THE EFFECTIVENESS OF DUOLINGO'S AI-POWERED LANGUAGE LEARNING PLATFORM IN IMPROVING SECOND LANGUAGE ACQUISITION AMONG MALAYSIA'S TERTIARY STUDENTS

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BY

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A final year project submitted in partial fulfilment of the requirement for the degree of

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MAY 2024

DECLARATION

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(1) This undergraduate FYP is the end result of my own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Sole contribution has been made by me in completing the FYP.

(4) The word count of this research report is 12225 .

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATION

AI	Artificial Intelligence
MALL	Mobile-assisted language learning
US	United State
SLA	Second Language Acquisition
L2	Second Language
L1	First Language
PEU	Perceived Ease of Use
PU	Perceived Usefulness
M	Motivation
PSI	Perceived Social Influence
ILA	Improvement in Language Acquisition
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
SPSS	Statistical Package for Social Science

PREFACE

In the era of digitalization, where technology persistently alters our everyday existence, the field of education is not immune to its revolutionary impact. The emergence of different digital platforms and applications has brought about a notable transformation in the way language learning, a crucial element of human communication and comprehension, is approached. Out of these options, Duolingo is particularly notable for its widespread accessibility and popularity as a tool for acquiring a second language.

This study project investigates the efficacy of Duolingo in improving second language acquisition among university students in Malaysia. Malaysia, a country with multiple languages spoken and a varied linguistic environment, provides an interesting setting to investigate the effects of digital tools on language learning results. Given the growing importance of bilingual competency in the Malaysian education system, it is crucial to recognise the significance of new platforms such as Duolingo. There are different factors that will influence how Duolingo may affect the way people learn different languages and increase their proficiency.

This research examines the factors that influences the effectiveness of Duolingo in improving language acquisition. Researcher has identified four factors which are perceived ease of use, perceived usefulness, motivation, and perceived social influence of Duolingo. With the help of the study, a better understanding and comprehension of the factors that may have an effect on how Duolingo can assist in language acquisition can be obtained.

ABSTRACT

The purpose of this study was to investigate the aspects of Duolingo that might improve Malaysian tertiary students' acquisition of a second language. The enhancement of second language learning is the dependent variable in this research study, and the independent variables - perceived ease of use, perceived usefulness, motivation, and perceived social influence - will be taken into consideration as the elements influencing this variable. Students in tertiary education who are at least 16 years old will be our target demographic. Using the convenience sampling approach, we administered the questionnaire to our target group in 200 sets overall.

The reliability test will be measured using Cronbach's Alpha to determine the level of reliability. Additionally, multiple regression analysis will be used to examine the data that has been obtained. Based on the research study's findings, the respondents acknowledge that Duolingo's perceived usefulness, motivation, ease of use, and perceived social influence are all significant factors that contribute to improved second language acquisition; however, perceived social influence has a greater effect. The study's findings imply that higher education students who felt more socially influential will benefit from Duolingo's assistance in learning a second language more.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

The research aims to study the effectiveness of Duolingo's AI-powered language learning platform in improving second language acquisition among Malaysia's tertiary students. The factors involved in this study include perceived usefulness, perceived ease of use, motivation, and perceived social influence of Duolingo. An analysis will be conducted to examine the impact of these factors on the acquisition of a second language among tertiary students in Malaysia. In addition, this chapter will provide a broad overview of the previous research conducted on artificial intelligence (AI) and Duolingo. It will also define the problem statements, establish research objectives, formulate research questions and hypotheses, and discuss the importance of the research. Therefore, this study aims to collect data on the significance of these elements in the process of acquiring a second language among tertiary students in Malaysia.

1.1 Research Background

In this digitalized era, technology plays a vital role in people's lives in the larger community. Technology has advanced quickly in the modern era, which is especially beneficial for "educational technologies," or the use of technology in language. Language and technology have been closely related since writing was developed about 5000 years ago (Habibie, 2020).

Aside from this, there has been a notable surge in the usage of mobile technology, with the number of mobile internet devices surpassing that of conventional desktop and laptop computers. It's because gadgets are practical educational resources that can be used anywhere, at any time. The increasing use of mobile devices, such as smartphones and tablets, has impacted how individuals’ study and acquire proficiency in a second language (Loewen et al., 2019).

Consequently, the rise has sparked interest in mobile-assisted language learning (MALL), or the application of mobile technology that facilitates students' access to educational resources such as dictionaries, tutorials, games, and flashcards conveniently on mobile devices. For instance, Duolingo, a free language learning software, where the global learner community of Duolingo surpasses 500 million members by the year 2023, underscoring the platform's substantial influence on language instruction and establishing it as one of the most widely downloaded educational applications (Piedrahíta, 2023). These technologies are permitted to surpass timeframe limitations and expedite the process of providing feedback. Enabling students to cultivate their language proficiency at their own pace can enhance their independent engagement and involvement within the language classroom. Moreover, the tool's ability to consistently and objectively evaluate students' language learning performance motivates learners to enhance their writing, reading, and speaking mechanics and accuracy (Parra G. & Calero S., 2019).

Duolingo is a language-learning website that provides free online classes via its mobile applications and website. The platform's popularity among millions of users can be attributed to its free-access strategy and gamified elements. Duolingo shares its learners' proficiency results as a company that values openness and responsibility. To this purpose, the current study set out to determine the reading and listening skill levels of Duolingo learners who finished the beginning-level courses in Spanish and French and how long it took them to finish the course material. Additionally, Duolingo contrasted the users' proficiency scores with the students' proficiency results in US university language programs based on semesters (Loewen et al., 2019).

1.2 Research Problem

This research aims to identify how Duolingo effectively improves second language acquisition among Malaysia's tertiary students. According to Irawan et al. (2020), students must master four fundamental life skills. The four essential abilities encompassed in language acquisition are reading, listening, speaking, and writing. The expectation is for all four skills to be performed collectively, with a particular emphasis on reading. Vocabulary is a fundamental aspect of language competency and dramatically influences learners' speaking, listening, reading, and writing proficiency (Ajisoko, 2020). A sufficient vocabulary is crucial for learners to tackle language learning challenges effectively. Back in the old days, without a comprehensive vocabulary and effective methods for developing new vocabulary, individuals could utilize language learning opportunities such as actively engaging with native speakers, using various contexts to employ the language, reading, or watching television. However, in this digitalized era, learning can be much more convenient and accessible through the power of the Internet and mobile devices. These tools employ algorithms and machine learning techniques to examine language data and adjust to students' unique requirements and learning preferences (Andreevich, 2023). Specific tools use speech recognition technology to offer immediate feedback on pronunciation. Moreover, AI-driven language learning software can be utilized for independent study or as an adjunct to conventional language instruction techniques (Andreevich, 2023). The platform provides diverse educational activities and exercises to enhance learners' vocabulary, grammar, and speaking proficiency. Specific programs also allow learners to engage in interactive conversations with virtual language tutors, enabling them to improve their communication skills in a simulated real-world environment.

In the contemporary education system, teachers act as facilitators of instructional materials that have been enhanced with technology-based educational media, enabling the efficient and effective delivery of content. This aims to attain fundamental proficiency levels and utilize evaluation tools as markers of learning attainment. However, using mobile applications in this digital age, such as games,

as an educational tool can foster an environment that enhances students' enthusiasm to study English. Utilizing mobile applications for English study is a methodical and innovative approach to engaging students and improving their learning experiences, preventing them from becoming quickly disinterested in the learning process (Irawan et al., 2020).

English is one of the most widely used languages for communication globally, and it is taught widely in various countries, including Malaysia. Malaysia is a diverse country with different races, each with its mother tongue or language for communication. Hence, English might be the second language for most people. Moreover, in tertiary and other stages of education, different language subjects may be offered to interested students. For example, Japanese and Korean are two of the most famous languages that Malaysians are interested in learning. Hence, other than learning from school, students may utilize language learning applications to self-learn or enhance their knowledge and vocabulary in the language.

However, the effectiveness of Duolingo in improving second language acquisition among Malaysia's tertiary students remains a subject of inquiry. While Duolingo offers a dynamic and accessible approach to language learning, factors influencing its efficacy in Malaysian education are poorly understood.

1.3 Research Objective

This research aims to investigate the factors that impact the efficacy of Duolingo's AI-powered language learning platform in enhancing second language acquisition among tertiary students in Malaysia.

1.3.1 General Objective

The primary objective of this research is to assess and understand the efficacy of Duolingo's AI-driven language learning platform in enhancing the acquisition of a second language among tertiary students in Malaysia.

1.3.2 Specific Objective

The specific objective of this research is to examine the correlation between the factors influencing the success of Duolingo's AI-driven language learning platform and its impact on enhancing the acquisition of a second language among tertiary students in Malaysia.

I: To examine the relationship between perceived ease of use of Duolingo and the effectiveness in improving second language acquisition among Malaysia’s tertiary students.

II: To examine the relationship between perceived usefulness of Duolingo and the effectiveness of improving second language acquisition among Malaysia’s tertiary students.

III: To examine the relationship between motivation in using Duolingo and the effectiveness of improving second language acquisition among Malaysia’s tertiary students.

IV: To examine the relationship between perceived social influence of Duolingo and the effectiveness in improving second language acquisition among Malaysia’s tertiary students.

1.4 Research Questions

Multiple questions have been formulated in this research, and they will be addressed in the following manner:

a) What is the relationship between perceived ease of use of Duolingo and the effectiveness of improving second language acquisition among Malaysia's tertiary students?
b) What is the relationship between perceived usefulness of Duolingo and the effectiveness of improving second language acquisition among Malaysia's tertiary students?
c) What is the relationship between motivation in using Duolingo and the effectiveness of improving second language acquisition among Malaysia's tertiary students?
d) What is the relationship between perceived social influence of Duolingo and the effectiveness of improving second language acquisition among Malaysia's tertiary students?

1.5 Hypothesis of the Study

The following are the developed hypotheses included:

H0: Perceived ease of use of Duolingo has no significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

H_1: Perceived ease of use of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

H0: Perceived usefulness of Duolingo has no significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

H_1: Perceived usefulness of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

H0: Motivation of using Duolingo has no significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

H_1: Motivation of using Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

H0: Perceived social influence of Duolingo has no significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

H_1: Perceived social influence of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

1.6 Significance of Study

The purpose of the research is to enhance understanding of the effectiveness of Duolingo in assisting the improvement of second language acquisition among Malaysia's tertiary students. This study will eventually identify the advantages that contribute to the effectiveness of using Duolingo in language learning. This research contributes to academia by offering insights into how the mentioned elements would impact the success of Duolingo in higher education language learning.

Moreover, including ethical considerations around bias, data privacy, and developing critical thinking skills adds an extra layer of responsibility to the integration process. The findings of this study can offer significant knowledge for educational institutions aiming to ascertain the most effective degree of Duolingo incorporation, maximizing its benefits and limiting possible disadvantages. Essentially, this research is significant outside the academic sphere as it will influence the future direction of artificial intelligence in education and advocate for a more advanced and ethically sound approach to technology-driven learning settings.

1.7 Conclusion

In summary, Chapter 1 explained the study's effects on using Duolingo in higher education. Furthermore, it offers an essential structure for forthcoming progressions in the realm of investigation. Hence, Chapter 2 will analyze relevant research many scholars undertake to provide a clear and concise study summary.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

Chapter 2 will provide a comprehensive review of the relevant literature to this research. This chapter comprises three sections that specifically examine the effectiveness of Duolingo's AI-Powered Language Learning Platform in enhancing second language acquisition among tertiary students in Malaysia. The initial segment begins with the investigation of the dependent variable.

2.1 Review of Literature

2.1.1 Duolingo & Second Language Acquisition

Independent study plays a crucial role in acquiring a new language. Duolingo is a widely used language learning platform that employs artificial intelligence (AI) technology to assist learners in mastering pronunciation and enhancing their vocabulary in a second language or new language independently (Inayah et al., 2020). The platform provides a range of engaging and interactive exercises and activities, facilitating practice and reinforcement of language skills, and provides access to about 95 languages for learning. In addition to English, users may also study in several other languages. The service boasts a user base of approximately 500 million registered individuals worldwide (Shortt et al., 2023).

The Duolingo app was developed in 2011 by Luis Von and Severin Hacker to offer free education (Inayah et al., 2020). In the system, the four English skills are taught: listening, reading, speaking, and writing skills. The distinguishing feature of Duolingo is its simple design, which enables individuals of any age and skill level to easily engage in language acquisition. The platform utilizes spaced repetition, a technique that involves reviewing vocabulary at ideal intervals to improve retention. It also incorporates adaptive learning algorithms, which customize the learning experience based on the user's individual strengths, limitations, and pace of learning.

Duolingo's language learning approach is distinguished by its focus on active involvement and drive (Kessler, 2023). Users are rewarded with points, badges, and virtual rewards when they successfully complete classes and reach learning milestones. This helps to create a feeling of achievement and development. In addition, the website integrates social functionalities that enable users to engage in friendly competition with their acquaintances, participate in language learning communities, and enhance their speaking skills by conversing with Duolingo's virtual chatbots.

In order to utilize the application, users are required to download it from either Google Play or iTunes and install it on their Android or IOS devices. Nevertheless, compared to similar applications available in the market, such as Babbel and Busuu, Duolingo offers an extensive selection of languages that continue to expand. This is mainly attributed to its distinctive and inclusive community of learners, who actively contribute to the platform. Once the learners have chosen their desired language, the app prompts them to select a "daily goal" from the available options. The daily targets vary from Casual to Insane, representing daily 5, 10, 15, and 20 minutes of daily practice. The application, after that, inquires if the student has any prior knowledge of the language, and if affirmative, it offers the learner a placement exam. Novice language learners start their journey by acquiring

fundamental knowledge. Undoubtedly, Duolingo is a very uncomplicated and user-friendly application. By just pressing Start, the learner may begin their first session without needing more inquiries or course registration. The types of exercises that Duolingo provides are translation exercises, matching exercises, pairing exercises, listening exercises, and speaking exercises for all learners (Habibie, 2020).

Furthermore, the popularity of learning foreign languages or second languages remains popular, as it offers more than just an academic certification for employment. Furthermore, the acquisition of foreign languages or the learning of a second language catalyses globalization and has the potential to promote international unity by equipping learners with a comprehensive comprehension of the multicultural world (Almelhes, 2023). SLA, or Second Language Acquisition, refers to the process of acquiring proficiency in a language after the individual has already learned their native tongue (Behney et al., 2020). Occasionally, the word also encompasses the acquisition of a third or fourth language. The crucial factor is that SLA pertains to the acquisition of a non-native language after the acquisition of one's native or primary language. The second language is generally known as the L2. L2, like the term "second language," encompasses any language acquired after the initial acquisition of the L1, regardless of whether it is the second, third, fourth, or fifth language. By this term, we are referring to the process of acquiring a second language, which can occur in a classroom setting or through more informal and immersive experiences.

According to Gayed et al. (2022), writing in a second language (L2) causes significant cognitive strain to students. This includes the mental effort required to translate from their first language (L1) to L2, as well as the use of digital tools like online dictionaries and translation programs to assist in completing the writing task. With the help of AI tools like Duolingo, it

facilitates the language learning process and provide a learning platform to users.

2.1.2 Perceived Ease of Use

According to Szyszka (2019), perceived ease of use refers to the extent to which an individual believes that utilizing a specific system would require minimal effort. Using AI-based technologies in language learning has wholly transformed the conventional method of obtaining English language proficiency. Through the utilization of AI algorithms and machine learning, these applications have facilitated the development of customized and adaptable language learning experiences that cater to the specific needs of each student. An exemplary instance of this phenomenon is Duolingo, a highly renowned language acquisition application that has revolutionized how students interact with the process of learning English. It is crucial to prioritize the selection or creation of user-friendly applications enabling students to easily access and utilize them at any time and from any location, which will result in more engagement with the application (Ünal & Güngör, 2021).

According to Freeman et al. (2023), Duolingo utilizes artificial intelligence to develop language lessons that are both gamified and very effective, resulting in an entertaining learning experience. Gamification is considered a valuable supplementary aid in the learning process. Within gamified learning sessions, students are tasked with assessing their learning progress. Consequently, it can foster independent learning among students, motivating them to have greater confidence in their learning (Arif et al., 2019). The application monitors the progress and performance of each learner, examining their strengths and shortcomings to pinpoint areas in need of enhancement. Utilizing this research, Duolingo's AI algorithms tailor customized workouts and challenges to match the specific learning

requirements of everyone, guaranteeing sustained motivation and active participation throughout their language acquisition process. The app provides immediate feedback, which enhances the learning process by allowing users to improve their language skills continuously.

Based on the study by Betaubun et al. (2023), Duolingo caters to learners at their current level and utilizes their replies and actions within the app to enhance their skills. The app tailors the learning environment by offering additional practice in areas where learners require it, modifying the order and complexity of exercises, and delivering feedback depending on student responses. This approach enhances learners' growth and long-term understanding. It is well-established that providing learners with appropriate difficulty results in increased engagement and enhanced learning outcomes. In order to achieve this, Duolingo developed its machine-learning models. Numerous machine learning models exist globally, but Duolingo constructed its own model to address the language, literacy, and math-related issues it aimed to resolve. Referred to as Birdbrain internally, this system utilizes data from over 1 billion daily exercises performed on Duolingo. It aims to acquire knowledge about the proficiency level of learners and the level of difficulty of the content for each individual. The following is the critical component that makes their individualized daily courses unique: Birdbrain assists in selecting and organizing tasks for individual learners and subsequently generates adaptive lessons tailored to the learner's specific development and learning requirements. Currently, Birdbrain holds the distinction of being the most extensive student model employed in language learning technologies. Therefore, hypothesis is proposed as followed:

H_1: Perceived ease of use of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

2.1.3 Perceived Usefulness

Based on the study by Camilleri & Camilleri (2019), the "perceived usefulness" (PU) of the technology refers to the extent to which an individual believes that utilizing a specific system would improve their job performance. The PU also refers to the extent to which an individual believes that a technology will assist them in efficiently and effectively completing a specific activity (Szyszka, 2019). Therefore, the primary focus of the PU construct is to assess the anticipated total influence of technology on an individual's job performance, considering both the process and the outcome. According to Alden Riyadh et al. (2020), perceived usefulness is the degree to which an individual believes technology will enhance their work performance. Hence, the level of consumers' inclination to utilize a technology is directly proportional to its level of usefulness (Singh & Sinha, 2020).

To determine the usefulness of Duolingo, a study conducted by Irzawati & Unamo (2023) listed a few functions that show usefulness from the users' perspective. For example, Duolingo offers a multitude of engaging elements that allow learners to engage in language learning and play simultaneously. For example, the Learn feature includes educational resources and practice exercises. The resources encompass various subjects, from fundamental to advanced levels. They provide a comprehensive examination of grammar through a guidebook format and engaging and concise stories exploring these topics. Furthermore, the tasks are available in several formats: completion, matching, translation, listening, and speaking. The activities are built using a game-based approach, which creates a fun learning environment for users. Additionally, users can utilize the Shop tool in Duolingo to enhance the functionality of the Streak Freeze and Double or Nothing features (Irzawati & Unamo, 2023). Streak Freeze enables users to prolong their streak or learning progress and maintain their current level for a full day of inactivity. Similarly, Double or Nothing allows users to increase

their initial five lingot bet by keeping a streak of one week. Finally, users can utilize additional capabilities in Duolingo. For instance, customers can utilize the Podcast feature, which offers many Podcasts covering many topics. The Podcast not only offers a specific explanation or discussion of a topic, but also provides information about the original speakers' culture, tradition, socioeconomic condition, and other relevant topics. Users can enhance their comprehension, expertise, and mastery of the language by accessing the Podcast. Therefore, hypothesis is proposed as followed:

H_2: Perceived usefulness of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

2.1.4 Motivation

Based on the study Hidayati & Diana (2019), motivation in learning a new/second language was perceived as combining three precise components: motivational intensity, desire to acquire the language, and attitude towards language learning activity. According to Maulya (2023), motivation is essential for effective learning. Students will study diligently, even alone, driven by solid motivation.

Moreover, Duolingo's gamified method of language acquisition creates an engaging and motivating experience, enticing students to delve further into the complex world of language (Zeng & Fisher, 2023). The interconnection of involvement on this platform is constructed using a combination of psychological factors, with each element contributing to a feeling of advancement, accomplishment, and personal agency. Points, badges, and leaderboards, which resemble elements from traditional video games, appeal to the inherent human need for accomplishment and social

comparison, reflecting the emphasis on internal motivation in self-determination theory (Lengyel, 2020). Every time a lesson is finished, it stimulates a release of dopamine, which strengthens good learning habits and generates a feeling of advancement similar to Skinner's operant conditioning. Influenced by the notion of loss aversion, Streaks incorporate a sense of anxiety about losing one's hard-earned progress in the learning process, enhancing engagement (Liu et al., 2020). Customized learning trajectories, in line with goal-setting theory, address specific individual requirements and preferences, promoting independence and control over the learning process. Nevertheless, this motivational tapestry is not without its complexities. The repetition of exercises and the absence of practical application might result in disengagement over time, emphasizing the necessity for continuous improvement to sustain engagement beyond the initial introduction of gamification (Kastelli et al., 2023). Furthermore, Duolingo has a Profile option. This feature allows users to update or edit their profile information, view statistics such as streaks, current league, total points, and achievements, receive friend suggestions, see their followers, and connect to their social media accounts (Irzawati & Unamo, 2023). Furthermore, individual variances, such as learning styles and prior knowledge, influence the efficacy of various motivational strategies. This necessitates adopting a customized approach to accommodate the needs of diverse learners. Duolingo can maintain the engagement and progress of students in their language learning endeavors by consistently providing fresh sources of motivation, incorporating practical situations, and customizing the learning experience to suit each unique learner (Indrawan et al., 2023). Aside from its practical advantages, the satisfaction and joy that students experience when using AI tools serves as a noteworthy source of motivation. According to the study by J. K. M. Ali et al. (2023), students are more likely to include AI tools into their academic routines when their interactions with it are both stimulating and rewarding. According to Shortt et al. (2023), users of Duolingo reported a high level of satisfaction and have a position perception of the usefulness of the tool. However, some users had a negative experience as they felt their motivation were diminished throughout the learning process (Loewen et al., 2019). The tool's hedonic

attraction is heightened by its ability to offer a novel and dynamic learning experience, beyond its functional constraints. Therefore, hypothesis is proposed as followed:

H_3: Motivation of using Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

2.1.5 Perceived Social Influence

Based on the study Szyszka (2019), social influence is defined as a subjective standard within the technology adoption literature. This norm reflects an individual's sense of how significant others view a particular behavior or action if they acknowledge it and if they anticipate someone to carry it out. Conversely, the conclusion was made that social influence has no substantial effect on attitude and intents of usage in cases where the system is voluntary. This indicates that individuals do not prioritize the social components when determining their willingness to use a system. Instead, they place greater emphasis on their incentives. Furthermore, as time passes and individuals gain more expertise, the impact of social influence on the continuous usage and usefulness of something diminishes.

However, the study by Skare & Riberio Soriano (2021) states that social influence has a significant role in the early stages of technology adoption, mainly when users are unfamiliar with the innovation and uncertain about how it works, and social influence in education pertains to the effect of the local social environment where the decisions and choices made by classmates, educators, or significant members of the academic community can create a domino effect, leading students to embrace new technologies. Moreover, perceived social influence positively affects attitude, but not necessarily behavior(Hamari & Koivisto, 2015). As mentioned above,

perceived social influence could be subjective depending on the targeted demographic, and hence, more research should be done on how and what effect social influence might bring. Therefore, hypothesis is proposed as followed:

H_4: Perceived social influence of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.

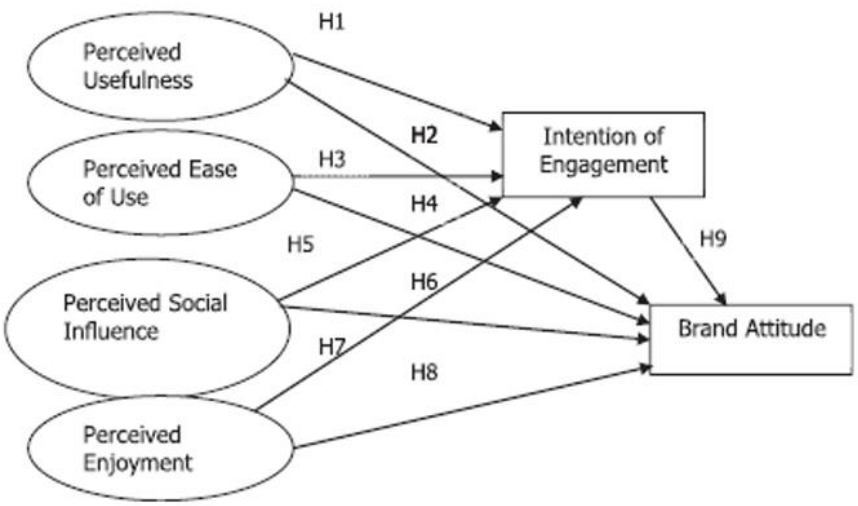
2.2 Review of Relevant Theoretical Models

2.2.1 Technology Acceptance Model (TAM) & Theory of Reasoned Action (TRA)

The Technology Acceptance Model (TAM) has its roots in the Theory of Reasoned Action (TRA), a psychological model developed by Hill et al. (1977).According to these authors, individuals examine the consequences and impacts of their actions before taking them as human action is driven by rationality and logic. The information that peoples gather is carefully assessed and influences their attitudes and behavioural choices. As to the Technology Acceptance Model (TAM), the two primary factors that determine the likelihood of using a technology are the perceived usefulness and perceived ease of use. Davis (1989) defines perceived usefulness as an understanding that utilizing a particular system enhances work performance, while perceived ease of use refers to the perception that using the system requires minimal effort (Davis, 1989). Both components are encompassed under the model under examination in our study. They provide the comprehension of the user's perception regarding the utility and user-friendliness of Duolingo. TAM received criticism from subsequent studies for excluding significant components, including social influence (Venkatesh & Davis, 2000). The social components in publications that examine

technology adoption typically revolve around perceived social influence, which pertains to the opinions of others regarding the behavior in question (Hamari & Koivisto, 2015). The research framework employed in this dissertation was established by Yang et al. (2017). It is grounded in both the Technology Acceptance Model (TAM) and the Theory of Reasoned Action (TRA), but its primary focus is to analyze the use of gamification in the field of marketing. Rather than focusing on the attitude towards a system, this model considers brand attitude, and the intention to use is substituted with the intention of participation. In this sense, the intention of involvement refers to the ongoing willingness to consistently utilize a gamified service. The concept incorporates social influence and enjoyment as supplementary aspects to enhance comprehension of gamification usage (Venkatesh & Davis, 2000).

Figure 2.2.1 Relevant Theoretical Models

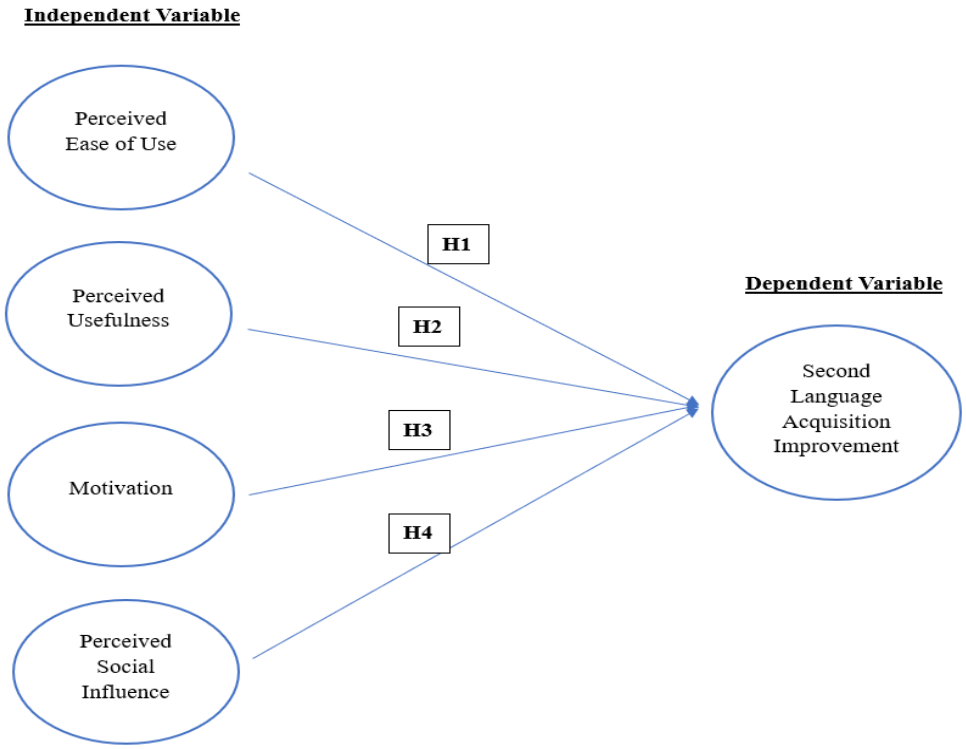


Adapted From: Yang, Asaad, & Dwivedi (2017).

This study is tested using the concept of the model and similar hypothesis but in a different context.

2.3 Proposed Theoretical/ Conceptual Framework

Figure 2.3.1 Conceptual Framework of the research



The diagram above illustrates the conceptual framework that integrates the TMA and TRA models to examine the correlation between dependent and independent variables in the research.

CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction

This chapter will discuss the several methodologies utilized in the study, including research design, data collection methods, data sampling techniques, instrumental design, measurement construction, data analysis, and data processing.

3.1 Research Design

A research design is a systematic framework that enables researchers to ensure the accuracy and reliability of the data obtained during a research project. This document establishes the steps required to get the essential data for the purpose of formulating or evaluating marketing research issues. Thus, this study employed quantitative and descriptive conceptual methodologies.

3.1.1 Quantitative Research

Quantitative research involves systematically collecting, examining, and numerically representation of organized data. This research establishes and confirms the causal relationship between the variables. The study aimed to assess the impact of perceived ease of use, perceived usefulness, motivation, and perceived social influence on the effectiveness of Duolingo in enhancing second language acquisition among tertiary students in Malaysia.

This research aims to determine the independent variables that have the most impact on the effects of Duolingo in improving second language learning among tertiary students in Malaysia.

3.1.2 Descriptive Research

This study utilized a descriptive research methodology. Section A of the questionnaire employed demographic profiles to describe a population based on important criteria. Descriptive research studies seek to analyze the characteristics of a certain population, including their background and personal details, to gain insight into groups of individuals or organizations.

3.2 Data Collection

The study exclusively relied on primary data as its source of information. The acquisition of primary data was carried out by collecting firsthand information that is relevant to the research topic.

3.2.1 Primary Data

In this study, primary data refers to the raw information obtained directly from the sources that were collected by the researcher. The purpose of collecting primary data is to obtain relevant information that is necessary to achieve the study objective. In addition, the collection of primary data is

crucial for uncovering information about the factors that would impact the enhancement of second language acquisition among Malaysia's tertiary students through the use of Duolingo. Therefore, in this study, primary data has been gathered by distributing survey questionnaires, which is a straightforward and reliable method.

3.3 Sampling Design

3.3.1 Target Population

The target population is the specific group of individuals who meet the necessary criteria and qualifications for the data analysis in the study. The target population consists of tertiary students in Malaysia who are currently pursuing Foundation, Diploma, Undergraduate, and Postgraduate studies. The specified age range is 16 to 26 years old and above, which corresponds to the typical age of university students. The rationale for choosing tertiary students as the target demographic is their higher likelihood of being exposed to Duolingo for enhancing second language acquisition. Therefore, this will enhance the dependability of the obtained outcomes.

3.3.2 Sampling Location

In order to simplify the data collection process, survey questionnaires have been distributed across various universities in Malaysia. This distribution is facilitated through online platforms such as WhatsApp and Instagram, as well as through direct face-to-face distribution to university students. Universities are chosen since they are the primary gathering places for

tertiary students and their location facilitates easy access to interact with the desired group.

3.3.3 Sampling Frame and Element

A sampling frame refers to a thorough and inclusive list or representation of the entire population, which serves as the basis for selecting a sample (Mweshi & Sakyi, 2020). The sampling element in this research consists of the respondents who participated in the questionnaire. The sampling element for this study consists of all tertiary students aged between 16 and 26 years old. The study aims to investigate the impact of Duolingo on enhancing the second language learning of tertiary students in Malaysia. Therefore, any college or university students who have prior experience with Duolingo are eligible to participate as possible respondents.

3.3.4 Sampling Technique

A sampling technique is a study methodology used to choose a subset of individuals from a larger population for investigation purposes. This study employed non-probability sampling, a method in which researchers choose sample elements without using a specified probability and without knowing if the selected people accurately represent the entire population (Mweshi & Sakyi, 2020). The study aims to target tertiary students, who are most likely to fall between the age range of 16 to 26 years old. Conversely, convenience sampling has been selected as the sample approach for the study. A convenience sample, as defined by Mweshi and Sakyi (2020), comprises persons who are easily accessible to the researcher and can offer the required

information. Furthermore, this method is cost-effective and convenient. However, its ability to generate results that accurately represent the entire population is dubious. Therefore, it is crucial to examine the impact of Duolingo on the enhancement of second language acquisition among tertiary students in Malaysia, considering that people may vary in their level of exposure to Duolingo or other language learning platforms.

3.3.5 Sampling Size

According to Lakens (2022), it is suggested that sample sizes bigger than 30 and fewer than 500 are generally suitable for most research purposes. To achieve a reliable solution using factor analysis, the research will select a sample size of 200 respondents.

3.4 Research Instrument

Research instruments are the tools utilized by a researcher to gather data and information in a research study. Furthermore, it has been designed to analyze factors, collect responses from participants, and streamline the process of data selection and analysis. The research focuses on investigating the effects of Duolingo on the improvement of Malaysia's tertiary students' second language acquisition. The research instrument used in the study is self-administered questionnaires, and Google form is utilized as a mean of designing, delivery and collecting the results of the questionnaires. The respondents will answer the questionnaire either through online or face-to-face methods.

3.4.1 Questionnaire Design

A clear and comprehensible structured questionnaire was developed for this investigation. The cover page of the survey questionnaire provided a concise overview of the investigation. Furthermore, the survey questionnaire is comprised of four (4) distinct sections, namely Section A, B, C, and D. Section A consists of general questions pertaining to the demographic information of the respondents, typically encompassing their gender and education level. Furthermore, Section B comprises the general inquiries of Duolingo and its practical implementations. Sections C and D comprise fundamental questions that are employed to determine the importance of each independent variable concerning the dependent variables. Measurements in the study are collected using a 5-Point Likert scale. Each participant is asked to choose a rank from the 5 available alternatives based on their satisfaction and preference to express their perspective. The measuring scale consists of a set of assertions, each associated with a range of response options that span from "strongly disagree" to "strongly agree".

Table 3.4.1 Summary of Measures

Variable	Number of Items	Measurement Scale
Perceived Ease of Use	4	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Perceived Usefulness	5	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Motivation	4	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Perceived Social Influence	4	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Improvement in Language Acquisition	4	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)

3.4.2 Pilot Test

The crucial stage in a research study is the pilot test, which aims to identify potential areas of concern and flaws in the research instruments. The goal of doing a pilot test is to improve the questionnaire to guarantee the accuracy and consistency of the gathered data. Furthermore, it can aid in detecting difficulties such as grammatical problems, spelling faults, and other inaccuracies. In this study, a total of 20 questionnaires were delivered to the selected participants to acquire a thorough examination of the questions. The Statistical Package for Social Science (SPSS) was employed to do a reliability assessment. The pilot test was evaluated using Cronbach's Alpha, and the findings are displayed below.

Table 3.4.2 Pilot Testing Result

Constructs	**Number of Items**	**Cronbach's Alpha**
Perceived Ease of Use	4	0.867
Perceived Usefulness	5	0.871
Motivation	4	0.928
Perceived Social Influence	5	0.933
Improvement in Language Acquisition	4	0.824

Source: Developed for the research

3.5 Construct Measurement

3.5.1 Origin of Construct

Construct	Sources
Improvement in Language Acquisition	• (Belda-Medina & Calvo-Ferrer, 2022)
Perceived Ease of Use	• (Szyszka, 2019) • (Indrawan et al., 2023)
Perceived Usefulness	• (Szyszka, 2019) • (Indrawan et al., 2023)
Motivation	• (Szyszka, 2019) • (Indrawan et al., 2023)
Perceived Social Influence	• (Szyszka, 2019)

Source: Developed for the research

3.5.2 Data Scale of Measurement

3.5.2.1 Nominal Scale

A nominal scale is used to categorize and identify variables that do not have any numerical value. The gender of the respondents in Section A has been precisely represented using a nominal scale, comprising two distinct categories: Male and Female.

3.5.2.2 Likert Scale

Section C and D contains data that is used to determine the general view of respondents on the constructs. This part utilized a 5-point Likert scale. An ordinal scale ranging from 1 to 5, with 1 representing Strongly Disagree and 5 representing Strongly Agree, is used to measure the level to which the respondent agrees with the questions.

3.6 Data Processing

Data processing is the act of organizing and manipulating data to make it suitable for research purposes. This entails tasks such as reviewing responses, editing, organizing, transcribing, and refining the data to guarantee its dependability and accuracy. Before doing data processing for the purpose of data validation, the researcher must verify that all survey questionnaires have been completed by the respondents.

3.6.1 Data Checking

Data editing will be performed after discovering any problems, ensuring that the data is converted into correct and reliable information. Consequently, any partial responses will be excluded from the gathered data. Furthermore, data editing plays a crucial role in upholding the research's standard by reducing inaccuracies.

3.6.2 Data Editing

Data editing will be conducted upon identifying any errors before the data is transformed into information that can be considered as accurate. Subsequently, any incomplete responses will be eliminated from the collected data. In addition, data editing contributes to maintaining the research's standard by minimizing errors.

3.6.3 Data Coding

During the data coding process, it is imperative to standardize and transform the data into numerical format. Each category in the surveys will be assigned a sequential number for classification purposes. In Questionnaire Section B, the scale of replies can be represented by numerical codes ranging from 1 to 5, indicating the degree of agreement with the statement, with 1 being strong disagreement and 5 representing a strong agreement.

3.6.4 Data Transcription

The purpose of data transcription is to examine the data via SPSS software. After importing the data into the SPSS software, it will analyze the data and generate a dependable result.

3.6.5 Data Cleaning

The objective is to verify the precision of the data and the input from the questionnaire in the SPSS software. Furthermore, the existence of inconsistencies in the data will diminish the degree of precision. Therefore, in this study, data cleansing is crucial to meticulously examine and preserve the integrity of the acquired data.

3.7 Data Analysis

Data analysis is a methodical procedure that involves the use of statistical or logical approaches to describe, illustrate, condense, summarize, and assess data. Readers may have misunderstandings as a result of an imprecise statistical study. Thus, SPSS is employed to evaluate the dependability, significance, descriptive analysis, and precision of data measures.

3.7.1 Descriptive Analysis

Descriptive analysis is the systematic examination and condensation of data to enhance comprehension of its attributes and patterns. Descriptive analysis involves transforming unprocessed data into a format that researchers can easily understand and evaluate. In addition, descriptive analysis provides detailed information about the characteristics of the population being studied. In addition, it includes the distribution of frequencies, measures of central tendency (such as the mean, mode, and median), and measures of dispersion (including the range, variance, and standard deviation).

3.7.2 Scale Measurement

The scale measurement is utilized to evaluate the reliability and precision of the questionnaire. The study utilized SPSS to conduct the reliability test.

3.7.2.1 Reliability Test

The reliability test is a quantitative evaluation that quantifies the extent of consistency and reliability of the study construct. Furthermore, researchers utilize Cronbach's Alpha, a statistical metric that quantifies the extent of consistency and dependability of data. A higher coefficient value signifies a higher level of consistency and reliability.

Table 3.7.2.1 Range of Cronbach's Alpha Value

Coefficient Range	Strength of Association
< 0.6	Low
0.6 to < 0.7	Moderate
0.7 to < 0.8	Relatively High
0.8 to < 0.9	Reliable
> 0.9	Excellent

Source: Taber, K. S. (2017). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education

3.7.3 Inferential Analysis

Inferential analysis refers to the systematic method of deriving conclusions or creating predictions by utilizing the data that is currently accessible. This study utilizes inferential analysis to determine the validity of the hypothesis by calculating the correlation between the variables.

3.7.3.1 Multiple Regression Analysis

Multiple regression analysis is a statistical method used to investigate the linear relationship between a dependent variable and multiple independent variables. Furthermore, it assists researchers in ascertaining the existence of a correlation between the dependent variable and the four independent variables. Moreover, multiple regression analysis is appropriate for utilization when all dependent and independent variables can be quantified using the identical scale. Furthermore, the ANOVA test results and coefficient value will be determined at the end of the analysis test.

The formula of multiple regression analysis:

Y= a + βX1, + βX2, + βX3+ .....+ β.X.

Whereby,

Y= Dependent variable a= Constant

ß, = Coefficient associated with the independent variables

X, = Independent variables

Equation:

YILA = β1PEU + β2PU + β3HM + β4PSI

Whereby:

ILA = Improvement in Language Acquisition

PEU = Perceived Ease of Use

PU = Perceived Usefulness

HM = Motivation

PSI = Perceived Social Influence

3.8 Conclusion

Concisely, this chapter offers a brief overview of the research methodology. A total of 200 questionnaires will be distributed to the targeted respondents, and all the collected data will be entered into the SPSS software for analysis and interpretation. Chapter 4 will include a comprehensive examination of the statistical results obtained from the collected data.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

The research will employ the SPSS software to analyze and generate conclusions from the obtained data. This chapter will present a comprehensive examination and clarification of the gathered data, encompassing the demographic characteristics and overall details of the participants. The data will be displayed using tables and graphs, using percentages. In addition, the chapter will focus explicitly on the results of reliability tests, as well as the independent and dependent variables in the Multiple Regression analysis and hypothesis testing.

4.1 Descriptive Analysis

4.1.1 Respondents' Demographic Profile

There are total of four (4) questions involved in this section which are gender, age, education level, and race/ ethnicity.

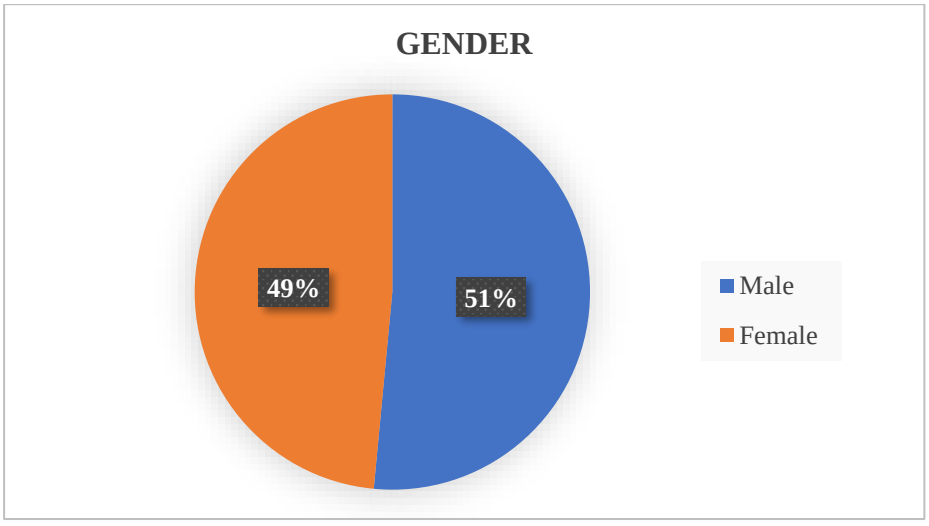
4.1.1.1 Gender

Table 4.1.1.1 Results of Respondent Based on Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	97	48.5	48.5	48.5
Male	103	51.5	51.5	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.1.1 Percentage of Respondent Based on Gender



Source: Developed from the research

According to the Table and Figure 4.1.1.1 above, 51% out of the 200 respondents are male, which is equivalent to 103 respondents. The remaining 49% are females, which is equivalent to 99 respondents.

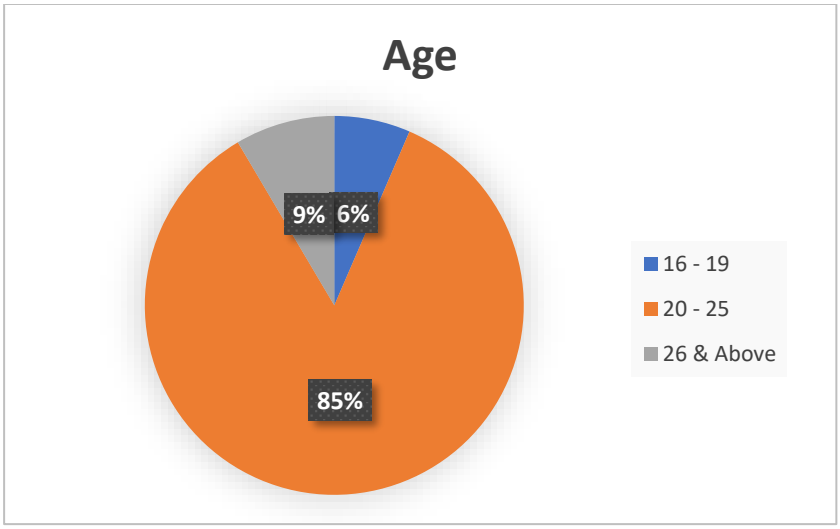
4.1.1.2 Age

Table 4.1.1.2 Results of Respondent Based on Age

	Frequency	Percent	Valid Percent	Cumulative Percent
16 - 19	13	6.5	6.5	6.5
20 - 25	170	85.0	85.0	91.5
26 & above	17	8.5	8.5	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.1.2 Percentage of Respondent Based on Age



Source: Developed from the research

According to Table and Figure 4.1.1.2, 170 out of the 200 respondents age between 20 – 25 years old (85%). Whereas only 13 respondents age between 16 – 19 years old (6%) and 17 respondents aged 26 years old and above (9%)

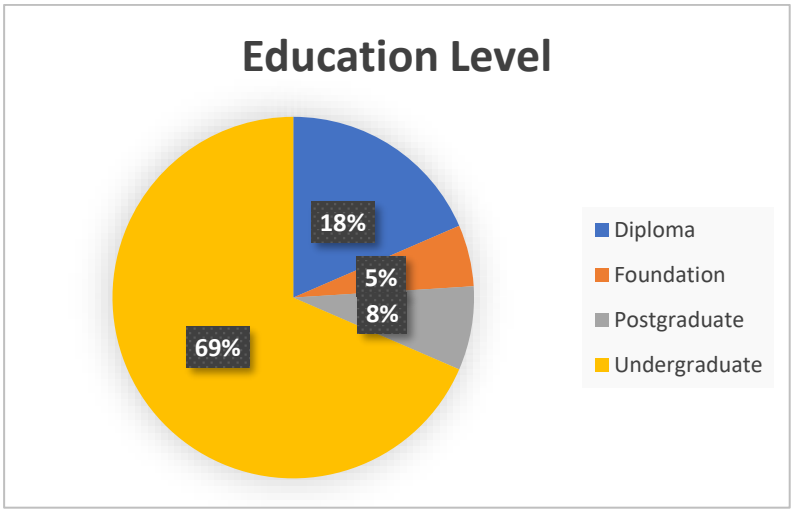
4.1.1.3 Education Level

Table 4.1.1.3 Result of Respondent Based on Education Level

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	37	18.5	18.5	18.5
Foundation	11	5.5	5.5	24.0
Postgraduates	15	7.5	7.5	31.5
Undergraduates	137	68.5	68.5	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.1.3 Percentage of Respondent Based on Education Level



Source: Developed from the research

According to Table and Figure 4.1.1.3, 69% of the respondents are undergraduates, which shows that 137 respondents are currently pursuing a degree in university. Besides that, 18% of the respondents, which are 37 respondents are taking Diploma. Lastly, there are 11 respondents (5%) who are currently in Foundation and 15 respondents (8%) who are taking postgraduate.

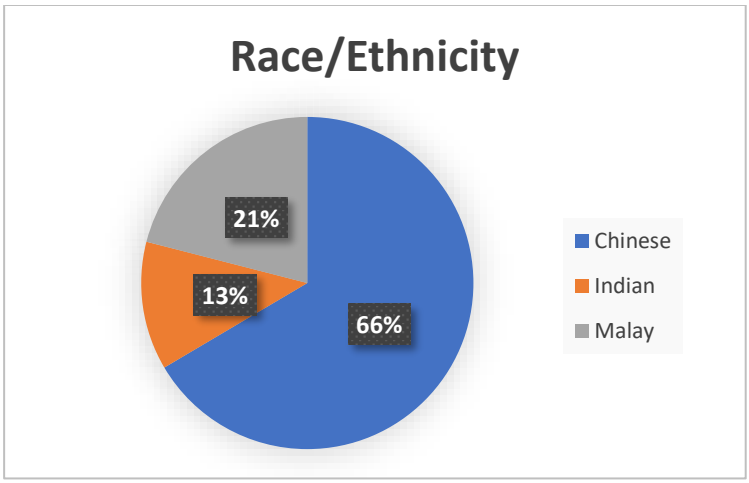
4.1.1.4 Race/Ethnicity

Table 4.1.1.4 Result of Respondent Based on Race/ Ethnicity

	Frequency	Percent	Valid Percent	Cumulative Percent
Chinese	133	66.5	66.5	66.5
Indian	25	12.5	12.5	79.0
Malay	42	21.0	21.0	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.1.4 Percentage of Respondent Based on Race/ Ethnicity



Source: Developed from the research

According to Table and Figure 4.1.1.4, majority of the respondents are Chinese, where they equivalent to 66% (133) of the total respondents. Whereas Malay and Indian respondents hold 21% (42) and 13% (25) of the total respondents.

4.1.2 Respondents' General Information

There are four questions covered in the general information section. The questions including the respondent's level of exposure to Duolingo, how often they use, the purpose of their usage, and how they know Duolingo in improving second language acquisition.

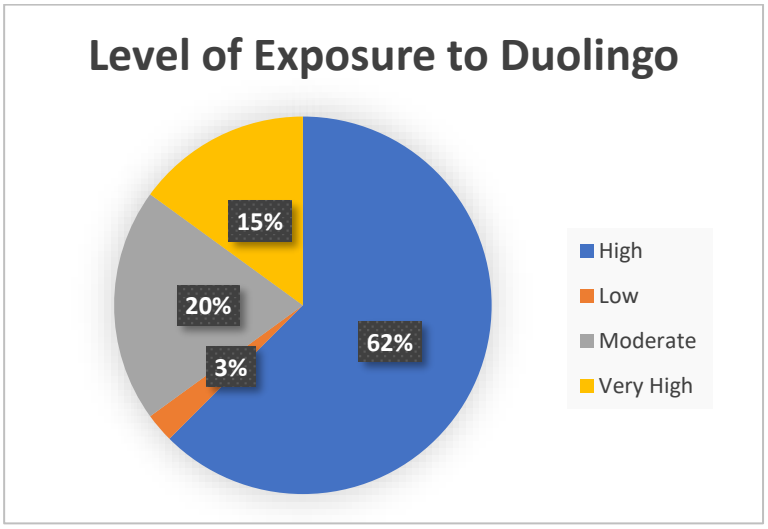
4.1.2.1 What is your level of exposure to Duolingo?

Table 4.1.2.1 Statistic Results of Respondent's Level of Exposure to Duolingo

	Frequency	Percent	Valid Percent	Cumulative Percent
High	125	62.5	62.5	62.5
Low	5	2.5	2.5	65.0
Moderate	40	20.0	20.0	85.0
Very High	30	15.0	15.0	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.2.1 Percentage of Respondent's Level of Exposure to Duolingo



Source: Developed from the research

According to Table and Figure 4.1.2.1, 125 out of 200 respondents (62%) have a high exposure to Duolingo and have a general knowledge on what are Duolingo and how its function, while 30 respondents (15%) showed that they have very high exposure to Duolingo and are more proficient in using Duolingo. Besides that. 40 respondents (20%) stated that they only have a moderate exposure to Duolingo, while only 5 respondent (3%) has low exposure to Duolingo.

4.1.2.2 How often do you use Duolingo?

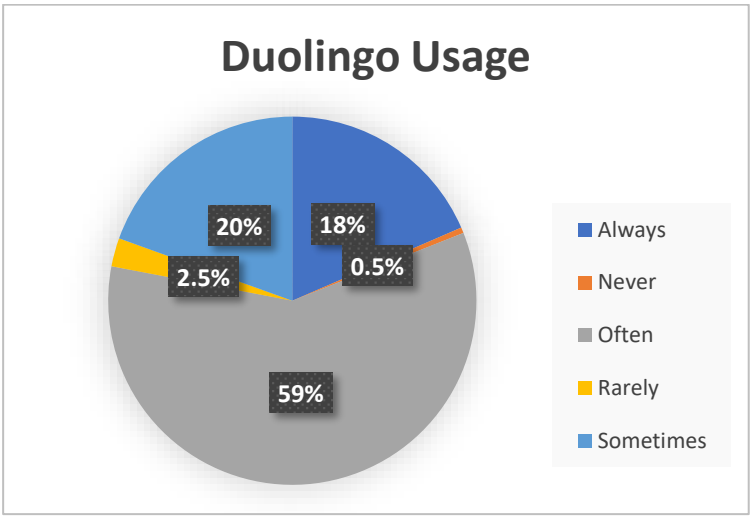
Table 4.1.2.2 Statistic Result of Respondents' Duolingo Usage

	Frequency	Percent	Valid Percent	Cumulative Percent
Always	37	18.5	18.5	18.5
Never	1	0.5	0.5	19.0
Often	118	59.0	59.0	78.0

Rarely	5	2.5	2.5	80.5
Sometimes	39	19.5	19.5	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.2.2 Percentage of Respondents' Duolingo Usage



Source: Developed from the research

According to *Table* and *Figure 4.1.2.2,* 118 out of 200 respondents (59%) often utilized Duolingo to improve their second language acquisition. Besides that, 37 respondents (18%) stated they always utilized Duolingo, while 5 respondents (2.5%) are rarely and 39 respondents (20%) only sometimes utilized Duolingo. But there is 1 respondent (0.5%) never utilized Duolingo.

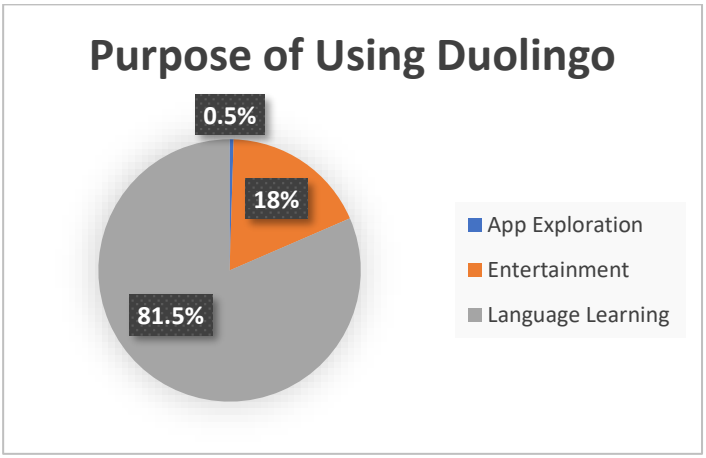
4.1.2.3 What is the purpose of you using Duolingo?

Table 4.1.2.3 Statistic Result of Respondents' Purpose of Using Duolingo

	Frequency	Percent	Valid Percent	Cumulative Percent
App Exploration	1	0.5	0.5	0.5
Entertainment	36	18.0	18.0	18.5
Language Learning	163	81.5	81.5	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.2.3 Percentage of Respondents' Purpose of Using Duolingo



Source: Developed from the research

According to Table and Figure 4.1.2.3, 163 out of 200 respondents (81.5%) using Duolingo for language learning. Besides that, there are also 36 respondents (18%) stated that they use Duolingo as an entertainment, while there is also 1 respondent (0.5%) use Duolingo just only for exploration.

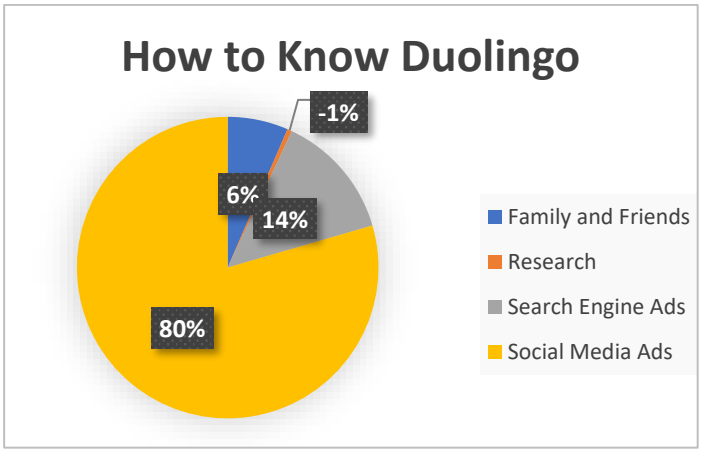
4.1.2.4 How do you know about Duolingo?

Table 4.1.2.4 Statistic Results of How Did Respondents Know About Duolingo

	Frequency	Percent	Valid Percent	Cumulative Percent
Family and Friends	13	6.5	6.5	6.5
Research	1	0.5	0.5	7.0
Search Engine Ads	27	13.5	13.5	20.5
Social Media Ads	159	79.5	79.5	100.0
Total	200	100.0	100.0	

Source: Developed from the research

Figure 4.1.2.4 Percentage of How Did Respondents Know About Duolingo



Source: Developed from the research

According to Table and Figure 4.1.2.4, 163 out of 200 respondents (80%) know Duolingo by social media ads, 27 respondents (14%) are by search engine ads, and only 1 respondent is known by research. On the other hand, 13 respondents (6%) know Duolingo by their family and friends.

4.1.3 Central Tendencies Measurement of Conducts

The central tendency analysis aims to calculate the mean score for five (5) interval scales of construct, which include the four independent variables (Perceived Ease of Use, Perceived Usefulness, Motivation, and Perceived Social Influence), as well as the dependent variable (Improvement in Language Acquisition). The average values for all statements are computed using SPSS software. Additionally, a 5-point Likert scale is employed to measure responses, ranging from "Strongly Disagree" to "Strongly Agree".

4.1.3.1 Perceived Ease of Use

Table 4.1.3.1 Central Tendencies Measurement of Constructs: Perceived Ease of Use

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. The Interaction with Duolingo is clear and understandable.	0.5	13.0	1.5	41.5	43.5	4.15	3
2. Using Duolingo interface does not require a lot of mental effort.	0.5	14.0	1.5	39.5	44.5	4.14	4
3. I find Duolingo easy to use.	0.0	5.0	1.0	44.5	49.5	4.39	1

4. I find it easy to get the interface of Duolingo to do what I want it to do.	0.0	5.0	1.0	54.5	39.5	4.29	2

Source: Developed from the research

According to Table 4.1.3.1, the independent variable consists of four (4) statement and the mean score range between 4.15 to 4.39. Based on the table above, the first statement shows a mean score of 4.15, which is in third position. Next, the second statement shows a mean score of 4.14, which is positioned last. Moreover, the third statement shows a mean score of 4.39, which is positioned at first. Lastly, the fourth statement shows a mean score of 4.29 and is positioned at the second.

4.1.3.2 Perceived Usefulness

Table 4.1.3.2 Central Tendencies Measurement of Constructs: Perceived Usefulness

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. Using Duolingo enables me to accomplish more with regards to learning.	0.0	5.0	0.5	43.0	51.5	4.41	1
2. I feel more effective with regards to learning when using Duolingo.	0.0	0.0	16.0	43.5	40.5	4.25	4

3. I find Duolingo useful.	0.0	5.0	1.0	56.5	37.5	4.27	3
4. Using Duolingo is useful for purpose of exercise.	0.0	0.0	7.5	53.0	39.5	4.32	2
5. Using Duolingo makes it easier for me to start learning.	0.0	13.5	2.0	42.5	42.0	4.13	5

Source: Developed from the research

According to Table 4.1.3.2, the independent variable consists of five (5) statements and the mean score range between 4.14 to 4.41. Based on the table above, the first statement shows a mean score of 4.41, which positioned at first. Next, the second statement shows a mean score of 4.25, which is positioned at fourth. Moreover, the third statement shows a mean score of 4.27, which is in third. Furthermore, the fourth statement shows a mean score of 4.32 and is positioned at second. Lastly, the fifth statement shows a mean score of 4.13 and is positioned at last.

4.1.3.3 Motivation

Table 4.1.3.3 Central Tendencies Measurement of Contracts: Motivation

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. I think Duolingo is a good App for self-practice.	0.0	8.5	7.5	46.5	37.5	4.13	4

2. I think the Duolingo application can enhance my Motivation to learn languages.	0.0	0.0	15.0	50.0	35.0	4.20	2
3. I feel motivated to play Duolingo when my friends get higher score or finish more units than me.	0.0	0.0	14.0	44.0	42.0	4.28	1
4. I feel satisfied when I can accomplish difficult questions when using Duolingo.	0.0	8.5	6.0	48.0	37.5	4.15	3

Source: Developed from the research

According to Table 4.1.3.3, the independent variable consists of four (4) statement and the mean score range between 4.13 to 4.28. Based on the table above, the first statement shows a mean score of 4.13, which positioned at last. Next, the second statement shows a mean score of 4.20, which is positioned at third. Moreover, the third statement shows a mean score of 4.28, which is in first position. Lastly, the fourth statement shows a mean score of 4.15 and is positioned at third.

4.1.3.4 Perceived Social Influence

Table 4.1.3.4 Central Tendencies Measurement of Constructs: Perceived Social Influence

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. People who I appreciate would encourage me to use Duolingo.	0.0	0.0	14.0	44.0	42.0	4.28	2
2. People who I appreciate would encourage me to use Duolingo.	0.0	8.5	6.0	48.0	37.5	4.15	4
3. My friends would think using Duolingo is a good idea.	0.0	8.5	5.5	45.0	41.0	4.19	3
4. People who influence my attitudes would recommend Duolingo.	0.0	0.0	6.0	53.5	40.5	4.35	1

Source: Developed from the research

According to table 4.1.3.4, the independent variable consists of four (4) statement and the mean score range between 4.15 to 4.35. Based on the table above, the first statemen shows a mean score of 4.28, which positioned at second. Next, the second statement shows a mean score of 4.15, which is positioned at last. Moreover, the third statement shows a mean score of 4.19 and is in third position. Lastly, the fourth statement shows a mean score of 4.35 and it's positioned at first.

4.1.3.5 Improvement in Language Acquisition

Table 4.1.3.5 Central Tendencies Measurement of Constructs: Improvement in Language Acquisition

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. Using Duolingo has increased my vocabulary in the target language.	0.0	5.0	1.5	33.0	60.5	4.49	1
2. Duolingo's personalized learning approach learning approach has effectively improved my understanding of the target language's grammar.	0.0	5.0	10.5	56.0	28.5	4.08	4
3. I am more confident in holding basic conversation in the target language after using Duolingo for a period of time.	0.0	0.0	14.0	46.5	39.5	4.26	3
4. Duolingo's exercise have helped me develop reading comprehension skills in the target language.	0.0	0.5	15.5	38.0	46.0	4.30	2

Source: Developed from the research

According to Table 4.1.3.5, the dependent variable consists of four (4) statement and the mean score range between 4.08 to 4.49. Based on the table above, the first statement shows a mean score of 4.49, which positioned at first. Next, the second statement shows a mean score of 4.08, which is positioned at last. Furthermore, the third statement shows a mean score of 4.26, which is in third position. Lastly, the fourth statement shows a mean score of 4.30 and is positioned at second.

4.2 Scale Measurement

4.2.1 Reliability Analysis Test

Table 4.2.1 Summary of Reliability Analysis Test Results

Variables	Number of Items	Mean	Standard Deviation	Cronbach's Alpha Value	N
Perceived Ease of Use	4	16.95	2.914	0.841	200
Perceived Usefulness	5	21.37	2.790	0.781	200
Motivation	4	16.76	2.667	0.868	200
Perceived Social Influence	4	16.96	2.489	0.824	200
Improvement in Language Acquisition	4	17.12	2.256	0.759	200

Source: Developed from the research

The validity and reliability of the variables in this study have been assessed using Cronbach's Alpha. There are a total of 21 questions being measured across 5 distinct variables. All 21 questions have been subjected to reliability analysis in order to determine the Cronbach's Alpha value using SPSS software.

According to table 4.2.1, the reliability analysis test results for all five variables have surpassed the minimum requirement of achieving reliability, which is a Cronbach's Alpha value of 0.6. Since all variables have surpassed the minimum value of 0.6, it demonstrates that the measurement scale is both trustworthy and consistent. Furthermore, Motivation exhibits the greatest level of dependability compared to all other variables, as indicated by its highest Cronbach's Alpha score of 0.868.

4.3 Inferential Analysis

4.3.1 Multiple Linear Regression Analysis

Multiple linear regression analysis is a statistical technique that is created and employed to better understand the correlation between two or more independent variables and one continuous dependent variable. Initial investigations were performed to verify that there were no breaches of the conditions of normality, linearity, multicollinearity, independence of errors, and homoscedasticity. The following table displays the outcome of the multiple linear regression analysis:

Table 4.3.1 Mode Summary of Multiple Linear Regression

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.914[a]	.836	.833	0.23065	1.888

Source: Developed from the research

a. Predictors: (Constant), PSI, PU, PEU, M

b. Dependent Variable: ILA

According to Table 4.3.1, the correlation coefficient (R) is roughly 0.914[a], which suggests a strong and statistically significant positive relationship between the independent and dependent variables. The coefficient of determination (R^2) is approximately 0.836, suggesting that roughly 83.6% of the variability in the dependent variable can be explained by the independent variables in the model. The Adjusted R-squared, which accounts for the number of predictors in the model, is approximately 0.833. This score shows that, after controlling for the number of predictors, about 83.3% of the variation in the dependent variable can be explained by the model. The Durbin-Watson statistic has a value of around 1.888. The goal of this statistic is to detect the presence of autocorrelation in the residuals (errors) of the regression model. A number close to 2 suggests a lack of significant autocorrelation.

Table 4.3.1.1 Summary of ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	52.946	4	13.237	248.810	.000[b]
Residual	10.374	195	0.053		
Total	63.320	199			

Source: Developed from the research

According to the ANOVA Table 4.3.1.1, the P-value has a significant level lower than 0.05. This proves that the ANOVA model indicates that the four independent variable (Perceived Ease of Use, Perceived Usefulness, Motivation, and Perceived Social Influence) are significant in explain the dependent variable, which is the Improvement in Language Acquisition.

Table 4.3.1.2 Table of Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.579	0.137		4.212	0.000		
Perceived Ease of Use	0.279	0.058	0.361	4.850	0.000	0.152	6.584
Perceived Usefulness	0.288	0.068	0.284	4.205	0.000	0.184	5.446
Motivation	-0.196	0.084	-0.232	-2.340	0.020	0.085	11.706
Perceived Social Influence	0.498	0.089	0.549	5.604	0.000	0.087	11.432

Source: Developed from the research

a. Dependent Variable: ILA

Based on Table 4.3.1.2, the following linear equation is formed as:

Improvement in Language Acquisition = 0.579 + 0.279 (Perceived Ease of Use) + 0.288 (Perceived Usefulness) + (-0.196) (Motivation) + 0.498 (Perceived Social Influence)

Table 4.3.1.2 indicates that the independent factors, Perceived Ease of Use, Perceived Usefulness, and Perceived Social Influence, have a significant relationship with the improvement of language acquisition in tertiary students. The reason for this is that the p-value for all three variables is less than 0.05, with all of them being valued at 0.000. These three variables likewise exhibit a positive correlation, meaning that an increase in both variables can result in an increase in the dependent variable as well. However, it can be demonstrated that Motivation has a negative coefficient of -0.196, however, its p-value is below the requirement of 0.05 (p-value = 0.020). Despite the negative coefficient, the statistically significant p-value provides sufficient evidence to reject the null hypothesis, which proposes no association between motivation and tertiary students' second language acquisition.

The linear equation above indicates that the regression coefficient for Perceived Ease of Use, Perceived Usefulness, and Perceived Social Influence is positive. This demonstrates that if one of these three independent variables increases by one unit while the others stay constant, the level of improvement in tertiary students' language acquisition will increase by the corresponding Beta value. In contrast, motivation has a negative correlation, indicating that an increase of one unit in motivation, while holding other independent variables constant, will result in a decline in the level of academic writing proficiency among undergraduates. Finally, the purpose of the standardized coefficient beta is to quantify the extent of influence between variables once they have been incorporated into an equation. According to the data provided, Perceived Social Influence has the highest level of influence on the enhancement of language learning in tertiary students, with a value of 0.549, surpassing other independent factors.

4.3.2 Hypothesis Testing

This research aims to examine the variables that could influence the successful improvement of language acquisition among tertiary students by utilizing Duolingo. Four hypotheses have been formulated for examination in the investigation. The objective of the analysis is to determine the validation of the hypothesis. According to the findings presented in Table 4.3.2, all four hypotheses (PEU, PU, M, PSI) are supported.

Table 4.3.2 Summary of Hypothesized Relationship

Hypothesis	Outcome (Multiple Linear Regression Analysis Results)	Determination
H1: Perceived ease of use of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.	Significant value: 0.000 P-value < 0.05	Supported
H2: Perceived usefulness of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.	Significant value: 0.000 P-value < 0.05	Supported
H3: Motivation of using Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.	Significant value: 0.020 P-value < 0.05	Supported

H4: Perceived social influence of Duolingo has a significant relationship with the effectiveness in improving second language acquisition among Malaysia's tertiary students.	Significant value: 0.000 P-value < 0.05	Supported

Source: Developed from the research

4.4 Conclusion

In conclusion, the study employed SPSS software to collect and produce the essential data analysis required for the chapter and research. Furthermore, the questionnaire was completed by a total of 200 participants, and the data was analyzed using both descriptive and inferential methods. Therefore, the analysis and interpretation of the data and findings will be further examined in Chapter 5.

CHAPTER 5: DISCUSSION AND IMPLICATION

5.0 Introduction

The main contribution of this chapter is in the interpretations of the findings gathered from the analysis of the survey research. Furthermore, this chapter includes an analysis of the research's limitations during the progression, as well as recommendations for future studies.

5.1 Discussions on Major Findings

The primary objective of the research is to identify the factors that influence the effectiveness of Duolingo in improving the second language acquisition of tertiary students. Four hypotheses were formulated for the investigation. Table 4.3.2 indicates that the findings of the hypotheses testing validate all four (4) hypotheses.

5.1.1 Finding on Hypothesis

5.1.1.1 Perceived Ease of Use of Duolingo and Improvement in Language Acquisition

The results of H_1 demonstrate a significant positive relationship between the perceived ease of use of Duolingo and improvements in language acquisition among tertiary students. The beta value of 0.279 and the p-value of 0.000, which is less than 0.05, further support this relationship. According to a study conducted by Szyszka (2019), the use of AI-based technologies

such as Duolingo in language learning has completely revolutionized the traditional approach to acquiring English language proficiency. This enables users to enhance their language acquisition through a convenient and user-friendly platform. Additionally, the research conducted by Ünal & Güngör (2021) asserts that user-friendly and innovative mobile applications have the potential to cultivate students' positive attitudes toward mobile learning. Therefore, the results of H_1, which indicate that the perceived ease of use is positively related to the improvement of second language learning in tertiary students, are validated.

5.1.1.2 Perceived Usefulness of Duolingo and Improvement in Language Acquisition

The findings on H_2 demonstrate a significant positive relationship between the perceived usefulness of Duolingo and the improvement in language acquisition among tertiary students. The beta value of 0.288 and the p-value of 0.000, which is less than 0.05, further support the relationship. Irzawati & Unamo (2023) conducted a study that found Duolingo offers several features that correspond to the diverse demands and preferences of individual users. An instance of this is the Learn feature, which offers users a variety of educational materials and practice tasks. The resources include a wide range of subjects, spanning from basic to advanced levels. Their approach encompasses a thorough analysis of grammar, presented in the form of a manual, along with captivating and brief narratives that explore these subjects. According to the survey, users perceive these functions as highly beneficial in their process of acquiring a second language. Szyszka (2019) conducted a study that demonstrates the efficacy of the gamification concept in Duolingo, indicating that it enhances the app's usefulness by making it more interesting for users. Therefore, the results of H_2, which demonstrate a positive correlation between perceived usefulness and the improvement of second language acquisition in tertiary students, are validated.

5.1.1.3 Motivation of Using Duolingo and Improvement in Language Acquisition

The findings on H_3 indicated that Perceived Usefulness of Duolingo has a negative but significant relationship with tertiary students' improvement in language acquisition, with a beta value of -0.196 and the p-value of 0.020, which is lower than 0.05. Based on the research conducted by J. K. M. Ali et al. (2023), it can be proven that students are more likely to include AI tools into their academic routines when their interactions with AI tools provide both stimulating and rewarding intrinsic motivation, which results in improvement in academic writing proficiency. Another study by Indrawan et al. (2023), shows that Duolingo can maintain the engagement and progress of students in their language learning endeavors by consistently providing fresh sources of motivation, incorporating practical situations, and customizing the learning experience to suit each unique learner. Hence, H_3 stating that motivation have a significant relationship with improvement of tertiary students' second language acquisition is supported.

On the other hand, the findings on H_4 shows a negative relationship. According to Al Shuraiaan et al. (2024), there are a few reasons why there is a negative relationship. Firstly, it is possible that individuals who are strongly motivated to learn a language may establish impractical expectations for themselves when use language learning tools such as Duolingo. If individuals don't see the rapid growth they had expected, their motivation may diminish (Al Shuraiaan et al., 2024). Furthermore, the incorporation of game elements in Duolingo, although initially inspiring, can potentially result in a decline in motivation over time if learners see inadequate progress or if the novelty diminishes. In addition, motivation alone may not be adequate for successful language learning; other elements such as consistency, practice tactics, and exposure to real language use also have significant roles to play. Hence, although motivation is crucial for achieving success in language learning, its inverse correlation with progress

in language acquisition via Duolingo may suggest the intricate interaction among motivation, learning tactics, and the efficacy of the learning platform.

5.1.1.4 Perceived Social Influence of Duolingo and Improvement in Language Acquisition

The findings on H_4 demonstrate a significant positive correlation between the perceived usefulness of Duolingo and the improvement in language acquisition among tertiary students. The beta value of 0.498 and the p-value of 0.000, which is less than 0.05, further support this relationship. Hamari & Koivisto (2015) shown that perceived social influence had a favorable impact on individuals' attitudes, leading to increased motivation and encouragement to improve performance. On the other hand, Skare & Riberio Soriano (2021) states that social influence from peers, teachers, or respected individuals within the academic community can have a cumulative impact, motivating students to exert more effort in attaining academic success. Therefore, the finding of H_4, which suggests that perceived social influence is strongly correlated with the improvement of second language learning among university students, is validated.

5.1.2 Conclusion on Findings on Hypothesis

In a nutshell, the variables –Perceived Ease of Use, Perceived Usefulness and Perceived Social Influence have been shown to have positive and significant relationships with the improvement of second language acquisition in tertiary students. On the other hand, Motivation shows a negative but significant relationship. Furthermore, H_1, H_2, H_3 and H_4 have effects on improvement of tertiary students' second language acquisition.

5.2 Implications of Study

This study provides insights for academic institutions. The data collected from the questionnaire surveys and the analysis of the results enhance the comprehension of the various factors associated with Duolingo, including perceived ease of use, perceived usefulness, motivation, and perceived social influence. It is definite useful to these institutions who are determined in contributing to the elevation of student's improvement in language acquisition and overall proficiency. Besides, the research findings may allow these institutions to improve the utilization of Duolingo in academic and tailored them to the needs for students. Moreover, the finding's results indicate that perceived ease of use, perceived usefulness, motivation, and perceived social influence of Duolingo have significant relationship with improvement of tertiary students' second language acquisition.

Through the results of perceived ease of use, it shows that it has a significant impact on improvement of tertiary students' second language acquisition. With the accepted and supported hypothesis, this research's insights may encompass that the perceived ease of use is a critical component that influences students' engagement with the platform. Improvements to the user interface and navigation can simplify the learning process, while tutorials and support tools can assist students in properly navigating the platform. This variable enhances the comprehension of technology acceptance models by shedding light on the correlation between usability variables and students' views of ease of use in language learning platforms, from a theoretical standpoint.

Moreover, the results also indicated that perceived usefulness of Duolingo has a significant influence on the improvement of tertiary students' second language acquisition. The perceived usefulness of Duolingo significantly influences students' attitudes and intentions when it comes to using it for language acquisition. Highlighting the practicality and advantages of the platform can increase students' enthusiasm to participate in language learning activities. Practical implications

involve presenting concrete examples and statements to demonstrate the effectiveness of Duolingo in assisting students in attaining their language learning objectives. This study on perceived usefulness contributes to developments in technology acceptance models by investigating its impact on students' adoption and usage behavior.

Furthermore, the results show that tertiary students are more likely to engage in utilizing Duolingo in their language acquisition journey due to the motivation of using the platform. Motivation has a crucial role in students' level of involvement with Duolingo and their subsequent achievements in language learning. Creating activities that are captivating, demanding, and in line with students' preferences can promote internal drive, while incorporating incentive structures and goal-setting procedures can boost external drive. Theoretical implications encompass advancements in motivation theories, specifically in comprehending the interplay between intrinsic and extrinsic motivating elements in influencing students' involvement with technology-based language learning platforms.

Lastly, the results indicated that perceived social influence of Duolingo has a significant influence on the improvement of tertiary students’ second language acquisition. The significance of peer dynamics and social connectivity in students' usage behavior and language learning experiences inside Duolingo is emphasized by perceived social influence. Facilitating chances for peer engagement, collaboration, and feedback may foster a sense of community and mutual assistance among students. This variable enhances the progress of social learning theory by investigating the impact of social norms, peer dynamics, and social comparison processes on students' motivation, engagement, and learning outcomes in online learning settings.

5.3 Limitations and Recommendations of Study

Future researchers should take into account potential limitations that may arise in this study. A limitation of this study is the absence of qualitative research in the process of collecting data. Quantitative research primarily investigates the correlation between independent and dependent variables, but it does not provide insights into the underlying reasons behind respondents' decision-making.

Quantitative research generates statistical results that can only be achieved by utilizing SSPS software. Furthermore, the participants are constrained by a restricted range of options to select from, perhaps resulting in an imprecise outcome in qualitative research. The respondents are limited to selecting from the provided answers in the questionnaire, regardless of the possibility of having other responses to the questions. Therefore, to achieve more precise and detailed findings for the study, it is recommended that the researchers employ a cross-sectional study, which combines qualitative research methods with quantitative research over a particular duration. The rationale behind this is that qualitative research possesses the capacity to offer a comprehensive comprehension of a subject, encompassing dependable facts, while actively involving individuals. Hence, it is recommended for researchers to employ a combination of qualitative and quantitative research approaches in future investigations. This methodology allows for the gathering of more comprehensive and intricate data from qualitative participants, while simultaneously decreasing the probability of participant misunderstanding during questionnaire completion.

5.4 Conclusion

In conclusion, the research has successfully accomplished the objective of examining the factors that contribute to the utilization of Duolingo to improve second language acquisition among tertiary students. Additionally, it has investigated the connections between these factors and the outcomes they influence. Upon conducting the study, it was discovered that each independent variable had a substantial influence on the dependent variable. Therefore, several recommendations have been proposed for future researchers as a guide when conducting similar research. Additionally, other institutions are encouraged to thoroughly examine the research to gain a better understanding of the factors that could impact the improvement of second language acquisition among tertiary students using Duolingo.

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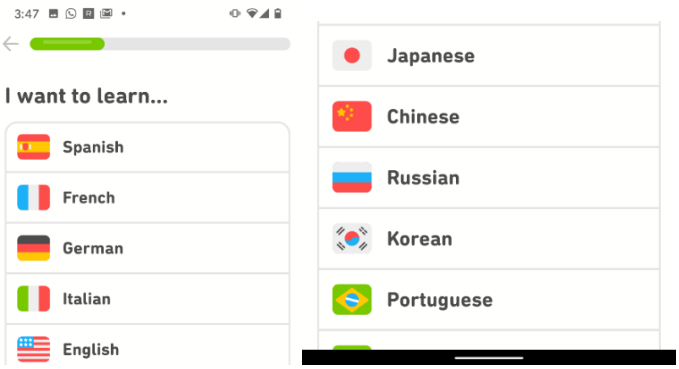
Appendices

Appendix A: Literature Review

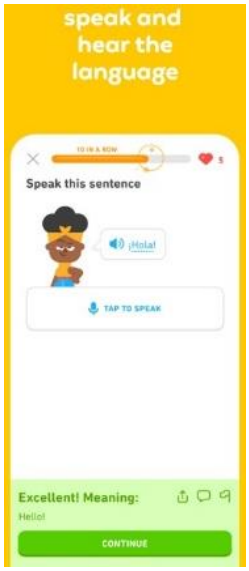
Appendix 2.1.1.1 Duolingo's Logo



Appendix 2.1.1.2 Duolingo provide several languages for user

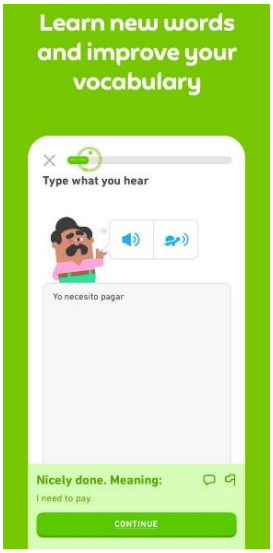
Appendix 2.1.1.3 A screenshot of translation exercise

Appendix 2.1.1.4 A screenshot of matching exercise

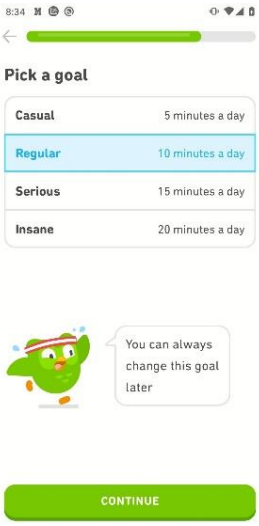


Appendix 2.1.1.5 A screenshot of speaking exercise

Appendix 2.1.1.6 A screenshot of pairing exercise

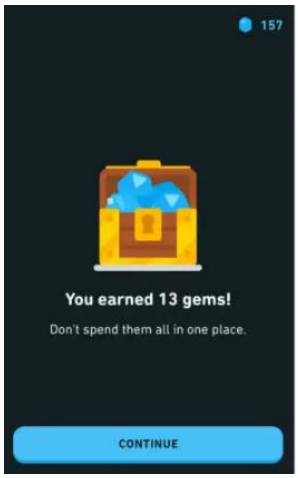


Appendix 2.1.1.7 A screenshot of listening exercise

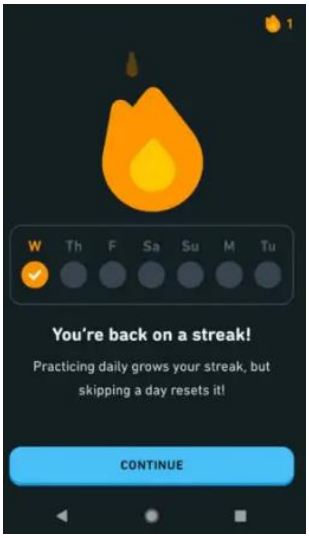


Appendix 2.1.1.8 Screenshot of setting target goal before learning

Appendix 2.1.1.9 Screenshot of Duolingo understanding learner level



Appendix 2.1.2.1 Screenshot of rewards after completed exercise

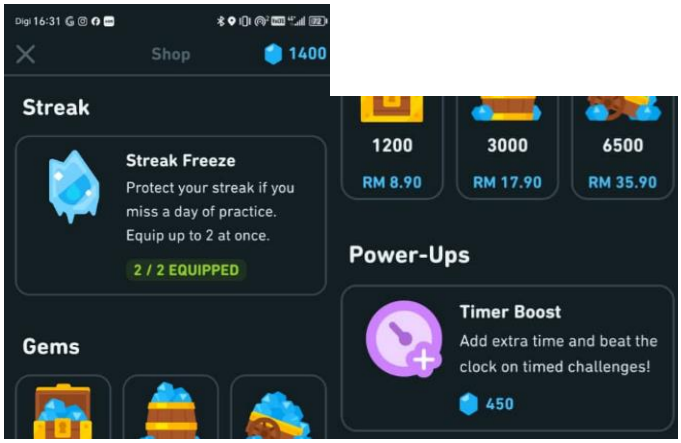


Appendix 2.1.2.2 Screenshot of streak after completed daily exercise

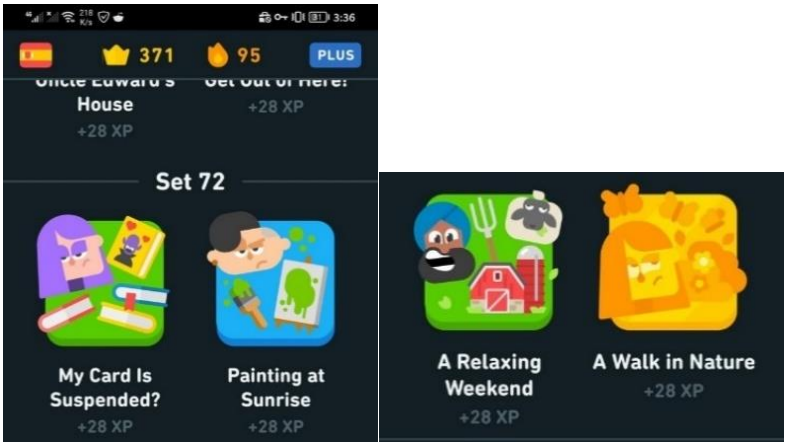
Appendix 2.1.2.3 Screenshot of immediate feedback while doing exercise

Appendix 2.1.2.4 Screenshot of Duolingo's entertaining learning progress app layout

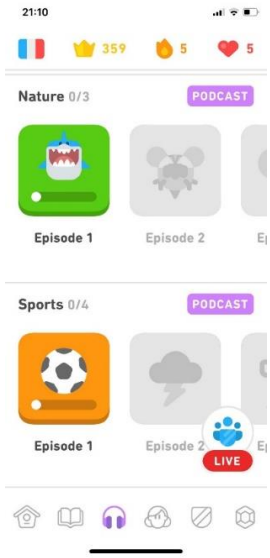
Appendix 2.1.3.1 Screenshot of Duolingo provide practice of character and grammar



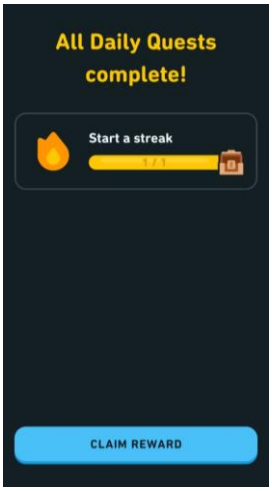
Appendix 2.1.3.2 Screenshot of shop in Duolingo



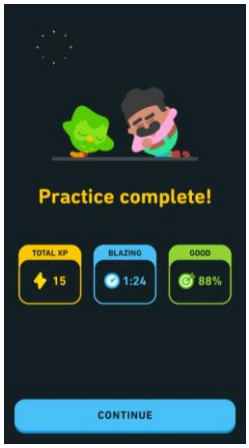
Appendix 2.1.3.3 Screenshot of Duolingo provide story practice learning



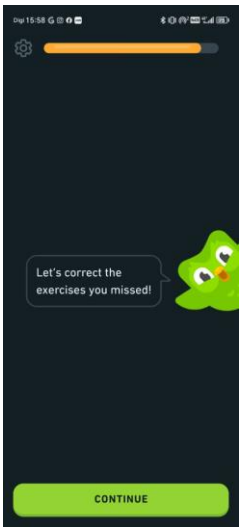
Appendix 2.1.3.4 Screenshot of Duolingo provide Podcast



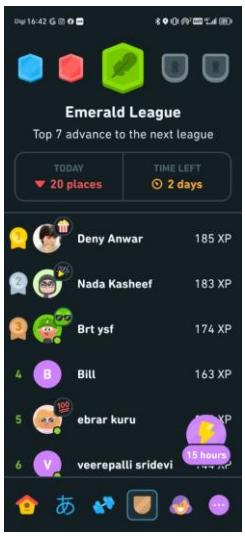
Appendix 2.1.4.1 Screenshot of getting reward after completed task



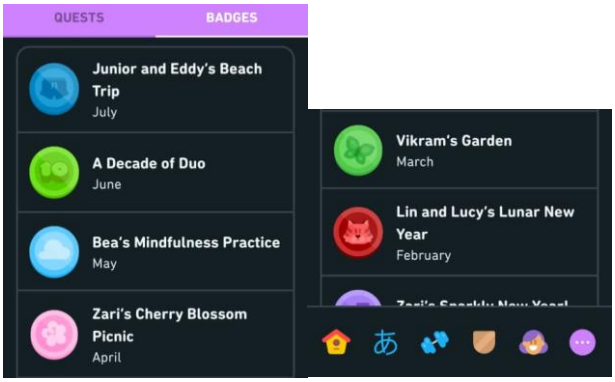
Appendix 2.1.4.2 Screenshot of Duolingo's point earned after learning



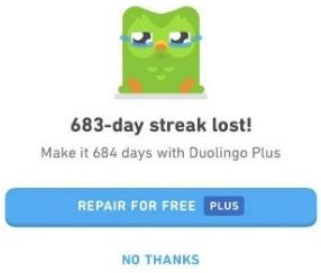
Appendix 2.1.4.3 Screenshot of motivation scene of Duolingo



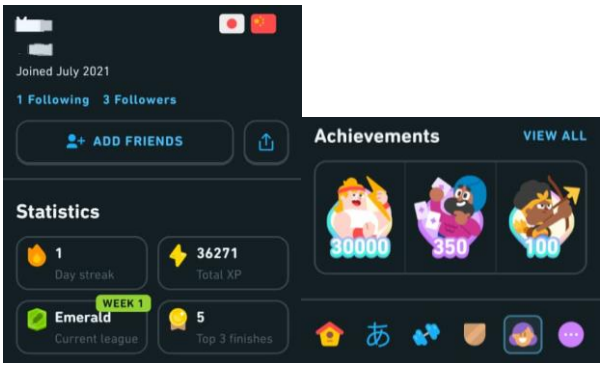
Appendix 2.1.4.4 Screenshot of Duolingo's leaderboards



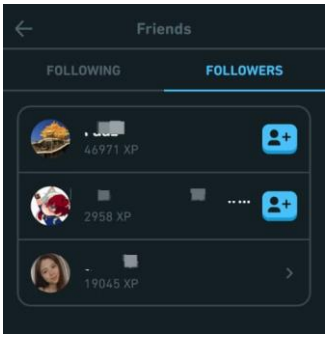
Appendix 2.1.4.5 Screenshot of Duolingo's badges earned after learning



Appendix 2.1.4.6 Screenshot of Duolingo's streak lost if miss few daily task

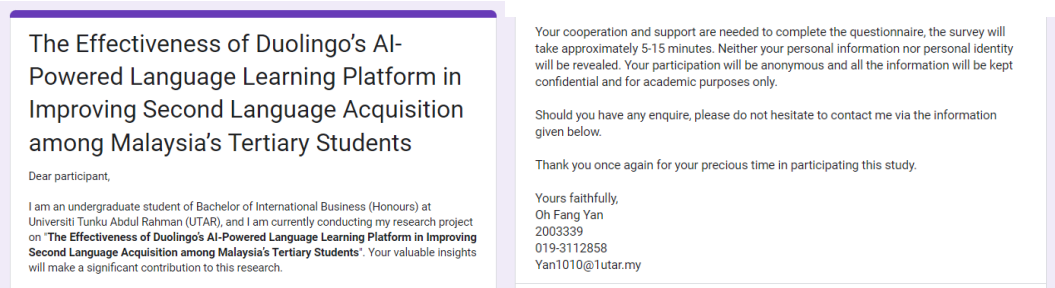


Appendix 2.1.4.7 Screenshot of user profile



Appendix 2.1.4.8 Screenshot of friend list in Duolingo

Appendix B: Survey Questionnaire



The Effectiveness of Duolingo's AI-Powered Language Learning Platform in Improving Second Language Acquisition among Malaysia's Tertiary Students

Dear participant,

I am an undergraduate student of Bachelor of International Business (Honours) at Universiti Tunku Abdul Rahman (UTAR), and I am currently conducting my research project on "**The Effectiveness of Duolingo's AI-Powered Language Learning Platform in Improving Second Language Acquisition among Malaysia's Tertiary Students**". Your valuable insights will make a significant contribution to this research.

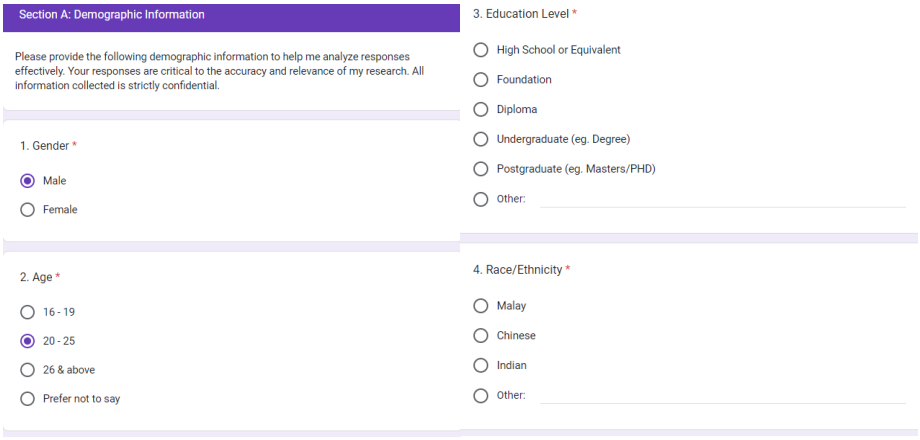
Your cooperation and support are needed to complete the questionnaire, the survey will take approximately 5-15 minutes. Neither your personal information nor personal identity will be revealed. Your participation will be anonymous and all the information will be kept confidential and for academic purposes only.

Should you have any enquire, please do not hesitate to contact me via the information given below.

Thank you once again for your precious time in participating this study.

Yours faithfully,
Oh Fang Yan
2003339
019-3112858
Yan1010@1utar.my

Appendix 3.0.1 Introduction and contact details of questionnaire



Section A: Demographic Information

Please provide the following demographic information to help me analyze responses effectively. Your responses are critical to the accuracy and relevance of my research. All information collected is strictly confidential.

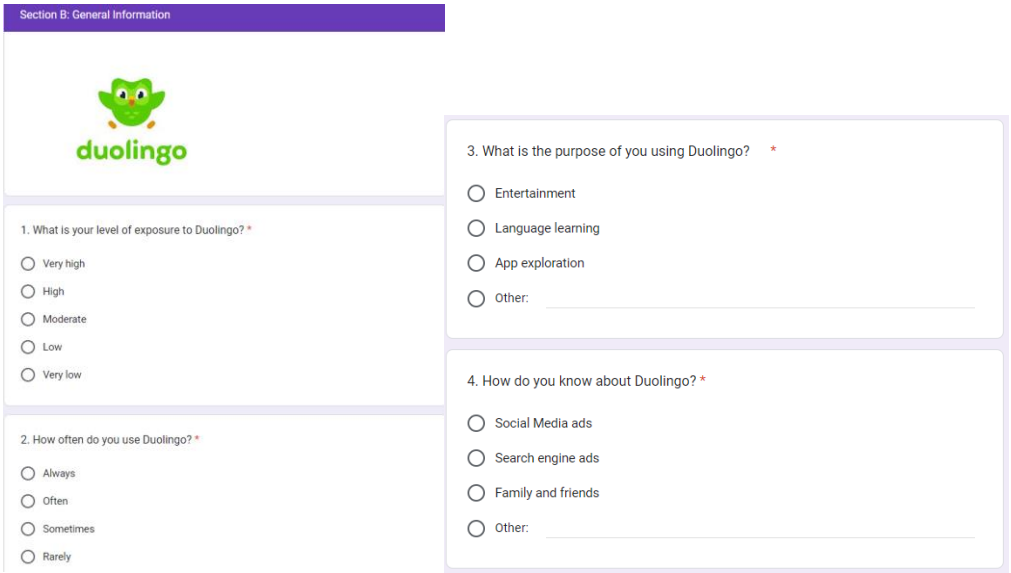
1. Gender *
- (●) Male
- ( ) Female

2. Age *
- ( ) 16 - 19
- (●) 20 - 25
- ( ) 26 & above
- ( ) Prefer not to say

3. Education Level *
- ( ) High School or Equivalent
- ( ) Foundation
- ( ) Diploma
- ( ) Undergraduate (eg. Degree)
- ( ) Postgraduate (eg. Masters/PHD)
- ( ) Other:

4. Race/Ethnicity *
- ( ) Malay
- ( ) Chinese
- ( ) Indian
- ( ) Other:

Appendix 3.0.2 Questionnaire of demographic information



Section B: General Information

duolingo

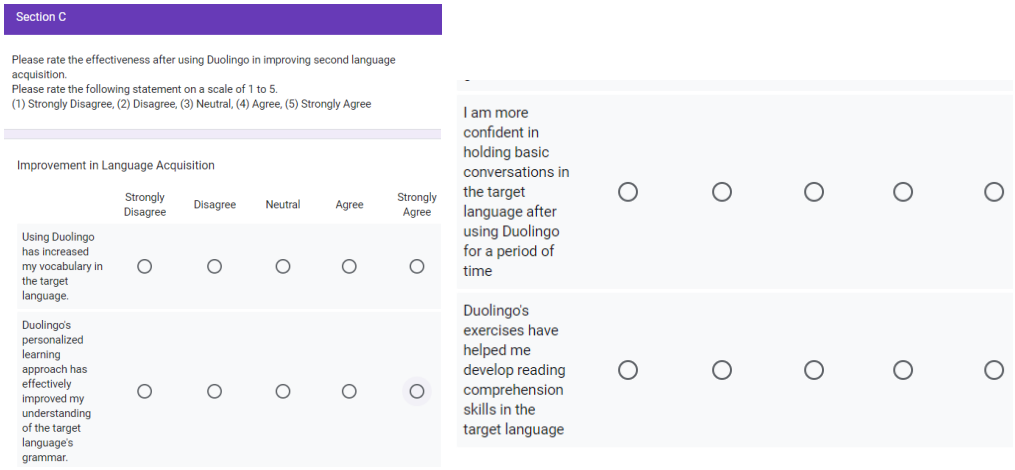
1. What is your level of exposure to Duolingo? *
- ( ) Very high
- ( ) High
- ( ) Moderate
- ( ) Low
- ( ) Very low

2. How often do you use Duolingo? *
- ( ) Always
- ( ) Often
- ( ) Sometimes
- ( ) Rarely

3. What is the purpose of you using Duolingo? *
- ( ) Entertainment
- ( ) Language learning
- ( ) App exploration
- ( ) Other:

4. How do you know about Duolingo? *
- ( ) Social Media ads
- ( ) Search engine ads
- ( ) Family and friends
- ( ) Other:

Appendix 3.0.3 Questionnaire of general information



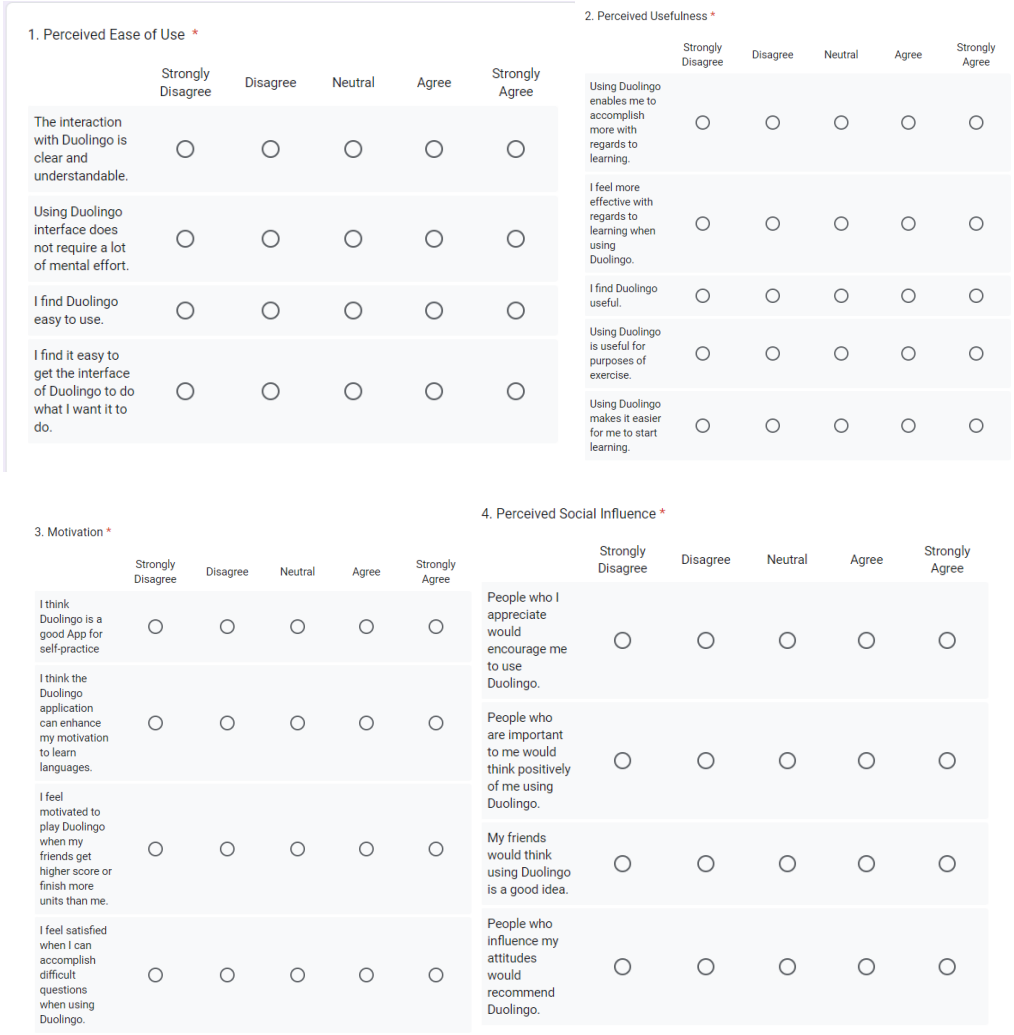
Section C

Please rate the effectiveness after using Duolingo in improving second language acquisition.
Please rate the following statement on a scale of 1 to 5.
(1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree

Improvement in Language Acquisition

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Using Duolingo has increased my vocabulary in the target language.					
Duolingo's personalized learning approach has effectively improved my understanding of the target language's grammar.					
I am more confident in holding basic conversations in the target language after using Duolingo for a period of time					
Duolingo's exercises have helped me develop reading comprehension skills in the target language					

Appendix 3.0.4 Questionnaire of DV: Improvement in Language Acquisition



1. Perceived Ease of Use *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The interaction with Duolingo is clear and understandable.					
Using Duolingo interface does not require a lot of mental effort.					
I find Duolingo easy to use.					
I find it easy to get the interface of Duolingo to do what I want it to do.					

2. Perceived Usefulness *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Using Duolingo enables me to accomplish more with regards to learning.					
I feel more effective with regards to learning when using Duolingo.					
I find Duolingo useful.					
Using Duolingo is useful for purposes of exercise.					
Using Duolingo makes it easier for me to start learning.					

3. Motivation *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think Duolingo is a good App for self-practice					
I think the Duolingo application can enhance my motivation to learn languages.					
I feel motivated to play Duolingo when my friends get higher score or finish more units than me.					
I feel satisfied when I can accomplish difficult questions when using Duolingo.					

4. Perceived Social Influence *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
People who I appreciate would encourage me to use Duolingo.					
People who are important to me would think positively of me using Duolingo.					
My friends would think using Duolingo is a good idea.					
People who influence my attitudes would recommend Duolingo.					

Appendix 3.0.5 Questionnaire of 4 independent variables

Appendix C: Pilot Test

Appendix 3.4.1 Pilot test result of DV: Improvement in language acquisition

```
RELIABILITY
/VARIABLES=ImprovementinLanguageAcquisitionUsingDuolingohasincreas
edmyvocab

ImprovementinLanguageAcquisitionDuolingospersonalizedlearningapp

ImprovementinLanguageAcquisitionIammoreconfidentinholdingbasicco

ImprovementinLanguageAcquisitionDuolingosexerciseshavehelpedmede
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  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
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Reliability

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Elapsed Time	00:00:00.02

Scale: ALL VARIABLES

Case Processing Summary

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Cases	Valid	20	100.0
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a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.824	4

Item Statistics

	Mean	Std. Deviation	N
Improvement in Language Acquisition [Using Duolingo has increased my vocabulary in the target language.]	4.50	.827	20
Improvement in Language Acquisition [Duolingo's personalized learning approach has effectively improved my understanding of the target language's grammar.]	4.35	.875	20
Improvement in Language Acquisition [I am more confident in holding basic conversations in the target language after using Duolingo for a period of time]	4.55	.686	20
Improvement in Language Acquisition [Duolingo's exercises have helped me develop reading comprehension skills in the target language]	4.35	.875	20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Improvement in Language Acquisition [Using Duolingo has increased my vocabulary in the target language.]	13.25	4.197	.637	.784
Improvement in Language Acquisition [Duolingo's personalized learning approach has effectively improved my understanding of the target language's grammar.]	13.40	3.937	.673	.768
Improvement in Language Acquisition [I am more confident in holding basic conversations in the target language after using Duolingo for a period of time]	13.20	4.484	.717	.759
Improvement in Language Acquisition [Duolingo's exercises have helped me develop reading comprehension skills in the target language]	13.40	4.147	.597	.805

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.75	7.039	2.653	4

Appendix 3.4.2 Pilot test result of IV: Perceived Ease of Use

```
RELIABILITY

/VARIABLES=@1.PerceivedEaseofUseTheinteractionwithDuolingoisclearandunderst

@1.PerceivedEaseofUseUsingDuolingointerfacedoesnotrequirealotofm
    @1.PerceivedEaseofUseIfindDuolingoeasytouse

@1.PerceivedEaseofUseIfinditeasytogettheinterfaceofDuolingotodow
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  /STATISTICS=DESCRIPTIVE SCALE
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Reliability

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Scale: ALL VARIABLES

Case Processing Summary

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a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.867	4

Item Statistics

	Mean	Std. Deviation	N
1. Perceived Ease of Use [The interaction with Duolingo is clear and understandable.]	4.35	.988	20
1. Perceived Ease of Use [Using Duolingo interface does not require a lot of mental effort.]	4.30	1.129	20
1. Perceived Ease of Use [I find Duolingo easy to use.]	4.50	.827	20
1. Perceived Ease of Use [I find it easy to get the interface of Duolingo to do what I want it to do.]	4.45	.759	20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. Perceived Ease of Use [The interaction with Duolingo is clear and understandable.]	13.25	5.461	.781	.804
1. Perceived Ease of Use [Using Duolingo interface does not require a lot of mental effort.]	13.30	5.379	.647	.876
1. Perceived Ease of Use [I find Duolingo easy to use.]	13.10	6.095	.799	.804
1. Perceived Ease of Use [I find it easy to get the interface of Duolingo to do what I want it to do.]	13.15	6.661	.716	.839

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.60	10.042	3.169	4

Appendix 3.4.3 Pilot test result of IV: Perceived Usefulness

```
RELIABILITY

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hmorewith
@2.PerceivedUsefulnessIfeelmoreeffectivewithregardstolearningwhe
    @2.PerceivedUsefulnessIfindDuolingouseful

@2.PerceivedUsefulnessUsingDuolingoisusefulforpurposesofexercise

@2.PerceivedUsefulnessUsingDuolingomakesiteasierformetostartlear
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  /STATISTICS=DESCRIPTIVE SCALE
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Reliability

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Scale: ALL VARIABLES

Case Processing Summary

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Cases	Valid	20	100.0
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	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.871	5

Item Statistics

	Mean	Std. Deviation	N
2. Perceived Usefulness [Using Duolingo enables me to accomplish more with regards to learning.]	4.60	.754	20

2. Perceived Usefulness [I feel more effective with regards to learning when using Duolingo.]	4.35	.813	20
2. Perceived Usefulness [I find Duolingo useful.]	4.35	.745	20
2. Perceived Usefulness [Using Duolingo is useful for purposes of exercise.]	4.30	.733	20
2. Perceived Usefulness [Using Duolingo makes it easier for me to start learning.]	4.05	.887	20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. Perceived Usefulness [Using Duolingo enables me to accomplish more with regards to learning.]	17.05	7.524	.519	.883
2. Perceived Usefulness [I feel more effective with regards to learning when using Duolingo.]	17.30	6.537	.732	.834
2. Perceived Usefulness [I find Duolingo useful.]	17.30	6.642	.792	.821
2. Perceived Usefulness [Using Duolingo is useful for purposes of exercise.]	17.35	7.292	.609	.863
2. Perceived Usefulness [Using Duolingo makes it easier for me to start learning.]	17.60	5.832	.845	.803

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
21.65	10.239	3.200	5

Appendix 3.4.4 Pilot test result of IV: Motivation

```
RELIABILITY
  /VARIABLES=@3.MotivationIthinkDuolingoisagoodAppforselfpractice

@3.MotivationIthinktheDuolingoapplicationcanenhancemymotivationt

@3.MotivationIfeelmotivatedtoplayDuolingowhenmyfriendsgethighers

@3.MotivationIfeelsatisfiedwhenIcanaccomplishdifficultquestionsw
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Reliability

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Case Processing Summary

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	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.928	4

Item Statistics

	Mean	Std. Deviation	N
3. Motivation [I think Duolingo is a good App for self-practice]	4.15	.875	20

3. Motivation [I think the Duolingo application can enhance my motivation to learn languages.]	4.30	.733	20
3. Motivation [I feel motivated to play Duolingo when my friends get higher score or finish more units than me.]	4.50	.688	20
3. Motivation [I feel satisfied when I can accomplish difficult questions when using Duolingo.]	4.30	.865	20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
3. Motivation [I think Duolingo is a good App for self-practice]	13.10	4.621	.775	.929
3. Motivation [I think the Duolingo application can enhance my motivation to learn languages.]	12.95	4.892	.887	.891
3. Motivation [I feel motivated to play Duolingo when my friends get higher score or finish more units than me.]	12.75	5.461	.736	.937
3. Motivation [I feel satisfied when I can accomplish difficult questions when using Duolingo.]	12.95	4.155	.965	.859

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.25	8.303	2.881	4

Appendix 3.4.5 Pilot test result of IV: Perceived Social Influence

```
RELIABILITY

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ouragemet

@4.PerceivedSocialInfluencePeoplewhoareimportanttomewouldthinkpo

@4.PerceivedSocialInfluenceMyfriendswouldthinkusingDuolingoisago

@4.PerceivedSocialInfluencePeoplewhoinfluencemyattitudeswouldrec
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Reliability

Notes

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	N of Rows in Working Data File	20
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY /VARIABLES=@4.PerceivedSocialInfluencePeoplewhoIappreciatewouldencouragemet @4.PerceivedSocialInfluencePeoplewhoareimportanttomewouldthinkpo @4.PerceivedSocialInfluenceMyfriendswouldthinkusingDuolingoisago @4.PerceivedSocialInfluencePeoplewhoinfluencemyattitudeswouldrec /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.933	4

Item Statistics

	Mean	Std. Deviation	N
4. Perceived Social Influence [People who I appreciate would encourage me to use Duolingo.]	4.50	.688	20

4. Perceived Social Influence [People who are important to me would think positively of me using Duolingo.]	4.30	.865	20
4. Perceived Social Influence [My friends would think using Duolingo is a good idea.]	4.25	.851	20
4. Perceived Social Influence [People who influence my attitudes would recommend Duolingo.]	4.50	.688	20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
4. Perceived Social Influence [People who I appreciate would encourage me to use Duolingo.]	13.05	5.103	.796	.928
4. Perceived Social Influence [People who are important to me would think positively of me using Duolingo.]	13.25	4.092	.918	.887
4. Perceived Social Influence [My friends would think using Duolingo is a good idea.]	13.30	4.221	.888	.898
4. Perceived Social Influence [People who influence my attitudes would recommend Duolingo.]	13.05	5.103	.796	.928

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.55	8.050	2.837	4

Appendix D: Frequencies

Appendix 4.1.1 Frequencies of Demographic Profile Result

```
FREQUENCIES VARIABLES=@1.Gender @2.Age @3.EducationLevel
@4.RaceEthnicity
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		05-APR-2024 23:44:01
Comments		
Input	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@1.Gender @2.Age @3.EducationLevel @4.RaceEthnicity /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Statistics

		1. Gender	2. Age	3. Education Level	4. Race/Ethnicity
N	Valid	200	200	200	200
	Missing	0	0	0	0

Frequency Table

1. Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	97	48.5	48.5	48.5
	Male	103	51.5	51.5	100.0
	Total	200	100.0	100.0	

2. Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16 - 19	13	6.5	6.5	6.5
	20 - 25	170	85.0	85.0	91.5
	26 & above	17	8.5	8.5	100.0
	Total	200	100.0	100.0	

3. Education Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	37	18.5	18.5	18.5
	Foundation	11	5.5	5.5	24.0
	Postgraduate (eg. Masters/PHD)	15	7.5	7.5	31.5
	Undergraduate (eg. Degree)	137	68.5	68.5	100.0
	Total	200	100.0	100.0	

4. Race/Ethnicity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chinese	133	66.5	66.5	66.5
	Indian	25	12.5	12.5	79.0
	Malay	42	21.0	21.0	100.0
	Total	200	100.0	100.0	

Appendix 4.1.2 Frequencies of General Information Result

```
GET DATA
  /TYPE=XLSX
  /FILE='C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.xlsx'
  /SHEET=name 'Balance data'
  /CELLRANGE=FULL
  /READNAMES=ON
  /DATATYPEMIN PERCENTAGE=95.0
  /HIDDEN IGNORE=YES.
EXECUTE.
DATASET NAME DataSet1 WINDOW=FRONT.
FREQUENCIES VARIABLES=@1.WhatisyourlevelofexposuretoDuolingo
@2.HowoftendoyouuseDuolingo
    @3.WhatisthepurposeofyouusingDuolingo
@4.HowdoyouknowaboutDuolingo
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		05-APR-2024 23:39:01
Comments		
Input	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@1.WhatisyourlevelofexposuretoDuolingo @2.HowoftendoyouuseDuolingo @3.WhatisthepurposeofyouusingDuolingo @4.HowdoyouknowaboutDuolingo /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

[DataSet1]

Statistics

	1. What is your level of exposure to Duolingo?	2. How often do you use Duolingo?	3. What is the purpose of you using Duolingo?	4. How do you know about Duolingo?

N	Valid	200	200	200	200
	Missing	0	0	0	0

Frequency Table

1. What is your level of exposure to Duolingo?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	125	62.5	62.5	62.5
	Low	5	2.5	2.5	65.0
	Moderate	40	20.0	20.0	85.0
	Very high	30	15.0	15.0	100.0
	Total	200	100.0	100.0	

2. How often do you use Duolingo?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	37	18.5	18.5	18.5
	Never	1	.5	.5	19.0
	Often	118	59.0	59.0	78.0
	Rarely	5	2.5	2.5	80.5
	Sometimes	39	19.5	19.5	100.0
	Total	200	100.0	100.0	

3. What is the purpose of you using Duolingo?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	App exploration	1	.5	.5	.5
	Entertainment	36	18.0	18.0	18.5
	Language learning	163	81.5	81.5	100.0
	Total	200	100.0	100.0	

4. How do you know about Duolingo?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Family and friends	13	6.5	6.5	6.5
	research	1	.5	.5	7.0
	Search engine ads	27	13.5	13.5	20.5
	Social Media ads	159	79.5	79.5	100.0
	Total	200	100.0	100.0	

Appendix 4.1.3.1 Frequencies of Perceived Ease of Use

```
FREQUENCIES
VARIABLES=@1.PerceivedEaseofUseTheinteractionwithDuolingoisclearan
dunderst

@1.PerceivedEaseofUseUsingDuolingointerfacedoesnotrequirealotofm
    @1.PerceivedEaseofUseIfindDuolingoeasytouse

@1.PerceivedEaseofUseIfinditeasytogettheinterfaceofDuolingotodow
  /STATISTICS=MEAN
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		06-APR-2024 17:12:17
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@1.PerceivedEaseofUseTheinteractionwithDuolingoisclearandunderst @1.PerceivedEaseofUseUsingDuolingointerfacedoesnotrequirealotofm @1.PerceivedEaseofUseIfindDuolingoeasytouse @1.PerceivedEaseofUseIfinditeasytogettheinterfaceofDuolingotodow /STATISTICS=MEAN /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Statistics

		1. Perceived Ease of Use [The interaction with Duolingo is clear and understandable.]	1. Perceived Ease of Use [Using Duolingo interface does not require a lot of mental effort.]	1. Perceived Ease of Use [I find Duolingo easy to use.]	1. Perceived Ease of Use [I find it easy to get the interface of Duolingo to do what I want it to do.]
N	Valid	200	200	200	200
	Missing	0	0	0	0
Mean		4.15	4.14	4.39	4.29

Frequency Table

1. Perceived Ease of Use [The interaction with Duolingo is clear and understandable.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.5	.5	.5
	2	26	13.0	13.0	13.5
	3	3	1.5	1.5	15.0
	4	83	41.5	41.5	56.5
	5	87	43.5	43.5	100.0
	Total	200	100.0	100.0	

1. Perceived Ease of Use [Using Duolingo interface does not require a lot of mental effort.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.5	.5	.5
	2	28	14.0	14.0	14.5
	3	3	1.5	1.5	16.0
	4	79	39.5	39.5	55.5

	5	89	44.5	44.5	100.0
	Total	200	100.0	100.0	

1. Perceived Ease of Use [I find Duolingo easy to use.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	2	1.0	1.0	6.0
	4	89	44.5	44.5	50.5
	5	99	49.5	49.5	100.0
	Total	200	100.0	100.0	

1. Perceived Ease of Use [I find it easy to get the interface of Duolingo to do what I want it to do.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	2	1.0	1.0	6.0
	4	109	54.5	54.5	60.5
	5	79	39.5	39.5	100.0
	Total	200	100.0	100.0	

Appendix 4.1.3.2 Frequencies of Perceived Usefulness Result

```
FREQUENCIES
VARIABLES=@2.PerceivedUsefulnessUsingDuolingoenablesmetoaccomplish
morewith

@2.PerceivedUsefulnessIfeelmoreeffectivewithregardstolearningwhe
    @2.PerceivedUsefulnessIfindDuolingouseful

@2.PerceivedUsefulnessUsingDuolingoisusefulforpurposesofexercise

@2.PerceivedUsefulnessUsingDuolingomakesiteasierformetostartlear
  /STATISTICS=MEAN
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		06-APR-2024 17:17:39
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@2.PerceivedUsefulnessUsingDuolingoenablesmetoaccomplishmorewith @2.PerceivedUsefulnessIfeelmoreeffectivewithregardstolearningwhe @2.PerceivedUsefulnessIfindDuolingouseful @2.PerceivedUsefulnessUsingDuolingoisusefulforpurposesofexercise @2.PerceivedUsefulnessUsingDuolingomakesiteasierformetostartlear /STATISTICS=MEAN /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.02

Statistics

		2. Perceived Usefulness [Using Duolingo enables me to accomplish more with regards to learning.]	2. Perceived Usefulness [I feel more effective with regards to learning when using Duolingo.]	2. Perceived Usefulness [I find Duolingo useful.]	2. Perceived Usefulness [Using Duolingo is useful for purposes of exercise.]	2. Perceived Usefulness [Using Duolingo makes it easier for me to start learning.]
N	Valid	200	200	200	200	200
	Missing	0	0	0	0	0
Mean		4.41	4.25	4.27	4.32	4.13

Frequency Table

2. Perceived Usefulness [Using Duolingo enables me to accomplish more with regards to learning.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	1	.5	.5	5.5
	4	86	43.0	43.0	48.5
	5	103	51.5	51.5	100.0
	Total	200	100.0	100.0	

2. Perceived Usefulness [I feel more effective with regards to learning when using Duolingo.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	32	16.0	16.0	16.0
	4	87	43.5	43.5	59.5
	5	81	40.5	40.5	100.0
	Total	200	100.0	100.0	

2. Perceived Usefulness [I find Duolingo useful.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	2	1.0	1.0	6.0
	4	113	56.5	56.5	62.5
	5	75	37.5	37.5	100.0
	Total	200	100.0	100.0	

2. Perceived Usefulness [Using Duolingo is useful for purposes of exercise.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	15	7.5	7.5	7.5
	4	106	53.0	53.0	60.5
	5	79	39.5	39.5	100.0
	Total	200	100.0	100.0	

2. Perceived Usefulness [Using Duolingo makes it easier for me to start learning.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	27	13.5	13.5	13.5
	3	4	2.0	2.0	15.5
	4	85	42.5	42.5	58.0
	5	84	42.0	42.0	100.0
	Total	200	100.0	100.0	

Appendix 4.1.3.3 Frequencies of Motivation Result

```
FREQUENCIES
VARIABLES=@3.MotivationIthinkDuolingoisagoodAppforselfpractice

@3.MotivationIthinktheDuolingoapplicationcanenhancemymotivationt

@3.MotivationIfeelmotivatedtoplayDuolingowhenmyfriendsgethighers

@3.MotivationIfeelsatisfiedwhenIcanaccomplishdifficultquestionsw
  /STATISTICS=MEAN
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		06-APR-2024 17:18:40
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@3.MotivationIthinkDuolingoisagoodAppforselfpractice @3.MotivationIthinktheDuolingoapplicationcanenhancemymotivationt @3.MotivationIfeelmotivatedtoplayDuolingowhenmyfriendsgethighers @3.MotivationIfeelsatisfiedwhenIcanaccomplishdifficultquestionsw /STATISTICS=MEAN /ORDER=ANALYSIS.

Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Statistics

		3. Motivation [I think Duolingo is a good App for self-practice]	3. Motivation [I think the Duolingo application can enhance my motivation to learn languages.]	3. Motivation [I feel motivated to play Duolingo when my friends get higher score or finish more units than me.]	3. Motivation [I feel satisfied when I can accomplish difficult questions when using Duolingo.]
N	Valid	200	200	200	200
	Missing	0	0	0	0
Mean		4.13	4.20	4.28	4.15

Frequency Table

3. Motivation [I think Duolingo is a good App for self-practice]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	17	8.5	8.5	8.5
	3	15	7.5	7.5	16.0
	4	93	46.5	46.5	62.5
	5	75	37.5	37.5	100.0
	Total	200	100.0	100.0	

3. Motivation [I think the Duolingo application can enhance my motivation to learn languages.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	30	15.0	15.0	15.0
	4	100	50.0	50.0	65.0

	5	70	35.0	35.0	100.0
	Total	200	100.0	100.0	

3. Motivation [I feel motivated to play Duolingo when my friends get higher score or finish more units than me.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	28	14.0	14.0	14.0
	4	88	44.0	44.0	58.0
	5	84	42.0	42.0	100.0
	Total	200	100.0	100.0	

3. Motivation [I feel satisfied when I can accomplish difficult questions when using Duolingo.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	17	8.5	8.5	8.5
	3	12	6.0	6.0	14.5
	4	96	48.0	48.0	62.5
	5	75	37.5	37.5	100.0
	Total	200	100.0	100.0	

Appendix 4.1.3.4 Frequencies of Perceived Social Influence Result

```
FREQUENCIES
VARIABLES=@4.PerceivedSocialInfluencePeoplewhoIappreciatewouldenco
uragemet

@4.PerceivedSocialInfluencePeoplewhoareimportanttomewouldthinkpo

@4.PerceivedSocialInfluenceMyfriendswouldthinkusingDuolingoisago

@4.PerceivedSocialInfluencePeoplewhoinfluencemyattitudeswouldrec
  /STATISTICS=MEAN
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		06-APR-2024 17:19:34
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@4.PerceivedSocialInfluencePeoplewhoIappreciatewouldencouragemet @4.PerceivedSocialInfluencePeoplewhoareimportanttomewouldthinkpo @4.PerceivedSocialInfluenceMyfriendswouldthinkusingDuolingoisago @4.PerceivedSocialInfluencePeoplewhoinfluencemyattitudeswouldrec /STATISTICS=MEAN /ORDER=ANALYSIS.

Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Statistics

		4. Perceived Social Influence [People who I appreciate would encourage me to use Duolingo.]	4. Perceived Social Influence [People who are important to me would think positively of me using Duolingo.]	4. Perceived Social Influence [My friends would think using Duolingo is a good idea.]	4. Perceived Social Influence [People who influence my attitudes would recommend Duolingo.]
N	Valid	200	200	200	200
	Missing	0	0	0	0
Mean		4.28	4.15	4.19	4.35

Frequency Table

4. Perceived Social Influence [People who I appreciate would encourage me to use Duolingo.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	28	14.0	14.0	14.0
	4	88	44.0	44.0	58.0
	5	84	42.0	42.0	100.0
	Total	200	100.0	100.0	

4. Perceived Social Influence [People who are important to me would think positively of me using Duolingo.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	17	8.5	8.5	8.5
	3	12	6.0	6.0	14.5
	4	96	48.0	48.0	62.5

	5	75	37.5	37.5	100.0
	Total	200	100.0	100.0	

4. Perceived Social Influence [My friends would think using Duolingo is a good idea.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	17	8.5	8.5	8.5
	3	11	5.5	5.5	14.0
	4	90	45.0	45.0	59.0
	5	82	41.0	41.0	100.0
	Total	200	100.0	100.0	

4. Perceived Social Influence [People who influence my attitudes would recommend Duolingo.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	12	6.0	6.0	6.0
	4	107	53.5	53.5	59.5
	5	81	40.5	40.5	100.0
	Total	200	100.0	100.0	

Appendix 4.1.3.5 Frequencies of Improvement in Language Acquisition Result

```
FREQUENCIES
VARIABLES=ImprovementinLanguageAcquisitionUsingDuolingohasincrease
dmyvocab

ImprovementinLanguageAcquisitionDuolingospersonalizedlearningapp

ImprovementinLanguageAcquisitionIammoreconfidentinholdingbasicco

ImprovementinLanguageAcquisitionDuolingosexerciseshavehelpedmede
  /STATISTICS=MEAN
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		06-APR-2024 17:16:27
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=ImprovementinLanguageAcquisitionUsingDuolingohasincreasedmyvocab ImprovementinLanguageAcquisitionDuolingospersonalizedlearningapp ImprovementinLanguageAcquisitionIammoreconfidentinholdingbasicco ImprovementinLanguageAcquisitionDuolingosexerciseshavehelpedmede /STATISTICS=MEAN /ORDER=ANALYSIS.

Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Statistics

		Improvement in Language Acquisition [Using Duolingo has increased my vocabulary in the target language.]	Improvement in Language Acquisition [Duolingo's personalized learning approach has effectively improved my understanding of the target language's grammar.]	Improvement in Language Acquisition [I am more confident in holding basic conversations in the target language after using Duolingo for a period of time]	Improvement in Language Acquisition [Duolingo's exercises have helped me develop reading comprehension skills in the target language]
N	Valid	200	200	200	200
	Missing	0	0	0	0
Mean		4.49	4.08	4.26	4.30

Frequency Table

Improvement in Language Acquisition [Using Duolingo has increased my vocabulary in the target language.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	3	1.5	1.5	6.5
	4	66	33.0	33.0	39.5
	5	121	60.5	60.5	100.0
	Total	200	100.0	100.0	

Improvement in Language Acquisition [Duolingo's personalized learning approach has effectively improved my understanding of the target language's grammar.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	21	10.5	10.5	15.5
	4	112	56.0	56.0	71.5
	5	57	28.5	28.5	100.0
	Total	200	100.0	100.0	

Improvement in Language Acquisition [I am more confident in holding basic conversations in the target language after using Duolingo for a period of time]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	28	14.0	14.0	14.0
	4	93	46.5	46.5	60.5
	5	79	39.5	39.5	100.0
	Total	200	100.0	100.0	

Improvement in Language Acquisition [Duolingo's exercises have helped me develop reading comprehension skills in the target language]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.5	.5	.5
	3	31	15.5	15.5	16.0
	4	76	38.0	38.0	54.0
	5	92	46.0	46.0	100.0
	Total	200	100.0	100.0	

Appendix E: Reliability

Appendix 4.2.1.1 Reliability Analysis of Perceived Ease of Use

```
RELIABILITY

/VARIABLES=@1.PerceivedEaseofUseTheinteractionwithDuolingoisclearа
ndunderst

@1.PerceivedEaseofUseUsingDuolingointerfacedoesnotrequirealotofm
    @1.PerceivedEaseofUseIfindDuolingoeasytouse

@1.PerceivedEaseofUseIfinditeasytogettheinterfaceofDuolingotodow
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		06-APR-2024 23:11:54
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY /VARIABLES=@1.PerceivedEaseofUseTheinteractionwithDuolingoisclearandunderst @1.PerceivedEaseofUseUsingDuolingointerfacedoesnotrequirealotofm @1.PerceivedEaseofUseIfindDuolingoeasytouse @1.PerceivedEaseofUseIfinditeasytogettheinterfaceofDuolingotodow /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.841	4

Item Statistics

	Mean	Std. Deviation	N
1. Perceived Ease of Use [The interaction with Duolingo is clear and understandable.]	4.15	.999	200
1. Perceived Ease of Use [Using Duolingo interface does not require a lot of mental effort.]	4.14	1.026	200
1. Perceived Ease of Use [I find Duolingo easy to use.]	4.39	.748	200
1. Perceived Ease of Use [I find it easy to get the interface of Duolingo to do what I want it to do.]	4.29	.726	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. Perceived Ease of Use [The interaction with Duolingo is clear and understandable.]	12.81	4.288	.774	.752
1. Perceived Ease of Use [Using Duolingo interface does not require a lot of mental effort.]	12.82	4.443	.693	.796
1. Perceived Ease of Use [I find Duolingo easy to use.]	12.57	5.664	.636	.817
1. Perceived Ease of Use [I find it easy to get the interface of Duolingo to do what I want it to do.]	12.67	5.721	.646	.816

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.95	8.490	2.914	4

Appendix 4.2.1.2 Reliability Analysis of Perceived Usefulness

```
RELIABILITY

/VARIABLES=@2.PerceivedUsefulnessUsingDuolingoenablesmetoaccomplis
hmorewith

@2.PerceivedUsefulnessIfeelmoreeffectivewithregardstolearningwhe
    @2.PerceivedUsefulnessIfindDuolingouseful

@2.PerceivedUsefulnessUsingDuolingoisusefulforpurposesofexercise

@2.PerceivedUsefulnessUsingDuolingomakesiteasierformetostartlear
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		06-APR-2024 23:15:47
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY /VARIABLES=@2.PerceivedUsefulnessUsingDuolingoenables metoaccomplishmorewith @2.PerceivedUsefulnessIfeelmoreeffectivewithregardstolearnin gwhe @2.PerceivedUsefulnessIfindDuolingouseful @2.PerceivedUsefulnessUsingDuolingoisusefulforpurposesofex ercise @2.PerceivedUsefulnessUsingDuolingomakesiteasierformetost artlear /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.781	5

Item Statistics

	Mean	Std. Deviation	N
2. Perceived Usefulness [Using Duolingo enables me to accomplish more with regards to learning.]	4.41	.745	200

2. Perceived Usefulness [I feel more effective with regards to learning when using Duolingo.]	4.25	.712	200
2. Perceived Usefulness [I find Duolingo useful.]	4.27	.719	200
2. Perceived Usefulness [Using Duolingo is useful for purposes of exercise.]	4.32	.608	200
2. Perceived Usefulness [Using Duolingo makes it easier for me to start learning.]	4.13	.984	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. Perceived Usefulness [Using Duolingo enables me to accomplish more with regards to learning.]	16.96	5.657	.443	.777
2. Perceived Usefulness [I feel more effective with regards to learning when using Duolingo.]	17.13	5.236	.625	.720
2. Perceived Usefulness [I find Duolingo useful.]	17.11	5.130	.655	.710
2. Perceived Usefulness [Using Duolingo is useful for purposes of exercise.]	17.05	6.098	.438	.776
2. Perceived Usefulness [Using Duolingo makes it easier for me to start learning.]	17.24	4.143	.667	.706

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
21.37	7.782	2.790	5

Appendix 4.2.1.3 Reliability Analysis of Motivation

```
RELIABILITY
  /VARIABLES=@3.MotivationIthinkDuolingoisagoodAppforselfpractice

@3.MotivationIthinktheDuolingoapplicationcanenhancemymotivationt

@3.MotivationIfeelmotivatedtoplayDuolingowhenmyfriendsgethighers

@3.MotivationIfeelsatisfiedwhenIcanaccomplishdifficultquestionsw
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		06-APR-2024 23:18:22
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY /VARIABLES=@3.MotivationIthinkDuolingoisagoodAppforselfpractice @3.MotivationIthinktheDuolingoapplicationcanenhancemymotivationt @3.MotivationIfeelmotivatedtoplayDuolingowhenmyfriendsgethighers @3.MotivationIfeelsatisfiedwhenIcanaccomplishdifficultquestionsw /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.868	4

Item Statistics

	Mean	Std. Deviation	N
3. Motivation [I think Duolingo is a good App for self-practice]	4.13	.881	200

3. Motivation [I think the Duolingo application can enhance my motivation to learn languages.]	4.20	.680	200
3. Motivation [I feel motivated to play Duolingo when my friends get higher score or finish more units than me.]	4.28	.696	200
3. Motivation [I feel satisfied when I can accomplish difficult questions when using Duolingo.]	4.15	.870	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
3. Motivation [I think Duolingo is a good App for self-practice]	12.63	3.663	.792	.802
3. Motivation [I think the Duolingo application can enhance my motivation to learn languages.]	12.56	4.620	.694	.845
3. Motivation [I feel motivated to play Duolingo when my friends get higher score or finish more units than me.]	12.47	4.622	.670	.852
3. Motivation [I feel satisfied when I can accomplish difficult questions when using Duolingo.]	12.61	3.797	.753	.819

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.76	7.111	2.667	4

Appendix 4.2.1.4 Reliability Analysis of Perceived Social Influence

```
RELIABILITY

/VARIABLES=@4.PerceivedSocialInfluencePeoplewhoIappreciatewouldenc
ouragemet

@4.PerceivedSocialInfluencePeoplewhoareimportanttomewouldthinkpo

@4.PerceivedSocialInfluenceMyfriendswouldthinkusingDuolingoisago

@4.PerceivedSocialInfluencePeoplewhoinfluencemyattitudeswouldrec
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		06-APR-2024 23:19:46
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY /VARIABLES=@4.PerceivedSocialInfluenceP eoplewhoIappreciatewouldencouragemet @4.PerceivedSocialInfluencePeoplewhoareim portanttomewouldthinkpo @4.PerceivedSocialInfluenceMyfriendswouldt hinkusingDuolingoisago @4.PerceivedSocialInfluencePeoplewhoinflue ncemyattitudeswouldrec /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.824	4

Item Statistics

	Mean	Std. Deviation	N
4. Perceived Social Influence [People who I appreciate would encourage me to use Duolingo.]	4.28	.696	200

4. Perceived Social Influence [People who are important to me would think positively of me using Duolingo.]	4.15	.870	200
4. Perceived Social Influence [My friends would think using Duolingo is a good idea.]	4.19	.880	200
4. Perceived Social Influence [People who influence my attitudes would recommend Duolingo.]	4.35	.590	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
4. Perceived Social Influence [People who I appreciate would encourage me to use Duolingo.]	12.67	3.849	.682	.767
4. Perceived Social Influence [People who are important to me would think positively of me using Duolingo.]	12.81	3.180	.727	.742
4. Perceived Social Influence [My friends would think using Duolingo is a good idea.]	12.77	3.123	.738	.736
4. Perceived Social Influence [People who influence my attitudes would recommend Duolingo.]	12.61	4.601	.492	.843

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.96	6.194	2.489	4

Appendix 4.2.1.5 Reliability Analysis of Improvement in Language Acquisition

```
RELIABILITY

/VARIABLES=ImprovementinLanguageAcquisitionUsingDuolingohasincreas
edmyvocab

ImprovementinLanguageAcquisitionDuolingospersonalizedlearningapp

ImprovementinLanguageAcquisitionIammoreconfidentinholdingbasicco

ImprovementinLanguageAcquisitionDuolingosexerciseshavehelpedmede
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		06-APR-2024 22:56:26
Comments		
Input	Data	C:\Users\Fang Yan\Downloads\FYP\Part 2\FY Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY /VARIABLES=ImprovementinLanguageAcquisitionUsingDuolingo hasincreasedmyvocab ImprovementinLanguageAcquisitionDuolingospersonalizedlearnin gapp ImprovementinLanguageAcquisitionIammoreconfidentinholdingba sicco ImprovementinLanguageAcquisitionDuolingosexerciseshavehelpe dmede /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.759	4

Item Statistics

	Mean	Std. Deviation	N

Improvement in Language Acquisition [Using Duolingo has increased my vocabulary in the target language.]	4.49	.763	200
Improvement in Language Acquisition [Duolingo's personalized learning approach has effectively improved my understanding of the target language's grammar.]	4.08	.766	200
Improvement in Language Acquisition [I am more confident in holding basic conversations in the target language after using Duolingo for a period of time]	4.26	.687	200
Improvement in Language Acquisition [Duolingo's exercises have helped me develop reading comprehension skills in the target language]	4.30	.742	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Improvement in Language Acquisition [Using Duolingo has increased my vocabulary in the target language.]	12.63	3.320	.427	.773
Improvement in Language Acquisition [Duolingo's personalized learning approach has effectively improved my understanding of the target language's grammar.]	13.04	2.752	.690	.625
Improvement in Language Acquisition [I am more confident in holding basic conversations in the target language after using Duolingo for a period of time]	12.86	3.243	.556	.704

Improvement in Language Acquisition [Duolingo's exercises have helped me develop reading comprehension skills in the target language]	12.82	3.060	.570	.695

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.12	5.091	2.256	4

Appendix F: Multiple Linear Regression Analysis

Appendix 4.3.1 Multiple Linear Regression Analysis of Research

```
GET
  FILE='C:\Users\Shi Zhe\OneDrive\Desktop\FYP\FY Balance
test.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
COMPUTE ILA=(ILA1+ILA2+ILA3+ILA4)/4.
EXECUTE.
COMPUTE PEU=(PEU1 + PEU2 + PEU3 + PEU4)/4.
EXECUTE.
COMPUTE PU=(PU1 + PU2 + PU3 + PU4 + PU5)/5.
EXECUTE.
COMPUTE M=(M1 + M2 + M3 + M4)/4.
EXECUTE.
COMPUTE PSI=(PSI1 + PSI2 + PSI3 + PSI4)/4.
EXECUTE.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ILA
  /METHOD=ENTER PEU PU M PSI
  /SCATTERPLOT=(*ZPRED ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Regression

Notes

Output Created		13-APR-2024 21:18:19
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\FYP\FY Balance test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.

Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT ILA /METHOD=ENTER PEU PU M PSI /SCATTERPLOT=(*ZPRED ,*ZPRED) /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID) /CASEWISE PLOT(ZRESID) OUTLIERS(3).
Resources	Processor Time	00:00:02.00
	Elapsed Time	00:00:00.65
	Memory Required	4944 bytes
	Additional Memory Required for Residual Plots	632 bytes

```
[DataSet1] C:\Users\Shi Zhe\OneDrive\Desktop\FYP\FY Balance
test.sav
```

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PSI, PU, PEU, M[b]	.	Enter

a. Dependent Variable: ILA

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.914[a]	.836	.833	.23065	1.888

a. Predictors: (Constant), PSI, PU, PEU, M

b. Dependent Variable: ILA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52.946	4	13.237	248.810	.000[b]
	Residual	10.374	195	.053		
	Total	63.320	199			

a. Dependent Variable: ILA

b. Predictors: (Constant), PSI, PU, PEU, M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.579	.137		4.212	.000		
	PEU	.279	.058	.361	4.850	.000	.152	6.584
	PU	.288	.068	.284	4.205	.000	.184	5.446
	M	-.196	.084	-.232	-2.340	.020	.085	11.706
	PSI	.498	.089	.549	5.604	.000	.087	11.432

a. Dependent Variable: ILA

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	PEU	PU	M	PSI
1	1	4.973	1.000	.00	.00	.00	.00	.00
	2	.017	17.071	.61	.04	.00	.01	.00
	3	.007	26.222	.00	.18	.09	.08	.06
	4	.002	47.910	.39	.66	.76	.02	.05
	5	.001	70.174	.00	.13	.15	.89	.89

a. Dependent Variable: ILA

Casewise Diagnostics[a]

Case Number	Std. Residual	ILA	Predicted Value	Residual

31	-5.076	3.00	4.1708	-1.17075
38	3.430	5.00	4.2089	.79108

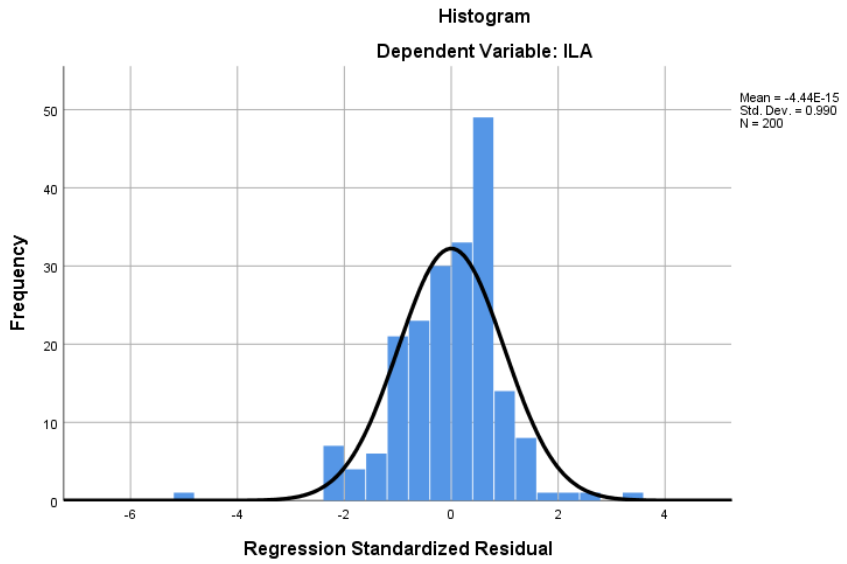
a. Dependent Variable: ILA

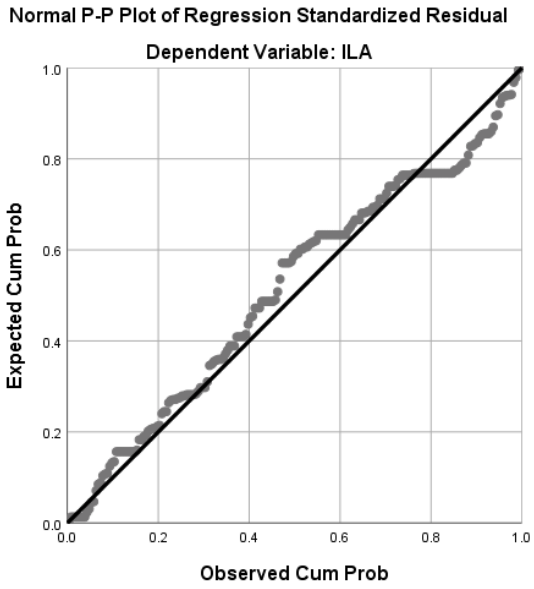
Residuals Statistics[a]

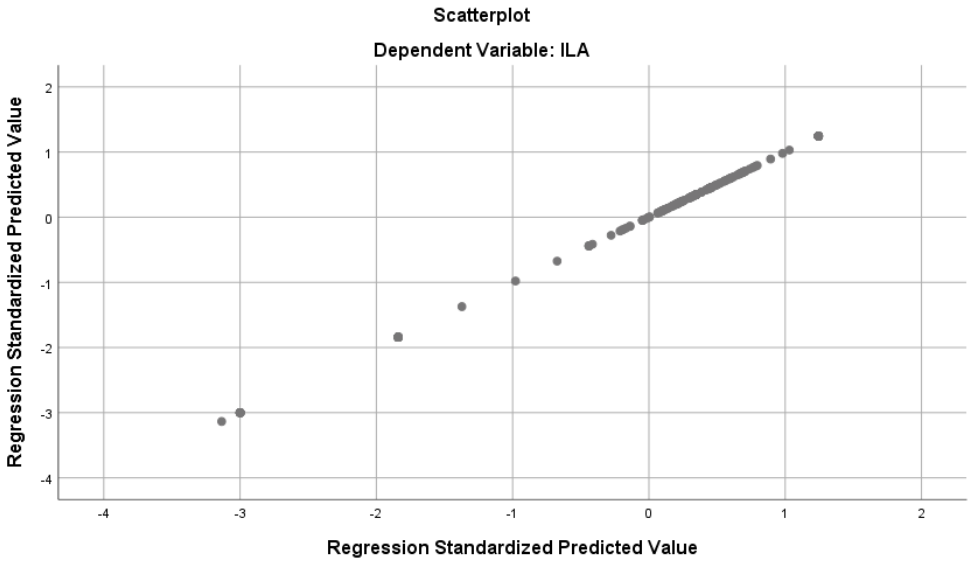
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.6628	4.9215	4.2800	.51581	200
Residual	-1.17075	.79108	.00000	.22832	200
Std. Predicted Value	-3.135	1.244	.000	1.000	200
Std. Residual	-5.076	3.430	.000	.990	200

a. Dependent Variable: ILA

Charts




Normal P-P Plot of Regression Standardized Residual
Dependent Variable: ILA
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: ILA
Regression Standardized Predicted Value
Regression Standardized Predicted Value
-4
-3
-2
-1
0
1
2