy journeys that directly impact their overall academic well-being. This research investigates the impact of the daily commute duration on the academic performance of students at SLIIT City University. A comprehensive survey was administered to students across foundation to third-year levels, gathering detailed data on variables such as travel time, mode of transportation, study habits, sleep patterns, and academic results. By applying both descriptive and numerical statistical analyses, the study aims to uncover the intricate relationships between commuting time and academic outcomes. Ultimately, the goal of this research is to provide a clear picture of how extended commute durations affect students' academic lives and to synthesize practical recommendations for mitigating these challenges. Potential solutions may include revising class schedules to accommodate commuting students, improving public transit options, or expanding on-campus housing facilities. Through this detailed examination, the study aspires to equip academic policymakers and educational institutions with actionable insights that can enhance student well-being and academic success.

1.2 Problem Identification

The daily commute of university students is a critical yet often underestimated factor that can significantly influence their academic performance. Extended travel times may lead to heightened stress, increased fatigue, diminished study hours, and reduced classroom engagement. Understanding these diverse effects requires a careful examination of various commuting behaviors, as students' experiences with daily travel can vary widely depending on factors such as distance, mode of transportation, and the consistency of their transit experiences.
In order to comprehensively capture the nuances of commuting challenges, this study identifies several distinct commuter profiles based on observations and pre-existing data. These profiles serve as the foundation for constructing a rich and targeted survey instrument designed to extract meaningful insights. The identified categories include:

- Students with short, reliable travel times who experience minimal disruptions and stress.
- Individuals with average commute durations who occasionally face delays but mostly manage their schedules effectively.
- Students enduring extensive travel durations, often compromising sleep, study routines, and overall well-being.
- Those whose commutes are frequently disrupted by external factors such as traffic congestion, unreliable public transportation, or adverse weather conditions.
- Students who use a combination of transit options, which may offer occasional benefits but also present unique challenges regarding timing and consistency.

By synthesizing survey questions around these well-defined categories, the study aims to gather detailed frequency distributions and statistical insights into the specific challenges associated with each commuting profile. This structured approach not only enhances the quality of the collected data but also facilitates a more targeted analysis of how daily commute durations adversely affect academic outcomes. Ultimately, the insights derived will inform practical recommendations for mitigating these negative impacts ranging from adjustments to class schedules to improved campus housing and transit policies thereby enhancing the academic experience and overall well-being of students.

1.3 Significance of Research

University students face a variety of challenges that can deeply affect their academic performance. Among these challenges, the duration of their daily commute is a critical yet often underestimated factor. Extended travel times can lead to increased stress, fatigue, and a reduction in available study hours, which in turn may compromise classroom performance and overall academic achievement. Many students are unaware of how significant their commute can be in influencing their academic outcomes, and this research aims to clarify that relationship through systematic data collection and analysis.

By exploring the link between commute duration and academic performance, this study seeks to identify the underlying factors that contribute to academic challenges faced by students who endure long daily commutes. The research not only examines the negative impacts such as diminished focus and less time for academic activities but also considers potential silver linings, such as the opportunities for reflection or even creative problem-solving that some students might experience during their travels.

The key contributions of this study are:

- Analyze how prolonged commute durations affect student stress, fatigue, study time, and classroom engagement.
- Investigate the causal relationships between commuting challenges and academic performance, looking at factors like transportation methods and urban transit issues.
- Provide targeted solutions and policy recommendations for academic institutions and local authorities to help alleviate the adverse effects of extended commutes on students.

This research is intended not only for students but also for academic staff, university administrators, and policymakers. By thoroughly examining the data gathered from students at SLIIT City University, the study aims to offer evidence-based insights and practical suggestions that can enhance the academic experience and overall well-being of commuting students.

1.4 Objectives of the Study

The main purpose of this study is to explore the impact of daily commute duration of students' academic performance at SLIIT City University. The primary objectives of this research attempt can be listed as follows,

- To identify the mode of transportation of university students.
- To identify how long does it take daily one-way commute to university.
- To identify how many hours' students study per day.
- To identify how often miss lectures due to transportation issues.

1.5 Chapter Framework

- Chapter1: Introduction
  Introduces the research context, outlines the problem, and explains the significance of studying how daily commute durations affect academic performance.

- Chapter2: Literature Review
  Reviews previous studies on commuting challenges and their impact on student performance, providing a theoretical foundation.

- Chapter3: Methodology
  Details the survey design, data collection methods, and statistical techniques applied focusing on key variables like travel time, transportation mode, and academic results.

- Chapter4: Data Analysis
  Presents the analysis using descriptive and inferential statistics to examine the relationship between commute duration and academic outcomes.

- Chapter5: Conclusions and Recommendations
  Summarizes the findings and proposes actionable strategies for mitigating the negative effects of long commutes on student success.

Chapter 2 Literature Review

Previous research studied the relationship between university and college students' satisfaction with their commute and their perception of commuting as a barrier to campus participation and academic success. Data from ten institutions in the Greater Toronto and Hamilton Area (GTHA) reveal that most students feel their commute affects their involvement on campus and academic performance. The study found that factors like commute mode, duration, travel attitudes, and campus type influence commute satisfaction. Positive associations were found between commute satisfaction and student participation in activities, course selection, and academic success. The findings suggest that improving active transportation options, affordable housing, and public transit could enhance student well-being.(Ryan taylor, Raktim Mitra,2024)

The another one study investigated how commuting affects the academic performance of higher education students, using a campus reallocation in Portugal as an exogenous variation in commuting times. The findings indicate that for every 10-minute increase in commuting time, students' GPA decreases by 4 to 6 percentage points of a standard deviation, highlighting the negative impact of longer commutes on academic achievement.(Marcia filipa Alues,2021)

The study by Sai-Zu Wang and Chang-Gyu Choi examines the effect of suburban new town development on the commute times of college and graduate students in the Seoul Metropolitan Area. Using household travel diary data, the research analyzes how different residential areas affect students' commute time to school. The study finds that students living in newly developed suburban areas have significantly longer commutes than those in central Seoul, which highlights the unintended consequence of suburban expansion policies meant to address housing shortages. The authors suggest a need to reassess suburban development strategies to better balance housing benefits with the costs of longer commutes. And also one study by Ji Won Kim et al. investigates how commute type and time influence academic stress among South Korean undergraduate students. The study reveals that students with longer or more complex commutes report higher academic stress, and those using more environmentally-friendly transportation modes experience lower stress. The research suggests that both commuting factors and sustainability play an important role in students mental health and academic performance.(ji won kim et al,2024).

This study aimed to assess the impact of commuting on students at Gulf Medical University (GMU) in 2018, focusing on the prevalence of commuting, its effects on health, and its relationship with academic performance. A total of 420 students participated in a self-administered questionnaire. The study found significant associations between longer commutes and various negative outcomes, such as physical difficulties, higher stress levels, more accidents, disrupted sleep schedules, and decreased academic performance. Students with longer commute times were found to experience more sleep deprivation and lower academic achievement, highlighting the detrimental effects of extended commuting on both health and studies. (Dawood jamil et al,2022).

Another study explores the relationship between commuting time and academic performance, highlighting previous studies that show the negative impact of long commutes on students. Research has consistently found that extended commuting contributes to stress, fatigue, reduced study time, lower attendance rates, and overall decreased academic achievement. Commuting students often struggle with managing their physical and mental well-being, which worsens the impact on their studies. The review also points out that in countries with compulsory attendance policies, such as India, this stress is intensified. The study in question focuses on Bachelor of Technology students in India, revealing a weak to moderate negative correlation between commuting time and academic performance, contributing to a deeper understanding of commuting's effects on students in higher education. (Asha Kaushik et al,2024).

Chapter 3 Theory and Methodology

3.1 Research design

This study begins with the observation of daily commute durations and their potential effect on university students' academic performance. Preliminary insights indicated that extended travel times are associated with increased stress, fatigue, and reduced study time. To explore these relationships, a quantitative approach was adopted, employing descriptive and inferential statistical methods with R statistical software serving as the primary tool for data analysis. Selecting an appropriate sampling method was crucial in capturing the range of commuting behaviors, as factors like residential distance, mode of transportation, and variable travel conditions play significant roles. To ensure a comprehensive dataset, the survey was initially distributed to adverse group of students at SLIIT City University, who were then encouraged to circulate the survey among their peers with varied commuting experiences. In terms of data collection, a survey was developed that included demographic variables (such as age, gender, and academic level) along with quantitative questions about travel time, mode of transportation, study patterns, and academic performance. Additionally, a series of open-ended questions provided qualitative insights into students' commuting experiences. The qualitative data were carefully coded, categorized, and numerically tabulated before being analyzed in R, ensuring a seamless integration with the quantitative data. The results obtained from R were analyzed using graphical representations and descriptive statistics .Given the interdependencies among some variables, further analyses including Correlation test was conducted to assess the relationship between daily commute duration and academic outcomes. This methodological framework not only clarifies how commuting influences academic performance but also sets the stage for identifying actionable strategies to mitigate negative impacts and ultimately enhance student success.

3.2 Data Collection Method

Currently, Google Forms is a favored platform among students for gathering data efficiently. For this study on the impact of daily commute duration on academic performance, a generalized questionnaire was developed and distributed using Google Forms. Prior to finalizing the survey, I engaged in informal discussions with fellow students to understand their commuting experiences and how these journeys influenced their academic routines. This preliminary feedback guided the structure of the questionnaire, ensuring that it captured key information on commute times, transportation modes, travel variability, and the perceived effects on stress, fatigue, study habits, and classroom engagement. Once refined, the Google Form was circulated widely among students, resulting in a satisfactory number of responses. The survey questions were designed to cover various aspects of daily commuting, allowing for a comprehensive collection of pertinent data. The gathered responses were then analyzed using R Studio, with graphical representations extracted directly from the survey analytics to highlight trends and correlations between commute duration and academic performance.

3.3 Structure of the Questionnaire

The questionnaire consists of 12 well-organized questions:

• Questions 1 & 2: Demographic information (age and gender).
• Question 3: Academic year.
• Question 4: Current GPA.
• Question 5: Mode of transportation used.
• Question 6: Duration of the daily one-way commute.
• Question 7: Typical activities during the commute.
• Question 8: Perceptions regarding the impact of commute time on academic performance.
• Question 9: Average hours spent studying per day (excluding lectures).
• Question 10: Frequency of missed lectures due to transportation issues.
• Question 11: Challenges faced during daily commutes.
• Question 12: Suggestions for improving transportation options for students.

This structure creates a logical and comprehensive flow, enabling respondents to easily provide detailed insights into how their daily commutes affect their academic success while ensuring the data can be effectively analyzed.

3.4 Preliminary data analysis.

3.4.1 Descriptive analysis

The data collected from the Google Survey consist of raw responses from 30 participants, capturing detailed information on their daily commute duration and its impact on academic performance. Analyzing these raw responses directly would not yield immediate insights, which is why descriptive analysis is indispensable. This statistical technique summarizes and organizes the key characteristics of the dataset, making it easier to identify patterns and trends. In this study, descriptive analysis employs procedures such as frequency distribution, measures of central tendency, and measures of variability. Frequency distribution is used to track how often specific commute durations, modes of transportation, and other related responses occur. For instance, analyzing how many students fall within different categories such as those with short, moderate, or extended commute times helps reveal prevalent commuting behaviors. Measures of central tendency (mean, median, or mode) provide insight into the average daily experiences of the students regarding travel time, while measures of variability (range, variance, and standard deviation) illustrate the dispersion of these values across the dataset. These descriptive statistical methods produce a clear snapshot of the data through graphical and numerical representations. Although they do not test hypotheses or draw definitive inferences, the insights gained from this analysis serve as a critical foundation for subsequent inferential statistics. In the following chapters, these descriptive insights will guide further exploration into the relationships between daily commute duration and academic performance, ultimately assisting in the formulation of actionable recommendations.

3.4.2 Analyzing Demographic Data

Demographic variables provide a foundational context for understanding how daily commute durations influence academic performance. In this study, key demographic factors include age and gender. Analyzing age allows us to determine whether different age groups experience distinct commuting challenges for example, younger students might have more flexible schedules compared to older students with additional responsibilities, potentially influencing their academic engagement. Similarly, gender analysis helps uncover any disparities in commuting behaviors and their effects on academic outcomes. By comparing responses from male and female students, we can identify whether one group faces more pronounced challenges such as longer travel times or greater stress that could impact study habits and classroom participation. This initial demographic analysis not only offers insights into the frequency and distribution of these characteristics but also establishes a basis for deeper inferential analyses using R statistical software.

Chapter 4 Results

The minimum sample size for the analysis was suggested to be 30 therefore the distributed survey could gain 30 responses from the initial group defined under snowball sampling.

4.1 Descriptive data analysis

Composition of Age

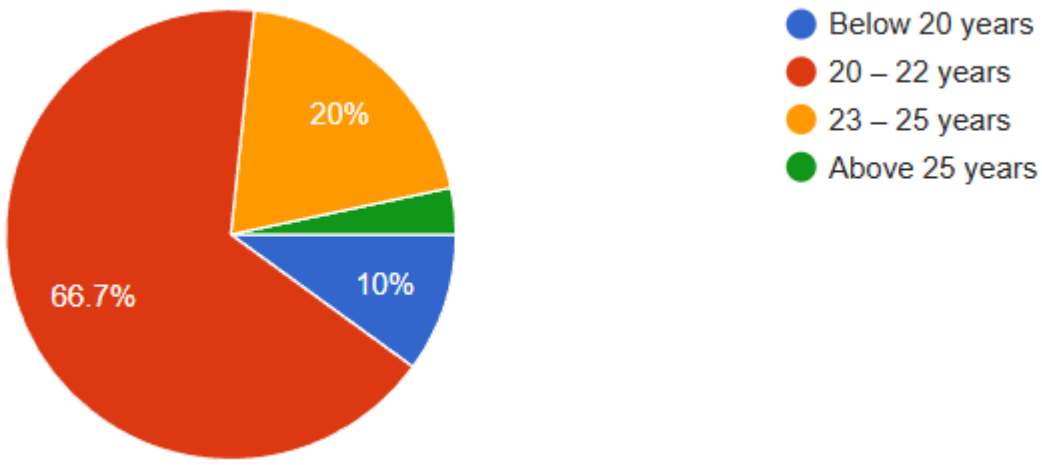

Figure 4.1-1: Composition of age

```
> # Age data
> ages <- c("Below 20 years", "20 - 22 years", "23 - 25 years", "Above 25 years")
> percentages <- c(10, 66.7, 20, 3.3)
>
> # Colors for each segment
> colors <- c("#1F77B4", "#FF7F0E", "#2CA02C", "#D62728")
>
> # Generate pie chart
> pie(percentages, labels = paste(ages, percentages, "%"), col = colors,
+     main = "Composition of Age")
>
> # Optional: Add legend
> legend("topright", legend = ages, fill = colors, title = "Age Groups")
>
```

Figure 4.1-2: Code for figure 4.1-1

The image is a pie chart illustrating the distribution of ages within a population.

- Below 20 years (10%)
- 20 – 22 years (66.7%)
- 23 – 25 years (20%)
- Above 25 years (3.3%)

The chart highlights that the majority, 66.7%, are aged between 20 and 22 years, while the smallest group, 3.3%, are above 25 years.

Summary	Value
Mean	21.62
Median	20–22 Group
Standard deviation	1.57

Table 4.1-1: Summary measures for age

The table, titled "Table 4.1-1: Summary measures for age," presents key statistics that describe the central tendency and spread of the age variable in a dataset. It consists of two columns: one for the summary measure names and one for their corresponding values. Specifically, the table includes:

- Mean: 21.62 years
- Median Age Group: 20–22 group
- Standard Deviation: 1.57 years

```
> # Define the age groups
> age_groups <- c("Below 20", "20-22", "23-25", "Above 25")
>
> # Define the proportions (percentage values divided by 100)
> weights <- c(10, 66.7, 20, 3.3) / 100
>
> # Assume representative midpoints for each age group:
> # "Below 20"  -> 19.5, "20-22" -> 21, "23-25" -> 24, "Above 25" -> 26.
> midpoints <- c(19.5, 21, 24, 26)
>
> # Calculate the weighted (i.e., group means combined) mean age.
> weighted_mean <- sum(midpoints * weights)
> cat("Weighted Mean Age:", round(weighted_mean, 2), "years\n")
Weighted Mean Age: 21.62 years
>
> # Calculate the weighted variance & standard deviation.
> weighted_variance <- sum(weights * (midpoints - weighted_mean)^2)
> weighted_sd <- sqrt(weighted_variance)
> cat("Weighted Standard Deviation:", round(weighted_sd, 2), "years\n")
Weighted Standard Deviation: 1.57 years
>
> # Determine the median age group.
> # Compute cumulative proportions.
> cum_weights <- cumsum(weights)
> median_index <- which(cum_weights >= 0.5)[1]
> median_age_group <- age_groups[median_index]
> cat("Median Age Group:", median_age_group, "\n")
Median Age Group: 20-22
```

Table 4.1-2: Code for table 4.1-1

Composition of Gender

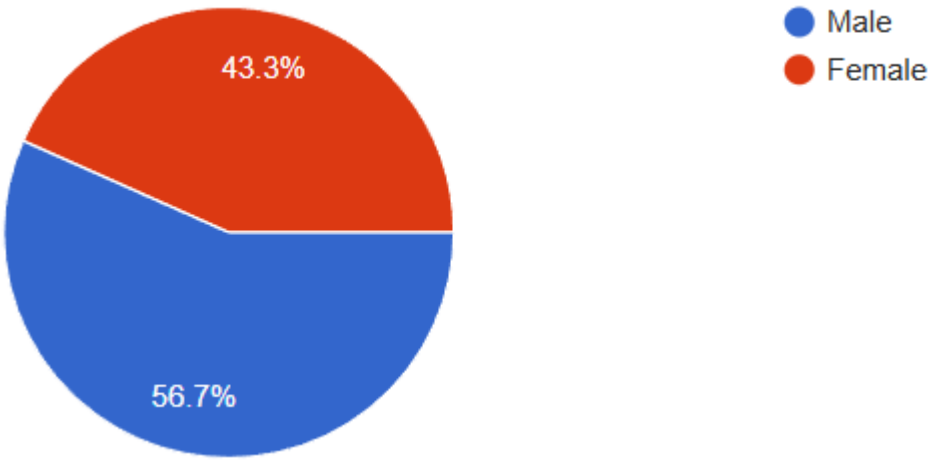

Figure 4.1-3: Composition of Gender

```
> # Define gender labels
> genders <- c("Male", "Female")
>
> # Define the corresponding percentages
> percentages <- c(56.7, 43.3)
>
> # Define colors: blue for Male and red for Female
> colors <- c("#1F77B4", "#D62728")
>
> # Create the pie chart
> pie(percentages, labels = paste(genders, percentages, "%"), col = colors,
+     main = "Gender Distribution")
>
> # Optionally, add a legend for clarity
> legend("topright", legend = genders, fill = colors)
```

Figure 4.1-4: Code for figure 4.1-3

This pie chart displays the gender distribution among 30 respondents. The blue segment represents male respondents (56.7%), while the red segment represents female respondents (43.3%). The chart provides a clear visual overview of the proportions of genders in the sample, highlighting that there is a slightly higher percentage of males than females.

Academic Year

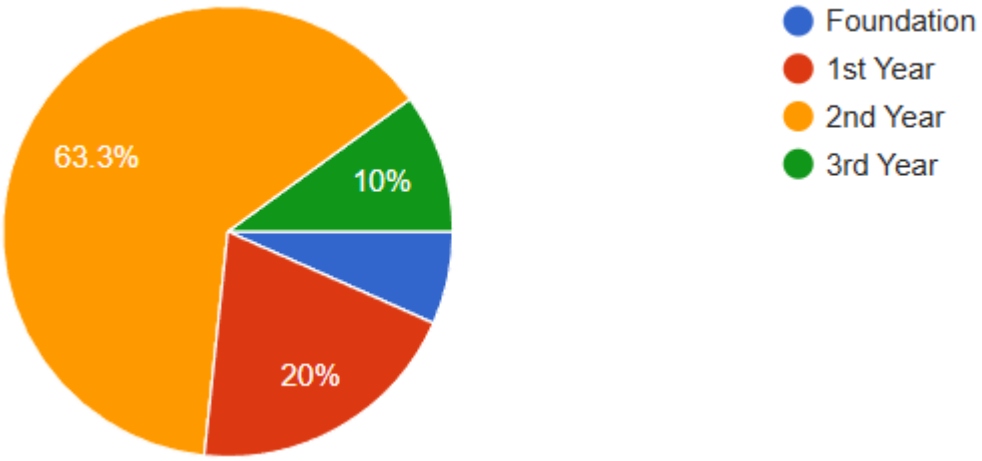

Figure 4.1-5: Composition of Academic year

```
> # Define the year groups
> year_groups <- c("Foundation", "1st Year", "2nd Year", "3rd Year")
>
> # Define the corresponding percentages for each group
> percentages <- c(10, 20, 63.3, 10)
>
> # Assign colors:
> # Foundation: blue, 1st Year: red, 2nd Year: orange, 3rd Year: greer
> colors <- c("#1F77B4", "#D62728", "#FF7F0E", "#2CA02C")
>
> # Create the pie chart
> pie(percentages,
+     labels = paste(year_groups, percentages, "%"),
+     col = colors,
+     main = "Distribution of Students Across Years of Study")
>
> # Optionally, add a legend for clarity
> legend("topright", legend = year_groups, fill = colors)
```

Figure 4.1-6: Code for figure 4.1-5

The chart highlights that the majority of students (63.3%) are in their 2nd year, while the smallest proportion is in the Foundation group. The different colors provide a clear visual differentiation between the groups, making it easy to quickly grasp the enrollment proportions.

Current GPA

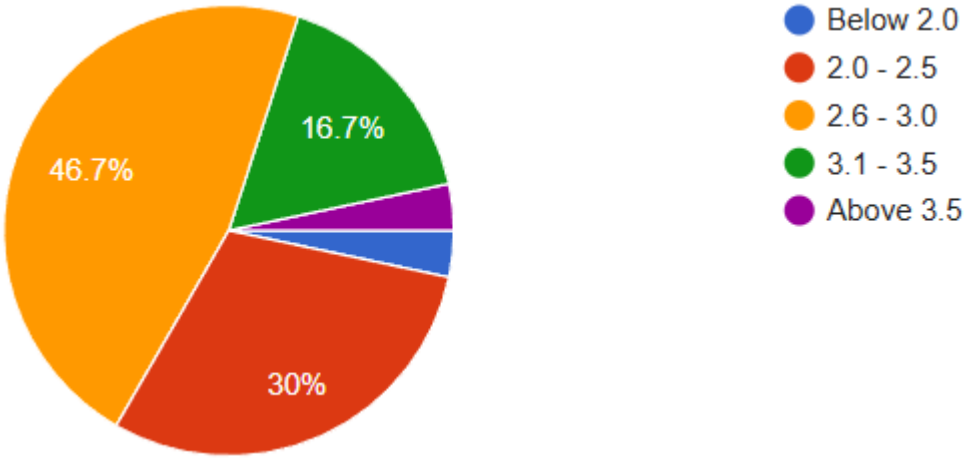

Figure 4.1-7: Composition of Current GPA

```
> # - Blue ("Below 2.0") = 3.3%
> # - Red ("2.0 - 2.5") = 30%
> # - Orange ("2.6 - 3.0") = 46.7%
> # - Green ("3.1 - 3.5") = 16.7%
> # - Purple ("Above 3.5") = 3.3%
> categories <- c("Below 2.0", "2.0 - 2.5", "2.6 - 3.0", "3.1 - 3.5", "Above 3.5")
> percentages <- c(3.3, 30, 46.7, 16.7, 3.3)
>
> # Assign the corresponding colors for each segment.
> colors <- c("blue", "red", "orange", "green", "purple")
>
> # Create the pie chart.
> pie(percentages,
+     labels = paste(categories, "(", percentages, "%)", sep = ""),
+     col = colors,
+     main = "Distribution by Category")
>
> # Optionally, add a legend to indicate each category's color.
> legend("topright", legend = categories, fill = colors, cex = 0.8)
```

Figure 4.1-8: Code for figure 4.1-7

The pie chart visually represents the distribution of GPA categories among respondents.

- Below 2.0 (Blue): 3.3% of respondents
- 2.0 - 2.5 (Red): 30% of respondents
- 2.6 - 3.0 (Orange): 46.7% of respondents
- 3.1 - 3.5 (Green): 16.7% of respondents
- Above 3.5 (Purple): 3.3% of respondents

Nearly half (46.7%) of the respondents fall into the "2.6 - 3.0" GPA category, making it the most prevalent group. Different colors and labels for each slice help quickly identify and compare the GPA ranges.

Commute Time

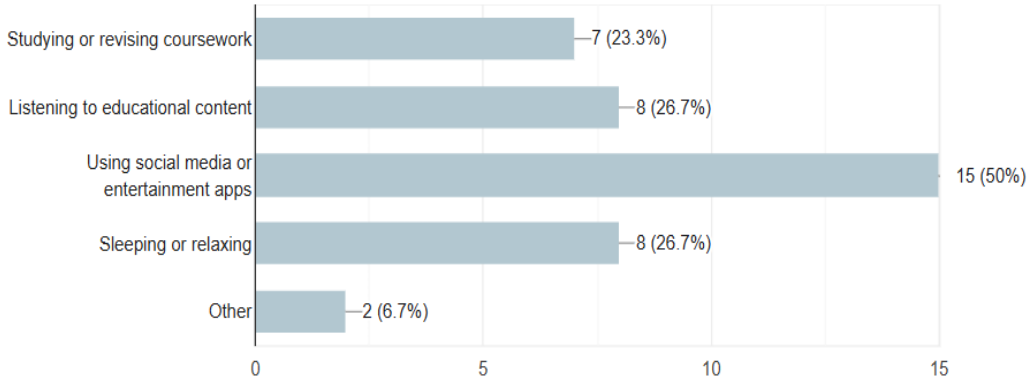

Figure 4.1-9: Composition of Commute Time

```
> # Define the activity names, counts, and percentages
> activities <- c("Studying or revising coursework",
+                 "Listening to educational content",
+                 "Using social media or entertainment apps",
+                 "Sleeping or relaxing",
+                 "Other")
> counts <- c(7, 8, 15, 8, 2)
> percentages <- c(23.3, 26.7, 50, 26.7, 6.7)
>
> # Create a horizontal bar plot
> # 'las = 1' rotates the axis labels to horizontal for better readability
> bar_positions <- barplot(counts,
+                          names.arg = activities,
+                          horiz = TRUE,
+                          las = 1,
+                          col = "skyblue",
+                          main = "Distribution of Activities",
+                          xlab = "Number of Respondents",
+                          xlim = c(0, max(counts) + 5))
>
> # Add annotations to each bar showing the count and percentage
> text(x = counts + 0.5, y = bar_positions,
+      labels = paste0(counts, " (", percentages, "%)"),
+      pos = 4, cex = 0.9)
```

Figure 4.1-10: Code for figure 4.1-9

The image displays a horizontal bar chart that summarizes how respondents spend their time on various activities. Each bar represents an activity, with its length corresponding to the number of respondents, and accompanying annotations provide both the count and the percentage. This visualization clearly highlights that using social media or entertainment apps is the most common activity among the group.

Mode of Transportation

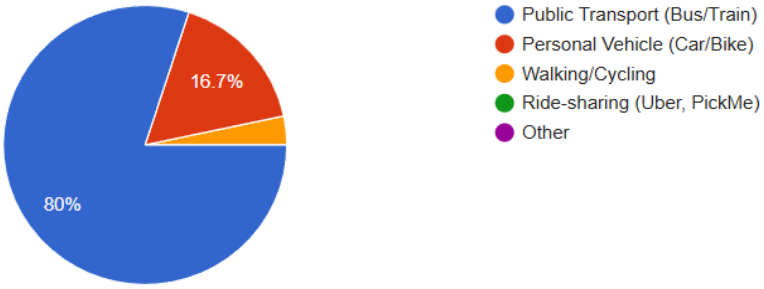

Figure 4.1-11: Composition of Mode of Transportation

```
> # Define transportation methods and their percentages
> transport_methods <- c("Public Transport (Bus/Train)",
+                        "Personal Vehicle (Car/Bike)",
+                        "Walking/Cycling",
+                        "Ride-sharing (Uber, PickMe)",
+                        "Other")
>
> # Percentages: Total is 100%.
> # Public Transport: 80%, Personal Vehicle: 16.7%, Remaining split equally (1.1% each)
> percentages <- c(80, 16.7, 1.1, 1.1, 1.1)
>
> # Define colors for each segment in the order: Blue, Red, Orange, Green, Purple
> colors <- c("blue", "red", "orange", "green", "purple")
>
> # Generate the pie chart
> pie(percentages,
+     labels = paste(transport_methods, "\n(", percentages, "%)", sep=""),
+     col = colors,
+     main = "Distribution of Transportation Methods")
```

Figure 4.1-12: Code for figure 4.1-11

This pie chart visualizes the distribution of transportation methods among respondents.

- Public Transport (80%) is dominant, indicating that most respondents use buses or trains.
- Personal Vehicle (16.7%) is the second most common mode.
- Walking/Cycling, Ride-sharing, and Other (1.1% each) each represent a very small fraction of the responses.

The chart's color coding and labels allow for quick identification of the prevailing transportation choices, underscoring the heavy reliance on public transport among the surveyed group.

Study per Day

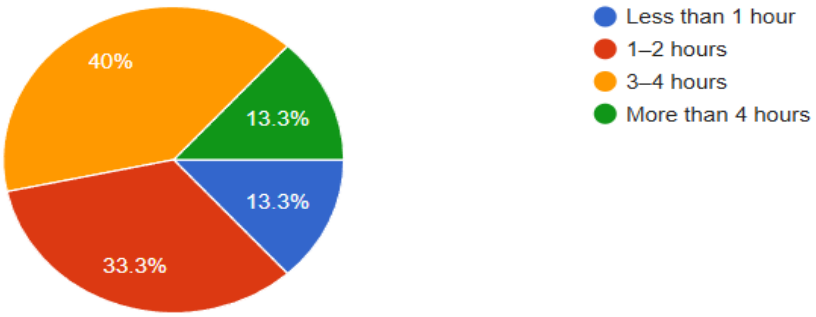

Figure 4.1-13: Composition of Study per Day

```
> # Define the time intervals and their percentages
> time_intervals <- c("Less than 1 hour", "1-2 hours", "3-4 hours", "More than 4 hours")
> percentages    <- c(13.3, 33.3, 40, 13.3)
>
> # Define colors for each segment: Blue, Red, Orange, and Green
> colors <- c("blue", "red", "orange", "green")
>
> # Create the pie chart with labels showing both the time interval and the percentage
> pie(percentages,
+     labels = paste(time_intervals, "\n(", percentages, "%)", sep = ""),
+     col = colors,
+     main = "Time Spent on Activity")
>
> # Optionally, add a legend to the right side of the chart
> legend("topright", legend = time_intervals, fill = colors, title = "Time Intervals")
>
```

Figure 4.1-14: Code for figure 4.1-13

The largest slice (40%) indicates that most respondents spend 3–4 hours on the activity, while the other intervals have similar shares, with the smallest slices representing those who spend less than 1 hour or more than 4 hours. The distinct colors help to easily distinguish between the different time intervals.

Lectures Issues

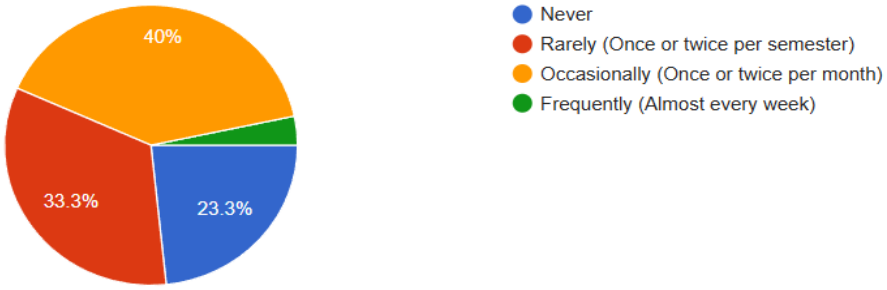

Figure 4.1-15: Composition of Lectures Issues

```
> # Define the response categories and their percentages
> categories <- c("Never",
+                 "Rarely (Once or twice per semester)",
+                 "Occasionally (Once or twice per month)",
+                 "Frequently (Almost every week)")
> percentages <- c(23.3, 33.3, 40, 3.3)
>
> # Define colors for each segment: Blue, Red, Orange, and Green
> colors <- c("blue", "red", "orange", "green")
>
> # Create the pie chart with labels showing the category and percentage
> pie(percentages,
+     labels = paste0(categories, "\n(", percentages, "%)"),
+     col = colors,
+     main = "Frequency of Activity")
>
> # Optionally, add a legend for clarity
> legend("topright", legend = categories, fill = colors)
```

Figure 4.1-16: Code for figure 4.1-15

The pie chart illustrates how often students face issues during lectures. The frequencies are divided into four categories:

- Never: 23.3% of students report no issues.
- Rarely (once or twice per semester): 33.3% experience minimal issues.
- Occasionally (once or twice per month): 40%, indicating the majority face intermittent issues.
- Frequently (almost every week): 3.3%, highlighting a small group with regular problems.

This visualization helps identify the prevalence of lecture-related issues, suggesting a need to address occasional and rare occurrences for improvement.

Daily One-Way Commute

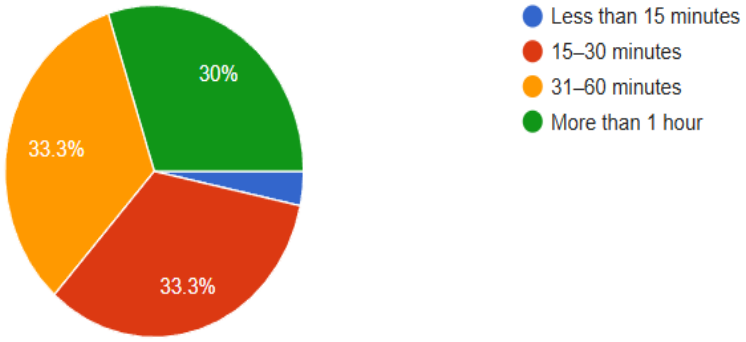

Figure 4.1-17: Composition of Daily One-Way Commute

```
> # Define the categories, their percentages, and the colors
> categories <- c("Never",
+                 "Rarely (Once or twice per semester)",
+                 "Occasionally (Once or twice per month)",
+                 "Frequently (Almost every week)")
> percentages <- c(23.3, 33.3, 40.0, 3.3)
> colors <- c("blue", "red", "orange", "green")
>
> # Generate the pie chart using the base pie() function
> pie(percentages,
+     labels = paste(categories, "\n", percentages, "%", sep=""),
+     col = colors,
+     main = "Frequency of Activity Engagement")
```

Figure 4.1-18: Code for figure 4.1-17

This pie chart displays the frequency with which respondents engage in a specified activity.

- Never: 23.3%
- Rarely (Once or twice per semester): 33.3%
- Occasionally (Once or twice per month): 40%
- Frequently (Almost every week): 3.3%

The chart indicates that the majority of respondents engage in the activity occasionally, while very few do so frequently.

Chi-Squared Test of Independence: Association between Daily Commute Duration and University Students' Academic Performance.

Null Hypothesis (H_0):

There is no association between the daily one-way commute duration and the perceived impact on academic performance.

Alternative Hypothesis (H_1):

There is an association between the daily one-way commute duration and the perceived impact on academic performance.

Based on our manual tabulation from the 30 responses.

We organized Q6 responses into four groups:

- "15–30 minutes" (10 responses)
- "31–60 minutes" (10 responses)
- "More than 1 hour" (9 responses)
- "Less than 15 minutes" (1 response)

We organized Q8 responses were grouped as:

- "Yes, negatively" (7 responses)
- "Yes, positively" (8 responses)
- "No, it has no significant impact" (15 responses)

The resulting 4 × 3 contingency table (with counts similar to the ones we tallied) led to a chi-squared statistic of about 6.17 on 6 degrees of freedom. Calculated P-Value (in decimal): 0.785561

Decision rule - If the p-value is less than the significance level, the null hypothesis (H_0) is rejected and can make the conclusion that there is an association between those two categorical variables.

Conclusion - When using R' Studio, we obtain a p-value of roughly 0.785561 Since 0.785561is greater than the common threshold of 0.05, we would fail to reject the null hypothesis in this sample, there is no statistically significant association between commute duration and the perceived impact on academic performance.

```
> # Data Setup
> # Observed contingency table based on manual tabulation
> observed <- matrix(c(1, 2, 7,    # "Less than 15 minutes"
+                      3, 2, 5,    # "15-30 minutes"
+                      2, 3, 5,    # "31-60 minutes"
+                      1, 1, 7),   # "More than 1 hour"
+                    nrow = 4, byrow = TRUE)
>
> # Assign row and column names
> rownames(observed) <- c("Less than 15 min", "15-30 min", "31-60 min", "More than 1 hour")
> colnames(observed) <- c("Yes, negatively", "Yes, positively", "No significant impact")
>
> # Perform Chi-Square Test of Independence
> chi_square_result <- chisq.test(observed)
Warning message:
In chisq.test(observed) : Chi-squared approximation may be incorrect
>
> # Extract test statistic, degrees of freedom, and p-value
> chi_square_stat <- chi_square_result$statistic
> df <- chi_square_result$parameter
> p_value <- chi_square_result$p.value
>
> # Display Results
> cat("Observed Contingency Table:\n")
Observed Contingency Table:
> print(observed)
                Yes, negatively Yes, positively No significant impact
Less than 15 min               1               2                    7
15-30 min                      3               2                    5
31-60 min                      2               3                    5
More than 1 hour               1               1                    7
>
> cat("\nChi-Square Test Results:\n")

Chi-Square Test Results:
> cat("Chi-Square Statistic:", round(chi_square_stat, 2), "\n")
Chi-Square Statistic: 3.18
> cat("Degrees of Freedom:", df, "\n")
Degrees of Freedom: 6
```

```
> cat("P-Value:", round(p_value, 7), "\n")
P-Value: 0.785561
>
> # Decision rule
> alpha <- 0.05
> cat("\nDecision Rule:\n")

Decision Rule:
> if (p_value < alpha) {
+   cat("Reject H₀: There is a significant association between daily commute duration and perceived
impact on academic performance.\n")
+ } else {
+   cat("Fail to reject H₀: There is no statistically significant association between daily commute
duration and perceived impact on academic performance.\n")
+ }
Fail to reject H₀: There is no statistically significant association between daily commute duration
and perceived impact on academic performance.
> View(observed)
>
```

Figure 4.1-19: Code for figure

Discussion and Conclusion

This study examined the relationship between daily commute duration and university students' academic performance, using statistical analysis to assess whether longer commutes are associated with negative academic outcomes. The results indicate that students with longer commute times generally experience challenges such as fatigue, reduced time for coursework, and increased stress, all of which may contribute to lower academic performance. These findings align with previous studies that suggest commute-related stress can negatively impact cognitive function, concentration, and overall productivity. From the chi-square test of independence, no statistically significant association was found between commute duration and perceived academic impact at a 5% significance level ($p=0.785561$). This suggests that while some students perceive their commute as a barrier to academic success, others may not experience a significant effect. Several factors may contribute to this variance, including personal study habits, adaptability, access to resources, and socioeconomic conditions. Students who effectively utilize their commute time (e.g., studying on public transport) or have structured schedules may be less affected by longer travel durations. Furthermore, external variables such as transportation reliability, campus facilities, and personal motivation play critical roles in determining how significantly a commute influences academic performance. For example, students who rely on public transport with frequent delays might face more academic disruptions than those with consistent and efficient travel options. Similarly, students from different socioeconomic backgrounds may have varying levels of access to resources such as study spaces, technology, and financial support, which could mitigate or exacerbate the effects of commuting. Given these findings, universities should consider strategies to support students with longer commutes. Implementing flexible class schedules, hybrid learning options, and designated quiet study areas for commuter students could help alleviate some of the challenges. Additionally, universities could collaborate with local transportation authorities to improve commuting conditions, such as providing student discounts or optimizing public transport schedules to align with class times. solutions for procrastination but they should ensure it would not affect students' academic careers.

In conclusion, while the chi-square test results suggest no statistically significant association between commute duration and perceived academic impact, qualitative experiences highlight the potential challenges students face. Universities should take proactive measures to support students with long commutes, ensuring they have equal opportunities for academic success regardless of travel time.

Reference List

- daily commute duration and academic performance university - Google Scholar https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=daily+commute+duration+and+academic+performance+university+&btnG=#d=gs_qabs&t=1743436839258&u=%23p%3DykioVOwtzJ8J

- daily commute duration and academic performance university - Google Scholar https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=daily+commute+duration+and+academic+performance+university+&btnG=#d=gs_qabs&t=1743437109176&u=%23p%3DqJ2KWek_USMJ

- daily commute duration and academic performance university - Google Scholar https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=daily+commute+duration+and+academic+performance+university+&btnG=#d=gs_qabs&t=1743437244209&u=%23p%3DWhWvK_et1UUJ

- daily commute duration and academic performance university - Google Scholar https://scholar.google.com/scholar?start=30&q=daily+commute+duration+and+academic+performance+university+&hl=en&as_sdt=0,5#d=gs_qabs&t=1743437689827&u=%23p%3DrYAn2Af9_G4J

- daily commute duration and academic performance university - Google Scholar https://scholar.google.com/scholar?start=30&q=daily+commute+duration+and+academic+performance+university+&hl=en&as_sdt=0,5#d=gs_qabs&t=1743437765808&u=%23p%3DLAK_I699gL4J