Psychosocial and Physical Predictors of Stress in University Students during the COVID-19 Pandemic: An Observational Study

Nutsupa Ubolnuar 1, Nongnuch Luangpon 1, Krittipat Pitchayadejanant 2 and Sirirat Kiatkulanusorn 1, *

1 Department of Physical Therapy, Faculty of Allied Health Sciences, Burapha University, Chonburi 20131, Thailand; nutsupa.ub@go.buu.ac.th (N.U.); nongnuchl@go.buu.ac.th (N.L.)
2 Burapha University International College, Burapha University, Chonburi 20131, Thailand; krittipat@go.buu.ac.th
* Correspondence: siriratk@go.buu.ac.th; Tel.: +66-882302582

Abstract: Currently, university students are at a high risk of stress due to university adjustment, educational interruption, and alterations in daily life because of the COVID-19 pandemic. This study examined the relationship of psychosocial and physical factors with stress in university students during the pandemic. Demographic, psychosocial, physical, and self-perceived stress level information were obtained from 409 Thailand university students. A multiple regression analysis was performed, with stress level as the dependent variable and gender, age, study period, study program, social support, self-esteem, health literacy, health behavior score, sedentary behavior, and physical activity (PA) as independent variables. Most participants had moderate stress levels (68.9%), high self-esteem (83.9%) and social support (66.5%), fair health literacy (41.1%) and health behavior (32%), sedentary lifestyle (85.3%), and PA-levels lower than 600 min per week (57.46%). The regression analysis showed that 45.7% of the variability in stress level was predicted by self-esteem, study period, social support, travel domain of PA, and health behavior. COVID-19 and the attendant restrictions resulted in moderate levels of stress in Thailand university students. High self-esteem, long duration of study, great social support, and having healthy behavior may contribute to the prevention of stress in this population.

Keywords: COVID-19; physical factors; psychosocial factors; stress; university students

1. Introduction

COVID-19 has been a global pandemic since December 2019 [1]. It has affected the economic and political climate and the public health of the world population [2,3]. The World Health Organization (WHO) has advised maintaining a distance of at least 1 m from others, avoiding public areas or crowded places, and staying at home as much as possible. Lockdown measures have been implemented in organizations, universities, schools, and public areas, to contain and limit the spread of COVID-19 [3].

In Thailand, the first case of COVID-19 was reported in January 2020. The number of cases increased drastically in March 2020, partially due to the emergence of nightclub and boxing stadium clusters. Following the WHO guidelines, the Thai government implemented lockdown measures that included a curfew between 10 p.m. and 4 a.m., shutting down nonessential businesses and organizations to keep workers at home, and closing public areas and crowded places [4]. Both international and domestic travel were restricted to limit movement and social interaction [3].

The spread of COVID-19 has directly affected people’s lifestyles. Social and physical distancing measures, along with the requirement to wear a mask in public areas were implemented to reduce infection [5]. However, daily physical activities (PAs), such as working, exercising, and outdoor pursuits, have all been limited by the restrictions [1]. The changes...
to daily life have affected the physical and psychological health of the world population. Moreover, the ongoing exposure to information about COVID-19, including uncertainties about health and the future; irritability due to work, study, or project disruption; reduced incomes; and political and economic issues, could exacerbate stress, depression, and other psychological problems [5]. Optimal health literacy and behavior are required to mitigate the detrimental effects of a pandemic [6]. Despite its importance to health and well-being, health literacy remains an area of inquiry, which is often neglected by research.

Due to the lockdown measure, universities have postponed classes or changed from onsite to online education [3,7]. These changes result in increased stress levels among university students [8]. This may cause some students to fail in their learning program, with negative effects emotionally and academically on their future careers [9]. The lockdown measures may also affect family incomes [10] and the social life of students, such as a reduction or the absence of recreational activities, sports, or PA [8,9]. Low PA has been reported among university students in different countries [11]. There has also been an increase in students’ social media use during COVID-19, and this has had negative effects on mental health [10]. Moreover, most university students are young adults, some of whom may lack the adequate skills to adjust during the COVID-19 pandemic [8]. Thus, there have been negative effects on both psychological and physical health in university students during the COVID-19 pandemic [9].

Apart from PA, psychosocial factors, including self-esteem and social support, have been affected by COVID-19 [12,13]. Self-esteem plays an important role in the mediation of stress-related biological processes and is associated with subjective well-being, effective biological regulation, and physical health [14]. Arsandaux et al. [12] found that university students were at higher risk of mental health disturbances, including reductions in self-esteem during lockdown than nonstudents [12]. Social support is known to increase resilience to stress, thereby improving mental and physical health [15]. Adequate coping strategies and social support are significantly correlated with lower psychological distress in university students during COVID-19 [13]. Friedlander et al. studied the predictors of adjustment to university in Canadian students and demonstrated that social support, self-esteem, and stress level are important predictors of adjustment to university among first-year undergraduate students [16].

COVID-19 increases stress in students, activating physiological, emotional, and behavioral responses [14]. Moreover, different situations, areas and occupations could influence the impact of the pandemic on individuals and population categories. There is no study on the impact of the pandemic, especially the first wave, on Thailand university students. Due to the novelty of the pandemic and accompanying restrictions, Thai university students are at high risk of stress because of learning adjustment, educational interruption, financial concerns, family problems, alterations in daily life, social isolation, etc. This study investigated the psychosocial and physical factors influencing the stress level in Thailand university students during the COVID-19 pandemic. Understanding these factors can be beneficial in the development of strategies aimed at stress reduction and prevention of psychological disorders.

2. Materials and Methods

2.1. Study Design

This was a cross-sectional, observational, analytical, and descriptive study. Participants were recruited using a stratified random sampling method, and they submitted online consent forms before participation. Neither patients nor the public were involved in the design, conduct, report, or dissemination of this research plans.

2.2. Participants

The sample size was calculated using the formula by Taro Yamane [17]. The population of students was 25,743. With a significance level of 0.05, the minimum valid sample size was
calculated to be 395 students. Undertaking a proportional stratified sampling of students from each faculty, 409 students at Burapha University were recruited for this study.

For confounders’ control, inclusion criteria were determined that the student was more than 18 years old, studying at Burapha University’s Bangsaen campus, and accessible on electronic devices to complete the online questionnaires. Participants were excluded if they were unable to read or understand the Thai language because the questionnaire was written in Thai. The confounders in the study were age, specific location, and nationality.

Participants were requested to participate in the study by responding to an online invitation posted on the official social media handles of each faculty’s student affairs (Facebook and LINE Application). The participants completed an anonymized online questionnaire that was created using Google Forms. Completed online questionnaires were collected and analyzed as participants of the study.

2.3. Data Collection and Instrument

This comprised six sections: demographic data, PA, social support, self-esteem, health literacy and health behavior, and perceived stress. Data were collected in October 2020 using a self-administered questionnaire. The validity and reliability of the instrument was assured through wide consultations with relevant academicians, a review of the literature, and adaptation of validated instruments. The questionnaire comprised of six sections: (1) sociodemographic characteristics, (2) PA, (3) social support, (4) self-esteem, (5) health literacy and health behavior, and (6) perceived stress. The participants were informed to rest for 5 min after completing each section of the questionnaire.

PA was assessed using the Global Physical Activity Questionnaire (GPAQ) v.2 [18]. The Thai version of GPAQ was published by Thailand’s Ministry of Public Health. A previous study showed a reliability of 0.67-0.73 and a moderate (0.45) to strong (0.65) validity [19]. Information was collected on three domains of PA: activity at work, travel, and recreation. The energy used in PA from each domain is calculated as metabolic equivalent minutes per week. Total PA is calculated on the basis of the overall score from all domains. The level of PA was considered in relation to that recommended by WHO (≥600 min/week). An additional section of the questionnaire that we classed as the sedentary behavior domain was also collected. The level of sedentary behavior was categorized into nonsedentary, sometimes sedentary, and always sedentary [20].

Levels of social support were measured using the Thai version of the revised Multidimensional Scale of Perceived Social Support. The questionnaire consists of 12 items that ask about the support from one’s family, friends, and significant others. Answers were presented on a 7-point Likert scale. The total score was the sum of the ratings for the 12 items. We classified these as high (scores of 61–84), moderate (scores of 37–60), and low support (scores of 12–36). The reliability of this questionnaire was between 0.86 and 0.92 [21].

Self-esteem was measured using the Thai version of the Rosenberg Self-Esteem Scale. The questionnaire consists of 10 items measured on a Likert scale of 0–4 points. Total possible scores ranged from 10 to 40. The levels of self-esteem were classified as high (scores > 32), moderate (scores of 26–32), and low self-esteem (scores < 26). This questionnaire had a strong reliability of 0.86 [22].

Health literacy was assessed using the health literacy and health behaviors 3E 2S evaluation of the Health Education Division of Thailand’s Ministry of Public Health. This questionnaire consists of six sections, including (i) demographic data (12 items), (ii) knowledge and understanding of health (6 items), (iii) accessibility of health information (10 items), (iv) decision making based on perceived health information (3 items), (v) health behavior (6 items), and (vi) health information (8 items). The Kuder–Richardson 20 score for this evaluation was 0.516 and it had a Cronbach’s alpha coefficient of 0.602–0.788.

Stress levels were measured using the Thai version of the 10-item Perceived Stress Scale. The questionnaire consists of 10 items measured on a Likert scale of 0–4 points. Stress
was classified into three levels: high stress (scores 0–13), moderate stress (scores 14–26), and low stress (scores 27–40). The reliability of this questionnaire was 0.85 [23].

2.4. Statistical Analysis

Data were analyzed using SPSS software. Stress level (ratio level) was our dependent variable (DV), whereas our independent variables (IVs) were gender, age, study period, study program, self-esteem, social support, health literacy, health behavior, sedentary behavior, and PA (including the work, travel, and recreational domains). We performed ordinary multiple regression analysis because of its suitability to our data set. Our study’s nominal data (gender, study program (health sciences vs. nonhealth sciences), and sedentary behavior (nonsedentary vs. sedentary behavior)) were recoded and transformed into dummy variables. To maintain the reliability of the instrument and reduce complexity in applying the model, the scale was not adjusted in this study. Due to concerns about the variability of different weightage in the Likert scale, the unstandardized coefficient was reported to predict the stress level. The model can be implemented into unobserved observation without transforming the data. Additionally, the standardized coefficient was reported to account for the comparison of the strength of factors affecting stress levels. Furthermore, assumptions of ordinary regression analysis were evaluated. The Kolmogorov–Smirnov test and scatter plots were used to test the normality and homoscedasticity of residuals. Autocorrelation and the multicollinearity of the IVs were tested using Durbin–Watson statistic, tolerance test, and variance inflation factor. Pearson’s product–moment correlation coefficient was used to examine the relationship between the stress level and demographic variables, as well as between the stress level and DVs. The significance level in the study was 0.05.

3. Results

A total of 523 questionnaires were retrieved from the students; however, 409 completed questionnaires were analyzed and included in this result. Participants’ characteristics are presented in Table 1. The majority of the participants were females (n = 297, 72.62%) and in nonhealth sciences programs (n = 334, 81.66%), whereas approximately 40% (n = 161, 39.36%) were in the fourth academic year.

Table 1. Demographic data of participants and correlations between participant characteristics and stress level.

| Participants Characteristics          | Frequency | Percentage | Total           | Correlation with the Level of Stress |
|--------------------------------------|-----------|------------|-----------------|-------------------------------------|
|                                      |           |            | Mean           | SD | r     | p-Value |
| Age (year)                           |           |            | 20.95          | 1.24 | -0.221 | <0.001 *** |
| Gender                               |           |            |                |    |       |         |
| - Male                               | 112       | 27.38      |                |    | -0.078 | 0.113   |
| - Female                             | 297       | 72.62      |                |    |        |         |
| Study period (year)                  |           |            | 2.126          | 1.04 | -0.252 | <0.001 *** |
| - First academic year                | 61        | 14.91      |                |    |        |         |
| - Second academic year               | 56        | 13.69      |                |    |        |         |
| - Third academic year                | 131       | 32.03      |                |    |        |         |
| - Fourth academic year               | 161       | 39.36      |                |    |        |         |
| Year of study                        |           |            |                |    |       |         |
| Study program (health: nonhealth)    |           |            |                |    | 0.046 | 0.356   |
| - Health sciences                    | 75        | 18.34      |                |    |        |         |
| - Other                              | 334       | 81.66      |                |    |        |         |
| Relationship status                  |           |            |                |    |       |         |
| - Single                             | 405       | 99.02      |                |    | -0.019 | 0.708   |
| - In a relationship                  | 4         | 0.98       |                |    |        |         |

*** p < 0.001.
The correlations between the participants’ characteristics and stress levels are presented in Table 1. Age \((r = -0.221, p < 0.001)\) and study period \((r = -0.252, p < 0.001)\) had a weak, significant negative correlation with stress levels.

The correlations between independent variables and stress levels are presented in Table 2. Self-esteem \((r = -0.625, p < 0.001)\) and social support \((r = -0.425, p < 0.001)\) had a moderate, significant negative correlation with stress levels. However, health literacy \((r = -0.140, p = 0.004)\) and health behavior \((r = -0.241, p < 0.001)\) had a weak, significant negative correlation with stress level. Activity domain \((r = 0.120, p = 0.015)\) and travel domain \((r = 0.137, p < 0.005)\) of PA had a weak, significant positive correlation with stress level. \[24\]. The remaining variables were not significant.

Table 2. Correlations between stress level and self-esteem, social support, health literacy, health behavior, physical activity, and sedentary behavior.

| Variables                       | Frequency | Percentage | Total Correlation with the Level of Stress | Mean  | SD   | r       | p-Value |
|---------------------------------|-----------|------------|-------------------------------------------|-------|------|---------|---------|
| Stress score                    |           |            |                                           | 17.82 | 6.61 |         |         |
| - Low perceived stress          | 96        | 23.5       |                                           |       |      | -0.625  | <0.001 *** |
| - Moderate perceived stress     | 282       | 68.9       |                                           |       |      |         |         |
| - High perceived stress         | 31        | 7.6        |                                           |       |      |         |         |
| Self-esteem                     |           |            |                                           | 30.68 | 4.82 | -0.625  | <0.001 *** |
| - Low self-esteem               | 2         | 0.5        |                                           |       |      |         |         |
| - Normal self-esteem            | 64        | 15.6       |                                           |       |      |         |         |
| - High self-esteem              | 343       | 83.9       |                                           |       |      |         |         |
| Social support                  |           |            |                                           | 63.50 | 12.36| -0.425  | <0.001 *** |
| - Low perceived social support  | 9         | 2.2        |                                           |       |      |         |         |
| - Moderate perceived social     | 128       | 31.3       |                                           |       |      |         |         |
| support                         | 272       | 66.5       |                                           |       |      |         |         |
| Health literacy                 |           |            |                                           | 44.72 | 6.22 | -0.14   | 0.004 ** |
| - Poor health literacy          | 109       | 26.7       |                                           |       |      |         |         |
| - Fair health literacy          | 168       | 41.1       |                                           |       |      |         |         |
| - Good health literacy          | 103       | 25.2       |                                           |       |      |         |         |
| - Excellent health literacy     | 29        | 7.1        |                                           |       |      |         |         |
| Health behavior                 |           |            |                                           | 20.97 | 3.09 | -0.241  | <0.001 *** |
| - Poor health behavior          | 52        | 12.7       |                                           |       |      |         |         |
| - Fair health behavior          | 131       | 32         |                                           |       |      |         |         |
| - Good health behavior          | 127       | 31.1       |                                           |       |      |         |         |
| - Excellent health behavior     | 99        | 24.2       |                                           |       |      |         |         |
| Total physical activity (min/week) |   |           |                                           | 1306.00 | 1731.59 | 0.070 | 0.159 |
| - Activity domain (min/week)    |           |            |                                           | 424.38 | 868.56 | 0.120 | 0.015 * |
| - Travel domain (min/week)      |           |            |                                           | 218.24 | 419.28 | 0.137 | 0.005 ** |
| - Recreational domain (min/week)|           |            |                                           | 663.37 | 1121.77 | -0.037 | 0.460 |
| PA ≥ 600 min/week               | 174       | 42.54      |                                           |       |      |         |         |
| PA < 600 min/week               | 235       | 57.46      |                                           |       |      |         |         |
| Sedentary behavior              |           |            |                                           |       |      | -0.058  | 0.243   |
| - Nonsedentary                  | 60        | 14.7       |                                           |       |      |         |         |
| - Sometimes sedentary           | 203       | 49.6       |                                           |       |      |         |         |
| - Always sedentary              | 146       | 35.7       |                                           |       |      |         |         |

* \(p < 0.05\); ** \(p < 0.01\); *** \(p < 0.001\).

The results of ordinary multiple regression analysis are presented in Table 3. The variables that were not significant in correlation were excluded from this analysis. The step-wise method iteratively examines each significant independent variable in the model. The regression model comprised five significant independent variables \((F = 67.90, p < 0.001)\): self-esteem, study duration, social support, the travel domain of PA, and health behavior. Overall, 45.7% of the variability in stress level was predicted by these five independent variables. In
addition, the Durbin-Watson test of autocorrelation ($n=409$, $k=5$, $\alpha=0.05$, $du=1.794$) result was 1.851. Based on the acceptable range of no evidence of autocorrelation (1.794 and 2.206), our result showed that there is no evidence of autocorrelation. The residuals presented normality and homoscedasticity.

### Table 3. Stepwise multiple regression analysis model with stress level as the dependent variable.

| Model | Independent Variables | R$^2$ | Adjusted R$^2$ | F     | p-Value | Durbin–Watson |
|-------|-----------------------|-------|----------------|-------|---------|---------------|
| 1     | Self-Esteem           | 0.391 | 0.389          | 261.06| <0.001 ***|               |
| 2     | Self-Esteem, Study Period | 0.417 | 0.414          | 145.02| <0.001 ***|               |
| 3     | Self-Esteem, Study Period, Social Support | 0.439 | 0.435          | 105.51| <0.001 ***| 1.851         |
| 4     | Self-Esteem, Study Period, Social Support, Physical Activity (Travel Domain) | 0.450 | 0.444          | 82.48 | <0.001 ***|               |
| 5     | Self-Esteem, Study Period, Social Support, Physical Activity (Travel Domain), Health Behavior | 0.457 | 0.451          | 67.90 | <0.001 ***|               |

*** $p < 0.001$.

In this study, multicollinearity was also investigated by variable inflation factors (VIF), which should be close to 1 and lower than 5. As shown in Table 4, the VIF value for each variable is between 1.024 and 1.409. This finding shows that our study had no multicollinearity issue.

### Table 4. Stepwise multiple regression of the relationship of self-esteem, study period, social support, physical activity in the travel domain, and health behavior with the stress level of Thailand university students during COVID-19.

| Independent Variables | Constant | B     | SE (B) | $\beta$   | t       | p-Value | $Sr^2$ (Unique) | Tolerance | VIF |
|-----------------------|----------|-------|--------|-----------|---------|---------|----------------|-----------|-----|
| Self-Esteem           | −0.680   | 0.058 | −0.497 | −11.664   | <0.001 ***| −0.502  | 0.742          | 1.349     |     |
| Study Period          | −1.064   | 0.235 | −0.168 | −4.523    | <0.001 ***| −0.220  | 0.976          | 1.024     |     |
| Social Support        | −0.084   | 0.023 | −0.158 | −3.621    | <0.001 ***| −0.178  | 0.710          | 1.409     |     |
| Physical Activity (Travel Domain) | 0.002   | 0.001 | 0.108  | 2.900     | 0.004 **  | 0.143   | 0.975          | 1.026     |     |
| Health Behavior       | −0.199   | 0.083 | −0.093 | −2.390    | 0.017 *   | −0.118  | 0.890          | 1.124     |     |

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4 shows the unstandardized regression coefficients (B), the standardized regression coefficient ($\beta$), and the semi-partial correlations ($Sr^2$). For the final model, five IVs contributed significantly to stress level prediction: self-esteem ($B = −0.680$, $\beta = −0.497$, $p < 0.001$ ***), study period ($B = −1.064$, $\beta = −0.168$, $p < 0.001$ ***), social support ($B = −0.084$, $\beta = −0.158$, $p < 0.001$ ***), the travel domain of PA ($B = 0.002$, $\beta = 0.108$, $p = 0.004$***), and health behavior ($B = −0.199$, $\beta = −0.093$, $p < 0.017$ *).

Hence, the equation model for predicting stress levels was derived for these variables:

Predicted stress level = $50.21 − 0.680$ (self-esteem) − $1.064$ (study period) − $0.084$ (social support) + $0.002$ (travel domain of PA) − $0.199$ (health behavior)

### 4. Discussion

This study assessed the relationship of self-esteem, social support, health literacy, and health behavior, and PA with stress in Thailand university students during the first wave of the COVID-19 pandemic. Our findings indicated that the combined influence of psychosocial and physical factors predicted 45.7% of the stress levels of Thailand students during the COVID-19 lockdown. The regression equation produced a moderate fit with the
data ($R^2 = 0.457$), with all predictors, including self-esteem, study duration, social support, health behavior, and the travel domain of PA.

To our knowledge, this study is the first to examine the combination of psychosocial and physical factors that predict stress levels in university students during COVID-19. Previous studies investigated the effects of COVID-19 on physical [1,11] or psychosocial [7,25] or mental health factors among university students [8,9]. Saleh et al. reported that a combination of psychological variables, including life satisfaction, self-esteem, optimism, self-efficacy, and psychological distress, could account for 57.89% of stress levels in French college students [26]. However, their research data were collected in 2017; therefore, their data cannot be compared with the data collected in the COVID-19 pandemic [26]. In 2020, Flesia et al. investigated stress among the Italian normative population during COVID-19 [27]. Sociodemographic variables could predict only 10.1% of stress, whereas the combination of sociodemographic and stable psychological traits could predict 35.6% [27]. However, both are low data fit models [24].

We found that the main predictors of university student stress during COVID-19 are self-esteem and social support. Consistent with previous studies, self-esteem and social support are important mediators of stress and its pathological effects [28,29]. It is possible that low self-esteem and low social support also increase the stress-induced cortisol release by modulating the regulation of the hypothalamic–pituitary–adrenal (HPA) axis and the noradrenergic system. Low self-esteem increases cortisol levels by stimulating diurnal cortisol secretion, and also increases disturbances of the HPA axis, which are associated with stress. Self-esteem affects people’s reactions and coping mechanisms to stressful events. Simultaneously, stressful events negatively affect self-esteem [14]. Increases in cortisol levels is usually associated with stress. Cortisol levels stimulate fat and carbohydrate metabolism but increases appetite. Additionally, increased cortisol levels can cause cravings for sweet, fatty, and salty foods, which can lead to weight gain if uncontrolled [30]. Herman and coworkers [31] found multiple and overlapping mechanisms to deal with both acute and chronic stress and named the reaction of stressors to homeostasis as “stress response,” wherein the HPA axis secretes the first hormonal response to homeostatic challenge when stimulated. Predominantly, few HPA axis changes are engendered by all varieties of stressor and are a hallmark of the physiological reaction to stress. Proper control of the stress response is of critical importance. Because of the long-term approaches in stress situations due to the COVID-19 pandemic, it can be implied that the pandemic caused prolonged HPA axis activation, which was linked with numerous physiological and psychological disease states. Social support was another predictor of stress level during the COVID-19 pandemic. A high level of social support can enhance resilience to stress, help protect against developing trauma-related psychopathology, and decrease the functional consequences of trauma-induced disorders [15]. The results of social support in human studies showed that low social support is related to physiological and neuroendocrine markers of intense stress response in laboratory stressors. A neuroendocrine that has been detected in humans during the stress response is oxytocin. The study design’s laboratory stressor test, by simulation of acting in a public situation with negative feedback led to anxiety and salivary cortisol release. This result showed that both oxytocin and social support reduced anxiety in healthy men. Therefore, they propose that oxytocin promotes social behavior and reduces HPA axis reactivity to stress [32]. These findings are consistent with the results of a study conducted by Steptoe et al. [33], who reported an overall increased noradrenergic and HPA reactivity in lonely individuals.

An interesting finding of this study was that, during the COVID-19 pandemic, there was an increase in travel activity among students, and this was positively associated with high levels of stress. During the first wave of the COVID-19 pandemic in Thailand, most universities adopted online learning from home for their students. They have the least medical risks, allowing them to go outside to obtain necessities for a living in order to support their family. In normal situations, individuals who are regularly physically active have lower levels of stress than those who are less active [1]. The higher stress level during
travel is likely to be due to feared exposure to COVID-19. Although the students will have been wearing masks and social distancing, there is still a risk of COVID-19 infection during travel to public areas. Moreover, the low confidence in pandemic control and the lack of resources for fighting COVID-19 might have further affected stress levels in the circumstances, especially the first wave of the pandemic [25,34].

High levels of stress were significantly correlated with young ages, short study duration, poor health literacy, and poor health behavior. Students with better health literacy can more actively adapt their health behavior, especially during COVID-19 [35]. Rababah et al. demonstrated that improving students’ health literacy and health behavior directly affects psychological disturbance, reducing levels of stress and improving quality of life [36]. In our study, most of the students had high levels of social support and self-esteem and fair health literacy and behavior. Although younger students who had been at the university for a shorter time were vulnerable to higher levels of stress, most of them may be able to handle the situation due to their high levels of social support and self-esteem [29].

The majority of the students in our study reported moderate levels of stress, an increase in sedentary lifestyle, and lower levels of PA as a result of COVID-19. The data collection period was between the first and second outbreaks of COVID-19 in Thailand. At that time, COVID-19 was new, and due to lockdown measures, it directly affected students’ lifestyles [37]. Students had to avoid public areas, including their classes and activities [3,7]. Most showed fair health literacy and behavior, possibly due to the lack of information about COVID-19 and pandemic control in Thailand. The high levels of self-esteem and social support might be explained by the family structure in Thailand, where teenagers and young adults usually live with their parents until they graduate or marry. Hertog and Kan [38] found that people of working age also sometimes choose to live with their parents for parental support or childcare. This family support might contribute to students’ levels of self-esteem and social support during COVID-19.

This study provided knowledge on stress levels related to psychosocial and physical factors during the first wave of the COVID-19 pandemic. Our result can be applied to the proper management of new and life-threatening pandemics, which impact human well-being.

Our study has some limitations. First, it was a cross-sectional online survey that used a questionnaire to elicit information from participants. Therefore, there was no control group to determine a cause-and-effect relationship. In addition, the responses were mainly subjective, the questionnaire was subject to varied interpretation and understanding, errors in responses, and mental fatigue by participants. Second, depression, anxiety, and posttraumatic stress disorders, which have been linked to the COVID-19 pandemic, were not measured [37]. Future studies on these psychological disorders and other complications associated with the COVID-19 pandemic are needed.

5. Conclusions

The first wave of the COVID-19 pandemic negatively impacted the stress levels of university students in Thailand. The majority of them presented with moderate stress levels. The combination of psychosocial and physical factors, including self-esteem, study duration, social support, health behavior, and the travel domain of PA predicted their level of stress during the pandemic. Higher self-esteem and social support were the factors that significantly helped students cope with stress. Moreover, mindfulness meditation can help people relax and regulate their emotions via upregulation and calming. Yoga, which includes cleansing techniques, physical postures, breathing exercises, and relaxation techniques, should be recommended to those who want to reduce stress and improve their self-esteem. Additionally, online platforms can be used to improve social support during pandemics by enhancing students’ attraction and their involvement in studies and other activities. Universities may play an essential role in providing online counseling and workshops to students. However, students experienced higher stress with traveling within public spaces. Further studies should investigate the long-term effect of COVID-19
pandemic on stress levels and the stress management strategies among specific categories of university students. Furthermore, experimental studies are needed to confirm the positive effect of self-esteem and social support on stress levels during pandemics or life-threatening situations.

**Author Contributions:** Conceptualization, N.U., N.L., K.P. and S.K.; data curation, N.U., N.L. and S.K.; formal analysis, N.U., N.L., K.P. and S.K.; investigation, N.U., N.L. and S.K.; methodology, N.U., N.L., K.P. and S.K.; project administration S.K.; resources, S.K.; validation, S.K.; writing—original draft, N.U., N.L. and S.K.; writing—review and editing, N.U., N.L., K.P. and S.K. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki and approved by the Human Ethics Committee, Health Sciences group, Burapha University (protocol number: HS 057/2563; IRB number: 043/2563; date of approval: 18 September 2020).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The datasets used and analyzed during this study are available from the corresponding author on reasonable request.

**Acknowledgments:** The authors acknowledge the support of the Faculty of Allied Health Sciences, Burapha University.

**Conflicts of Interest:** The authors declare no conflict of interest.

**References**

1. Lipert, A.; Kozłowski, R.; Timler, D.; Marczak, M.; Musial, K.; Rasmus, P.; Kamecka, K.; Jegier, A. Physical Activity as a Predictor of the Level of Stress and Quality of Sleep during COVID-19 Lockdown. *Int. J. Environ. Res. Public Health* **2021**, *18*, 5811. [CrossRef] [PubMed]
2. Cotula, L. Towards a political economy of the COVID-19 crisis: Reflections on an agenda for research and action. *World Dev.* **2021**, *138*, 105235. [CrossRef] [PubMed]
3. Onyeaka, H.; Anumudu, C.K.; Al-Sharify, Z.T.; Egele-Godswill, E.; Mbaegbu, P. COVID-19 pandemic: A review of the global lockdown and its far-reaching effects. *Sci. Prog.* **2021**, *104*, 36850421101985. [CrossRef] [PubMed]
4. Katewongsa, P.; Widyaastaria, D.A.; Saonuam, P.; Haematulin, N.; Wongsingha, N. The effects of the COVID-19 pandemic on the physical activity of the Thai population: Evidence from Thailand’s Surveillance on Physical Activity 2020. *J. Sport Health Sci.* **2021**, *10*, 341–348. [CrossRef]
5. Puccinelli, P.J.; da Costa, T.S.; Seffrin, A.; de Lira, C.A.B.; Vancini, R.L.; Nikolaidis, P.T.; Knechtble, B.; Rosemann, T.; Hill, L.; Andrade, M.S. Reduced level of physical activity during COVID-19 pandemic is associated with depression and anxiety levels: An internet-based survey. *BMC Public Health* **2021**, *21*, 425. [CrossRef]
6. Nguyen, T.T.; Le, N.T.; Pham, L.V.; Do, B.N.; Nguyen, H.C.; Nguyen, H.C.; Ha, T.H.; Dao, H.K.; Nguyen, P.B.; et al. Health Literacy and Preventive Behaviors Modify the Association between Pre-Existing Health Conditions and Suspected COVID-19 Symptoms: A Multi-Institutional Survey. *Int. J. Environ. Res. Public Health* **2020**, *17*, 8998. [CrossRef]
7. Lee, J.; Solomon, M.; Stead, T.; Kwon, B.; Ganti, L. Impact of COVID-19 on the mental health of US college students. *BMC Psychol.* **2021**, *9*, 95. [CrossRef]
8. Coakley, K.; Lardier, D.; Holladay, K.; Amorim, E.; Zuhl, M. Physical Activity Behavior and Mental Health among University Students during COVID-19 Lockdown. *Front. Sports Act. Living* **2021**, *3*, 682175. [CrossRef]
9. Talapko, J.; Perić, I.; Vulić, P.; Pustijanac, E.; Jukić, M.; Bekić, S.; Meštrović, T.; Škrlec, I. Mental Health and Physical Activity in Health-Related University Students during the COVID-19 Pandemic. *Healthcare* **2021**, *9*, 801. [CrossRef]
10. Haddad, J.M.; Macenski, C.; Mosier-Mills, A.; Hibara, A.; Kester, K.; Schneider, M.; Conrad, R.C.; Liu, C.H. The Impact of Social Media on College Mental Health during the COVID-19 Pandemic: A Multinational Review of the Existing Literature. *Curr. Psychiatry Rep.* **2021**, *23*, 70. [CrossRef]
11. López-Valenciano, A.; Suárez-Iglesias, D.; Sanchez-Lastra, M.A.; Ayán, C. Impact of COVID-19 Pandemic on University Students’ Physical Activity Levels: An Early Systematic Review. *Front. Psychol.* **2020**, *11*, 624567. [CrossRef] [PubMed]
12. Arsandaux, J.; Montagni, I.; Macalli, M.; Texier, N.; Pouriel, M.; Germain, R.; Mebarki, A.; Kinouani, S.; Tournier, M.; Schuck, S.; et al. Mental health condition of college students compared to non-students during COVID-19 lockdown: The CONFINS study. *BMJ Open* **2021**, *11*, e053231. [CrossRef] [PubMed]
13. Akbar, Z.; Aisyawati, M.S. Coping Strategy, Social Support, and Psychological Distress among University Students in Jakarta, Indonesia during the COVID-19 Pandemic. *Front. Psychol.* **2021**, *12*, 1–7. [CrossRef]
14. Galanakis, M.; Palaiologou, A.; Patsi, G.; Velegi, I.-M.; Darviri, C. A Literature Review on the Connection between Stress and Self-Esteem. *Psychology* **2016**, *7*, 687–694. [CrossRef]
15. Ozbay, F.; Johnson, D.C.; Dimoulas, E.; Morgan, C.A.; Charney, D.; Southwick, S. Social support and resilience to stress: From neurobiology to clinical practice. *Psychiatry Edgmont* **2007**, *4*, 35–40. [PubMed]
16. Friedlander, L.; Reid, G.; Shupak, N.; Cribbie, R. Social Support, Self-Esteem, and Stress as Predictors of Adjustment to University among First-Year Undergraduates. *J. Coll. Stud. Dev.* **2007**, *48*, 259–274. [CrossRef]
17. Yamane, T. *Statistics: An Introductory Analysis*, 2nd ed.; Harper and Row: New York, NY, USA, 1973.
18. World Health Organization. Global Physical Activity Questionnaire (GPAQ) Analysis Guide. Available online: http://www.who.int/chp/steps/resources/GPAQ_Analysis_Guide.pdf (accessed on 1 March 2020).
19. Bull, F.C.; Maslin, T.S.; Armstrong, T. Global physical activity questionnaire (GPAQ): Nine country reliability and validity study. *J. Phys. Act. Health* **2009**, *6*, 790–804. [CrossRef]
20. Armstrong, T.; Bull, F. Development of the Global Physical Activity Questionnaire (GPAQ). *J. Public Health* **2006**, *14*, 66–70. [CrossRef]
21. Wongpakaran, N.; Wongpakaran, T. A revised Thai Multi-Dimensional Scale of Perceived Social Support. *Span. J. Psychol.* **2012**, *15*, 1503–1509. [CrossRef]
22. Wongpakaran, N.; Wongpakaran, T. A comparison of reliability and construct validity between the original and revised versions of the Rosenberg Self-Esteem Scale. *Psychiatry Investig.* **2012**, *9*, 54–58. [CrossRef]
23. Wongpakaran, N.; Wongpakaran, T. The Thai version of the PSS-10: An Investigation of its psychometric properties. *Biopsychosoc. Med.* **2010**, *4*, 4. [CrossRef] [PubMed]
24. Schober, P.; Boer, C.; Schwarte, L.A. Correlation Coefficients: Appropriate Use and Interpretation. *Anesth. Analg.* **2018**, *126*, 1763–1768. [CrossRef] [PubMed]
25. Premkuti, I.; Strong, C.; Sitsinmongkol, Y.; Setiawan, A.; Pandin, M.G.R.; Yen, C.F.; Lin, C.Y.; Griffiths, M.D.; Ko, N.Y. Anxiety and Suicidal Thoughts during the COVID-19 Pandemic: Cross-Country Comparative Study among Indonesian, Taiwanese, and Thai University Students. *J. Med. Internet Res.* **2020**, *22*, e24487. [CrossRef]
26. Saleh, D.; Camart, N.; Romo, L. Predictors of Stress in College Students. *Front. Psychol.* **2017**, *8*, 19. [CrossRef] [PubMed]
27. Flesia, L.; Monaro, M.; Mazza, C.; Fietta, V.; Colicino, E.; Segatto, B.; Roma, P. Predicting Perceived Stress Related to the COVID-19 Outbreak through Stable Psychological Traits and Machine Learning Models. *J. Clin. Med.* **2020**, *9*, 3350. [CrossRef] [PubMed]
28. Özer, Ö.; Özkan, O.; Budak, F.; Ozmen, S. Does social support affect perceived stress? A research during the COVID-19 pandemic in Turkey. *J. Hum. Behav. Soc. Environ.* **2021**, *31*, 134–144. [CrossRef]
29. Chen, H.; Zhao, X.; Zeng, M.; Li, J.; Ren, X.; Zhang, M.; Liu, Y.; Yang, J. Collective self-esteem and perceived stress among the non-infected general public in China during the 2019 coronavirus pandemic: A multiple mediation model. *Personal. Individ. Differ.* **2021**, *168*, 110308. [CrossRef]
30. Chrousos, G.P. Stress and disorders of the stress system. *Nat. Rev. Endocrinol.* **2009**, *5*, 374–381. [CrossRef]
31. Herman, J.P.; McKline, J.M.; Ghosal, S.; Kopp, B.; Wulsin, A.; Makinson, R.; Scheimann, J.; Myers, B. Regulation of the Hypothalamic-Pituitary-Adrenocortical Stress Response. *Compr. Physiol.* **2016**, *6*, 603–621. [CrossRef]
32. Heinrichs, M.; Baumgartner, T.; Kirschbaum, C.; Ehler, U. Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biol. Psychiatry* **2003**, *54*, 1389–1398. [CrossRef]
33. Steptoe, A.; Owen, N.; Kunz-Ebrecht, S.R.; Brydon, L. Loneliness and neuroendocrine, cardiovascular, and inflammatory stress responses in middle-aged men and women. *Psychoneuroendocrinology* **2004**, *29*, 593–611. [CrossRef]
34. Lentoor, A.G.; Maepa, M.P. Psychosocial Aspects during the First Wave of COVID-19 Infection in South Africa. *Front. Psychiatry* **2021**, *12*, 663758. [CrossRef] [PubMed]
35. Li, S.; Cui, G.; Kaminga, A.C.; Cheng, S.; Xu, H. Associations between Health Literacy, eHealth Literacy, and COVID-19-Related Health Behaviors among Chinese College Students: Cross-Sectional Online Study. *J. Med. Internet Res.* **2021**, *23*, e25600. [CrossRef] [PubMed]
36. Rababah, J.; Al-Hammouri, M.; Drew, B. The impact of health literacy on college students’ psychological disturbances and quality of life: A structural equation modeling analysis. *Health Qual. Life Outcomes* **2020**, *18*, 292. [CrossRef]
37. Li, Y.; Wang, A.; Wu, Y.; Han, N.; Huang, H. Impact of the COVID-19 Pandemic on the Mental Health of College Students: A Systematic Review and Meta-Analysis. *Front. Psychol.* **2021**, *12*, 669119. [CrossRef]
38. Hertog, E.; Kan, M.-Y. Married Adults Coping with Older Parents: Implications for Paid Work and Domestic Workloads. *J. Popul. Ageing* **2021**, *14*, 507–535. [CrossRef]