DEPRESSION AND ITS ASSOCIATED FACTORS AMONG UNDERGRADUATE ENGINEERING STUDENTS: A CROSS-SECTIONAL SURVEY IN THAILAND

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MASTER OF SCIENCE
IN MENTAL HEALTH

GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
AUGUST 2023

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A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MENTAL HEALTH

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THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MENTAL HEALTH

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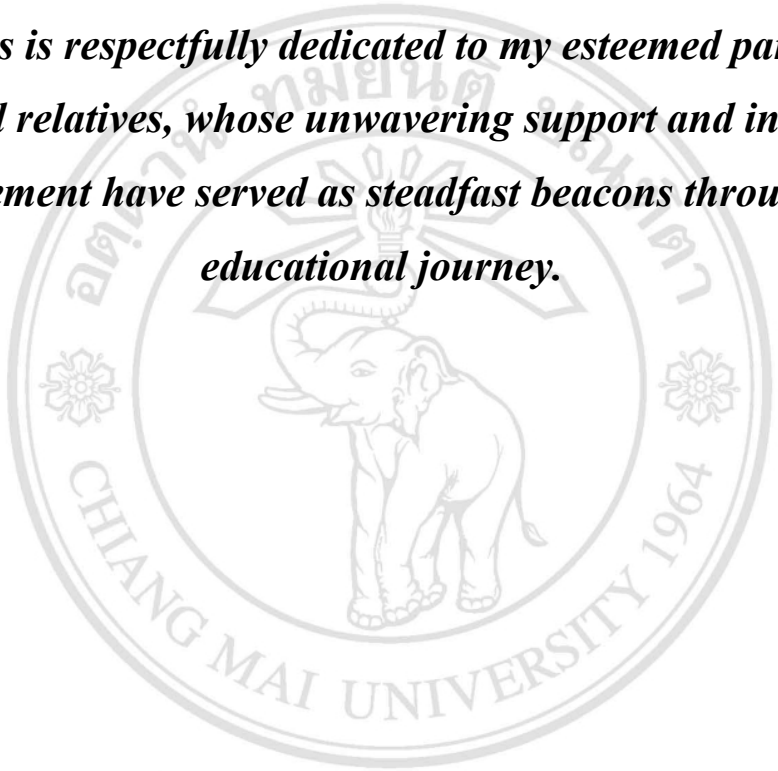
To

This thesis is respectfully dedicated to my esteemed parents and cherished relatives, whose unwavering support and invaluable encouragement have served as steadfast beacons throughout my educational journey.



ACKNOWLEDGEMENTS

Foremost, I extend my sincere gratitude to all the esteemed advisors who have played an instrumental role in the fruition of this paper. Among them, my heartfelt thanks go to Prof. Tinakon Wongpakaran, with his affable demeanor, who has provided me with numerous invaluable suggestions that have greatly influenced my writing process. His involvement encompassed various stages, ranging from the initial selection of the topic to the scrutiny of the proposal report. Notably, Prof. Nahathai Wongpakaran, whose invaluable assistance in formulating the initial concept and structural framework of this paper, as well as dedicated efforts in facilitating the acquisition of pertinent literature and guiding the progression of my proposal report, have been truly instrumental. Prof. Patraporn Bhatarasakoon, an enthusiastic individual, exhibited a keen eye for identifying minute intricacies within the paper and offered invaluable advice in their rectification. Asst. Prof. Preda Pichayapan exhibited remarkable benevolence and support during the data collection phase, significantly contributing to the progress of this research work. Additionally, advisor Shirley Worland, imparted invaluable insights on enhancing my writing proficiency and diligently corrected certain idiosyncrasies in my written expression. The successful completion of this paper is undeniably indebted to the collective care and guidance bestowed upon me by all the advisors.

Moreover, I extend special thanks to my thesis assistant, Little, as well as all the friends who generously assisted me in data collection. To everyone who played a role in aiding my progress, I express my deepest gratitude for their unwavering support.

Yuanyue Huang

หัวข้อวิทยานิพนธ์ ภาวะซึมเศร้าและปัจจัยที่เกี่ยวข้องในนักศึกษาวิศวกรรมระดับปริญญาตรี : การสำรวจแบบภาพตัดขวางในประเทศไทย

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บทคัดย่อ

ความเป็นมา: ภาวะซึมเศร้าเป็นปัญหาสุขภาพจิตที่พบได้บ่อยและสามารถกระทบกับทุกคนในช่วงการเจริญเติบโต แม้ความชุกของภาวะซึมเศร้าในนักศึกษามหาวิทยาลัยจะเพิ่มขึ้น การสำรวจในนักศึกษาวิศวกรรมยังมีจำนวนจำกัด วัตถุประสงค์ของการศึกษานี้คือการสำรวจความชุกของภาวะซึมเศร้าและปัจจัยที่เกี่ยวข้องในนักศึกษาวิศวกรรมในประเทศไทย

วิธีการ: นักศึกษาจำนวน 346 คนเข้าร่วมการศึกษานี้และได้ทำแบบประเมินภาวะซึมเศร้าด้วยเครื่องมือ Outcome Inventory - Depression Subscale (OI-Dep) เพื่อประเมินระดับและความชุกของภาวะซึมเศร้า ตัวแปรอื่น ๆ ที่ประเมินได้แก่ ทักษะทางสังคม รูปแบบการเรียนรู้ ความพึงพอใจในสัมพันธภาพ ความภาคภูมิใจในตนเอง ปัญหาสัมพันธภาพระหว่างบุคคล การใช้สุรา การติดอินเทอร์เน็ต และบุคลิกภาพแบบนิวโรติซิสม การวิเคราะห์ข้อมูลใช้การวิเคราะห์สหสัมพันธ์และการวิเคราะห์สถิติถดถอยเชิงเส้นทางเพื่อทดสอบความสัมพันธ์ระหว่างปัจจัยทางประชากร สังคมเศรษฐศาสตร์ และปัจจัยทางจิตวิทยาที่ทำนายกับภาวะซึมเศร้า

ผลการศึกษา: ในจำนวนนักศึกษาทั้ง 346 คน มีอายุเฉลี่ย 20.25 ปี (SD = 1.33) เป็นชายร้อยละ 52.3 และหญิงร้อยละ 47.7 ผลการประเมินด้วย OI-Dep พบว่าร้อยละ 35.5 ของผู้เข้าร่วมการศึกษาแสดงอาการที่บ่งชี้ถึงภาวะซึมเศร้า พบความสัมพันธ์ทางบวกอย่างมีนัยสำคัญระหว่างภาวะซึมเศร้า

กับบุคลิกภาพแบบนิวโรติซิสม ปัญหาความสัมพันธ์ระหว่างบุคคล และการติดอินเทอร์เน็ต พบความสัมพันธ์ทางลบอย่างมีนัยสำคัญระหว่างภาวะซึมเศร้ากับความภาคภูมิใจในตนเอง ทักษะทางสังคม และความพึงพอใจในสัมพันธภาพ ผลการวิเคราะห์ถดถอยเชิงเส้นพบว่า ปัจจัยที่มีอิทธิพลในการทำนายผลมากที่สุดคือบุคลิกภาพแบบนิวโรติซิส ทักษะทางสังคม ปัญหาความสัมพันธ์ระหว่างบุคคล และความภาคภูมิใจในตนเอง

สรุป: ความชุกของภาวะซึมเศร้าในนักศึกษาวิศวกรรมนั้นค่อนข้างสูง ปัจจัยต่าง ๆ ที่เกี่ยวข้องกับภาวะซึมเศร้า ได้แก่ ความภาคภูมิใจในตนเอง บุคลิกภาพแบบนิวโรติซิสม ทักษะทางสังคม และปัญหาสัมพันธภาพระหว่างบุคคล ซึ่งสอดคล้องกับการวิจัยก่อนหน้านี้ สิ่งสำคัญคือต้องสนับสนุนการศึกษาเพิ่มเติมในการค้นหาปัจจัยเสี่ยง

นอกจากนี้ การนำเสนอมาตรการแก้ไขที่มุ่งหวังในการระบุภาวะซึมเศร้าและปัจจัยเสี่ยงที่เกี่ยวข้องนั้นควรได้รับการพิจารณาอย่างจริงจัง

Thesis Title	Depression and Its Associated Factors Among Undergraduate Engineering Students: A Cross-sectional Survey in Thailand
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Abstract

Background: Depression is a common mental health problem that can affect everyone at different stages of development. Though the prevalence rate of depression among university students is rising, investigations among engineering students remains limited. The aim of the study was to examine the prevalence of depression and its associated factors of among engineering students in Thailand.

Method: Totally, 346 students participated in this study. All completed the outcome inventory-depression subscale (OI-Dep) to evaluate the level and prevalence of depression. Other variables assessed included social skill, learning styles, relationship satisfaction, self-esteem, interpersonal difficulty, alcohol use, internet addiction, IA and neuroticism. Correlation and regression analysis were applied to test the association between sociodemographic and psychosocial factors and depression.

Results: Of 346 students with the mean age was 20.25 (SD= 1.33), 52.3 % were male, 47.7% were female. Based on the OI-Dep, 35.5% of participants exhibited symptoms indicative of major depression. Significantly positive correlations were observed between depression and neuroticism personality, anxiety, interpersonal difficulty, somatization and IA. Additionally, a negative correlation was found between depression and self-esteem, social skills and relationship satisfaction. Multiple linear regression

showed that neuroticism, social skills, interpersonal difficulty, and self-esteem, constituted the significant predictors of depression.

Conclusion: The prevalence of depression among engineering students has proven to be surprisingly elevated. Among the contributing factors associated with depression include self-esteem, neuroticism, social skills, and challenges in interpersonal interactions. It is crucial to promote further investigation into the identification of these risk factors. Furthermore, the implementation of interventions aimed at identifying depression and its associated risk factors warrants serious consideration.

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LIST OF ABBREVIATIONS

SSI	Social Skill Inventory
VARK	Visual Aural Read/Write Kinesthetic questionnaire
RAS	Relationship Assessment Scale
OI-21	Outcome Inventory-21
OI-A	Outcome Inventory-Anxiety
OI-Dep	Outcome Inventory-Depression
OI-Inter	Outcome Inventory-Interpersonal Difficulty
OI-S	Outcome Inventory-Somatization
FBAQ	Functional-Belief-Based Alcohol Use Questionnaire
IAT	Internet Addiction Test
IA	Internet Addiction
RSES	Rosenberg Self-Esteem Scale
S/E	Self-Esteem
NI	Neuroticism Inventory
NE	Neuroticism
RR	Romantic Relationship

CHAPTER 1

INTRODUCTION

This chapter introduces the background, rationale and purpose of the study. In addition, the literature review, conceptual framework, hypothesis, scope of the studies and the benefits of the study were included.

1.1 Background

Embarking on higher education at the university level entails a significant shift in the learning approach for every college student. Without a proper understanding of this transition, passive acceptance can severely impact their learning outcomes. College courses progress at a rapid pace, often leaving students struggling to grasp the content and its significance. In contrast to high school, where teachers closely supervise students' progress, college instructors tend to place less emphasis on monitoring individual students' efficiency in completing assignments. This can result in students neglecting their assignments or group work. Failure to adapt to the changes in teaching styles may lead to academic setbacks or the need to retake courses. Consequently, university studies demand a high level of self-study ability from students [1].

For students fresh out of the college entrance examination, adjusting to university life involves more than just adapting to a new study mode. Interpersonal relationships, romantic involvements and social interactions become crucial aspects to navigate. Difficulties in these relationships can directly impact students' physical and mental well-being, thereby influencing their academic performance. Hence, addressing mental health challenges is as important as adapting to the new learning environment. Research has shown that while students often experience mental health issues upon entering university, these challenges tend to decrease as they progress through their studies [2].

Depression is a prevalent mental health issue that can impact individuals at various stages of their development. This condition is characterized by feelings of sadness, a persistent negative mood and physical disturbances related to sleep or appetite [3]. Depression can have detrimental effects on various aspects of a person's life, including academic performance, eating habits, sleep patterns and behavior. The incidence of depression among college students is steadily increasing and surpasses that of the general population [4]. The World Health Organization (WHO) projects that by 2030, depression will become the most prevalent illness globally [5].

For young individuals with depression, graduating from university can be challenging as it often leads to neglecting academic responsibilities and accumulating academic pressure. Moreover, depression can strain relationships with family members and friends [1]. If left untreated, these depressive symptoms and emotions can potentially give rise to other physical and psychological problems [6, 7]. Several factors contribute to the high incidence of depression among college students, with one prominent factor being anxiety about career planning. However, college students have more flexibility in managing their course schedules compared with high school, allowing them to allocate time for work and studies. This affords them an opportunity to enhance their social skills and become familiar with societal norms through work experiences. Nonetheless, this transition from campus to society can also bring about various psychological challenges, including depression, stress, and anxiety.

1.2 Rationale

University students may share similar experiences of mental health challenges living in a similar environment; however, the study major could contribute to the different effects on depression. Students who study arts, health science and engineering, may have different effects from the burden of their studies. Moreover, they may require different sets of social skills, learning styles or even personality traits to maximize the achievement of the subject they are studying.

Engineering is a unique course. The main task of engineering education is to train students to have sufficient knowledge and skills that meet the needs of society. Engineering graduates primarily enter to the front line of industrial production, where

they are engaged in design, manufacturing, operation, construction, research and development, and management. Engineering education is varied due to different national conditions. The training focus also differs, but generally, most countries pay more attention to the practical operation ability of students, aiming to help them adapt to social life in the shortest time after graduation [8, 9].

Regarding mental health issues among engineering students, many factors are found to be associated with sex, low self-esteem, year the students are studying in, dropping out the college, not being satisfied with hair and recent breakups, for example [10].

Most engineering majors require students to have more rational thinking, so students majoring in science in high school are more inclined to choose engineering majors in college. This indicates that cognitive reverberating on learning style has an impact on how well an individual student does academically [11].

Another factor comprises personality traits influencing their coping strategies [12]. Students majoring in engineering learn a great deal of science knowledge from the beginning of school, and the academic burden causes a certain psychological burden to them. However, certain students have poor coping skills to deal with pressure and lack sufficient psychological strength to help them resolve any negative emotions [13].

At times, students may use maladaptive copings to relieve their psychological distress or disorders such as alcohol consumption or problematic Internet use to avoid their real social lives [14].

The opportunity to experience stress seems to be higher during the advancing years. As academic assignments end in the third year of their university life, in the final year, they face the internship task, which is a transition stage for engineering students from campus life to work life, and it becomes a necessary task for them to adapt to the new environment. This transition period could bring more stress, resulting in more negative emotions or psychological disorders [15].

The psychological problems of college students cannot be ignored. focusing on mental health care, developing students' emotional intelligence and learning effective psychological coping methods is necessary. When college students deal with the crisis of

environmental change and interpersonal relationships, it could be a help to solve their problems using a rational point of view and balancing their emotional fluctuations in perceptual thinking.

However, a significant gap exists in our understanding of mental health outcomes specifically those related to engineering students. While extensive research has been conducted among university students, particularly in health science fields such as medicine or nursing, limited attention has been allocated to engineering students [16]. Addressing this gap becomes crucial considering that engineers hold one of the most important and influential roles, as their work directly impacts society. Therefore, addressing the current state of minimizing or preventing the adverse socio-psychological impacts on engineering students is imperative.

Related studies have highlighted the prevalence of depression among university students, and while research on engineering students remains limited, evidence suggests an increasing trend in the number of engineering students experiencing depression [10, 17]. Understanding the psychological challenges faced by engineering students and identifying predictors of depressive symptoms is essential. By investigating these factors, researchers can gain a comprehensive understanding of the mental health landscape of future engineers.

Drawing on existing evidence [10, 14, 18, 19], this study hypothesizes that various factors, including self-esteem, learning style, social skills, interpersonal difficulties, alcohol consumption, romantic relationships, internet addiction (IA) and the personality trait of neuroticism, contribute to the experience of depression among engineering students. Examining these potential predictors could shed light on the underlying psychological obstacles faced by engineering students and their association with depressive moods or depression.

1.3 Purposes of the study

The purposes of the study includes three objectives listed below.

1.3.1 Examining the prevalence rate of depression among Thai undergraduate engineering students.

1.3.2 Exploring the relationship between associated factors and depressive symptoms.

1.3.3 Determining the significant predictive factors for depressive symptoms among Thai undergraduate engineering students.

1.4 Literature review

A 2020 study in Pakistan found that engineering students exhibited a higher rate of depression than medical students, the prevalence was 82.87 and 56.9%, respectively [10]. Both engineering and medical students experience different levels of depressive symptoms. Overall, 31.5% of students experience mild depression, 18.5% moderate, 8.8% severe and 11% encountered very severe depression.

In a study conducted in Jordan among undergraduates of all levels, depression and anxiety were found in 22.3% and 15.8%, respectively. The factors contributing to depression among engineering students in this study were sex and low income [16].

In Thailand, no single study has been reported on the prevalence of depression among undergraduate engineering students only. A 2017 study of depression among Thammasat University Health Sciences students in Thailand found that 4% of Health Sciences students reported major depression. 13.3% of participants presented less than major depression and 33.5% experienced mild depression [20].

1.4.1 Romantic relationship

A romantic relationship is a mutually recognized, ongoing, voluntary interaction. Romantic relationships are significantly exclusive compared with other peer relationships and are often used to express affection and attachment to another person [21]. Healthy relationships play a key role in personal growth including respect for each other, a proper sense of free space and boundaries and a balance of emotional give and take [22]. On the contrary, unhealthy relationships can lead to many arguments and negative emotions, which can lead to various psychological disorders such as bipolar disorder, obsessive-compulsive disorder and depression [23, 24].

In terms of anxiety levels, being female, students and engineering students as well as individuals who have experienced divorce, exhibit higher levels of anxiety compared

with those not within these categories. Notably in Naser et al.'s [16] study, divorce and recent breakup [8] were identified as predictors of depression, alongside the significant factors of being female, earning a low income and being an arts or engineering student. These findings suggest that romantic relationships warrant further examination including exploring whether the success of such relationships can serve as a predictor for reducing depression among the subjects.

1.4.2 Self-esteem

Many early theories have suggested that self-esteem is a basic human need or motivation. American psychologist Abraham Maslow included self-esteem in two different forms of esteem: 'The need for respect from others' and 'The need for self-respect, or inner self-esteem' [25]. Self-esteem progresses into an individual's growth stage and presents different states in specific development phases. For example, during childhood, the level of self-esteem gradually increases. It especially increases when people start dating from adolescence, and those who fall in love show higher self-esteem in late adolescence, gradually stabilize, then began to decline in old age [26, 27]. A study comparing depression among medical and engineering students found that favoritism negatively correlated with students' self-esteem levels in the class, and self-esteem is one of the associated factors of depression [10].

1.4.3 Internet addiction (IA)

In a 2018 Indian study of 1,086 engineering students, 27.1% reported mild IA, 9.7% had moderate IA, and 0.4% presented severe IA. The strongest predictor was being male. In addition, the time and frequency of using the network were predictors causing engineering students to become addicted to the network. From this study, IA is considered a serious problem for engineering students, identified as an obstacle to their academic progress that may also interfere with their social life. The researchers found that being male, daily time of internet use, frequency of internet use and psychological distress (depression) were predictors of IA, with psychological distress (depression) positively correlated with IA [14]. A related study by Carli et al. [28] also found that depression was the leading main predictor of IA.

1.4.4 Substance use and abuse

The Thai National Mental Health Survey (2013), which examined two thirds of males in Thailand, revealed that a considerable number of participants started consuming alcohol under the legal age. Specifically, those who began drinking before the age of 15 had a higher likelihood of developing addiction to cannabis, club drugs and inhalants. Additionally, they were significantly more prone to experiencing psychotic symptoms, intermittent explosive disorder and panic disorder [29].

The frequency of alcohol and substance use among engineering students is notably similar, with alcohol consumption being strongly correlated with tobacco use, particularly among engineering students. The male population of engineering students exceeds that of females. Research has indicated that being male is a predictive factor for tobacco use. Conversely, tobacco use also serves as a predictor for alcohol consumption; thus, establishing a detrimental cycle between the two. Both tobacco and alcohol consumption are predictive factors for depression and suicide. Identifying early signs of alcohol addiction among students can facilitate timely interventions to prevent more severe mental disorders and suicide attempts [19].

1.4.5 Interpersonal difficulty and social skill

Siddiqui and colleagues [10] revealed that medical and engineering majors are two favorite college majors for students with high scores. Their choice not only shows that these two majors are excellent prospects, but also indicates that these two professions have deeply penetrated the life of other industries. Students in these two majors usually spend much time immersed in studying since their high school days. They tend to feel showing their self-worth through learning is easier than through socializing. Long term immersion learning makes them more receptive to loneliness, less sociable, unable to perceive social hot spots properly; and thus, not on the same mental channel as their friends. This kind of population was found to have a high probability of lacking social skills. In their study, engineering students had a higher prevalence of depression (82.87%) than medical students (56.9%), which is inconsistent with most other studies comparing the two groups [10].

1.4.6 Learning style

A study where participants were pre-engineering students in northwest Ethiopia showed that the prevalence of depressive symptoms was 71.4%, and perceiving difficulties in learning independently was a predictor of increased depressive symptoms and substance use [18]. Bitew and colleagues found that perceived learning is a predictor of substance abuse, and participants experiencing difficulty in perceived learning are more likely to abuse substances. Each student's different educational experience leads to different learning habits, so different students accept the same learning content at different rates. Each student's learning style becomes a potential predictor of whether s/he developed depressive symptoms. Prithishkumar and Michael's study [30] specified that first year undergraduate medical students preferred visual and kinesthetic learning styles.

1.4.7 Neuroticism

A prospective longitudinal cohort study conducted in Germany involved university students enrolled in 2011 and 2012. The students in the study were assessed once yearly during the course. The sample size was 531 STEM (science, technology, engineering, and mathematics) students and 350 medical students. The results showed that the overall health of medical students performed well compared with that of STEM students, 90.9 and 79.7%, respectively. Participants in both groups also displayed good mental health, at 88.3 and 86.3%, respectively. Medical students scored two percent higher. Lower levels of personality of neuroticism, intention to resign and general health among STEM students significantly correlated to better mental health [12].

1.5 Gaps in knowledge

Various predictors have been identified in related studies that are found to be associated with depression among young adults ranging from personal to social factors [31-33]. Environmental factors that predispose undergraduate students to depression include academic pressure, rising parents' and teachers' expectations, hindrances to goal achievement, favoritism, change in role from students to professionals and recent breakup [24, 31-33]. While a few studies have explored the relationship between social skills, learning style and romantic relationships among undergraduate students, their research has not

focused on interpersonal relationships and self-esteem. Most of the published articles have explored the relationship between depressive symptoms in target populations from two broad perspectives: negative factors and demographic characteristics, such as being female and the year students studied in [33], substance use [19], IA [14, 28] and stigma [34].

1.6 Conceptual framework

This study adapted Engel's biopsychosocial model [35] (Figure 1.1), the model concept for the human body is based on biological, psychological and social factors constituting a whole. Biological, psychological and social factors can restrict an individual's health status and disease; sometimes one of these factors plays a leading role, but the three always influence each other. This concept highly overlaps with the concept of "health" proposed by WHO [36]. Health and disease are mutually continuous states that can be transformed to each other under certain conditions. To ensure and enhance health, the treatment and management of diseases should not only focus on biological factors but also consider psychological and social factors. By implementing targeted treatment and nursing approaches that encompass all aspects including biological, psychological, social and other elements, comprehensive care can be provided for the human body [37].

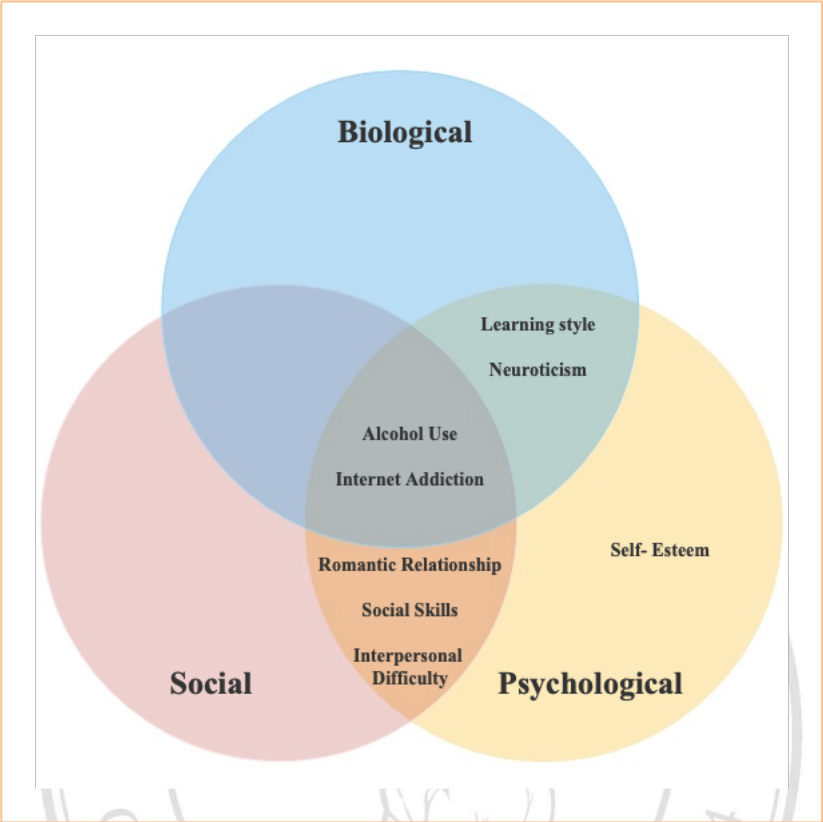

Figure 1.1. Biopsychosocial model in all psychosocial factors

This study hypothesized that eight social psychological factors would impact depressive outcomes (Figure 1.2). Based on a literature review, this study suggests that social skills, learning style, romantic relationships, interpersonal difficulties, alcohol use, IA, self-esteem, and neuroticism may serve as predictive factors for depression among undergraduate engineering students. Certain factors may be more effective predictors of depression than others.

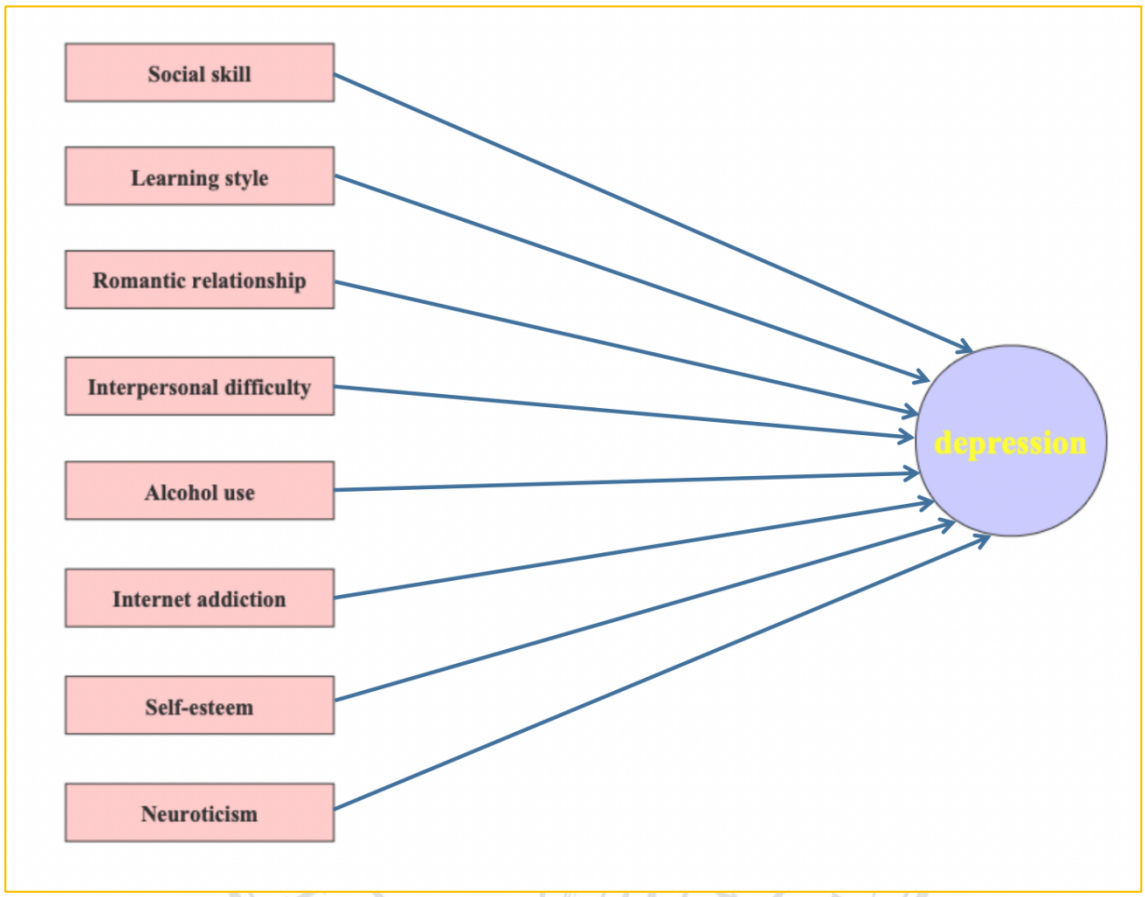

Figure 1.2. Relationship between Social Psychological Factors and Depression

1.7 Hypotheses

1.7.1 A higher level of social skill is negatively associated with the level of depressive symptoms.

1.7.2 A higher level of romantic relationship is negatively associated with the level of depressive symptoms.

1.7.3 A higher level of interpersonal difficulty is positively associated with the level of depressive symptoms.

1.7.4 A higher level of alcohol consumption is positively associated with the level of depressive symptoms.

1.7.5 A higher level of IA is positively associated with the level of depressive symptoms.

1.7.6 A higher level of self-esteem is negatively associated with the level of depressive symptoms.

1.7.7 A higher level of personality of neuroticism is positively associated with the level of depressive symptoms.

1.7.8 The relationship between participants' different learning styles and their depression varies.

1.8 Scope of the study

This study surveyed engineering undergraduate students, both male and female, aged 18 to 25 years in all universities across Thailand concerning their depressive symptoms and associated factors. This study commenced following the approval of the ethics committee on October 5, 2022, and concluded in June 2023 after data collection and analysis were completed. Participants were recruited nationwide from Thailand and consisted of individuals from 24 engineering-related disciplines, including electronic engineering, civil engineering, aerospace engineering among others.

CHAPTER 2

METHOD

This chapter delineates the research methods employed to conduct a cross-sectional study aimed at examining the correlation between demographic factors and various aspects including social skills, romantic relationships, alcohol consumption, IA, self-esteem, neuroticism personality traits and anxiety/depression among undergraduate engineering students.

2.1 Research design

This study constitutes a quantitative cross-sectional descriptive online survey.

2.2 Population

The participants comprised undergraduate engineering students in Thailand.

2.3 Sample size

2.3.1 Sample size calculation

The sampling method employed in this study followed convenience sampling strategies as proposed by Samuel J. Stratton [38]. Convenience sampling allows the researchers to select participants who are easily accessible and readily available. In the context of undergraduate engineering students in Thailand, approaching students on campus or through university networks to participate in the study was more convenient.

Two calculation formulas were used to determine the sample size in this study. Calculation formula 1 (Figure 2.1) was derived from a study on sample size calculation in exploratory medical research. This formula calculates the sample size based on the expected prevalence. Formula 2 (Figure 2.2), on the other hand, originated from a study conducted by Mm Rodríguez Del Águila [39] specifically focusing on sample size calculation for academic research. This equation determines the required sample size by considering the size of the overall population from which the sample will be taken. In the

actual calculation of Formula 1, the researchers used an expected prevalence of 71.4% derived from a study conducted by Dhand [40], focusing on a target population and research direction similar to that of the current study.

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Figure 2.1. Sample Size Calculation Formula 1

$$n = \frac{t_\alpha^2 * p * q * N}{(N-1) * e^2 + t_\alpha^2 * p * q}$$

Figure 2.2. Sample Size Calculation Formula 2

In Formula 2, the 'n' value represents the sample size, while the 'N' value indicates the size of the overall population from which the sample will be taken. 'N' refers to the results of a nationally conducted survey in the National Statistical Office Thailand [41], encompassing a total of 30,346 engineering students. The 'p' value corresponds to the expected percentage of depression based on a related study. The 'q' value is the inverse of the expected percentage of the response variable. The 'e' value represents the accepted margin of error, typically ranging from 5 to 10% (5% was used in this case). The 'tα' value represents the specific point on the normal curve relating to the chosen confidence level. In this particular study, a value of 1.96 was used. A confidence level of 95% was employed for this research, resulting in a sample size of 310 participants according to the calculation Formula 2.

The two calculation formulas yielded results of 317 and 310, respectively. The researchers obtained an average of 314, with a 10% margin of error, leading to an estimated total of 345 individuals.

2.3.2 Sampling

Convenience sampling was employed in this research due to time constraints, budget limitations and the impact of the COVID-19 situation. However, to ensure a comprehensive representation of Thai engineering students, the researchers engaged research assistants who reached out to engineering students located in various provinces across four regions in Thailand. The research assistants used email and Facebook platforms to contact students majoring in engineering. Furthermore, to enhance the sample's representativeness, the researchers collaborated with universities from the central and eastern regions, two universities from the northern, five universities from the northern and two universities from the southern region.

2.3.3 Inclusion criteria

1) Engineering undergraduates who were in years 1 to 4 in a university in Thailand as of June 2023.

2) Age: 18 to 25 years

3) Sex: Any sex or gender

4) Fluent in Thai

5) Able to access the internet

2.3.4 Exclusion criteria

1) Experiencing mental health conditions like schizophrenia, bipolar disorder or substance use disorder involving drugs or alcohol identified through diagnosis

2) Participants were asked to refrain from consuming alcohol within 24 hours before taking part in the research, as the researchers required documentation of alcohol intake.

2.4 Data collection

To begin with, highlighting that the research conducted was granted approval by the Ethics Committee of Chiang Mai University was important. Additionally, all the instruments and surveys used throughout the study were made accessible in both English and Thai. Moreover, these tools exhibited a Cronbach's alpha value of at least 0.80. Due to the prevailing circumstances of the COVID-19 pandemic, data were collected using an online survey. Microsoft Form was the chosen platform for the questionnaire, and the survey was administered between August and September 2022. All participants provided their consent after being adequately informed before taking part.

To facilitate recruitment, the researchers established contact with engineering student unions at various universities in Thailand. The purpose and significance of the research were explained to these unions, following which approval was sought. Subsequently, the researchers shared the research flyer or QR code with students enrolled in engineering faculties.

2.5 Measurements

The study involved the administration of nine questionnaires to the participants. These questionnaires encompassed various domains, including demographic information, social skills assessment, evaluation of romantic relationships, learning styles, interpersonal difficulties, depressive symptoms, IA, self-esteem, alcohol consumption and neuroticism assessment. The instruments used comprised the Social Skills Inventory (SSI), the Relationship Assessment Scale, the Visual Aural Read/Write Kinesthetic (VARK) questionnaire, the Outcome Inventory-Interpersonal (OI-Inter), the Outcome Inventory-Depression (OI-Dep), the Internet Addiction Test (IAT), the Rosenberg Self-esteem Scale (RSES), the Functional-Belief-Based Alcohol Questionnaire (FBAQ) and the Neuroticism Inventory (NI). To ensure their applicability to the sample, all scales were initially validated using the Thai version and assessed for fundamental reliability. If any of the scales were unavailable in Thai, the researchers sought the assistance of specialized translation agencies to translate them accurately.

2.5.1 Demographic data questionnaire

A total of 28 inquiries focused on sociodemographic aspects. The basic information included age, sex, religion, major, home language, romantic relationship, marital status, the age of their mother and father, parents' marital status, cumulative GPA, the latest GPA and the number of students at their school. The researchers asked participants about their physical and mental illness status, specifying if they had any. Participants were asked to rate their perceived fame and support from their university compared with others on a scale of 1 to 7. A question was included to inquire about participants' alcohol consumption and how it interfered with their functioning. Options were provided for participants to indicate their family's monthly income and monthly allowance, categorized as lower than 25000 THB, 25000 to 50000 THB, 50001 to 75000 THB, 75001 to 100000 THB and over 100000 THB. The allowance was categorized based on the amount: below 5000 THB, between 5000 and 10000 THB, between 10001 and 15000 THB, between 15001 and 20000 THB, and above 20000 THB. Participants' parents' education level was divided in four options: elementary to junior high school, high school or vocational school, bachelor's degree or higher than bachelor’ degree. The researchers included two questions about how often participants spent time with their partner and parents. Additionally, two questions asked participants if they had any practicum experience related to the engineering field.

2.5.2 Social Skills Inventory

The Social Skill Inventory (SSI), consisting of six scales was used to assess communication skills in both emotional (nonverbal) and social (verbal) dimensions, as well as to evaluate fundamental social skills. Consequently, the SSI serves as a reliable and valid measure of emotional intelligence ability [42]. The SSI comprised two subscales: emotional control (EC) and social control (SC). The reliability coefficients, known as Cronbach's alpha, for the EC and SC measures were calculated to be 0.76 and 0.87, respectively [42]. Each scale included 15 items, resulting in a total of 30 items employed in this study. Below is one example of an EC item: "When I am really not enjoying myself at some social function." Individuals with high EC may excel at emotional acting [43], swiftly displaying appropriate emotions and behaviors in response to the mood shifts of those around them, while also adeptly concealing and masking their own emotions. On

the other hand, SC items such as "I find it very easy to play different roles at different times" gauge the participants' abilities in role-playing, social self-expression and adapting to diverse social situations. Individuals with high SC scores tend to be tactful, socially skilled, and confident. The Thai version of the SSI was developed by Darawan Klomkliang [44], and demonstrated a Cronbach's alpha of 0.88 [45]. In the present study, the Cronbach's alpha for the SSI was 0.534.

2.5.3 Relationship Assessment Scale

The measurement tool used to assess general relationship satisfaction is the Relationship Assessment Scale (RAS), as described by Hendrick and colleagues [46]. This scale consists of seven items investigating various aspects of relationship satisfaction, such as the extent to which one's partner meets their needs, overall satisfaction with the relationship and a comparative evaluation of the relationship to others. Participants were requested to assign a score to each item using a 5-point scale, where 1 represents low and 5 signifies high satisfaction [46].

The RAS, or Relationship Assessment Scale, is a tool used to measure satisfaction within relationships. It assigns individual scores ranging from 7 to 35. Related studies have reported Cronbach's alpha coefficients of 0.89 for assessing relationships with parents, 0.87 for friendships and 0.90 for romantic partnerships [47]. In the current study, the Cronbach's alpha score for the RAS was 0.834, indicating a good level of internal consistency. The RAS is grounded in relationship theory, providing a reliable and valid measure of general relationship satisfaction.

2.5.4 Visual Aural Read/Write Kinesthetic

The Visual Aural Read/Write Kinesthetic (VARK) questionnaire, used to evaluate an individuals' learning preferences, comprises 16 multiple-choice questions. For instance, when faced with the task of locating a shop recommended by a friend, respondents are presented with options such as: a) determining the shop's location relative to a familiar place, b) seeking directions from the friend, c) jotting down the street directions to remember, or d) using a map [30]. Each of these choices corresponds to one of the four sensory modalities assessed by the VARK: visual, aural, read/write, and kinesthetic [30].

The Cronbach's alpha coefficients, indicative of internal consistency, were calculated to assess the reliability of the learning styles measured by VARK. In a study by Leite and colleagues [48], the VARK demonstrated Cronbach's alpha scores of 0.85, 0.82, 0.84 and 0.77, respectively. These coefficients suggest high levels of internal consistency, reinforcing the reliability of the VARK questionnaire.

Furthermore, a Thai version of the VARK was developed by Sureeporn Pawuttipattarapong [49]. In a subsequent study, the Cronbach's alpha coefficients for the Thai version of VARK were reported as 0.666, 0.576, 0.655 and 0.648 for the visual, aural, read/write and kinesthetic learning styles, respectively. Although slightly lower than the coefficients reported in the related study, these values still indicate acceptable levels of internal consistency for the Thai version of VARK [49].

2.5.5 Outcome Inventory-21(OI-21)

The Outcome Inventory-21 (OI-21) is a psychometric instrument used to assess anxiety, depression, somatization and interpersonal difficulty. The assessment comprises a set of 21 questions presented in a questionnaire format, where individuals are asked to rate their responses using a 5-point Likert scale. This scale allows participants to indicate how much they agree or disagree with options ranging from "0" representing not at all to "4" indicating almost always [50]. In a study conducted by Wongpakaran and colleagues [50], the internal consistency of the OI-21 questionnaire was found to be high, as indicated by the calculated Cronbach's alpha coefficient of 0.92. In the current investigation, the Cronbach's alpha coefficient for the OI-21 was calculated to be 0.915, further substantiating its strong internal consistency.

Furthermore, within the OI-21, there exists two subscales referred to as the OI-Inter and OI-Dep. Two subscales are specific four-item questionnaire measuring interpersonal difficulty and five-item questionnaire measuring depression, respectively. Encompassing items such as "I do not get along with others" and "I prefer solitude over social interactions" [50]. The OI-Inter subscale encompasses a score range of 0 to 16, where higher scores signify heightened levels of interpersonal difficulties. The Cronbach's alpha coefficient for the OI-Inter and OI-Dep in the related study conducted by Wongpakaran

and colleagues [50] were determined as the same score to be 0.83, indicating a satisfactory level of internal consistency.

2.5.6 Internet Addiction Test

The Internet Addiction Test (IAT), developed by Young [51], is used to assess the severity of IA by measuring mild, moderate or severe levels. Consisting of 20 questions such as "How often do you neglect household chores to spend more time online?", participants rate themselves on a scale ranging from 0 (not applicable) to 5 (always), based on the frequency of these occurrences. The IAT has gained substantial recognition within the global academic community, being widely employed in numerous research studies. Related investigations [52] have confirmed its effectiveness and practicality in diagnosing IA.

Individual results on the IAT can range from 0 to 100, with higher scores indicating a stronger level of IA. Notably, the Thai version of the IAT, as assessed by Neelapaijit and colleagues [53], displayed a Cronbach's alpha score of 0.89, indicating favorable internal consistency. In our current investigation, the researchers observed a Cronbach's alpha coefficient of 0.919 for the IAT.

2.5.7 Revised Thai version of Rosenberg Self-esteem Scale

The Rosenberg Self-esteem Scale (RSES), originally developed by Rosenberg in 1965, was primarily designed to evaluate the overall sense of self-worth among adolescents. This scale consisted of six positively-phrased items (e.g., "I feel that I have a number of good qualities" etc.) and four negatively-phrased items (e.g., "At times I think I am no good at all" etc.). In this scale, strongly disagree is rated as 1, strongly agree as 4. The RSES uses a scoring system ranging from 0 to 40. A greater score on this scale indicates a stronger sense of self-worth and confidence.

To ensure the reliability of the Thai version of the RSES [54], calculated the Cronbach's alpha coefficient, obtaining a score of 0.87. In the present research, the researchers computed the Cronbach's alpha coefficient for the RSES and obtained a value of 0.91. The Cronbach's alpha serves as an indicator of internal consistency, revealing the

degree to which the items within the scale are interconnected. A higher Cronbach's alpha score indicates a stronger internal consistency and reliability of the scale.

2.5.8 Functional-Belief-Based Alcohol Use Questionnaire

The Functional-Belief-Based Alcohol Use Questionnaire (FBAQ), developed by Yingchankul and colleagues [55], is designed to evaluate the respondent's beliefs regarding alcohol consumption. This survey comprises three direct inquiries related to personal beliefs, specifically: "Alcohol consumption calms you down when you are stressed or upset," [55]. Unlike other assessments, the FBAQ does not require intricate calculations to determine standard alcohol consumption levels.

The FBAQ assesses individual perceptions about alcohol consumption, using a rating scale from 1 to 5. Higher scores on the FBAQ reflect a stronger presence of distorted beliefs related to alcohol consumption. In the present study, the FBAQ demonstrated an acceptable discriminative ability, as evidenced by the area under the receiver operating characteristic curve (AuROC) of 0.74. Moreover, the Cronbach's alpha was found to be 0.892 in the current study.

2.5.9 Neuroticism Inventory

The Neuroticism Inventory (NI) serves as a quantifiable indicator of the personality characteristic known as neuroticism, derived from Eysenck's comprehensive model of personality traits consisting of five factors [56]. The NI was developed by Nahathai Wongpakaran and Tinakon Wongpakaran [57] and consists of a total of 15 items. These objects are evaluated using a 4-point Likert scale spanning from 0 (never like me) to 4 (like me the most). For example, some of the items include "I tend to brood over things" and "I often feel stressed" [57].

The NI is a measure assessing an individual's level of neuroticism, with scores ranging from 0 to 60. Higher scores on the NI indicate a greater degree of neuroticism. In one study conducted by Banjongrewadee [57], the Cronbach's alpha coefficient for the NI was determined to be 0.83. In the current research, the Cronbach's alpha coefficient for the NI was re-examined and found to be 0.918, suggesting a high degree of internal consistency [57].

2.6 Data analysis

To analyze the sociodemographic characteristics of the data, descriptive analysis techniques were employed. This involved calculating the frequency, percentage, minimum, maximum, mean and standard deviation (SD) for the variables under consideration as follows: major, religion, the number of students at participants' school, perceived fame of participants' university (rated on a scale), perceived support from participants' university (rated on a scale), home language, marriage status, physical illness, mental illness, alcohol consumption, frequency of alcohol consumption, family monthly income, monthly allowance, working experience in a company while studying at the university, parents' marital status, parents' education, frequency of staying with partner and parents, practicum experience in the engineering field and satisfaction with practicum experience in the engineering field. Anxiety, depression, romantic relationship, social skills, interpersonal difficulty, alcohol consumption, IA, neuroticism and self-esteem were also calculated as means and percentages. The researchers assessed the prevalence of depression using descriptive analysis.

To examine the differences in sociodemographic factors related to depression, including age, religion, major, the number of students at school, perceived fame of university compared with others, perceived support from university, home language, marriage status, physical illness, mental illness, alcohol consumption, frequency of alcohol consumption, alcohol intake interference function, monthly family income, monthly allowance, work experience in a company while studying at the university, parents' marital status, education level of mother and father, romantic relationship, spending time with partner, relationship with parents, practicum experience in the engineering field and satisfaction with practicum experience in the engineering field, the researchers employed the chi-square test. Furthermore, the chi-square test was used to analyze the relationship between sociodemographic factors and depression among the participants. The depression status of all participants was categorized as "Depression" or "No depression." The results were presented in the format of (degrees of freedom, sample size) = [chi-square value, p-value].

Additionally, the t-test was employed to analyze the association between sociopsychological factors and depression among all participants. Similarly, the depression status of all participants was classified as "Depression" or "No depression," and the results were presented in the format of (t (degree of freedom) = t-value, p = p-value).

Pearson's Correlation coefficient was used to assess the relationships among variables such as romantic relationships, self-esteem, alcohol consumption, neuroticism, social skills, IA, interpersonal difficulties, somatization, anxiety and depression. The coefficient (r) indicates the strength and direction of the correlation. Positive correlations denote a simultaneous increase or decrease in the variables, while negative correlations indicate an inverse relationship. The magnitude of the correlations is determined by the absolute value of r, with values closer to 1 indicating a stronger correlation. The level of statistical significance was established by examining the p-value, with a value of $p < 0.05$ indicating a strong degree of statistical significance.

Multiple linear regression analysis was employed to test the predictive impact of the social psychological factors proposed in this study on the dependent variable, depression. The beta values derived from the analysis results elucidated the nature of the relationship between each factor and depression, whether positive or negative. Additionally, the p-values accompanying these coefficients indicate the statistical significance of the relationships. Specifically, a p-value below 0.05 signifies that a particular factor serves as a robust predictor of depression.

2.7 Ethics Approval

The study received approval from the ethics committee of the Faculty of Medicine, Chiang Mai University. This study was assigned the code PSY-2565-09146, and it obtained certification number 340/2022, effective 5 October 2022. As stipulated by this approval, the study involved Thai undergraduates aged between 18 and 25 years old, majoring in any engineering-related field. The participants were requested to provide responses to general information questions including their age, sex, religion, major, the number of students at their school, perceived fame and support of their university, accumulative GPA, latest GPA, home language, marital status, physical and mental health

conditions, monthly family income, monthly allowance, business experience, parents' marital status and educational level, frequency of spending time with a partner, relationship with parents, practicum experience in the field of engineering, and satisfaction with the practicum experience.

Additionally, the questionnaire encompassed inquiries on social skills, learning styles, romantic relationships, interpersonal difficulties, alcohol consumption experiences, internet use behavior, self-esteem and the personality trait of neuroticism. The questionnaire was divided in nine sections, totaling 128 questions, and it took approximately 25 to 30 minutes to complete online.

In compliance with the approved ethical guidelines, participation in this research posed a low risk. However, participants were informed that if they experienced any physical or mental discomfort while answering the questions, they could take a break. They were also permitted to skip answers to certain questions that they found inconvenient. Nevertheless, the research team ensured the completeness of each participant's responses and allowed participants to complete any inadvertently skipped questions.

Participants did not receive direct benefits from participating in this research; however, the study aimed to contribute to the scientific and research community in the field of mental health. As compensation for their voluntary participation and time, participants received 50 THB. To facilitate the compensation process, participants were asked to provide their bank account information.

The information and responses provided by participants were treated as confidential and protected, and the ethics committee guaranteed the confidentiality of this information. Any personal information that participants chose not to disclose remained confidential. Participants' consent documents were kept separate from their questionnaire data to ensure the safeguarding of their identity. Only the researchers had access to the questionnaire results, and identifiable information was unpublished. The objective of the research outcomes is to be shared through academic journals and potentially referenced during conferences.

Adhering to international ethical guidelines for studies involving human participants and the Personal Data Protection Act, B.E. 2562, the communication of research findings in academic conferences or journals necessitates the omission of personally identifiable information. Data were entered in a database by the researchers, and anonymized and not linked to individual participants. However, certain entities, such as the Human Research Ethics Committee, research coordinator, research supervisor and officials from institutions or government organizations responsible for verifying research data and procedures, may have requested access to personal information.

CHAPTER 3

RESULTS

The objectives of this chapter is to elucidate the prevalence of depression among the subjects surveyed. Furthermore, it aims to provide a comprehensive elucidation of the intricate connections between various hypotheses and depression, offering a thorough investigation of these associations. Additionally, this chapter intends to identify and emphasize significant predictors contributing to the manifestation of depression.

The results confirm the research hypotheses as listed below.

a. A higher level of social skills is negatively associated with the level of depressive symptoms.

b. A higher level of romantic relationship is negatively associated with the level of depressive symptoms.

c. A higher level of interpersonal difficulty is positively associated with the level of depressive symptoms.

d. A higher level of alcohol consumption is positively associated with the level of depressive symptoms.

e. A higher level of IA is positively associated with the level of depressive symptoms.

f. A higher level of self-esteem is negatively associated with the level of depressive symptoms.

f. A higher level of personality of neuroticism is positively associated with the level of depressive symptoms.

g. The relationship between participants' different learning styles and their depression varies.

3.1 Sociodemographic characteristics

In this study, a total of 346 engineering undergraduates from Thailand participated in a questionnaire. The participants included 181 males and 165 females. Among the 346, 18 reported that they were LGBTQ. The male participants had an average age of 20.19 (SD = 1.35), while the female participants had an average age of 20.30 (SD = 1.298). The overall mean age of all subjects was 20.25 (SD = 1.33).

Religious beliefs were also recorded for the 346 participants. Among them, 84.7% identified as Buddhists, 4.3% were Muslim, 9.2% had no religious affiliation and only 1.7% believed in Christianity.

Regarding the participants' engineering majors, 67 students were majoring in Electrical Engineering, accounting for 19.4% of the total. Civil Engineering had 50 students (14.5%), followed by Mechanical Engineering (42 students, 12.2%), Industrial Engineering (40 students, 11.6%) and Chemical Engineering (30 students, 8.7%).

In terms of the size of the participants' educational institutions, 148 students attended schools with a total student population of more than 20,000, 98 students attended schools with a population between 15,000 and 20,000 and 81 students attended schools with a population less than 15,000. These percentages correspond to 45.3, 30.0 and 24.8% of the total population, respectively.

The participants were also asked to rate the perceived fame of their universities compared with others on a scale of 1 to 7. Among 226 valid cases, male participants showed a mean score of 5.21 (SD = 1.41), while the female participants indicated a mean score of 4.75 (SD = 1.41). The overall mean score of all subjects was 5.09 (SD = 1.43). By rating their perceived support from the university, among 226 valid cases, male participants showed a mean score of 4.34 (SD = 1.25), while the female participants revealed a mean score of 4.20 (SD = 1.34). The overall mean score of all subjects was 4.33 (SD = 1.25).

Among the participants, 150 males obtained a mean GPA of 2.92 (SD = 0.59), while 135 females obtained a mean GPA of 2.85 (SD = 0.51). The overall mean GPA for the valid sample of 285 participants was 2.90 (SD = 0.55).

Language proficiency was assessed among the engineering students, with 336 being native speakers of Thai (97.1% of the total), 9 native English speakers (2.6%) and 1 native Japanese speaker (0.3%).

Regarding marital status, 338 participants were single (98.3%), while 6 were married (1.7%).

The questionnaire also inquired about the participants' physical and mental illnesses. Of the total population, 310 participants reported having no physical illness (93.4%), and 22 had physical illness (6.6%). Similarly, 330 participants reported having no mental illnesses (97.9%), while 6 reported having mental illness (2.1%).

Alcohol consumption patterns were explored, with 208 participants expressing a desire to consume alcohol (60.3%). Among them, 107 were male (31.0%), and 101 were female (29.3%). On the other hand, 137 participants reported being nondrinkers (39.7%) including 74 males (21.4%) and 63 females (18.3%). Additionally, 157 participants reported consuming alcohol once weekly (75.8%), 40 drank two to three times weekly (19.3%), 8 consumed four to five times weekly (3.9%), and 2 consumed alcohol every day (1.0%).

Participants were also asked about the perceived impact of alcohol consumption on their functioning. A total of 108 participants believed that alcohol consumption would not affect their function at all (35.9%), while 20 participants believed it would significantly affect their function (6.6%).

Information regarding the participants' monthly family income and monthly allowance was collected. Among the participants, 129 reported a monthly family income between 25,000/750 and 50,000/1500 (THB/USD) (37.3%), while 26 reported a monthly family income between 75,001/2250 and 100,000/3000 (THB/USD) (7.5%). In terms of monthly allowance 155 participants received between 5,000/150 and 10,000/300 (THB/USD) monthly (45.1%), 131 received less than 5,000/150 (THB/USD) monthly (38.1%), and 9 received between 15,001/450 and 20,000/600 (THB/USD) (2.6%).

Regarding the latest GPA, 150 males obtained a mean of 2.95 (SD = 0.63), and 135 females obtained a mean of 2.82 (SD = 0.61). The overall mean latest GPA for the entire sample of 285 participants was 2.91 (SD = 0.63).

Regarding work experience, 195 participants had no prior experience working in a company (57.2%), while 146 participants had work experience (42.8%).

Among the 285 valid participants, the data indicated that the mean age of mothers for 150 males was 50.01 (SD = 5.52) and for 135 females was 48.86 (SD = 5.71). The overall mean age of mothers for all participants was 49.40 (SD = 5.75).

Among the 285 valid participants, the data showed that the mean age of fathers for 150 males was 52.81 (SD = 7.94) and for 135 females was 50.81 (SD = 6.77). The overall mean age of fathers for all participants was 51.83 (SD = 7.41).

Family backgrounds were also examined, with 239 participants having married parents (69.7%), 65 reporting parents were divorced (19.0%), and 25 reporting parents were deceased (7.3%).

Educational attainment of the participants' fathers was analyzed. Of the participants, 100 earned a bachelor's degrees (29.6%), while 39 had a higher degree than bachelor's (11.5%). Regarding the educational attainment of mothers, 118 obtained a bachelor's degree (34.2%), and 22 had a higher than bachelor's degree (6.4%).

Romantic relationships were explored, with 197 participants reporting no romantic relationship (57.1%) and 148 participants reporting being in a romantic relationship (42.9%). Of those in a relationship, 82 reported seeing their partner at least once daily (56.2%), while 2 reported seeing their partner every six to seven months (1.4%).

The quality of participants' relationships with their parents was also surveyed. A total of 128 participants spent quality time with their parents at least once daily (38.6%), 89 spent quality time once weekly (26.8%), and 1 participant reported spending quality time with parents at least once every four months (0.3%).

Internship experiences related to engineering were explored, with 241 students reporting no internship experience (70.1%), while 103 students reported having relevant internship experience (29.9%). Among those with internship experience, 56 participants

rated their satisfaction as 4, 55 participants as 5, and 5 participants as 2 (rating from 1 to 7), corresponding to 24.8, 24.3 and 2.2% of the total population, respectively.

The researchers conducted ANOVA tests to determine the sex differences in five sociodemographic factors, namely, age, GPA, latest semester GPA, mother's age and father's age. The researchers used the t test to examine the sex differences in perceived fame of university compared with others, perceived support from university and satisfaction with practicum experience in engineering field. The researchers used the chi-square test to investigate the sex differences in other sociodemographic factors such as religion and major.

The study findings revealed significant sex differences among participants' majors, rating score of perceived fame of universities compared with others, latest semester GPA, father's age, mother's education, romantic relationship status and relationship with parents. The test results indicated significant differences as follows: χ^2 (9) = 36.91, p <.001; t (344) = 2.83, p= 0.005; *F* (1, 329) = 8.48, p= 0.004; *F* (1, 313) = 4.64, p= 0.032; χ^2 (3) = 9.34, p= 0.025; χ^2 (1) = 4.15, p= 0.042 and χ^2 (4) = 15.39, p= 0.004 respectively.

These findings suggest that participants' sex significantly relates to their major, perception of university fame, latest semester GPA, father's age, mother's education, romantic relationship status and relationship with parents.

Overall, this questionnaire-based study provides insights into various aspects of the surveyed engineering undergraduates from Thailand, including demographics, educational backgrounds, perceived fame and supports from universities, physical illness, mental illness, alcohol consumption, family members and relationship dynamics, and internship experiences. (Detailed data can be referred to in Table 3.1

Table 3.1. Sociodemographic characteristics and test differences among participants

Variables		**N (%) Mean±Sd**	**N (%) Mean±Sd**	**N (%) Mean±Sd**	**Test difference**
		Male (N=181)	**Female (N=165)**	**Total (N=346)**	
Age (18-25)		20.19±1.35	20.30±1.30	20.25±1.33	t (338) = -.78, p = .438
Religion	No religion	20(5.8%)	12(3.5%)	32 (9.2%)	χ^2 (3) = 4.09, p = .252
	Buddhist	149(43.1%)	144(41.6%)	293 (84.7%)	
	Christian	5(1.4%)	1(0.3%)	6 (1.7%)	
	Muslim	7(2.0%)	8(2.3%)	15 (4.3%)	
Major	Mechanical Engineering	26(7.5%)	16(4.6%)	42(12.2%)	χ^2 (9) = 36.91, p <.001
	Electrical Engineering	46(13.1%)	21(6.1%)	67(19.4%)	
	Civil Engineering	26(7.5%)	24(7.0%)	50(14.5%)	
	Computer Engineering	17(4.9%)	11(3.2%)	28(8.1%)	
	Chemical Engineering	11(3.2%)	19(5.5%)	30(8.7%)	
	Biomedical Engineering	7(2.0%)	10(2.9%)	17(4.9%)	
	General Engineering	11(3.2%)	6(1.7%)	17(4.9%)	
	Industrial Engineering	11(3.2%)	29(8.4%)	40(11.6%)	
	Environmental Engineering	3(0.9%)	16(4.6%)	19(5.5%)	
	Others*	23(6.7%)	12(3.5%)	35(10.1%)	

Table 3.1 (Continued)

Variables		**N (%) Mean±SD**	**N (%) Mean±SD**	**N (%) Mean±SD**	**Test difference**
		Male (N=181)	**Female (N=165)**	**Total (N=346)**	
The number of students at school	Less than 15000	40(12.2%)	41(12.5%)	81(24.8%)	χ^2 (2) = .86, p = .652
	15000-20000	54(16.5%)	44(13.5%)	98(30.0%)	
	Over 20000	82(25.1%)	66(20.2%)	148(45.3%)	
Perceived fame of universities compared to others (rating scale 1-7)		119 (5.21±1.41)	107 (4.75±1.41)	226 (5.09±1.43)	t (344) = 2.83, p = .005
Perceived support from universities (rating scale 1-7)		119 (4.34±1.25)	107 (4.20±1.34)	226 (4.33±1.25)	t (344) = 0.38, p = .707
GPA		150(2.92±0.59)	135(2.85±0.51)	285(2.90±0.55)	t (318) = 1.72, p = .087
Home Language	Thai	175(47.7%)	161(44.5%)	336(97.1%)	χ^2 (2) = .96, p = .620
	English	5(1.2%)	4(1.2%)	9(2.6%)	
	Japanese	1(0.3%)	0(0%)	1(0.3%)	
Marriage status	Single	176(51.2%)	162(47.1%)	338(98.3%)	χ^2 (1) = .01, p = .920
	Married	3(0.9%)	3(0.9%)	6(1.7%)	

Table 3.1 (Continued)

Variables		N (%) Mean±SD	N (%) Mean±SD	N (%) Mean±SD	Test difference
		Male (N=181)	Female (N=165)	Total (N=346)	
Having Physical illness	No	160(48.2%)	150(45.2%)	310(93.4%)	χ^2 (1) = .07, p = .790
	Yes	12(3.6%)	10(3.0%)	22(6.6%)	
Having Mental illness	No	174(51.6%)	156(46.3%)	330(97.9%)	χ^2 (1) = .27, p = .605
	Yes	3(0.9%)	4(1.2%)	7(2.1%)	
Drinking alcohol	Yes	107(31.0%)	101(29.3%)	208(60.3%)	χ^2 (1) = 0 .22, p = .640
	No	74(21.4%)	63(18.3%)	137(39.7%)	
Frequency of drinking alcohol	Once a week	79(38.2%)	78(37.7%)	157(75.8%)	χ^2 (3) = 1.93, p = .588
	2-3 days a week	25(12.1%)	15(7.2%)	40(19.3%)	
	4-5 days a week	4(1.9%)	4(1.9%)	8(3.9%)	
	7 days a week (everyday)	1(0.5%)	1(0.5%)	2(1.0%)	
Alcohol intakes interfere function	Not at all	50(16.1%)	58(19.3%)	108(35.9%)	χ^2 (4) = 6.35, p = .175
	Little	50(16.6%)	46(15.3%)	96(31.9%)	
	Moderate	28(9.3%)	26(8.6%)	54(17.9%)	
	Much	17(5.6%)	6(2.0%)	23(7.6%)	
	Very much	12(4.0%)	8(2.7%)	20(6.6%)	

Table 3.1 (Continued)

Variables		N (%) Mean±SD	N (%) Mean±SD	N (%) Mean±SD	Test difference
		Male (N=181)	Female (N=165)	Total (N=346)	
Family monthly income (THB/USD = 0.03)	Lower than 25,000THB	51(14.7%)	48(13.9%)	99(28.6%)	χ^2 (4) = 8.60, p = .072
	25,000-50,000THB	60(17.3%)	69(19.9%)	129(37.3%)	
	50,001-75,000THB	33(9.5%)	27(7.8%)	60(17.3%)	
	75,001-100,000THB	13(3.8%)	13(3.8%)	26(7.5%)	
	Over 100,000THB	24(6.9%)	8(2.3%)	32(9.2%)	
Monthly allowance (THB/USD = 0.03)	Lower than 5,000THB	66(19.2%)	65(18.9%)	131(38.1%)	χ^2 (4) = 4.37, p = .358
	5,000-10,000THB	81(23.5%)	74(21.5%)	155(45.1%)	
	10,001-15,000THB	18(5.2%)	21(6.1%)	39(11.3%)	
	15,001-20,000THB	7(2.0%)	2(0.6%)	9(2.6%)	
	Over 20,000THB	7(2.0%)	3(0.9%)	10(2.9%)	
Latest semester GPA		150(2.95±0.63)	135(2.82±0.61)	285(2.91±0.63)	t (329) = 2.91, p = .004
Work experience in the company while studying in university	Yes	77(22.6%)	69(20.2%)	146(42.8%)	χ^2 (1) = .01, p = .937
	No	101(29.2%)	93(27.3%)	195(57.2%)	
Mother's age		150(50.01±5.52)	135(48.86±5.71)	285(49.40±5.75)	t (335) = 1.82, p = .070

Table 3.1 (Continued)

Variables		N (%) Mean±SD Male (N=181)	N (%) Mean±SD Female (N=165)	N (%) Mean±SD Total (N=346)	Test difference
Father's age		150(52.81±7.94)	135(50.81±6.8)	285(51.83±7.41)	t (313) = 2.15, p = .032
Marital Status of Parents	Married	130(37.9%)	109(31.8%)	239(69.7%)	χ^2 (4) = 2.79 p = .594
	Divorced	30(8.7%)	35(10.2%)	65(19.0%)	
	Widowed	2(0.6%)	4(1.2%)	6(1.7%)	
	Single	5(1.5%)	3(0.9%)	8(2.3%)	
	Deceased	12(3.5%)	13(3.8%)	25(7.3%)	
Father's education	Elementary-Junior high school	50(14.8%)	57(16.9%)	107(31.7%)	χ^2 (3) = 5.53, p = .137
	High school or vocational	45(13.1%)	47(13.9%)	92(27.2%)	
	Bachelor	56(16.6%)	44(13.0%)	100(29.6%)	
	Higher than bachelor	26(7.7%)	13(3.8%)	39(11.5%)	
Mother's education	Elementary-Junior high school	57(16.5%)	56(16.2%)	113(32.8%)	χ^2 (3) = 9.34, p = .025
	High school or vocational	38(11.0%)	54(15.7%)	92(26.7%)	
	Bachelor	72(20.9%)	46(13.3%)	118(34.2%)	
	Higher than bachelor	14(4.1%)	8(2.3%)	22(6.4%)	
	No	94(27.2%)	103(29.9%)	197(57.1%)	

Table 3.1 (Continued)

Variables		N (%) Mean±SD	N (%) Mean±SD	N (%) Mean±SD	Test difference
		Male (N=181)	Female (N=165)	Total (N=346)	
Romantic relationship	Yes	87(25.2%)	61(17.7%)	148(42.9%)	χ^2 (1) = 4.15, p = .042
	No	94(27.2%)	103(29.9%)	197(57.1%)	
Spending time with partner	At least once every day	45(30.8%)	37(25.3%)	82(56.2%)	χ^2 (4) = 2.50 p = .644
	At least Once every week	25(17.1%)	11(7.5%)	36(24.7%)	
	At least Once every month	7(4.8%)	6(4.1%)	13(8.9%)	
	At least Once every three months	7(4.8%)	6(4.1%)	13(8.9%)	
	At least once every 6-7 months	1(0.7%)	1(0.7%)	2(1.4%)	
Relationship with parent	Spent quality time with parent at least once every day	54(16.7%)	74(22.9%)	128(38.6%)	χ^2 (4) = 15.39, p = .004
	Spent quality time with parent at least once every week	48(14.9%)	41(12.7%)	89(26.8%)	
	Spent quality time with parent at least once every month	36(11.1%)	15(4.6%)	51(15.4%)	

Table 3.1 (Continued)

Variables		N (%) Mean±SD	N (%) Mean±SD	N (%) Mean±SD	Test difference
		Male (N=181)	Female (N=165)	Total (N=346)	
Relationship with parent	Spent quality time with parent at least once every three months	34(10.5%)	20(6.2%)	54(16.3%)	χ^2 (4) = 15.39, p = .004
	Spent quality time with parent at least once every four months	1(0.3%)	0(0%)	1(0.3%)	
Practicum experience in engineering field	Yes	53(15.4%)	50(14.5%)	103(29.9%)	χ^2 (1) = .05, p = .833
	No	127(36.9%)	114(33.1%)	241(70.1%)	
Satisfaction with practicum experience in engineering field (rating scale 1-7)		119(4.26±1.80)	107(4.01±1.79)	226(4.14±1.80)	*t* (224) = 1.05, p = .295

*Others include Aerospace & Aeronautical Engineering, Material Engineering, System Engineering, Electronic and Telecommunication Engineering, Mining Engineering, Mechatronics Engineering, Robots and Artificial Intelligence Engineering, Nano Engineering, Integrated Engineering, Software Engineering, Automotive Engineering, Agriculture Engineering, Logistic Engineering, Manufacturing Engineering, No limited branch

3.2 Descriptive statistics and test differences of psychosocial factors among all participants

Through analyzing of various psychosocial factors among engineering undergraduates in Thailand, the mean score and standard deviations (SD) for anxiety were examined. Among the 342 valid subjects, the mean score for male anxiety was 10.94 (SD = 5.30), while 10.60 for females, (SD = 5.32). The overall mean anxiety score was 10.94 (SD = 5.30).

Regarding depression, the mean score for males among 343 valid subjects was 5.68 (SD = 4.79), and 5.53 for females, (SD = 4.35). The total mean depression score was 5.61 (SD = 4.58).

The analysis of romantic relationships among 321 valid subjects revealed a mean score of 24.60 (SD = 6.09) for males, and 24.78 (SD = 5.70) for females. The overall mean score for a romantic relationship was 24.69 (SD = 6.98).

In terms of self-esteem, among 340 valid subjects, males had a mean score of 28.74 (SD = 6.02), and 29.56 for females, (SD = 5.24). The total mean self-esteem score was 29.13 (SD = 5.67).

Alcohol consumption among 344 effective subjects indicated a mean score of 12.49 (SD = 5.15) for males, and 12.09 (SD = 4.88) for females. The overall mean alcohol consumption score was 12.30 (SD = 5.02)

Examining neuroticism personality among 335 subjects, males had a mean score of 38.92 (SD = 9.55), and 40.26 for females (SD = 9.35). The total mean neuroticism personality sco39.57 (SD = 9.46).

The social skills of engineering undergraduates in Thailand were analyzed using data from 327 valid subjects. Males had a mean social skill score of 85.56 (SD = 11.90), and 86.60 for females (SD = 11.40). The total mean social skill score was 86.06 (SD = 11.66).

IA, a significant psychosocial factor, was assessed among 304 subjects who reported their internet use habits. Males had a mean score of 47.76 (SD = 16.25), and 46.21 females (SD = 14.47). The total mean IA score was 47.04 (SD = 15.44).

Interpersonal difficulty, analyzed among 341 subjects, yielded a mean score of 6.56 (SD = 3.77) for males, and 6.33 (SD = 3.43) for females. The total mean score for interpersonal difficulty was 6.45 (SD = 3.61).

Lastly, somatization was examined among 344 students, resulting in a mean score of 7.51 (SD = 4.98) for males, and 8.04 (SD = 4.12) for females. The total mean somatization score was 7.76 (SD = 4.59).

Regarding depression, of 122 individuals, 67 were males, accounting for 19.5% of the total number of individuals with depression. Altogether, 55 females comprised 16.0% of the total number of individuals with depression. (Detailed data can be referred to in Table 3.2)

The researchers conducted a statistical analysis of the learning styles of all participants using the steppingstone method. Of a total of 340 valid samples, 92 individuals (27.06%) exhibited a unimodal learning style (V, A, R, K), 42 individuals (12.35%) exhibited a bimodal learning style (VA, VK, AR, AK, RK), 60 individuals (17.65%) exhibited a trimodal learning style (VAR, VAK, ARK, VAR) and 146 individuals (42.94%) exhibited a quadmodal learning style (VARK). (Detailed data can be referred to in Figure 3.5).

The results of the difference test revealed significant sex differences for the read/write learning style.

A t teat analysis indicated a statistically significant difference in the mean exam scores among at least two groups for each of the factors: t (344) = -2.03, p = .043.

The t test results demonstrated meaningful differences in the mean scores of these factors among different male and female groups (Detailed data can be referred to in Table 3.2).

Table 3.2. Descriptive statistics and test differences of psychosocial factors among participants

Variables	N (%) Mean ± SD			Test difference
	Male	Female	Total	
Anxiety	178	164	342	t (340) = 1.11, p = .266
	(11.24±5.27)	(10.60±5.32)	(10.94±5.30)	
Depression	179	164	343	t (341) = .29, p = .769
	(5.68±4.79)	(5.53±4.35)	(5.61±4.58)	
V (Visual)	181	165	346	t (344) = .62, p = .535
	(5.87±3.16)	(5.67±3.00)	(5.77±3.0)	
A (Aural)	181	165	346	t (344) = .62, p = .539
	(6.13±2.71)	(5.95±2.59)	(6.04±2.651)	
R (Read/write)	181	165	346	t (344) = -2.03, p = .043
	(5.35±2.70)	(5.93±2.55)	(5.63±2.64)	
K (Kinesthetic)	181	165	346	t (344) = .66, p = .508
	(6.11±2.61)	(5.93±2.53)	(6.02±2.57)	
RS	166	155	321	t (319) = -.28, p = .780
	(24.60±6.09)	(24.78±5.70)	(24.69±6.98)	
RSES	178	162	340	t (338) = -1.34, p = .180
	(28.74±6.02)	(29.56±5.24)	(29.13±5.67)	
Alcohol use	181	163	344	t (342) = .73, p = .468
	(12.49±5.15)	(12.09±4.88)	(12.30±5.02)	

Table 3.2 (Continued)

Variables	N (%) Mean ± SD			Test difference
	Male	Female	Total	
NE	173	162	335	t (333) = -1.30, p = .196
	(38.92±9.55)	(40.26±9.35)	(39.57±9.46)	
SS	171	156	327	t (325) = -.81, p = .418
	(85.56±11.90)	(86.60±11.40)	(86.06±11.66)	
IA	162	142	304	t (302) = .87, p = .384
	(47.76±16.25)	(46.21±14.47)	(47.04±15.44)	
ID	178	163	341	t (339) = .57, p = .566
	(6.56±3.77)	(6.33±3.43)	(6.45±3.61)	
Somatization	180	164	344	t (342) = -1.07, p = .284
	(7.51±4.98)	(8.04±4.12)	(7.76±4.59)	
Prevalence of depression	67(19.5%)	55(16.0%)	122(35.3%)	χ^2 (1) = .57, p = .499

RS=Relationship Satisfaction, RSES=Rosenberg Self-Esteem Scale, NE=Neuroticism, SS=Social Skill, IA= Internet Addiction, ID=Interpersonal Difficulty

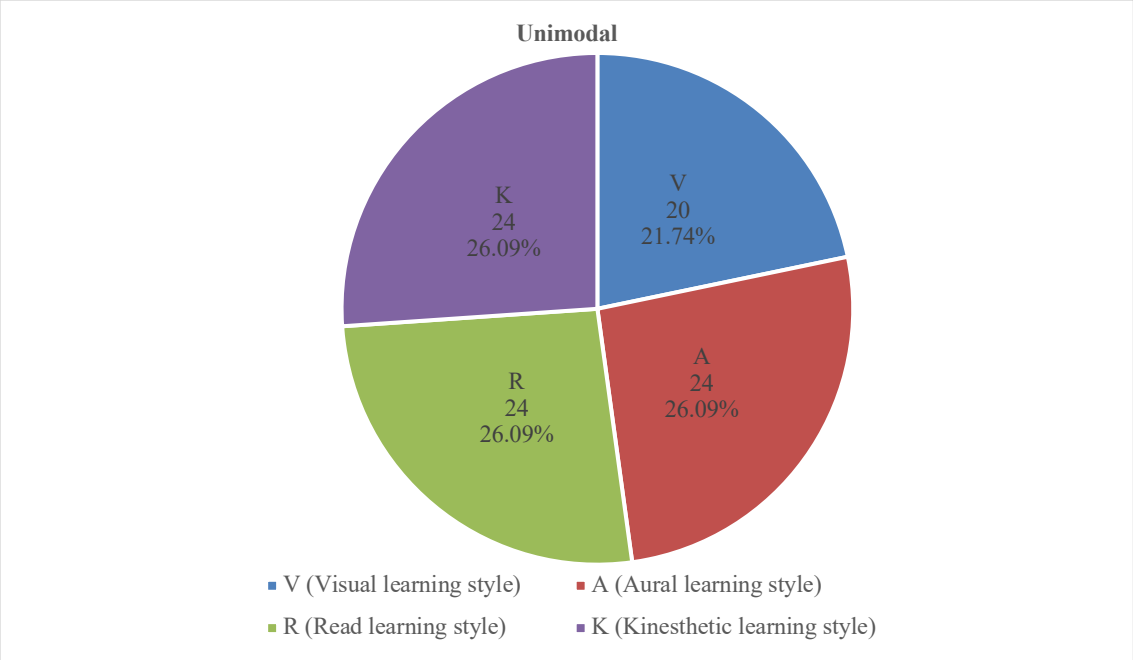

Figure 3.1. Distribution of learning style with a unimodal aptitude (V, A, R, K)

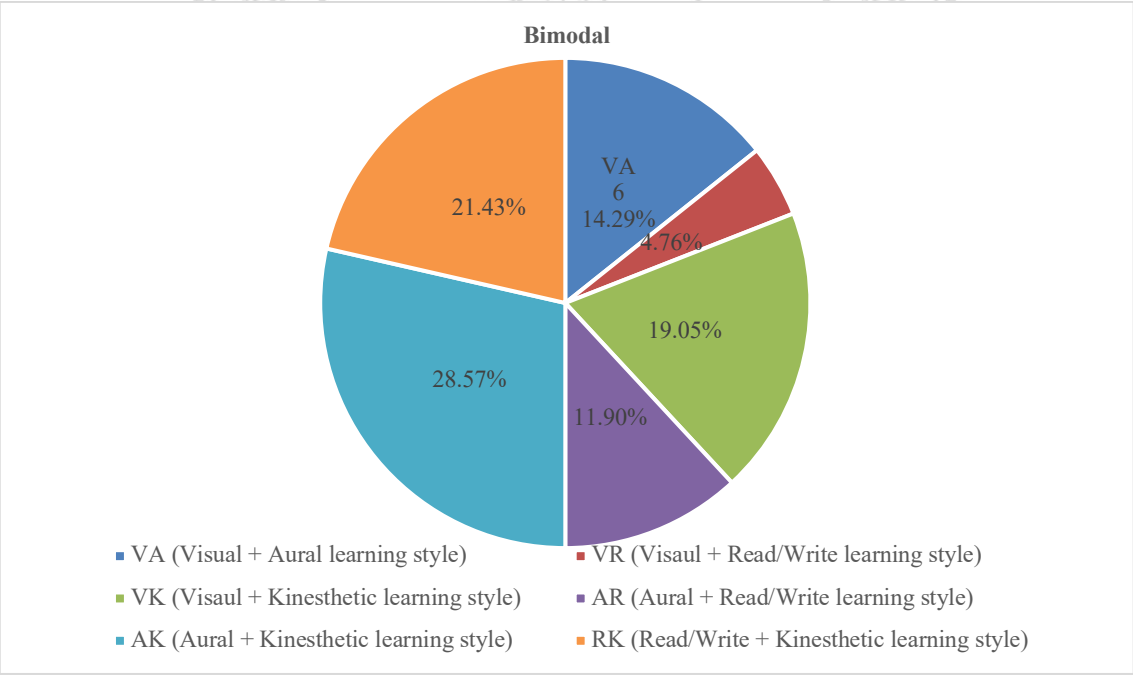

Figure 3.2. Distribution of learning style with a bimodal aptitude (VA, VR, VK, AR, AK, RK)

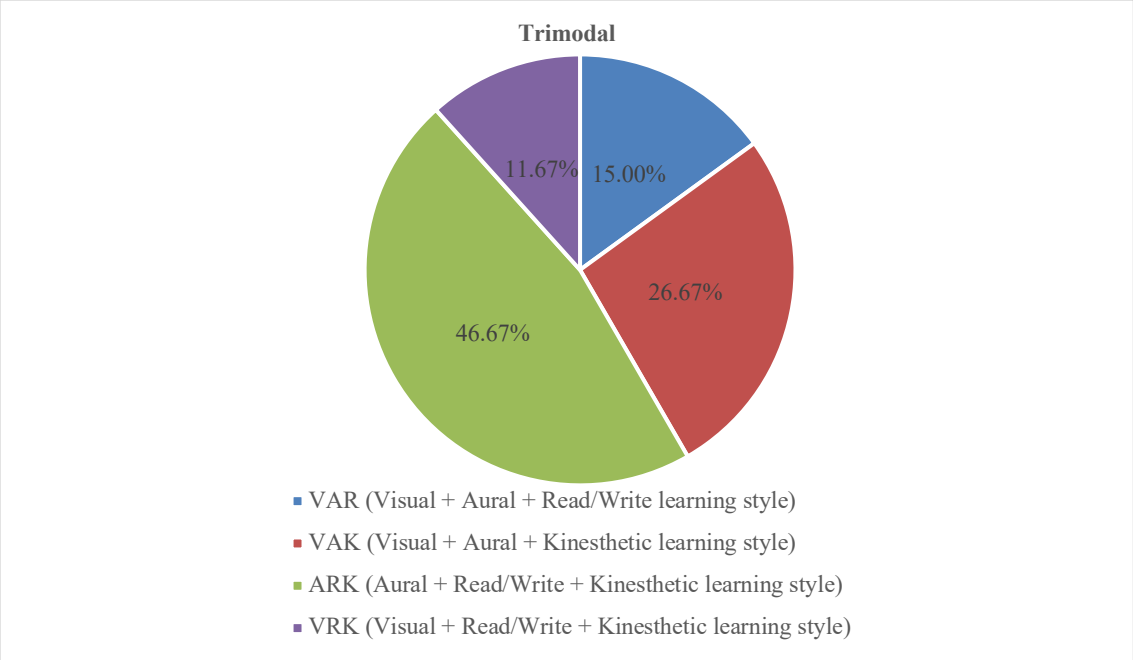

Figure 3.3. Distribution of learning style with a trimodal aptitude (VAR, VAK, ARK, VRK)

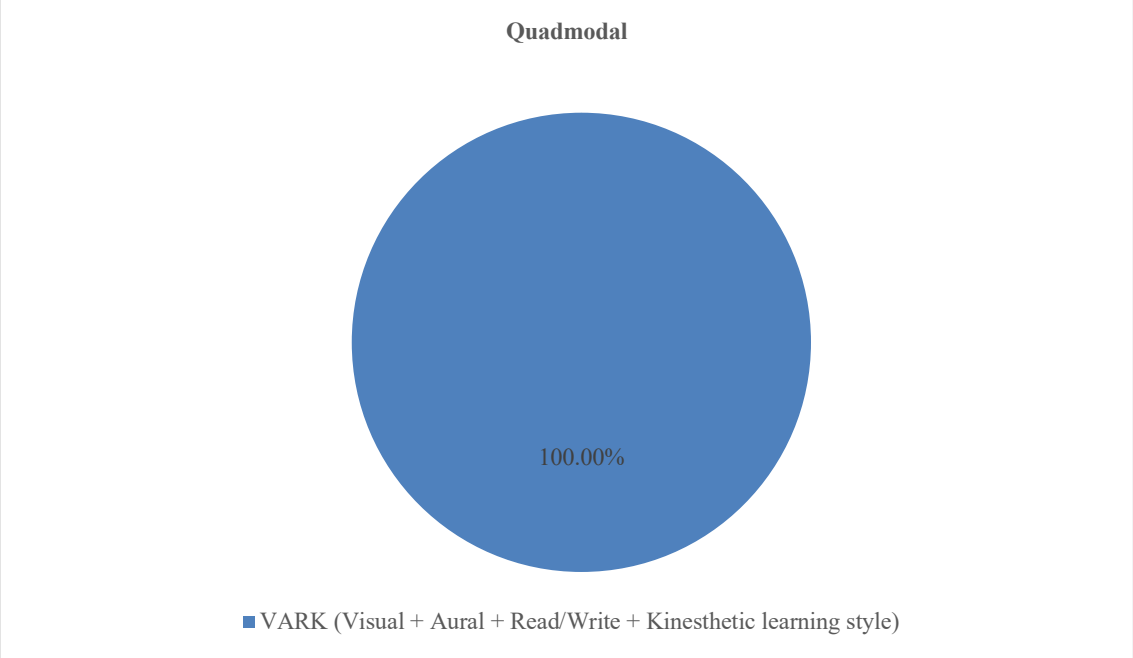

Figure 3.4. Distribution of learning style with quadmodal aptitude (VARK)

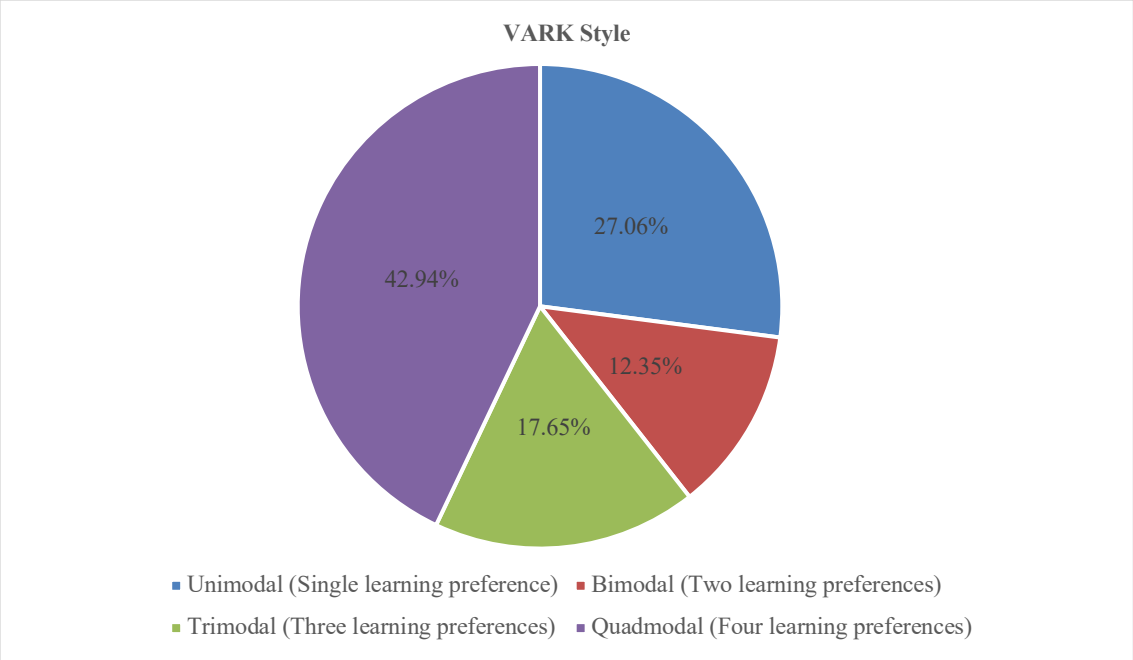

Figure 3.5. Distribution of uni/bi/tri/quad modal aptitudes

3.3 Test differences between sociodemographic factors and depression

Several sociodemographic factors included in this study did not show any significant impact on the dependent variables. These factors include major, home language, marriage status, physical illness, mental illness, alcohol consumption, frequency of consuming alcohol, alcohol intake interference function, monthly family income, monthly allowance, work experience in a company while studying at the university, marriage status of parents, father's education, mother's education, romantic relationship, spending time with a partner, relationship with parents and practicum experience in the engineering field.

Among these social demographic factors, religion, history of mental illness and current romantic relationship had significant impact on the dependent variable, specifically depression. The result indicated significant difference with respect to depression (F (3, 339) = 9.62, p<.001; t (332) = -3.48, p = .001; and t (340) = -2.65 and p = .008, respectively). (Detailed data can be viewed in Table 3.3)

Table 3.3. Test differences between sociodemographic factors and depression among participants

Variables	Mean ± SD	Test difference
Sex		
Male	5.68 ± 4.79	t (341) = .29, p = .769
Female	5.53 ± 4.35	
Religion		
No religion	9.56 ± 5.41	*F* (3, 339) = 9.62, p<.001 No religion > Christian (p = .606) Christian > Buddhist (p = 1.000) Buddhist > Muslim (p = 1.000)
Buddhist	5.19 ± 4.29	
Christian	6.33 ± 5.20	
Muslim	4.87 ± 4.05	
Major		
Mechanical Engineering	5.40 ± 4.98	*F* (9, 332) = .65, p = .756
Electrical Engineering	5.13 ± 5.10	
Civil Engineering	5.06 ± 4.20	
Computer Engineering	6.36 ± 5.32	
Chemical Engineering	5.34 ± 4.89	
Biomedical Engineering	5.41 ± 3.59	
General Engineering	6.24 ± 4.71	
Industrial Engineering	5.75 ± 3.77	
Environmental Engineering	7.47 ± 4.31	

Table 3.3 (Continued)

Variables	Mean ± SD	Test difference
Major		
Others*	5.62 ± 4.13	*F* (9, 332) = .65, p = .756
Home language		
Thai language	5.57 ± 4.59	*F* (2, 340) = .34, p = .714
English	6.56 ± 4.42	
Japanese	8.00 ± /	
Marriage status		
Single	5.59 ± 4.57	t (339) = -.48, p = .629
Married	6.50 ± 4.93	
Physical illness		
No	5.40 ± 4.54	t (327) = -1.50, p = .135
Yes	6.91 ± 4.67	
Mental illness		
No	5.36 ± 4.39	t (332) = -3.48, p = .001
Yes	11.29 ± 7.11	
Drinking alcohol		
Yes	5.82 ± 4.49	t (340) = 1.04, p = .299
No	5.29 ± 4.71	

Table 3.3 (Continued)

Variables	Mean ± SD	Test difference
Frequency of drinking alcohol		
Once a week	6.17 ± 4.67	F (3, 201) = 1.23, p = .301
2-3 days a week	5.13 ± 4.30	
4-5 days a week	7.13 ± 3.36	
7 days a week (everyday)	2.00 ± 2.83	
Alcohol intakes interfere function		
Not at all	5.64 ± 4.82	F (4, 294) = 1.79, p = .131
Little	6.26 ± 4.35	
Moderate	5.72 ± 4.57	
Much	5.26 ± 3.93	
Very much	3.35 ± 3.82	
Monthly family income (THB/USD = 0.03)		
Lower than 25,000THB	5.91 ± 4.61	F (4, 338) = 1.75, p = .138
25,000-50,000THB	6.10 ± 4.87	
50,001-75,000THB	5.20 ± 3.97	
75,001-100,000THB	3.88 ± 4.03	
Over 100,000THB	4.84 ± 4.45	

Table 3.3 (Continued)

Variables	Mean ± SD	Test difference
Monthly allowance (THB/USD = 0.03)		
Lower than 5,000THB	5.62 ± 4.40	*F* (4, 336) = .14, p = .967
5,000-10,000THB	5.59 ± 4.69	
10,001-15,000THB	5.92 ± 5.21	
15,001-20,000THB	5.67 ± 3.84	
Over 20,000THB	4.67 ± 3.61	
Work experience in the company while studying in university		
Yes	5.37 ± 4.36	t (336) = -.74, p = .462
No	5.74 ± 4.66	
Marital Status of Parents		
Married	5.51 ± 4.55	*F* (4, 335) = .33, p = .861
Divorced	6.09 ± 4.51	
Widowed	5.00 ± 6.87	
Single	4.63 ± 4.60	
Deceased	5.64 ± 4.65	
Father's education		
Elementary-Junior high school	6.09 ± 4.77	*F* (3, 331) = 1.02, p = .383
High school or vocational	5.73 ± 4.70	

Table 3.3 (Continued)

Variables	Mean ± SD	Test difference
Father's education		
Bachelor	4.99 ± 4.08	*F* (3, 331) = 1.02, p = .383
Higher than bachelor	5.44 ± 5.02	
Mother's education		
Elementary-Junior high school	5.75 ± 4.80	*F* (3, 338) = .12, p = .948
High school or vocational	5.59 ± 4.18	
Bachelor	5.41 ± 4.59	
Higher than bachelor	5.82 ± 5.22	
Romantic relationship		
Yes	4.84 ± 4.12	t (340) = -2.65, p = .008
No	6.16 ± 4.83	
Spending time with partner		
At least once every day	5.52 ± 4.53	*F* (4, 139) = 1.80, p = .133
At least Once every week	3.91 ± 3.36	
At least Once every month	2.85 ± 2.94	
At least Once every three months	4.92 ± 3.97	
At least once every 6-7 months	4.50 ± 2.12	

Table 3.3 (Continued)

Variables	Mean ± SD	Test difference
Relationship with parent		
Spent quality time with parent at least once every day	5.43 ± 4.51	*F* (4, 316) = .36, p = .840
Spent quality time with parent at least once every week	5.82 ± 4.45	
Spent quality time with parent at least once every month	5.18 ± 5.10	
Spent quality time with parent at least once every three months	6.09 ± 4.74	
Spent quality time with parent at least once every four months	6.00 ± /	
Practicum experience in engineering field		
Yes	5.80 ± 4.48	t (339) = .44, p = .660
No	5.56 ± 4.62	

*Others include Aerospace & Aeronautical Engineering, Material Engineering, System Engineering, Electronic and Telecommunication Engineering, Mining Engineering, Mechatronics Engineering, Robots and Artificial Intelligence Engineering, Nano Engineering, Integrated Engineering, Software Engineering, Automotive Engineering, Agriculture Engineering, Logistic Engineering, Manufacturing Engineering, No limited branch
SD: Standard Deviation
F: Variation between variable means
t: Ratio of the difference between the mean of the two sample sets and the variation that exists within the sample sets

3.4 Test differences between VARK modal and depression

The researchers used ANOVA to examine the differences between uni-, bi-, tri-, quadmodal and depression among all participants. The ANOVA results were as follows: *F* (3, 333) = 2.63, p = .050. (Detailed data can be referred to in Table 3.4)

Table 3.4. Test differences between VARK modal and depression among participants

VARK Style	Mean ± SD	Test difference
Unimodal	6.02 ± 4.94	*F* (3, 333) = 2.63, p = .050 Bimodal > Unimodal (p = 1.000) Unimodal > Trimodal (p = .084) Quadmodal > Trimodal (p = .069)
Bimodal	6.02 ± 5.36	
Trimodal	4.14 ± 3.52	
Quadmodal	5.93 ± 4.40	

SD: Standard Deviation
F: Variation between variable means

3.5 Pearson's correlation and multiple linear regression between psychosocial variables and depression

Hypothesis A: A higher level of social skill is negatively associated with the level of depressive symptoms.

The researchers conducted Pearson's correlation analyses to examine the relationship between social skills and depression, revealing a significant negative correlation with a correlation coefficient of -.233.

Hypothesis B: A higher level of romantic relationship is negatively associated with the level of depressive symptoms.

The Pearson's correlation analysis further indicated a negative correlation between relationship satisfaction and depression (r = -.269).

Hypothesis C: A higher level of interpersonal difficulty is positively associated with the level of depressive symptoms.

Additionally, interpersonal difficulty exhibited a significant positive correlation with depression (r = .549).

Hypothesis D: A higher level of alcohol consumption is positively associated with the level of depressive symptoms.

Alcohol consumption showed a positive correlation with depression (r = .089) according to the Pearson's correlation analysis.

Hypothesis E: A higher level of IA is positively associated with the level of depressive symptoms.

IA demonstrated a significant positive correlation with depression (r = .317).

Hypothesis F: A higher level of self-esteem is negatively associated with the level of depressive symptoms.

Self-esteem showed a negative correlation with depression (r = -.698) according to the Pearson's correlation analysis.

Hypothesis G: A higher level of personality of neuroticism is positively associated with the level of depressive symptoms.

Neuroticism exhibited a significant positive correlation with depression (r = .563).

Lastly, the research findings indicate that participants' learning styles did not exhibit significant sex differences. (Detailed data can be viewed in Table 3.5)

The researchers conducted a multiple linear regression analysis with four sociodemographic factors (Buddhism, history of mental illness, GPA and current romantic relationship) and six psychosocial independent variables (relationship satisfaction, self-esteem, neuroticism, social skills, interpersonal difficulty and IA) and depression as the dependent variable. Only significant variables observed on test difference and correlation analysis ($p<.05$) were included in the regression model.

The results showed significant relationships between the variables. The beta coefficients are as follows: self-esteem ($\beta = -.526$, $p<.001$), neuroticism ($\beta = .137$, $p =.029$), social skills ($\beta = .131$, $p =.022$) and interpersonal difficulty ($\beta = 0.267$, $p<.001$). (Detailed data can be viewed in Table 3.6)

The positive beta coefficients in neuroticism, social skills and interpersonal difficulty indicated positive relationships, implying that an increase in these variables was associated with an increase in depression. Conversely, the negative beta coefficient in self-esteem indicated a negative relationship, suggesting that an increase in self-esteem was associated with a decrease in depression.

In summary, the results revealed that self-esteem, neuroticism, social skills and interpersonal difficulty were significant psychosocial factors contributing to depression among Thai undergraduate engineering students.

Table 3.5. Pearson's correlation between psychosocial variables and depression

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Age	1																	
2. N. of students	-.188**	1																
3. UR	-.128*	.214**	1															
4. US	-.211**	.157**	.484**	1														
5. Overall GPA	-.073	-.088	-.037	.083	1													
6. Alcohol use	.093	-.058	.054	-.037	-.324**	1												
7. LSGPA	.036	-.037	-.014	.067	.872**	-.287**	1											
8. Mother's age	.132*	.072	.067	-.091	.064	-.033	.091	1										
9. Father's age	.010	.019	.119*	-.067	.103	-.031	.080	.523**	1									
10. SEWS	.066	.141*	.203**	.290**	-.019	-.054	.030	.003	-.069	1								
11. RS	-.092	.072	.062	.164**	.046	.015	.064	-.028	-.102	.049	1							
12. Self-esteem	-.024	-.073	.077	.097	.125*	-.102	.102	-.031	-.084	.094	.358**	1						
13. FBAU	.118*	.005	.018	-.052	-.149**	.508**	-.146**	-.002	-.009	-.007	-.157**	-.175**	1					
14. Neuroticism	-.024	.184**	.030	.000	-.033	-.075	.015	.010	-.042	.029	-.135*	-.485**	-.144**	1				
15. Social skills	-.004	-.116*	-.032	.084	-.113*	.214**	-.159**	-.052	-.047	-.005	.167**	.293**	.148**	-.353**	1			
16. ID	-.013	.168**	.015	-.032	.033	-.122*	.094	.038	.048	.051	-.074	-.420**	-.148**	.597**	-.551**	1		
17. IA	.149**	.074	.018	.015	-.155**	.155**	-.064	.052	.003	-.047	-.232**	-.273**	.188**	.280**	-.024	.233**	1	
18. Depression	-.001	.040	-.050	-.090	-.130*	.056	-.106	.041	.058	-.094	-.269**	-.698**	.089	.563**	-.233**	.549**	.317**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

N. of students=Number of students, UR=University reputation, US=University Support, LSGPA=Latest Semester GPA, SEWS=Satisfaction of Engineering Working Experience, RS=Relationship Satisfaction, FBAU=Functional Belief Alcohol Use, ID=Interpersonal difficulty, IA=Internet Addiction

Table 3.6. Multiple Linear Regression for Depression

Variables	B	SE B	β	t	Sig.	Lower Bound (95.0% CI for B)	Upper Bound (95.0% CI for B)
(Constant)	8.953	2.857		3.134	.002	3.320	14.585
Buddhism	.299	.547	.026	.546	.585	-.779	1.377
Current romantic relationship	.095	.402	.012	.237	.813	-.697	.887
GPA	-.245	.338	-.033	-.724	.470	-.911	.422
RS	-.043	.040	-.058	-1.074	.284	-.122	.036
RSES	-.417	.044	-.526	-9.548	.000	-.503	-.331
NE	.064	.029	.137	2.199	.029	.007	.122
SS	.048	.021	.131	2.316	.022	.007	.090
ID	.325	.084	.267	3.886	.000	.160	.491
IA	.027	.015	.094	1.793	.074	-.003	.056

Dependent variables: Depression

RR=Relationship satisfaction, RSES=Rosenberg self-esteem scale, NE=neuroticism, SS=social skills, ID=interpersonal difficulty, IA=Internet Addiction

B=the unstandardized beta, CI=confidence interval, SE B=the standard error for the unstandardized beta, β=the standardized beta

3.6 Summary of the findings based on the hypotheses.

A higher level of social skill is negatively associated with the level of depressive symptoms. (Supported)

A higher level of romantic relationship is negatively associated with the level of depressive symptoms. (Supported)

A higher level of interpersonal difficulty is positively associated with the level of depressive symptoms. (Supported)

A higher level of alcohol use is positively associated with the level of depressive symptoms. (Supported)

A higher level of IA is positively associated with the level of depressive symptoms. (Supported)

A higher level of self-esteem is negatively associated with the level of depressive symptoms. (Supported)

A higher level of personality of neuroticism is positively associated with the level of depressive symptoms. (Supported)

The relationship between participants' different learning styles and their depression varies. (Supported)

CHAPTER 4

DISCUSSION AND CONCLUSION

This chapter discusses the findings, strengths, limitations, implications, and recommendations of the study. A descriptive cross-sectional study was conducted to explore the relationships between social demographic factors, such as romantic relationship status of undergraduate engineering students in Thailand, and social psychological factors, such as interpersonal difficulty with depression.

4.1 Discussion

4.1.1 General discussion

This study aimed to investigate the prevalence of depression among Thai engineering undergraduate students and examine the sociodemographic and psychosocial factors associated with depression, as well as the predictive factors for depression within the target population. The results of this study sheds light on the relationship between sociopsychological factors such as romantic relationships and self-esteem with depression. Multiple linear regression analysis revealed that neuroticism, interpersonal difficulty and other sociopsychological factors significantly predicted depression. These findings have significant implications for mental health prevention programs for students in Thai higher education. The study also explored the expectations and satisfaction of Thai engineering students in multiple relationships including romantic relationships, relationships with parents, perceived fame of the university and satisfaction with engagement in engineering-related practices. The study focused on the depressive status and prevalence in the target population under the influence of various factors.

4.1.1.1 Sociodemographic factors on depression

Women are more prone to depression than men generally [58]. However, the results of this study indicated no significant sex differences in depression in the target

population. The target population of this study consisted of undergraduate engineering students. From the perspective of gender roles and societal expectations, male engineering students are usually expected to be strong, self-reliant and successful. The pressure to achieve academic and professional success in engineering and related fields can increase stress levels and the risk of depression. Furthermore, men may face more barriers when seeking help for mental health issues. The shame associated with masculinity and emotional vulnerability can hinder their ability to seek psychological assistance for their problems. Engineering, being a male-dominated field, may further reinforce stigma among men [59]. Lastly, individuals may lack social support. In the male-dominated engineering environment, seeking social support is often seen as a sign of weakness [60]. Male students studying engineering may face challenges in establishing and maintaining social relationships. The lack of social support can lead to feelings of isolation and increase the risk of depression.

Notably, depression can affect individuals of any sex. Sociodemographic factors, such as socioeconomic status including monthly family income and parental education level can influence the incidence rate of depression. Lower socioeconomic status is often associated with increased stressors, limited resources and a higher risk of depression. The quality of relationships within the family can impact mental health outcomes. Positive family relationships, open communication and a supportive environment can serve as protective factors against depression. Thai engineering undergraduates may face significant academic pressure due to demanding coursework, competition and high familial expectations. Excessive academic stress can contribute to increased incidence rates of depression. The availability of social support networks, such as the support and care provided by partners, plays a crucial role in mental well-being. Strong social support systems can provide emotional support, advice and a sense of belonging, which helps prevent depression. Cultural factors, including values and religious beliefs, can influence the experience and expression of depression. Similar to many East Asian cultures, mental health issues may be stigmatized in Thai culture, discouraging individuals from seeking help or openly discussing their struggles. The research findings also indicate a significant test difference between religion and depression among Thai engineering undergraduates.

4.1.1.2 Role of sex differences

Research found significant sex differences in major and participants' perceived reputation of university, engineering fields' sex disparity may impact individuals' practices due to differing engineering majors and societal expectations [61]. In STEM (Science, Technology, Engineering and Math) fields, including engineering, sex disparities are prevalent, resulting in potential differences in experiences, opportunities, and exposure to information about universities [62].

Research found significant sex differences in latest semester GPA. Males and females may have distinct study habits, learning styles and approaches to academics, affecting their performance and GPA [63]. Regarding their relationship with parents, the quality of the relationship between engineering undergraduates and their parents can impact various aspects of their experiences. Support, encouragement and parental involvement can contribute to academic success, mental well-being and career aspirations. Male role and societal expectations can influence the dynamics and expectations within parent-child relationships [64]. Males bear a greater burden of societal and familial expectations. This is intertwined with the prevailing traditional gender roles and patriarchal structures found in Asian societies. Within these societies, males have historically been regarded as the primary providers and bearers of the family name, while females have been assigned domestic or supportive roles and have been expected to prioritize marriage and child-rearing. These gender roles often result in parents placing a greater emphasis on the education, careers and future successes of their sons.

4.1.2 Prevalence of Depression among Thai Engineering Undergraduates

In this study, the researchers found that the prevalence of depression among all 346 Thai undergraduate engineering students was 35.3%.

These findings are consistent with related research on the mental health of university students. One study [33] reported a similar prevalence of depression (27.1%) among university students in a different country.

The high prevalence rates of depression and anxiety among engineering students highlight the importance of addressing mental health issues in this specific population.

The academic demands, intense competition and social pressures experienced by engineering students may contribute to their elevated risk for mental health problems.

The prevalence rates in the current study compared with a similar study conducted in college students [65] in 2020 were found to be 35.3% and 48.3% respectively. This difference in prevalence rates could be attributed to the use of different measurement tools. While this study employed the OI-Depression scale, the related study used the Beck's Depression Inventory (BDI). Both scales are self-report measures. The BDI focuses on evaluating cognitive symptoms associated with depression, such as negative thoughts, pessimism, guilt, self-criticism and feelings of worthlessness. On the other hand, the OI-Depression scale places greater emphasis on an individual's experience of depressive symptoms and assesses the severity of these symptoms. By measuring symptom distress, the OI-Depression scale offers insights into an individual's emotional and psychological well-being.

4.1.3 Psychosocial factors

1) Social skills

In this study, the researchers hypothesized a negative correlation between social skills and depression, and the research findings indeed indicated a negative correlation between these variables. The reason could be the specific characteristics of the sample, such as cultural factors or demographic composition, could have influenced the observed relationship. Cultural differences in the expression of social skills or depression [66], as well as variations in the engineering student population, may impact the correlation between these variables.

The Social Skill Inventory (SSI) comprises a series of statements or scenarios related to social interactions. The researchers selected a brief version consisting of 30 items, including, but are not limited to, exploring participants' emotional expression, EC, and social sensitivity during social interactions. Individuals completing the inventory are typically required to choose the most appropriate response or rate their level of agreement/disagreement with each statement. This scale may encompass various domains of social skills including communication, empathy, confidence, conflict resolution,

cooperation, problem-solving, listening skills, nonverbal communication and social awareness.

The results of this study indicate that self-esteem is a significant predictor of depression. This applies specifically to the experimental population of Thai engineering undergraduates. Individuals with such characteristics may struggle to cope with the pressures associated with engineering studies, making them more susceptible to developing depression. Engineering students frequently face multiple challenges simultaneously, including academic stress and intense peer competition. These challenges accumulate and have a cumulative impact on individuals' mental well-being. Those with a history of mental illness may experience decreased capacity to handle these challenges, resulting in reduced coping mechanisms and an increased likelihood of developing depression. Environmental factors can contribute to depression as well [67]. Engineering students may encounter intense peer pressure, social competition, fragile romantic relationships, a lack of social support and difficulty maintaining a work-life balance. These environmental stressors, combined with a lack of social skills, heighten the risk of developing depression.

2) Relationship satisfaction

The study hypothesized a negative correlation between relationship satisfaction and depression, and the research findings supported this hypothesis. This negative correlation implies that as the quality or satisfaction of romantic relationships increases, the levels of depression tend to decrease. The study results revealed a significant association between relationship satisfaction and depression. Romantic relationships often provide individuals with emotional support, understanding, and companionship. Having a supportive and loving partner can create a sense of belonging [68], reduce feelings of loneliness and serve as a buffer against stressors, all of which may contribute to lower levels of depression. Intimate relationships can foster emotional closeness and a secure attachment bond. Sharing emotions, experiences and vulnerabilities with a romantic partner can enhance emotional well-being and provide a sense of comfort and validation, potentially reducing depressive symptoms.

The onset of depression is influenced by various stimulating factors such as marital breakdown [69], romantic failures, or emotional disturbances [70]. These factors can potentially lead to the occurrence of depression. Individuals with depression generally experience poor mental and physical states, accompanied by low mood, affecting the quality of their romantic relationships. Depression is a psychological disorder that can also influence an individual's mate selection and romantic standards.

For engineering students, academic benchmarks are typically strict and demanding, requiring a significant amount of time and effort to achieve success. Balancing the demands of coursework, exams and emotional needs within a romantic relationship poses a challenge. This heightened pressure can result in feelings of fatigue and an increased risk of depression [71]. Furthermore, college students often face multiple pressures in their academic pursuits, often driven by high expectations from themselves, their family members or peers [72]. In the context of a romantic relationship, there may be additional partner expectations. The perceived need to meet these expectations in both academic and romantic domains create extra stress and increases the risk of depression.

Social isolation is another significant factor to consider [73]. The initiation of a romantic relationship signifies a change in an individual's social network, including friendships and other academic social interactions, leaving less time for socializing and maintaining relationships. If a romantic relationship becomes the primary or sole source of social support, the pressure of managing academics and the relationship can become overwhelming. Additionally, if the relationship faces difficulties or ends, the loss of this primary social support can lead to feelings of loneliness and depression.

3) Interpersonal Difficulty

In this study, the researchers hypothesized a positive correlation between interpersonal difficulty and depression, and the research findings indeed confirmed a positive correlation between the two variables. The fact that interpersonal difficulty predicted depression among Thai engineering undergraduates could be because engineering education can be demanding, time-consuming and involve repetitive practice, leaving students with limited time for social activities. This isolation and lack of social support can contribute to feelings of loneliness and lead to depressive symptoms.

Difficulties in interpersonal relationships, such as the challenge of forming meaningful connections, particularly for male engineering students who may perceive themselves as less emotionally expressive or empathetic compared with females, could also be a contributing factor in their struggle to establish deep connections with peers. The disconnection from peers further exacerbates feelings of isolation and increases the risk of depression. Interpersonal relationships may lead to feelings of isolation and loneliness [74]. Which are unhelpful to individuals who are experiencing problems. However, the focus of this discussion pertains to negative interpersonal relationships, where individuals often lack confidence and a sense of security when facing difficulties in their social interactions [75]. The self-struggle within interpersonal relationships is a significant mental drain that can lead to physiological issues including disturbances in sleep patterns and decreased appetite.

The nature of engineering education itself often emphasizes individual problem-solving and technical skills, which may not provide ample opportunities for developing strong interpersonal skills [76]. For engineering-related or similar industries, cultivating strong interpersonal skills such as effective communication, teamwork and leadership abilities is particularly crucial. This is especially important for engineers who require cross-departmental collaboration, interactions with diverse stakeholders and the ability to communicate their ideas and solutions effectively. Those with interpersonal difficulty may lack sufficient opportunity to cultivate more interpersonal skills. As a result, engineering students may struggle with effective communication, collaboration and building supportive social networks, which are important protective factors against depression.

4) Alcohol consumption

The researchers hypothesized a positive correlation between alcohol consumption and depression, and the research findings indeed indicated a positive correlation between the two variables. However, the research results revealed a lack of significant association between alcohol consumption and depression. The positive correlation observed between alcohol consumption and depression among Thai engineering undergraduates may be overshadowed by various factors. For example, the

academic demands and high pressure environment associated with engineering programs can lead to increased stress levels and psychological distress. In an attempt to cope with these stressors, some students may turn to alcohol as a form of self-medication or temporary escape, which could exacerbate feelings of depression [77].

In Thailand, engineering students are known to be alcohol abusers [78]. However, the issue of alcohol abuse is complex and can be influenced by various factors such as personal environment, peer influence, stress, cultural factors and individual choices. Within the university setting, factors that may contribute to alcohol misuse among engineering students or any student population include, but are not limited to, academic pressure, social pressures, social environment and individual coping mechanisms [79]. Engineering programs are known for their demanding curriculum and rigorous academic requirements. The high workload, challenging assignments and high expectations can generate immense pressure for engineering students. Students may turn to alcohol to cope with stress, seek relaxation and temporarily escape academic pressures. Engineering colleges often have a distinct social culture characterized by male-dominated social networks [80], which may involve students' curiosity about alcohol and higher alcohol consumption. The unique social culture may also make students feel the need to participate in drinking activities to fit in with their peers or establish connections with their peers [81].

In Thai society, socializing and bonding often involve alcohol consumption, especially in certain social contexts such as celebrations or gatherings with peers. Engineering undergraduates may feel compelled to conform to these cultural norms and engage in alcohol consumption, even when they are personally experiencing mental health challenges such as depression [82]. The current study has confirmed this as over 60% of participants consumed alcohol. Even though 14% reported to have many problems with their function due to alcohol, it did not constitute a predictor for depression. Quite possibly, alcohol was used to cope with these stressors and could prevent them experiencing depression. Using alcohol to cope with stress or emotions is an individual's attempt to temporarily alleviate personal distress. While it may provide short term relief, relying on alcohol as a coping mechanism can perpetuate a lasting dependence on alcohol,

leading to behavioral and emotional consequences for the individual [83]. Moreover, it can make it more challenging to address the underlying issues causing stress or contributing to depression.

5) Internet Addiction

The researchers hypothesized a positive correlation between IA and depression, and the research results also showed a positive correlation between them. However, the research results indicated no significant correlation between IA and depression. IA can serve as a form of escapism, allowing individuals to retreat from real-life problems or difficulties they may be facing. This can lead to social isolation and a lack of face-to-face interactions, which are important for maintaining emotional well-being [84]. Without adequate social support, individuals may be more prone to developing depressive symptoms [85]. The internet provides a platform for constant social comparisons, which can negatively impact self-esteem and contribute to feelings of depression. Thai engineering undergraduates, like many other students, may frequently engage in social media use and be exposed to carefully curated images of others' seemingly perfect lives. This constant comparison to others' achievements and lifestyles can create a sense of inadequacy and dissatisfaction with their own lives, potentially leading to depressive symptoms.

Even though his IA problem is related to depression, it was overshadowed by other important factors. Like alcohol consumption, excessive internet use can be viewed as a coping mechanism. The behavior itself is not indicative of depression but when individuals are dealing with depression or other pressures, they may seek certain activities or behaviors to temporarily alleviate or distract themselves from negative emotions and attention. Using the internet, particularly engaging in certain online activities or social interactions such as multiplayer online gaming, can provide a sense of escapism or temporary pleasure [86], which may alleviate depressive symptoms in the short term. The relationship between IA and depression may be bidirectional. The fatigue and exhaustion experienced as a result of depression can decrease social engagement while increasing the likelihood of IA. Although IA may serve as a coping mechanism for some individuals with depression [87], excessive internet use can also lead

to or exacerbate depressive symptoms. It can result in social withdrawal, reduced physical activity, changes in sleep patterns and increased feelings of loneliness, all of which can have negative impacts on mental health.

6) Self-esteem

In this study, a negative correlation was hypothesized to exist between self-esteem and depression. The research results showed a negative correlation between them, indicating that higher levels of self-esteem were associated with lower levels of depression among Thai engineering undergraduates. Conversely, individuals with higher self-esteem may set ambitious goals for themselves, but when they face difficulties or fall short of their own expectations, they may be more prone to self-criticism and self-blame. This self-critical attitude can contribute to depressive symptoms [88]. Engineering undergraduates may engage in social comparison, particularly in academic and career-related aspects. Individuals with higher self-esteem levels may have a greater need for validation and may compare themselves with their peers or societal standards. When they perceive themselves as falling short, it can lead to feelings of inadequacy and self-doubt, which are associated with depressive symptoms. This is another confirmation that self-esteem is universally related to depression, regardless of population.

7) Neuroticism

In this study, the researchers hypothesized a positive correlation between neuroticism and depression, and the research results also showed a positive correlation between them. Furthermore, the research results indicate a significant correlation between neuroticism and depression. Neurotic individuals tend to be more emotionally sensitive and reactive to stressful situations. Engineering undergraduates often face high levels of academic pressure including demanding coursework, exams and deadlines. The combination of neuroticism and these stressors may lead to heightened emotional vulnerability, making them more susceptible to experiencing depressive symptoms [89]. They may tend to focus on negative aspects of situations, exaggerate their significance and have difficulties in finding positive interpretations. These cognitive biases can amplify negative emotions and thoughts, contributing to the development of

depression. Like self-esteem, neuroticism is widely accepted to be a predictor for depression.

8) Learning styles

In this study, the researchers hypothesized that participants' different learning styles would have varying relationships with their depressive outcomes. In 2011, a study conducted in Turkey [90] analyzed 107 students from computer engineering, manufacturing engineering and mechatronic engineering, revealing that the majority of students preferred a bimodal learning style. In contrast, the study sample encompassed students from 24 engineering-related majors including civil engineering, computer engineering and environmental engineering. The findings of the study indicated that over one half of the students (52.5%) preferred a quadrimodal learning style. Similarly, in a 2015 study among medical students in the Kingdom of Saudi Arabia [91] and a 2020 study among nursing students in Thailand [92], they were more inclined towards all VARK modalities (43.5% and 77.37% respectively). The possible reason for the similarity in research findings between these two groups could be attributed to the common requirement for a combination of theoretical knowledge and practical skills in the fields of engineering and medicine. Both engineering and medical education involve a range of learning environments, including laboratory work, academic methods and practical exercises, which are also similar. However, the study results demonstrated no significant correlations existed between the four types of learning styles and depression. Cultural factors such as societal expectations, academic pressure or the emphasis on group-based learning approaches in engineering education could have overshadowed the potential impact of individual learning styles on depressive outcomes.

4.1.4 Benefits of the study

These research findings can help enhance the understanding among individuals, educational institutions and mental health professionals regarding the factors contributing to depression among Thai engineering undergraduates. This understanding aids in better comprehension and early identification of risk factors, facilitating timely intervention and comprehensive support. Particularly noteworthy are the suicidal ideation and behaviors associated with depression.

4.1.5 Clinical, research application and implication

The results of this study may have certain clinical implications. Clinicians can refer to these research findings to identify the risk of depression among undergraduate engineering students. Two approaches that can be employed are discussed below.

First, based on the findings, major depression evidently exists among engineering students. Therefore, the need for direct screening for depression becomes urgent as a secondary preventive measure. Individuals who screen positive should promptly seek help from professionals.

Second, a specific strategy should be implemented for those at risk. Many students are unaware that changes in their mood or behavior could be linked to depression. Additionally, other relevant factors such as self-esteem and IA should be assessed through screening for primary prevention strategies, aimed at enhancing overall mental health.

Depression is a disease with a high suicide rate in psychiatry. Depression has now become an important disease that has placed a serious burden on human beings among the global diseases. The pain caused to patients and their family members, and the loss to society are incomparable with other diseases. The main reason this situation can spread is that the general public lacks a sufficient and scientific understanding of depression. Personal and social prejudices force most patients to be ashamed to admit the condition and are unwilling to visit psychiatrists, a specialist qualified physician. A large number of patients failed to receive timely and effective diagnosis and treatment, leading to the deterioration of their condition and even the social consequences of increased suicide rate. One of the public health implications of this study is to provide a reference for those who want to understand the status and characteristics of depression in a specific population in this study and to provide an insight into the characteristics of other similar populations.

4.1.6 Future research

Conducting longitudinal studies can help establish the causal relationship between these predictive factors and depression. Long term investigations can provide valuable insights into how changes in these strong predictive factors over time affect the

development and course of depression. Alternatively, efforts can be focused on developing and evaluating interventions and preventive strategies specifically targeting these predictive factors to determine effective methods for reducing the risk of depression or improving treatment outcomes.

4.1.7 Limitation

Notably, this study encountered certain limitations. Firstly, the sample size was limited to Thai undergraduate engineering students, which may restrict the generalizability of the results to other populations. Secondly, the study relied on self-report measures, which are subject to biases and may not capture the full spectrum of mental health disorders. Future research should consider employing larger and more diverse subjects, as well as employing clinical interviews or diagnostic criteria for a more comprehensive assessment of mental health in engineering students. Furthermore, this research did not investigate temporal relationships or cause-effect relationships due to its cross-sectional nature. The use of convenience sampling in this research poses potential implications for the generalizability of the findings. Another concern is the influence of social desirability, where respondents might provide insincere responses, either portraying themselves overly positively or negatively while responding to the questionnaires. To mitigate this bias, the researchers took several measures. Firstly, they employed the Participant Information Sheet to ensure confidentiality and encourage honest responses. Secondly, the researchers meticulously examined the results to identify any aberrant or anomalous data that could be attributed to response distortion. During the data collection process, the researchers identified and excluded several instances of abnormal responses. Nevertheless, acknowledging that a certain degree of bias arising from social desirability may still be present is crucial.

4.2 Conclusion

The study revealed a substantial prevalence of depression among undergraduate engineering students in Thailand. The high prevalence rates of depression highlight the importance of addressing mental health issues in this specific population. While academic demands, intense competition and social pressure are experienced by engineering students, a significant correlation exists between psychosocial variables and depression.

Individual or intrapersonal variables such as neuroticism personality traits, interpersonal difficulties and self-esteem become the potent predictors for depression, as found in other related the research. These findings provide valuable insights for universities, suggesting the necessity for targeted educational initiatives aiming to prevent potential psychological issues among students.

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APPENDIX A

Ethic approval certificate

ภาควิชาจิตเวชศาสตร์
รับที่ 1696
วันที่ 07 ตค. 2565
เวลา 15 -

บันทึกข้อความ

ส่วนงาน งานบริหารงานวิจัย คณะแพทยศาสตร์ โทร. 36641
ที่ อว 8393(8).3 บจ.จธ/๓๖๗ **วันที่** 6 ต.ค. 2565
เรื่อง แจ้งผลการพิจารณาให้การรับรองเชิงจริยธรรม (แบบเร่งด่วน)

เรียน หัวหน้าภาควิชาจิตเวชศาสตร์

ตามบันทึกที่ อว 8393(8).7/655 ลงวันที่ 10 สิงหาคม 2565 ภาควิชาฯ ได้เสนอโครงการวิจัย เรื่อง "ภาวะซึมเศร้าและปัจจัยที่เกี่ยวข้องในนักศึกษาวิศวกรรมระดับปริญญาตรี: การสำรวจแบบภาคตัดขวางในประเทศไทย" (Depression and its associated factors among undergraduate engineering students: A cross-sectional survey in Thailand) Research ID: 9146 / Study Code: PSY-2565-09146 ของ **ศ.นพ. ทินกร วงศ์ปการันย์** มาเพื่อขอรับการพิจารณารับรองเชิงจริยธรรม (แบบเร่งด่วน) นั้น

คณะแพทยศาสตร์ ขอแสดงความยินดีที่งานวิจัยอันมีค่าของท่านได้ผ่านการพิจารณาจากคณะกรรมการจริยธรรมการวิจัย โดยคณะกรรมการจริยธรรมการวิจัย ได้พิจารณาแล้ว มีมติเห็นชอบให้ดำเนินการวิจัยได้ ทั้งนี้ ตั้งแต่วันที่ระบุในเอกสารรับรองโครงการเป็นต้นไป ดังได้แนบเอกสารรับรองฯ มาพร้อมนี้ อนึ่งหลังผู้วิจัยได้รับเอกสารรับรองฯ แล้ว ขอให้ผู้วิจัยปฏิบัติ ดังนี้

1. ส่งรายงานผลการวิจัยเมื่อสิ้นสุดโครงการ
2. หากใกล้ระยะเวลาสิ้นสุดการอนุมัติแล้ว แต่ผู้วิจัยยังดำเนินการไม่แล้วเสร็จ ขอให้ผู้วิจัยส่งรายงานความก้าวหน้าโครงการวิจัย พร้อมบันทึกขอขยายระยะเวลาการดำเนินการวิจัย โดยระบุเหตุผลความจำเป็นในการขอขยายระยะเวลา พร้อมทั้งระบุระยะเวลาที่จะขอขยายให้ชัดเจน *ทั้งนี้ ขอให้ผู้วิจัยรายงานความก้าวหน้าและขอขยายระยะเวลาก่อนที่จะสิ้นสุดระยะเวลาการอนุมัติตามที่ระบุในเอกสารรับรอง อย่างน้อย 1 เดือน* ทั้งนี้สามารถ Download แบบฟอร์ม version 6.0 ได้จากเว็บไซต์จริยธรรมการวิจัย คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ ดังนี้ https://w1.med.cmu.ac.th/research/ethics/default.html และสร้างรายการร้องขอรายงานความก้าวหน้าและต่ออายุ (Progress Report)ที่เว็บไซต์ http://ros.med.cmu.ac.th

จึงเรียนมาเพื่อทราบ และเพื่อแจ้งผู้ที่เกี่ยวข้องได้รับทราบต่อไปด้วย จักเป็นพระคุณยิ่ง

เรียน หัวหน้าภาควิชาจิตเวชศาสตร์
☐ เพื่อทราบ.....
☐ เพื่อพิจารณา.....
☑ เรียน/แจ้ง ศ.ชพ. จันทร
☐ .....

(ศาสตราจารย์เกียรติคุณ นายแพทย์ปัญจะ กุลพงษ์)
ประธานคณะกรรมการจริยธรรมการวิจัย

ศ.(เชี่ยวชาญพิเศษ) พญ.เบญจลักษณ์ มณีพอน
หัวหน้าภาควิชาจิตเวชศาสตร์

APPENDIX A

Ethic approval certificate (Continued)

เอกสารเลขที่ 340/2565

ใบรับรองจริยธรรมการวิจัยในมนุษย์

ชื่อคณะกรรมการจริยธรรมการวิจัย : คณะกรรมการจริยธรรมการวิจัย **ชุดที่** 5 คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่	
ที่อยู่ : 110 ถนนอินทวโรรส ตำบลศรีภูมิ อำเภอเมือง จังหวัดเชียงใหม่ 50200	
ชื่อหัวหน้าโครงการวิจัย : **ศ.นพ. ทินกร วงศ์ปการันย์** **สังกัด** : ภาควิชาจิตเวชศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่	
ชื่อโครงการวิจัย : ภาวะซึมเศร้าและปัจจัยที่เกี่ยวข้องในนักศึกษาวิศวกรรมระดับปริญญาตรี: การสำรวจแบบภาคตัดขวางในประเทศไทย **Study Code (ถ้ามี)** : PSY-2565-09146 **Research ID:** 9146 **ผู้ให้ทุนวิจัย** : -	
เอกสารที่รับรอง	**ฉบับที่รับรอง**
โครงการวิจัย	ฉบับที่ 2.0 วันที่ 16 กันยายน 2565
ส่วนแก้ไขเพิ่มเติม	-
เอกสารให้ข้อมูลและหนังสือแสดงความยินยอม -เอกสารให้ข้อมูลและหนังสือแสดงความยินยอม (ฉบับภาษาไทย) -เอกสารให้ข้อมูลและหนังสือแสดงความยินยอม (ฉบับภาษาอังกฤษ)	 ฉบับที่ 2.0 วันที่ 16 กันยายน 2565 ฉบับที่ 2.0 วันที่ 16 กันยายน 2565
เอกสารเชื้อเชิญ -โปสเตอร์	 ฉบับที่ 2.0 วันที่ 16 กันยายน 2565
แบบบันทึกข้อมูล (ฉบับภาษาอังกฤษ) แบบบันทึกข้อมูล :Demographic (ฉบับภาษาไทย) แบบบันทึกข้อมูล :Demographic (ฉบับภาษาอังกฤษ) แบบสอบถาม (ฉบับภาษาไทย) แบบสอบถาม (ฉบับภาษาอังกฤษ)	ฉบับที่ 2.0 วันที่ 16 กันยายน 2565 ฉบับที่ 2.0 วันที่ 16 กันยายน 2565 ฉบับที่ 1.0 วันที่ 1 สิงหาคม 2565 ฉบับที่ 1.0 วันที่ 1 สิงหาคม 2565 ฉบับที่ 1.0 วันที่ 1 สิงหาคม 2565
บัตรประจำตัวและเอกสารอื่นที่ใช้กับผู้เข้าร่วมการวิจัย	-
เอกสารประกอบการพิจารณา เอกสารคู่มือผู้วิจัย - อัตตประวัติหัวหน้าโครงการวิจัย - ศ.นพ.ทินกร วงศ์ปการันย์ ฉบับ วันที่ 10 มิถุนายน 2565 อัตตประวัติผู้วิจัยร่วม -ศ.พญ.ณหทัย วงศ์ปการันย์ ฉบับ วันที่ 10 มิถุนายน 2565	

APPENDIX A

Ethic approval certificate (Continued)

เอกสารเลขที่ 340/2565

-รศ.ดร.ภัทราภรณ์ ภทรสกุล	ฉบับ วันที่ 7 มิถุนายน 2565
- ผศ.ดร.ปรีดา พิชยาพันธ์	ฉบับ วันที่ 7 มิถุนายน 2565
- Shirley Worland, BSW, PhD	ฉบับ วันที่ 7 มิถุนายน 2565
- Ms. Yuanyue Huang	ฉบับ วันที่ 2 มิถุนายน 2565
เอกสารประกันการชดเชย -	

การวิจัยได้รับความเห็นชอบโดยวิธีเร่งด่วน (Expedited review)

ความเห็นชอบ มีผลตั้งแต่ วันที่ 5 เดือน ตุลาคม พ.ศ. 2565 ถึงวันที่ 4 เดือน ตุลาคม พ.ศ. 2566

คณะกรรมการจริยธรรมการวิจัย คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ จัดตั้งและดำเนินการตามแนวทางการปฏิบัติการวิจัยทางคลินิกที่ดี (ICH GCP) และแนวทางจริยธรรมสากล กฎหมายและข้อบังคับที่เกี่ยวข้อง

ลงชื่อ : .....

(ศาสตราจารย์เกียรติคุณ นายแพทย์ปัญจะ กุลพงษ์)
ประธานคณะกรรมการจริยธรรมการวิจัย

การปฏิบัติหลังจากรับรอง

- ผู้วิจัยควรขอความเห็นชอบต่ออายุใบรับรองภายใน 1 เดือน ก่อนใบรับรองหมดอายุหากจะดำเนินการวิจัยต่อ
- หากจะแก้ไขเปลี่ยนแปลงใด ๆ ในโครงการวิจัย เอกสารข้อมูลและขอความยินยอม ต้องขอความเห็นชอบจากคณะกรรมการจริยธรรมการวิจัยก่อน เว้นแต่ (ก) เป็นเรื่องจำเป็นเพื่อสวัสดิภาพของผู้เข้าร่วมการวิจัย (ข) เป็นเรื่องเล็กน้อยเกี่ยวกับทางโลจิสติกส์หรือการบริหารโครงการวิจัย เช่น เปลี่ยนหมายเลขโทรศัพท์ เปลี่ยนกำกับดูแลการวิจัย
- หากมีข้อมูลใหม่หรือเหตุการณ์ใด ๆ ที่อาจมีผลต่อความปลอดภัยของผู้เข้าร่วมการวิจัยหรือการดำเนินการของการศึกษาวิจัย ให้รายงานต่อคณะกรรมการจริยธรรมการวิจัยโดยรีบด่วน
- การเบี่ยงเบนไปจากโครงการวิจัย ต้องแจ้งคณะกรรมการจริยธรรมการวิจัยทุกครั้ง
- หากพบเหตุการณ์ไม่พึงประสงค์ที่ร้ายแรงต้องรายงานให้คณะกรรมการจริยธรรมการวิจัยโดยเร็วตามประกาศคณะ

APPENDIX A

Ethic approval certificate (Continued)

No.340/2022

Certificate of Ethical Approval

Name of Ethics Committee: Research Ethics Committee Panel 5 Faculty of Medicine, Chiang Mai University **Address of Ethics Committee:** 110 Intavaroros Rd., Amphoe Mueang, Chiang Mai, Thailand 50200	
Principal Investigator: Prof.Tinakon Wongpakaran, M.D. Department of Psychiatry, Faculty of Medicine, Chiang Mai University.	
Protocol title: Depression and its associated factors among undergraduate engineering students: A cross-sectional survey in Thailand **STUDY CODE:** PSY-2565-09146 Research ID: 9146 **Sponsor:** -	
Documents approved	**Document reference**
Research protocol	Version 2.0 date 16 September 2022
Protocol amendment	-
Participant information sheet/ Informed consent form - Participant information sheet/ Informed consent form (Thai Version) - Participant information sheet/ Informed consent form (English Version)	 Version 2.0 date 16 September 2022 Version 2.0 date 16 September 2022
Recruitment material -Poster	Version 2.0 date 16 September 2022
Case report form (English Version) Case report form :Demographic (Thai Version) Case report form :Demographic (English Version) Questionnaire (Thai Version) Questionnaire (English Version)	Version 2.0 date 16 September 2022 Version 2.0 date 16 September 2022 Version 1.0 date 1 August 2022 Version 1.0 date 1 August 2022 Version 1.0 date 1 August 2022
Patient's card and other documents given to research participants	-
Supplementary documents reviewed **Investigator's brochure -** **Principal Investigator Curriculum vitae**	

APPENDIX A

Ethic approval certificate (Continued)

No.340/2022

- Prof.Tinakon Wongpakaran, M.D.	Version date 10 June 2022
Co-Investigator Curriculum vitae	
-Prof.Nahathai Wongpakaran, M.D	Version date 10 June 2022
-Assoc.Prof.Patraporn Bhatarasakoon, Ph.D.	Version date 7 June 2022
-Assist.Prof.Preda Pichayapan, Ph.D.	Version date 7 June 2022
- Shirley Worland, BSW, PhD	Version date 7 June 2022
- Ms. Yuanyue Huang	Version date 2 June 2022
Certificate of Insurance -	

The research has been approved by expedited review

Date of Approval: 5 October 2022 **Expiration Date:** 4 October 2023

The Research Ethics Committee, Faculty of Medicine, Chiang Mai University is organized and operates according to Guideline for Good Clinical Practice (ICH GCP) and relevant international ethical guidelines, the applicable laws and regulations.

Signature : P. Kulapongs

(Emeritus Professor Panja Kulapongs, M.D.)
Chairman of REC, Faculty of Medicine, CMU

POSTAPPROVAL REQUIREMENT:

- Investigator should make a request to renew approval within one month prior to the expiration date if the research is to be continued.
- In case there are any changes in the research protocol or informed consent form, the investigator must obtain REC approval prior to implementation unless (a) these changes are necessary for the safely of subjects, (b) minor changes such as logistical or administrative aspects of the trial (e.g., change of monitor(s), telephone number(s)).
- Any event or new information that adversely affects the safety of the subject or conduct of the trial must be reported to the REC promptly.
- Any protocol deviation/violation/noncompliance must be reported to the REC.
- Any serious adverse event must be reported to the REC promptly as stated in the Faculty of Medicine Notice.

APPENDIX B

Publication article

healthcare

MDPI

Article

Depression and Its Associated Factors among Undergraduate Engineering Students: A Cross-Sectional Survey in Thailand

Yuanyue Huang [1], Tinakon Wongpakaran [1,2,*], Nahathai Wongpakaran [1,2], Patraporn Bhatarasakoon [1,3], Preda Pichayapan [1,4] and Shirley Worland [1,5]

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[2] Department of Psychiatry, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand
[3] Faculty of Nursing, Chiang Mai University, Chiang Mai 50200, Thailand
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Abstract: Background: Depression is a common mental health problem that can affect everyone at different stages of development. Though the prevalence rate of depression among university students is rising, exploration among engineering students is limited. The aim of the study was to examine the prevalence of depression and its associated factors of among engineering students in Thailand. Methods: A total of 346 students participated in this study. All completed the outcome inventory depression subscale (OI-D) to evaluate the level and prevalence of depression. Other variables assessed included social skills, learning styles, relationship satisfaction, interpersonal difficulty, alcohol use, internet addiction, and neuroticism. Correlation and regression analyses were applied to test the association between sociodemographic and psychosocial factors and depression. Results: Of the 346 students with the mean age of 20.25 (SD, 1.33), 52.31% were male. Based on the OI-D, 35.3% of participants exhibited symptoms indicative of major depression. Multiple regression showed that only neuroticism, interpersonal difficulties, social skills, and self-esteem appeared to be the significant predictors of depression. Conclusion: The prevalence of depression among engineering students in Thailand was unexpectedly high compared with the prevalence of depression among engineering students in some other countries. Intra- and interpersonal factors were found to be associated with depression. Further study on identifying these risk factors should be encouraged.

Keywords: depression; engineering undergraduates; romantic relationship; self-esteem; interpersonal difficulty; social skill; neuroticism

Citation: Huang, Y.; Wongpakaran, T.; Wongpakaran, N.; Bhatarasakoon, P.; Pichayapan, P.; Worland, S. Depression and Its Associated Factors among Undergraduate Engineering Students: A Cross-Sectional Survey in Thailand. *Healthcare* **2023**, *11*, 2334. https://doi.org/10.3390/healthcare11162334

Academic Editor: Axel Steiger

Received: 17 July 2023
Revised: 8 August 2023
Accepted: 16 August 2023
Published: 18 August 2023

1. Introduction

Extensive research has been conducted on depression among university students, revealing a significant prevalence of depressive symptoms at 24.4% [1]. It is crucial to address these symptoms and emotions promptly, as untreated depression can potentially lead to various physical and psychological complications [2,3]. Suicidality represents the most severe manifestation of depression, with a systematic review involving nearly 90,000 college students in China indicating that individuals with depression had 2.2 times greater odds of developing suicidal ideation [4]. While mental health research among university students has predominantly focused on health science students, particularly medical students, recent systematic reviews have shed light on the prevalence of depression within this population. Notably, a review specifically targeting medical students found a depression prevalence of 41%, with several major risk factors identified. These risk factors included being female, being in the junior or preclinical years, exposure to COVID-19, academic stress, a history of psychiatric or physical disorders, economic troubles, fear

APPENDIX C

Abstract for the Mental Health Research Conference (MHRC) 2023

Title: Depression and its associated factors among undergraduate engineering students: A cross-sectional survey in Thailand

Yuanyue Huang [1], Tinakon Wongpakaran [1,2,], Nahathai Wongpakaran [1,2], Patraporn Bhatarasakoon [1,3], Preda Pichayapan [1,4] and Shirley Worland [1,5]

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2. Department of Psychiatry, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand
3. Faculty of Nursing, Chiang Mai University, Chiang Mai 50200, Thailand
4. Faculty of Engineering, Chiang Mai University, Chiang Mai 50200, Thailand
5. Faculty of Social Sciences, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract:

Objective: This study aims to examining the prevalence rate of depression among Thai undergraduate engineering students, the relationship between associated factors and depressive symptoms and try to find out the significant predictive factors for depressive symptoms among Thai undergraduate engineering students.

Design: This study is a quantitative cross-sectional descriptive online survey.

Method: participants will be selected from engineering undergraduates who are in year 1 to 4 in universities in Thailand, their age needs between 18 to 25 years old, participants can be any sex or gender, they need to be fluent in Thai, and able to access the internet. people who were diagnosed with psychiatric disorders such as Schizophrenia, Bipolar disorder, Drug, or alcohol use disorder or have a record of alcohol use within 24 hours will not be included in the study. The estimate participants number is 345 in total in this study.

Results: In total, 232 students participated in the study validly. The mean age was 20.27 ± 1.592 years old (range, 18-25), 43.9% of participants were men, 48.3% were female, and 7.8% were LGBT. With the Outcome Inventory 21-Depression, 34.5% were found to indicating depression symptoms, With the Outcome Inventory 21-Anxiety, 78% were found to indicating anxiety symptoms. Internet addiction, neuroticism personality, and anxiety were positively correlated with depression ($r = 0.235$, 0.562, and 0.769 respectively, $P < 0.01$), romantic relationship was negatively correlated with depression ($r= -.248$, $P< 0.01$), self-esteem was negatively correlated with depression ($r = -.141$ and $P < 0.05$). We got neuroticism personality is the significant predictor of depression, the P value is less than 0.01. Conclusion: The most of results here are satisfied with hypotheses of the study design, we found a quite high prevalence of anxiety among Thai undergraduate engineering students, this result could be a reference of universities to set more specific education for students to prevent potential risk of mental problems.

APPENDIX D

Best presentation award from the MHRC 2023

CURRICULUM VITAE

Author's Name Ms. Yuanyue Huang

Place of Birth Chongqing City, China

Education

2018-2020 Bachelor of Engineering (Civil Engineering), Rambhai Barni. Rajabhat University, Chanthaburi Province, Thailand

2021-Present Master of Science (Mental Health), Graduate School, Chiang Mai University, Chiang Mai Province, Thailand

Scholarship

Research scholarship for a master student

Source International Master of Mental Health Program

Year 2023

Scholarship for publication on international database

Source International Master of Mental Health Program

Year 2023

Publication 1) Huang, Y., Wongpakaran, T., Wongpakaran, N., Bhatarasakoon, P., Pichayapan, P., & Worland, S. (2023). Depression and Its Associated Factors among Undergraduate Engineering Students: A Cross-Sectional Survey in Thailand. *Healthcare*, *11*(16), 2334. https://www.mdpi.com/2227-9032/11/16/2334