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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, 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: 346students 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 skill, learning styles, relationship satisfaction, interpersonal difficulty, alcohol use, internet addiction, 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), 52.31% was 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 is unexpectedly high. 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

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-fold increased 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 of educational impairment, difficulties with online learning, fear of infection, feelings of loneliness, low physical activity, limited social support, problematic internet or smartphone use, and young age[5].

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Engineering students are gaining attention for a comparative study with medical students. Because both profession are stressful[6]. Like medical students, engineering students require long hours of studying, training, and practice. Students are overburdened with a massive amount of information, having a limited amount of time to memorize all the information studied, overloaded information creates a feeling of disappointment, inability to handle all the information and increased incidence of errors which ultimately break the stability of the student's wellness and result in illness [7]. Researchers found that depression among engineering students were associated with male gender, internet use [8, 9], and lacking social skills[7], and alcohol use disorder[10]. Particularly, alcohol use was found in two-third of male according to the Thai National Mental Health Survey (2013), which consequently led to psychotic symptoms, intermittent explosive disorder, and panic disorder [10].

Different disciplines may require different learning styles. A study revealed that students with visual and kinesthetic styles of learning were likely to develop depression [11]. In comparison to medical students that the quadmodal VARK (Visual, Aural, Read/Write, Kinesthetic) mode was the most preferred style[12], approximately 25% of students preferred a multi-modal learning style among engineering students[13]. No associations between VARK modal preferences and depression were observed among medical students.

Although limited in number, research on psychosocial factors associated with depression among engineering students has gained attention. Personality traits, such as neuroticism, interpersonal problems, and self-esteem, have been extensively studied and found to have significant influence on depression[7, 14-18]. Furthermore, relationship issues hold particular significance for young individuals during this stage of life. Previous studies have demonstrated that relationship satisfaction is associated with elevated stress levels, academic difficulties, and depression among university students [19-21]. Examining the interplay between relationship satisfaction and depression within the context of engineering students could provide valuable insights into the unique challenges they face.

As previously mentioned, there is a lack of comprehensive research on factors associated with depression among undergraduate engineering students. Therefore, the primary objective of this study was to examine the prevalence of depression and identify potential factors associated with it among engineering students in Thailand. Specifically, we investigated sociodemographic data, learning styles, social skills, and various psychosocial factors. Based on existing literature on university students, we anticipated that depression would also be prevalent among engineering students. We hypothesize that certain psychosocial variables, such as low self-esteem and neuroticism, would emerge as significant predictors of depression in this population. Additionally, we expected that alcohol use may be more prevalent among engineering students compared to health science students. Furthermore, since engineering is a unique discipline, we were interested in exploring the distinctive learning styles preferred by engineering students, although we did not formulate a specific hypothesis regarding the association between learning styles and depression. By investigating these factors and their relationship with depression, this study aimed to contribute to the understanding of mental health among engineering students and provided valuable insights for developing targeted interventions and support programs.

2. Materials and Methods

2.1. Study Design

This study is a quantitative cross-sectional descriptive online survey. The study was approved by the ethics committee of the Faculty of Medicine, Chiang Mai University. Study code: PSY-2565-09146, certification number 340/2022 effective 5 October 2022.

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2.2. Sample Size Calculation

The study would require a sample size of 317. According to the Statistical Thailand [22], the number of engineering students in Thailand in 2018 were 30346, with the calculation formula [23] the estimated number is 345 people in total.

2.3. Participants and Setting

Participants need to be Thai undergraduates age from 18-25 years old and they could be any major related in engineering, participants would be asked fluent in Thai and be able the access the internet. The exclusion criteria included those diagnosed with schizophrenia, bipolar disorder, drug, or alcohol use disorder. Sociodemographic data, including academic information such as grade point average (GPA), as well as physical/mental illness and social relationships, including current romantic relationships, were collected.

2.4. Measurements

2.4.1. Social Skills Inventory (SSI)

The Social Skills Inventory (SSI), includes six scales were used to measure communication skills in both emotional (non-verbal) and social (verbal) dimensions, and to assess basic social skills [24]. SSI consists of 30 items. Some sample of SSI item is that, I am able to conceal my true feelings from just about anyone. The Thai version of SSI showed [25], Cronbach's alpha of 0.88 [19]. Cronbach's alpha of SSI in the current study was 0.853.

2.4.2. Relationship Assessment Scale (RAS)

The RAS measures general relationship satisfaction[26]. It has 7 items (e.g., How well does your partner meet your needs? In general, how satisfied are you with your relationship? How good is your relationship compared to most?). Respondents answer each item using a 5-point scale ranging from 1 (low satisfaction) to 5 (high satisfaction) [26]. Individual scores on the RAS can range from 7 to 35, higher scores mean individual get higher satisfaction of relationship. The Cronbach's alpha score of relationship assessment scale for parents, friends and romantic partners was 0.89, 0.87 and 0.90, respectively [27]. Cronbach's alpha of RAS in the current study was 0.834.

2.4.3. Visual Aural Read/Write Kinesthetic (VARK)

The VARK questionnaire, which can be used to assess individuals' learning preference, includes 16 multiple choice questions (e.g., I need to find the way to a shop that a friend has recommended. I would: a) find out where the shop is in relation to somewhere I know. b) ask my friend to tell me the directions. c) write down the street direction I need to remember. d) use a map.). All choices correspond to the four sensory modalities which are measured by VARK [11]. The Cronbach's alpha scores of the learning styles were 0.85, 0.82, 0.84, and 0.77 for the visual, aural, read/write, and kinesthetic styles, respectively [28]. The Thai version of VARK showed Cronbach's alpha of VARK in the current study were 0.666, 0.576, 0.655, and 0.648 for the visual, aural, read/write, and kinesthetic learning styles, respectively[29].

2.4.4. Outcome Inventory-21(OI-21)

The OI-21 measures anxiety, depression, somatization, and interpersonal difficulty. It is a 21-item questionnaire with 5-Likert type response, from "0" not at all to "4" almost always. The Cronbach's alpha score of OI-21 was 0.92 [30]. Cronbach's alpha of OI-21 in the current study was 0.915. In the present study only subscales of depression and interpersonal difficulty were used.

Outcome Inventory-Interpersonal difficulty (OI-I) measures interpersonal problems. This subscale has four items. The sample of the OI-I items include, I do not get along with others; I feel uncomfortable with people that are not family. Individual scores on the OI-I can range from 0 to 16

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with higher scores indicating higher interpersonal problems. The Cronbach's alpha score of OI-I was 0.83 [30]. Cronbach's alpha of OI-I in the current study was 0.796.

Outcome Inventory-Depression (OI-D): measures depressive symptoms. This subscale has five items. The sample of the OI-D items include, I believed that I cannot have a happy life – as others do. Individual scores on the OI-D can range from 0 to 20 with higher scores indicating a higher level of depression. The Cronbach's alpha score of OI-D was 0.83 [30]. Cronbach's alpha of OI-D in the current study was 0.847. The cut-off score of 7 was used to determine major depression[29].

2.4.4. Internet Addiction Test (IAT)

The IAT, developed by Young, measures mild, moderate, or severe levels of Internet addiction[31]. It has 20 questions (e.g., How often do you find that you stay online longer than you intended? and participants rate themselves on a scale of 0(not applicable) to 5(always) based on how often the questions occur. IAT has been widely used in global academic studies. Its effectiveness and practicality in diagnosing Internet addiction have been confirmed in previous studies [32]. Individual scores on the IAT can range from 0 to 100. Higher scores mean individuals have higher levels of internet addiction. The Thai version demonstrated that Cronbach's alpha score of IAT was 0.89 [33]. Cronbach's alpha of IAT in the current study was 0.919.

2.4.4. The Revised Thai Version of Rosenberg Self-Esteem Scale (RSES)

The Self-esteem Scale (SES), developed by Rosenberg[34], was initially used to assess adolescents' overall feelings of self-worth. The scale was composed of 6 items (e.g., On the whole, I am satisfied with myself; I feel that I have a number of good qualities) with positive scores and 4 items with negative scores (e.g., At times I think I am no good at all; I feel I do not have much to be proud of). It is a 4-rating scale, from "1" strongly to "4" strongly disagree. Individual scores on the RSES can range from 0 to 40 with higher scores indicating a higher level of self-esteem. The Cronbach's alpha score of the Thai version of RSES was 0.87 [35]. Cronbach's alpha of RSES in the current study was 0.91.

2.4.3. Neuroticism Inventory (NI)

The NI is a dimensional measure of the neuroticism personality trait based on Eysenck's five-factor model [36]. The NI, developed by Wongpakaran and Wongpakaran [37], has 15-item in total, with 4-Likert type of scale; 0(never like me) to 4(like me the most) (e.g., I tend to brood over things; I often feel stressed). Individual scores on the NI can range from 0 to 60 with a higher score reflecting a higher level of neuroticism. The Cronbach's alpha score of NI was found to be 0.83 [37]. Cronbach's alpha of NI in the current study was 0.92.

2.5. Statistical Analysis

The data analysis of socio-demographic characteristics, prevalence of depression, used descriptive analysis to calculate frequency, percentage, mean and standard deviation (SD). The prevalence of depression was calculated by using the cut-off score for OI-D. We employed ANOVA and t-test to analyze the difference of the continuous scores across group. The chi-square test was used to analyze the association between categorical variables across groups.

Pearson correlation coefficient was employed to assess the relationships among variables with continuous scores such as relationship satisfaction, self-esteem scores and neuroticism scores.

Variables with significant correlation with depression score ($p<.05$), were included in multiple linear regression model. The beta values derived from the analysis results were used to elucidate the nature of the relationship between each independent variable and depression, whether positive or negative. Normality of residual would be evaluated to confirm that the assumption of regression model was met. Additionally, the p values accompanying these coefficients will 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. IBM SPSS version 22 was used for all analysis.

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3. Results

3.1. Sociodemographic and Clinical Variables

In this study, a total of 346 engineering undergraduates from Thailand participated in a questionnaire. The participants included 181 males, 165 females. 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 = 1.30). No difference of age between sexes was observed. Most participants were Buddhists (84.7%). 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%).

The overall mean GPA was 2.90 (SD = 0.55, n = 285); male: female was 2.92 (SD = 0.59) and 2.85 (SD = 0.51), respectively. No difference of GPA between sexes was observed. Most participants reported having no physical illness (93.4%), and no mental illnesses (97.9%). Among all, 60.3% reported having alcohol consumption (31.0% male, 29.3% female). Most of them reported drinking alcohol once a week (75.8%). Only 6.6% admitted that alcohol significantly affected their function.

Information regarding the participants' monthly family income and monthly allowance was collected. Among the participants, 129 (37.3%) reported a monthly family income between 25,000 and 50,000 baht. In terms of monthly allowance 155 (45.1%) participants received between 5,000 and 10,000 baht per month, (Table 1).

Romantic relationships were explored, 148 (42.9%) participants reported being in a romantic relationship. Of those in a relationship, 82 reported seeing their partner at least once a day (56.2%), while 2 reported seeing their partner every six to seven months (1.4%).

Table 1. Sociodemographic characteristics of the participants.

Variables		**Male (N=181)** Mean ± SD	**Female (N=165)** Mean ± SD	**Total (N=346)** Mean ± SD	Test difference
Age (18-25)		20.19±1.35	20.30±1.30	20.25±1.33	t (338) = -.78, p = .438
Religion	Buddhism	149(43.1%)	144(41.6%)	293 (84.7%)	$X^2(3) = 4.09$, p = .252
	Christianity	5(1.4%)	1(0.3%)	6 (1.7%)	
	Islam	7(2.0%)	8(2.3%)	15 (4.3%)	
	No religion	20(5.8%)	12(3.5%)	32 (9.2%)	
Major	Mechanical Engineering	26(7.5%)	16(4.6%)	42(12.2%)	$X^2(9) = 36.91$, 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%)	

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	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%)	
Marriage status	Single	176(51.2%)	162(47.1%)	338(98.3%)	X2(1) = .01, p = .920
	Married	3(0.9%)	3(0.9%)	6(1.7%)	
History of Physical illness	No	160(48.2%)	150(45.2%)	310(93.4%)	X2(1) = .07, p = .790
	Yes	12(3.6%)	10(3.0%)	22(6.6%)	
History of Mental illness	No	174(51.6%)	156(46.3%)	330(97.9%)	X2(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%)	X2(1) = 0 .22, p = .640
	No	74(21.4%)	63(18.3%)	137(39.7%)	
Family monthly income	Lower than 25,000THB	51(14.7%)	48(13.9%)	99(28.6%)	X2(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	Lower than 5,000THB	66(19.2%)	65(18.9%)	131(38.1%)	X2(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%)	

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	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		2.95 ± 0.63	2.82 ± 0.61	2.91 ± 0.63	t (329) = 2.91, p = .004

*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. Learning Styles Results

Out of a total of 331 valid samples, 94 individuals (28.40%) exhibited a unimodal learning style (V or A or R or K), 49 individuals (14.80%) exhibited a bimodal learning style (e.g., VA, RK), 54 individuals (16.31%) exhibited a trimodal learning style (e.g., VAR, ARK), and 134 individuals (40.48%) exhibited a quadmodal learning style (VARK). No significant difference of depression scores between VARK modalities was observed.

3.3. Pearson's Correlation, Linear Regression between Psychosocial Variables and Depression

Pearson correlation analysis revealed that being Buddhism, being in romantic relationship, and relationship satisfaction were negatively associated with depression ($p<.01$), whereas history of mental illness, neuroticism, internet addition, interpersonal difficulties, and currently having relationship were positively associated with depression (Table 2)

Table 2. Pearson's Correlation between psychosocial variables and depression.

Variables	Depression
age	-0.001
Sex (Male vs. Female)	-0.016
Grade point average	-0.130*
Buddhism (vs. non-Buddhism)	-0.269**
Relationship satisfaction	-0.210**
Rosenberg self-esteem	-0.698**
Neuroticism	0.563**
Social skills	-0.238**
Internet addition test	0.317**
Interpersonal difficulties	0.550**
History of mental illness (Yes vs. No)	0.179**
Current romantic relationship (Yes vs. No)	0.188**

Multiple linear regression analysis results discovered that self-esteem, neuroticism, interpersonal difficulty, and social skills significantly predicted depression score (F (10, 206) = 31.063, $p<.001$). This model explained 58.2% variances of depression (Table 3).

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Table 3. Multiple linear Regression for Depression.

	B	SE	Beta	*t*	p-value	95.0% Confidence Interval for B Lower Bound	Upper Bound
(Constant)	10.664	3.483		3.062	.002	3.798	17.530
Relationship satisfaction	-0.037	0.039	-0.050	-.929	.354	-0.114	0.041
Rosenberg self-esteem	-0.418	0.044	-0.530	-9.573	.000	-0.504	-0.332
Neuroticism	0.065	0.029	0.140	2.234	.027	0.008	0.123
Interpersonal difficulty	0.319	0.083	0.263	3.828	.000	0.155	0.484
Buddhism	0.285	0.546	0.024	.521	.603	-0.792	1.362
Internet addition test	0.027	0.015	0.097	1.838	.068	-0.002	0.057
Current romantic relationship	0.121	0.401	0.015	.302	.763	-0.669	0.911
Past Mental illness	-1.895	1.892	-0.046	-1.001	.318	-5.626	1.836
GPA	-0.244	0.338	-0.033	-0.722	.471	-0.910	0.422
Social skills	0.048	0.021	0.131	2.313	.022	0.007	0.089

Adjusted r square =.582, SE= Standard error, B = unstandardized coefficient, beta = standardized coefficient, GPA = grade point average.

4. Discussion

The aim of this study was 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 shed light on the relationship between psychosocial factors such as neuroticism, interpersonal difficulty, social skills and self-esteem significantly predicted depression.

In this study, we found that the prevalence of depression among all 346 Thai undergraduate engineering students was 35.3%. These findings are consistent with previous research on the mental health of university students. A study [38] reported a similar prevalence of depression (27.1%) among university students in a different country. The high prevalence rates of depression 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 variation in the prevalence rates between the current study and the mentioned study could be attributed to the utilization of different measurement tools. In the present study, OI-Depression was employed, whereas Bayram and Bilgel's research utilized the Depression Anxiety and Stress Scale (DASS-42).

As anticipated, several psychosocial variables were found to be associated with depression, including high levels of neuroticism, low self-esteem, elevated interpersonal difficulties, and lower level of social skills. These variables seem to be related to each other. Without a question, low self-esteem is related to depression, regardless of age and population. The vulnerability model describes low self-esteem significantly influences depression, even though depression influences self-esteem as well. A metanalysis study has supported the former hypothesis[39].

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The fact that interpersonal difficulty predicted depression among Thai engineering undergraduates could be because interpersonal difficulties may lead to feelings of isolation and loneliness [40]. 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. Those with interpersonal difficulties may not have 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. Similarly, social skills follow a similar pattern. Numerous studies have found a correlation between a lack of social skills and depression [41-43]. Individuals who struggle with interpersonal communication often exhibit deficits in social skills. Moreover, researchers have identified loneliness as a potential mediator between social skills and depression[44], possibly operating through the pathway of self-esteem [45]. In a longitudinal study, it was discovered that fostering social skills in individuals may play a crucial role in preventing adolescent depression. This is because an improvement in social skills contributes to increased responsibility and self-control, which, in turn, corresponds to a slower rise in depression[43].

Based on previous research, it was anticipated that neuroticism would emerge as a significant predictor of depression, aligning with findings from similar studies. [16, 37, 46-49]. 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 [50]. 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.

Regarding learning style, similar to other related studies, multimodal learning according to the VARK model was preferred among students. Among the engineering students in this study, 40.48% exhibited quadmodal learning style, which was close to the percentage observed in medical students (43.57%). It is noteworthy to compare the depression scores between the study by Paiboonsitthiwong and colleagues and the current study, as both studies used the same depression measurement (OI-D) and included Thai samples[51]. Medical students reported higher levels of depression compared to engineering students. Similar to the medical students, no significant difference in depression based on VARK style among these engineering students. This suggests that the relationship between learning style and depression is less significant when compared to intra and interpersonal factors.

Furthermore, the study found that other factors such as relationship satisfaction and romantic relationships were weak and non-significant predictors. Being in a relationship was associated with decreased depression. However, the quality of relationships seems to be more important. Romantic relationships often provide individuals with emotional support, understanding, and companionship. Having a supportive and loving partner can create a sense of belonging [52], reduce feelings of loneliness, and serve as a buffer against stressors, all of which may contribute to lower levels of depression. However, the significance of social skills in predicting depression was overshadowed by other influential factors.

Similarly, the use of alcohol did not emerge as a predictor of depression. 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 [53]. Research has shown that students who tend to avoid seeking help for depressive symptoms and potentially take up drinking as a coping strategy[54]. However, other investigators found no correlation between alcohol and depression[55]. The current study has confirmed this as over 60 percent consumed alcohol. Even though 14 % reported having many problems with their function due to alcohol, it was not a predictor for depression. Therefore, it is possible that engineering students tend to use alcohol for social drinking rather than as a coping strategy. The same is true for internet addiction. It can serve as a form of

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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[56]. Without adequate social support, individuals may be more prone to developing depressive symptoms [57]. Even though the internet use problem was found to be related to depression, it was overruled by other important factors. Like alcohol consumption, internet excessive use can be viewed as a coping mechanism. The behavior itself is not indicative of depression.

4.1. Implications and Future Research

These findings offer valuable insights for universities, highlighting the importance of proactively implementing focused educational initiatives to address potential psychological challenges among engineering students. For instance, using screening tools to assess personality traits like neuroticism and interpersonal difficulties can help identify individuals at risk for depression. This identification can enable targeted interventions and support for at-risk students. Social skill training should be promoted, especially for those who lack interpersonal skills.

In future research, it is recommended to incorporate positive mental health variables such as character strength or inner strength. This would allow investigation into how these positive factors might serve as buffers against mental health problems like depression, particularly for individuals who have been identified as at-risk through positive screening. Exploring the protective effects of positive factors can contribute to a more comprehensive understanding of mental health and inform the development of effective preventive strategies and support systems.

Limitation

It is essential to acknowledge that this study has several limitations. Firstly, the participants included in the study were exclusively Thai undergraduate engineering students. This sample specificity raises a concern regarding the generalizability of the findings to other populations or cultural contexts. To enhance the external validity of the results, future research should consider expanding the participant pool to include a more diverse range of individuals.

Secondly, the study relied on self-report measures as the primary data collection method. Self-report measures are susceptible to biases such as social desirability or recall biases, which could affect the accuracy and reliability of the reported information. Moreover, self-report measures may not capture the entire spectrum of mental health disorders and may be limited in their ability to provide a comprehensive assessment. Incorporating additional objective measures or clinician-administered assessments in future studies could provide a more comprehensive understanding of mental health outcomes.

4.2. Conclusion

The study findings revealed a notable prevalence of depression among undergraduate engineering students in Thailand. The high rates of depression underscore the importance of addressing mental health concerns within this population. The unique combination of academic demands, intense competition, and social pressures experienced by engineering students contributes significantly to these elevated rates. Notably, the study established a significant correlation between psychosocial variables and depression in this group.

Specifically, individual (intra-personal) and interpersonal factors such as self-esteem, personality traits (e.g., neuroticism), interpersonal difficulties, and social skills emerged as robust predictors of depression, aligning with findings from related research. Furthermore, although internet addiction and alcohol consumption were prevalent among undergraduate engineering students in Thailand, they did not demonstrate themselves as essential predictors for depression.

These findings carry practical implications for universities, highlighting the necessity for targeted educational initiatives to prevent potential psychological issues among students. By recognizing the influence of psychosocial factors on depression, universities can implement

interventions and support systems tailored to the unique needs of engineering students. Such initiatives can foster positive mental health and well-being within this student population.

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References

1. Akhtar, P., et al., *Prevalence of depression among university students in low and middle income countries (LMICs): a systematic review and meta-analysis.* J Affect Disord, 2020. **274**: p. 911-919.
2. Eisenberg, D., et al., *Mental health service utilization among college students in the United States.* J Nerv Ment Dis, 2011. **199**(5): p. 301-8.
3. Hirsch, J.K., J.R. Webb, and E.L. Jeglic, *Forgiveness, depression, and suicidal behavior among a diverse sample of college students.* J Clin Psychol, 2011. **67**(9): p. 896-906.
4. Lew, B., et al., *Associations between depression, anxiety, stress, hopelessness, subjective well-being, coping styles and suicide in Chinese university students.* PloS one, 2019. **14**(7): p. e0217372-e0217372.
5. Peng, P., et al., *The prevalence and risk factors of mental problems in medical students during COVID-19 pandemic: A systematic review and meta-analysis.* J Affect Disord, 2023. **321**: p. 167-181.
6. Singh, I. and A. Jha, *Anxiety, Optimism and Academic Achievement among Students of Private Medical and Engineering Colleges: A Comparative Study.* Journal of Educational and Developmental Psychology, 2013. **3**.
7. Siddiqui, N.A., et al., *Depression among undergraduate medical and engineering students: A comparative study.* Pak J Med Sci, 2020. **36**(5): p. 1096-1099.
8. Anand, N., et al., *Internet Use Patterns, Internet Addiction, and Psychological Distress Among Engineering University Students: A Study from India.* Indian J Psychol Med, 2018. **40**(5): p. 458-467.
9. Carli, V., et al., *The association between pathological internet use and comorbid psychopathology: a systematic review.* Psychopathology, 2013. **46**(1): p. 1-13.
10. Tanaree, A., S. Assanangkornchai, and P. Kittirattanapaiboon, *Pattern and risk of developing alcohol use disorders, illegal substance use and psychiatric disorders after early onset of alcohol use: Results of the Thai National Mental Health Survey 2013.* Drug Alcohol Depend, 2017. **170**: p. 102-111.
11. Prithishkumar, I.J. and S.A. Michael, *Understanding your student: using the VARK model.* J Postgrad Med, 2014. **60**(2): p. 183-6.
12. Paiboonsithiwong, S., et al., *Learning styles, academic achievement, and mental health problems among medical students in Thailand.* Journal of educational evaluation for health professions, 2016. **13**: p. 38-38.
13. Ictenbas, B.D. and H. Eryilmaz, *Determining Learning Styles Of Engineering Students To Improve The Design Of A Service Course.* Procedia - Social and Behavioral Sciences, 2011. **28**: p. 342-346.
14. Wongpakaran, N., T. Wongpakaran, and R. van Reekum, *Social inhibition as a mediator of neuroticism and depression in the elderly.* BMC Geriatr, 2012. **12**: p. 41.
15. Wongpakaran, N., et al., *Prevalence, clinical and psychosocial variables of depression, anxiety and suicidality in geriatric tertiary care settings.* Asian J Psychiatr, 2019. **41**: p. 38-44.
16. Wongpakaran, N., et al., *Moderating role of observing the five precepts of Buddhism on neuroticism, perceived stress, and depressive symptoms.* PLoS One, 2022. **17**(11): p. e0277351.
17. Tang, T., J. Jiang, and X. Tang, *Psychological risk and protective factors associated with depression among older adults in mainland China: A systematic review and meta-analysis.* Int J Geriatr Psychiatry, 2022. **37**(1).

18. Szücs, A., et al., *Personality and Suicidal Behavior in Old Age: A Systematic Literature Review.* Front Psychiatry, 2018. **9**: p. 128.
19. Kurimoto, P.L., P.; Maes, M., *Impaired Social Skills as a Key Component of Clinical Depression: Associations with Severity of Illness, Self-Esteem, Family Functional Health Satisfaction, and Personality Features.* Preprints, 2020.
20. Dooley, B., A. Fitzgerald, and N.M. Giollabhui, *The risk and protective factors associated with depression and anxiety in a national sample of Irish adolescents.* Ir J Psychol Med, 2015. **32**(1): p. 93-105.
21. Whitton, S.W. and M.A. Whisman, *Relationship satisfaction instability and depression.* J Fam Psychol, 2010. **24**(6): p. 791-4.
22. THAILAND, S., *Number of new enrollments bachelor degree level in field of science and technology during academic year 2009 - 2018 by programme*. 2018.
23. Rodríguez Del Águila, M. and A. González-Ramírez, *Sample size calculation.* Allergol Immunopathol (Madr), 2014. **42**(5): p. 485-92.
24. Riggio, R., *Assessment of Basic Social Skills.* Journal of Personality and Social Psychology, 1986. **51**: p. 649-660.
25. Klomkliang, D., *Klomkliang D. A construction of social skills tests for mathayom suksa I-III students [Master of Education]: Srinakharinwirot University*. 2003.
26. Hendrick, S.S., A. Dicke, and C. Hendrick, *The Relationship Assessment Scale.* Journal of Social and Personal Relationships, 1998. **15**(1): p. 137-142.
27. ÇELİK, E., *Adaptation of Relationship Assessment Scale to Turkish Culture: Study of Validity and Reliability.* International Journal of Psychology and Educational Studies, 2014. **1 (1)**: p. 1-7
28. Leite, W.L., M. Svinicki, and Y. Shi, *Attempted Validation of the Scores of the VARK: Learning Styles Inventory With Multitrait–Multimethod Confirmatory Factor Analysis Models.* Educational and Psychological Measurement, 2009. **70**(2): p. 323-339.
29. Pawuttipattarapong, S. *VARK (Thai version) [Internet] Chon Buri (Thailand): Burapha University*. 2014; Available from: http://vark-learn.com/wp-content/uploads/2014/08/The-VARK-Questionnaire-Thai.pdf.
30. Wongpakaran, N., T. Wongpakaran, and Z. Kövi, *Development and validation of 21-item outcome inventory (OI-21).* Heliyon, 2022. **8**(6): p. e09682.
31. Young, K.S., *Internet addiction - a new clinical phenomenon and its consequences.* Am Behav Sci, 2004. **48**.
32. Jelenchick, L.A., T. Becker, and M.A. Moreno, *Assessing the psychometric properties of the Internet Addiction Test (IAT) in US college students.* Psychiatry Res, 2012. **196**(2-3): p. 296-301.
33. Neelapaijit, A., et al., *Psychometric properties of a Thai version internet addiction test.* BMC Research Notes, 2018. **11**(1): p. 69.
34. Rosenberg, M. *ROSENBERG SELF-ESTEEM SCALE*. 1965 [cited 2021 30th May]; Available from: https://fetzer.org/sites/default/files/images/stories/pdf/selfmeasures/Self_Measures_for_Self-Esteem_ROSENBERG_SELF-ESTEEM.pdf.
35. Wongpakaran, N. and T. Wongpakaran, *The Thai version of the PSS-10: An Investigation of its psychometric properties.* BioPsychoSocial medicine, 2010. **4**: p. 6-6.
36. McCrae, R.R. and P.T. Costa Jr, *The five-factor theory of personality*, in *Handbook of personality: Theory and research, 3rd ed.* 2008, The Guilford Press: New York, NY, US. p. 159-181.
37. Banjongrewadee, M., et al., *The role of perceived stress and cognitive function on the relationship between neuroticism and depression among the elderly: a structural equation model approach.* BMC Psychiatry, 2020. **20**(1): p. 25.
38. Bayram, N. and N. Bilgel, *The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students.* Social Psychiatry and Psychiatric Epidemiology, 2008. **43**(8): p. 667-672.
39. Sowislo, J.F. and U. Orth, *Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies.* Psychol Bull, 2013. **139**(1): p. 213-240.
40. Wang, L., et al., *Moderating Effect of Gender and Engineering Identity on the Association between Interpersonal Relationships and Mental Health of Female Engineering Students.* International Journal of Environmental Research and Public Health, 2022. **19**(16): p. 10425.
41. Pereira-Lima, K. and S.R. Loureiro, *Burnout, anxiety, depression, and social skills in medical residents.* Psychol Health Med, 2015. **20**(3): p. 353-62.
42. Segrin, C., *Social skills deficits associated with depression.* Clin Psychol Rev, 2000. **20**(3): p. 379-403.
43. Yao, Z. and R. Enright, *A Longitudinal Analysis of Social Skills and Adolescent Depression: A Multivariate Latent Growth Approach.* Int J Psychol Res (Medellin), 2021. **14**(1): p. 66-77.
44. Moeller, R.W. and M. Seehuus, *Loneliness as a mediator for college students' social skills and experiences of depression and anxiety.* J Adolesc, 2019. **73**: p. 1-13.
45. Dou, Y., et al., *Bullying Victimization Moderates the Association between Social Skills and Self-Esteem among Adolescents: A Cross-Sectional Study in International Schools.* Children (Basel), 2022. **9**(11).

46. Nochaiwong, S., et al., *Mental health circumstances among health care workers and general public under the pandemic situation of COVID-19 (HOME-COVID-19).* Medicine (Baltimore), 2020. **99**(26): p. e20751.
47. Suradom, C., et al., *Prevalence and associated factors of comorbid anxiety disorders in late-life depression: findings from geriatric tertiary outpatient settings.* Neuropsychiatr Dis Treat, 2019. **15**: p. 199-204.
48. Wongpakaran, N., et al., *Prevalence, clinical and psychosocial variables of depression, anxiety and suicidality in geriatric tertiary care settings.* Asian J Psychiatr, 2018.
49. Wongpakaran, N., et al., *Role of Equanimity on the Mediation Model of Neuroticism, Perceived Stress and Depressive Symptoms.* Healthcare (Basel), 2021. **9**(10).
50. Gao, T., et al., *Neuroticism and quality of life: Multiple mediating effects of smartphone addiction and depression.* Psychiatry Research, 2017. **258**: p. 457-461.
51. Paiboonsithiwong, S., et al., *Learning styles, academic achievement, and mental health problems among medical students in Thailand.* J Educ Eval Health Prof, 2016. **13**: p. 38.
52. Amand, C.S., et al., *Romantic Relationships of Female-to-Male Trans Men: A Descriptive Study.* International Journal of Transgenderism, 2013. **14**(2): p. 75-85.
53. Arslan, G., et al., *Prevalence of depression, its correlates among students, and its effect on health-related quality of life in a Turkish university.* Upsala Journal of Medical Sciences, 2009. **114**(3): p. 170-177.
54. Chow, M.S.C., et al., *Alcohol Consumption and Depression Among University Students and Their Perception of Alcohol Use.* East Asian Arch Psychiatry, 2021. **31**(4): p. 87-96.
55. Bryl, N., et al., *Drinking alcohol as a way of coping with stress in students of medical faculties.* Psychiatr Pol, 2020. **54**(2): p. 265-277.
56. Orsal, O., et al., *Evaluation of Internet Addiction and Depression among University Students.* Procedia - Social and Behavioral Sciences, 2013. **82**: p. 445-454.
57. B, S. and Y. Deshpande, *Prevalence, predictors, psychological correlates of internet addiction among college students in India: a comprehensive study.* Anatolian Journal of Psychiatry, 2020. **21**: p. 1.