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Validation of "Depression, Anxiety, and Stress Scales" and "Changes in Psychological Distress during COVID-19" among University Students in Malaysia

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Abstract: Objectives: This study assessed the reliability and validity of the DASS-21 self-reported measure in the context of COVID-19 on anxiety, stress, and depression. Through this Study, the psychological effect of COVID-19 on anxiety, tension, and depression amongst samples of students enrolled in 201 Malaysian private universities was assessed. **Methods:** The data were collected from university students through an online survey because of Malaysian Government Movement Control Order (MCO) restrictions. Two separate intervals were used for data collection (i.e., May and September 2020), as this period was associated with the pandemic. For scale validation, convergent, discriminant, and nomological validity criteria were used. **Results:** The outcome of a CFA model for DASS-21 yielded factor loading that is very significant. Therefore, the measure of the root means square error approximation (RMSEA) and the comparative fit index (CFI) are acceptable values that were produced, demonstrating a good fit for the data. **Conclusions:** This study was conducted in the Malaysian context to validate depression, anxiety, and stress among university students using the DASS-21 scale. Our findings support the reliability of using DASS-21 in the Malaysian cultural context. Lastly, we testified to the presence of depression, anxiety, and stress among university students through descriptive statistics and provided empirical evidence in this regard. Our results suggested that there was a significant presence of DASS among university students.

Keywords: COVID-19; depression; anxiety; stress; DASS-21 scale; university students

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1. Introduction

Today, it is essential for the research community to explore the effect of COVID-19 on students' mental well-being and the need for urgent treatments, as indicated by [1]. Individuals react to stress in various ways based on whether they have an adverse or optimistic reaction to the stressor and how they recognise their stress [2,3]. Most students experience mental and social trauma when transitioning from high school to university [4]. Early research has reported pandemics' negative impacts on students' psychological well-being [5,6], which has resulted in acute anxiety and depression [5,7]. As a result, it should be remembered that two broad themes characterise the new stress paradigm. The very nature of a mechanism by which people measure incidents relates them to psychological and psychical well-being [8,9]. Second, individuals control their internal states and employ compensatory processes in response to external activities, such as occupational stress,

which cause them to change. As with every other psychological term, stress has various definitions [10]. Stress is a strong emotional reaction to internal and external changes. Personal, psychological, and emotional responses to stimuli are referred to as stress [11,12]. It is an excellent time to start looking at the effect of COVID-19 on students' mental well-being and the need for urgent action [13]. Stress is described by [14] as any disturbance to an individual where they experience physical and psychological hypertension because of circumstances that are beyond the human capacity to cope with. Stressors are sources or stimulators that induce mental or physical pain. Adults are fully conscious of the advantages of regular physical activity. Campaigns to encourage physical exercise have been a widespread public health tool for combating chronic diseases [15,16]. Sudden shock, chronic stressors, and daily annoyances were the three forms of stressors examined.

To begin, tension is not a fixed state but rather a free-floating variable that is both the result of and a contributor to a person's unique collection of internal and external elements. These factors include both the person's environment and the person's thoughts and feelings. Second, because it is a response to the external environment, stress is considered a dependent variable, which means that it has an effect on the physiological, emotional, and cognitive processes that occur within the body. The transaction approach might be considered the third innovation because it combines the first two in its methodology [17]. Researchers are currently looking into different ways to measure the levels of stress experienced by college students. Students, particularly first-year students, are more susceptible to the effects of stress due to the ephemeral nature of life at college. [18]. They are required to adjust to living away from home for the first time, maintain a high level of academic performance, and become accustomed to a new social environment. No matter what year they are in their graduate studies, students face the burden of trying to locate employment or a potential life partner [19].

Lovibond developed the stress scale DASS-21 [20], which comprises depression, anxiety, and stress, and these were each later recognised as a sub-dimension of the DASS scale, combined into a higher-order single factor commonly known as psychological distress [21]. Prior research has assessed the validity aspects of psychological distress, which comprised 42 items and resulted in some incongruences [22]. Models tested on confirmatory factor analysis (CFA) consisted of three-factor models that included the three latent variables of depression, anxiety, and stress, with fourteen reflective indices of elements for the individually underlying variable.

One of the drawbacks of previous CFA model research in DASS-42 studies is outcomes with good factor loadings, i.e., >0.70. Moreover, CFA has been used by several other researchers to explore the relevance of the short form, i.e., DASS-21, which has further sub-dimensions of depression, anxiety, and stress with 21 elements [23]. A previous study employed either sub-factors or a single-factor model, with a latent predictor of psychological pain in the one-factor model and twenty-one reflective interventions in the three-factor model (i.e., items). The experiments suffered from two significant flaws: the overall derived results were well below prescribed limits, and their model(s) did not represent the novel theoretical ideas (i.e., Lovibond and Lovibond).

The current research has developed a new DASS-21 CFA model, which has been updated from the single-factor framework utilised in the past literature dealing with the validation of the DASS-21 scale, to investigate the three types of DASS-21 validity. Our research distinguishes itself from others by utilising depression, anxiety, and stress as factors in calculating the latent variables of psychological disorders. Further information was provided by the findings of this study. In doing so, the geographical boundaries of research that deals with psychometric scales to measure mental health are expected to be expanded in this cultural context, which will also increase the incremental validity of the scale and its utility in general, especially in an educational context.

Considering the questions mentioned above, the ones that our research will address will fall into two distinct categories. First, using the data collected from the questionnaires, we will investigate the extent to which COVID-19 impacts the mental health of college

students. Then, we will discuss the results of our investigation. In addition, in terms of convergent, discriminant, and nomological validity, we ask if it is possible for DASS-21 to be valid when administered by CFA. Second, the goal of this study is to construct a second research question to validate the scale while keeping the research need in mind. Is it conceivable to validate DASS-21 employing a CFA that incorporates convergent, discriminant, and nomological validity? Moreover, this research is expected to test the following four study hypotheses to address the survey questions mentioned above.

- RH 1: The latent variable psychological distress has a concurrent validity coefficient of 0.70 or higher, suggesting that DASS-21 has convergent validity.
- RH 2: The latent variable psychological distress has an average variance extracted (AVE) of 0.50 or higher, suggesting that DASS-21 has convergent validity.
- RH 3: The association between variables measured for depression, anxiety, and stress is less than r = 0.85, validating the discriminative validity of DASS-21.
- RH4: Correlations between the variables measured for anxiety, depression, and stress are r= 0.50 and more significant in representing nomological validity.

2. Literature Review

Since its introduction in 1995, the DASS has been extensively employed in various situations, including clinical and non-clinical groups in numerous nations and different age groups. However, there is not much information on how medical experts use DASS-21. Prior literature has investigated the DASS's internal consistency among hospital employees; however, there was evidence to explore other crucial DASS-21 psychometric properties. DASS-21 has three sub-factor or latent variables, making this scale a reflective higher-order construct (if measured at a higher level). The constituents of the DASS-21 scale are depression, anxiety, and stress, which are distinct latent variables. Hopelessness, self-deprecation, low positive affect, and a devaluation of life are defining characteristics of depression. In contrast, physiological hyperstimulation and conscious awareness of anxious affect are central tenets of anxiety. The difficulties with relaxation, tension, impatience, irritability, and restlessness are critical aspects of stress [20].

Coronavirus illness (COVID-19) has had a tremendous influence on the lives of people all over the world, particularly when the World Health Organization proclaimed a global pandemic in the second week of March 2020 [22,24]. Many researchers looked at students' pressures and the demographic variables influencing them. Hamadeh's study [25] was conducted to recognise responses among university students and analysed the associations between student stressors and study variables. College is a transitional and stressful period for students, who may develop subthreshold or psychiatric anxiety and depression symptoms [26]. It was revealed that the most common source of stress for students was strain, with self-imposed stressors coming in second place.

Consequently, stressors are the causes or stimuli that lead to either mental or bodily stress. Researchers classify these stresses into several categories according to how frequently or for how long they are experienced. The present COVID-19 pandemic is beginning to have a psycho-emotional impact, as evidenced by the fact that countries are reporting an increase in the prevalence of mental health issues such as anxiety, depression, exhaustion, sleep difficulties, and panic among their populations [27]. Stressors have been categorised into three groups [28]: sudden shock, persistent stressors, and everyday hassles. First, since stress is a stimulus that influences an individual's existence, it is an independent variable that results from that person's inner world. Second, since stress is a reaction to the outside world, it is viewed as a dependent variable that affects physiological, mental, and cognitive body functions. The transaction approach combines the two previous trends [17], the third development. Researchers also look at how to assess the stress levels of college students. Due to college life's transformative nature, university students, especially newcomers, are particularly vulnerable to stress. They must adapt to being away from home for the first time, sustain high academic performance, and adjust to a new social atmosphere [29]. Furthermore, educational settings have a rare chance of meeting the expectations of a varied

population of students who might be subjected to external stressors such as segregation; acculturative stress; financial pressure; and juggling home, job, and school obligations [26].

Regardless of their year of education, university students experience pressures linked to seeking a career or a future life partner [29]. This is never a positive experience while taking college classes because, with all the workload, college students begin to develop bad eating and sleeping habits. Alternatively, they reduce the number of courses by each semester and lean towards overloading themselves with classes, not realising how much stress this can bring over time. As a result, it seems that college is an excellent opportunity for students to think about evidence-based skills for dealing with anxiety and depression [23]. Consequently, depression develops in many situations, resulting in health issues, anxiety, and difficulty focusing on learning [30]. However, while the workload has risen, the cost of attending university has also increased, putting many college students at risk of long-term debt.

Furthermore, several reports have been published examining the virologic features and medical effects of COVID-19. However, during pandemics such as COVID-19, healthcare services are placed under immense strain, and a lack of healthcare practitioners (HCP) may cause less seasoned HCP, such as medical students, to engage [26]. One cross-sectional study found that young students with poor/weak health, sitting for long periods in front of screens, who had positive or suspected cases of COVID-19 amidst this pandemic have a psychological risk factor for their mental health [1]. During our time in college, if we experience financial difficulties, this will lead us to make poor judgements, and for some people, this will become a trend. This may seem like a good idea while we are preparing to head off to college since we have the impression that we are taking steps to better ourselves, but it is a horrible decision to make when we are applying for a student loan. The purpose of this paper is to investigate the practicability and effectiveness of holding a workshop on acceptance-based interpersonal tension and anxiety treatments for university students located on a diverse metropolitan campus. Students in higher education can start to lose sight of their dreams and aspirations when they become overwhelmed with mounting debt, an excessive amount of coursework, and the onset of despair [26].

In contrast to the longitudinal approach or multiple engagement interventions, other researchers have examined students' stress via general workshops and preventive techniques in educational settings [31]; they found that students' efforts to perform value affirmation exercises two times fortnightly may yield better performance and can reduce the outcome gap between male and female students [32]; they also considered a two-hour mental treatment (CT) and affirmation-based conduit treatment (ABBT) workshop for assessing anxiety and found that those using the ABBT improved their test taking, as evaluated by test scores, while those in the CT treatment worsened in their test taking, as evaluated by test scores. Some studies describe students encountering mental injury when they change from secondary school to college [33]. Adapting to university life, keeping good grades, preparing for the future, and trying to function separately from their parents are all everyday stressors for university students [2]. Health-promoting activities have been linked to improved quality of life in university students in general [2]. A new systematic study of 41 studies found that programmers for university students who focus on moderate physical exercise, sleep, and a healthy weight successfully encouraged good lifestyle habits [15].

The COVID-19 pandemic is predicted to have a detrimental effect on university students' mental well-being in general, but there is a shortage of prospective empirical evidence quantifying those consequences [34]. Higher education organisations across the globe are concerned about the effect of the COVID-19 pandemic on students' mental health [35]. Study results show that wellness coaching can help people with cardiovascular risk factors make meaningful behavioural improvements. In healthcare environments, either specialist or peer mentor health coaching is simple to implement [36]. According to current reports, during the COVID-19 pandemic, mental health and physical exercise decreased, whereas perceived tension and sedentary behaviour increased. There was no

connection between decreased mental health and increased perceived stress and increases in physical activity, although there was a weak link between perceived stress and sedentary behaviour [37]. These discoveries show that the COVID-19 pandemic detrimentally affects students' conduct, prosperity, and movement propensities. However, these effects have not been firmly connected. Other studies indicate that students' academic health has worsened because of the pandemic [35]. Figure 1 depicts the number of cases from February 15 to March 31, 2021 (the time of this writing), when the COVID-19 pandemic in Malaysia was at its peak.

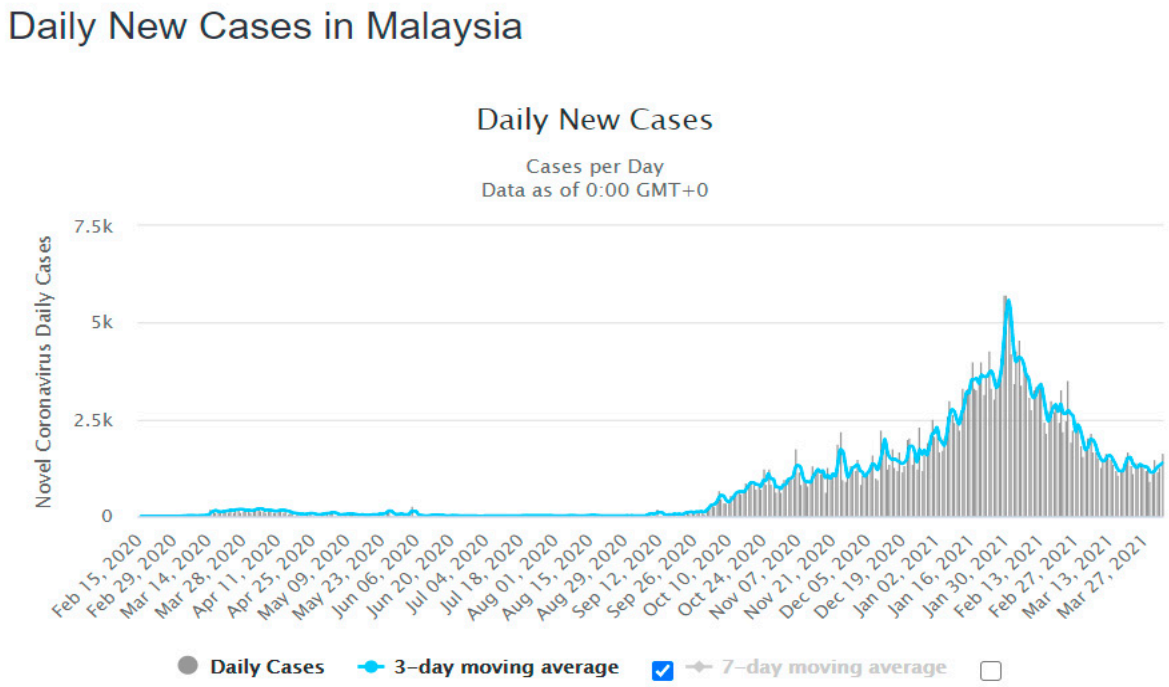

Figure 1. Total and daily new cases reported in Malaysia: https://www.worldometers.info/coronavirus/country/malaysia/ accessed on 27 March 2021.

3. Methods and Materials

The following sections illustrate the study design, data collection approach, research instruments used, and statistical analysis of the proposed study.

3.1. Sampling and Study Design

We created and studied a one-factor model of psychological distress along with its sub-dimensions (observed variables known as depression, anxiety, and stress) using CFA. The research approach for this study was based on this model. Based on previous research and power analyses, a minimum sample size of one hundred was decided upon for this investigation. Validating statistical DASS-21, such as SEM statistics, required using a technique known as canonical factor analysis (CFA), a form of fundamental equation modelling. In previous studies on structural equation modelling, a SEM sample size using a minimum of 100 individuals for the sample was recommended [31,38–41]. A sample of 200 has also been recommended. The online Free Statistics Calculators software, version 4.0, was used to perform the power analysis. The following analysis conditions were used: minimal effect size = 0.10, power level = 0.80, number of latent variables = 1, number of measurable variables = 3, and probability = 0.05. The power analysis and previous research led the researchers to conclude that a sample size of at least one hundred should be used for the current investigation. Two hundred and one people were included in the study's sample population for analysis. The Depression, Anxiety, and Stress Scale-21 (DASS-21) model was used to determine the overall levels of depression, anxiety, and stress among

the respondents. The cross-sectional method was utilised in the course of our investigation. The present investigation used CFA to establish and investigate the most recent one-factor of "Psychological Distress" (latent variable) as it is expressed in the three indices of the observed/measured variables of DASS-21.

3.2. Research Instrument Used

For this study, we used the shorter version of DASS-21 to assess psychological distress [20,41]. DASS-21 includes 21 items that ask participants to rate their recent anxiety, stress, and depression experiences. There are seven elements in each of the depression, anxiety, and stress subscales. Lovibond and Lovibond [20] found that DASS-21 can be utilised in research settings. The downturn subscale comprises seven questions covering topics such as dysphoria, unhappiness, deteriorating quality of life, self-gloom, inclusion or stress misfortune, anhedonia, and latency. There are seven factors, and they include the following: autonomic excitement, skeletal muscle impacts, situational anxiousness, an emotional view of an on-edge influence subscale, and an overall view of the seven factors. The pressure subscale consists of seven questions concerned with inconvenience unwinding, tense excitement, effectively getting upset or disappointed, being irritable/over-responsive swiftly, and worry. DASS-21 has a seven-item dimension that measures emotional distress on three levels: (1) depression (e.g., "I couldn't seem to experience any positive feeling at all"); (2) anxiety (e.g., "I was aware of dryness of my mouth"); and (3) stress (e.g., "I found it hard to wind down").

Every component is evaluated on a four-point Likert scale: Never applied to oneself (0 focuses), part degree/a portion of the time (1 point), considerable degree/a critical segment of the time (2 focuses), and without a doubt/more often than not (3 focuses) are appraising decisions (3 focuses). Each subscale's score is determined by duplicating the number of things by two. To discourage a person's degree of depression, anxiety, and stress, in the DASS-21 manual, RC Plotnikoff [15] uses each subscale's score in the following categories. The standards for depression are normal (0–9 points), mild (10–13 points), moderate (14–20 points), significant (21–27 points), or very intense (28+ points). The anxiety prerequisites are ordinary (0–7 focuses), gentle (8–9 focuses), moderate (10–14 focuses), extreme (15–19 focuses), or intense (20+ focuses). The pressure boundaries are ordinary (0–14 focuses), gentle (15–18 focuses), moderate (19–25 focuses), weighty (26–33 focuses), or very extreme (34+ focuses).

The current examination divided these degrees of seriousness into typical =1, mild = 2, moderate = 3, severe = 4, and incredibly severe= 5 for every marker's score in the CFA to provide consistency in the seriousness standards among tension, stress, and depression. Subsequently, the CFA scores for depression, anxiety, and stress ranged from one to five. DASS-21 has a significant degree of consistency as far as sturdiness. Cronbach's alphas for DASS-21 in this examination were 0.959 for discouragement, 0.962 for uneasiness, and 0.977 for stress, as demonstrated in Table 1. The scale's Cronbach's coefficient alphas were 0.88 for pessimism, 0.82 for dread, and 0.90 for stress in an investigation by Lovibond and Lovibond [20]. Depression scores were 0.85, anxiety scores were 0.81, and stress scores were 0.88, according to Asghari et al. [42].

Table 1. Reliability of DASS-21.

N = 201	Cronbach's Alpha (α)
Total DASS-21	0.976
Depression	0.959
Anxiety	0.962
Stress	0.977

3.3. Data Collection

Due to the movement restriction imposed by the Malaysian government during the course of the COVID-19 study (N = 201), data were collected from students through the

use of an online survey in 2 distinct semesters (100 in the first semester and 101 in the second semester). In May and September of 2020, data collecting was carried out at the university during online student classes to determine the students' responses to stress in the midst of the COVID-19 pandemic. Each student had around fifteen minutes to finish their self-report questionnaire, which was broken up into two semesters that would be due in May 2020 and September 2020. Last but not least, we used descriptive statistics and offered empirical evidence to substantiate our claims regarding the prevalence of mental health issues such as depression, anxiety, and stress among college students. Students were aware of the research's purpose and the confidentiality requirements for participation. The DASS-21 scale uses the four-level ranking scale developed by Likert (see below):

- 0 NEVER—This did not matter to me in the slightest.
- 1 SOMETIMES—Applied to me to a degree.
- 2 OFTEN—Applied to me to a significant extent or a large portion of the time.
- 3 ALWAYS—Applied to me constantly, or at least most of the time.

3.4. Data Analysis

For data analysis, the acquired information needed to be organised first. For the three standard deviation rules, there was no anomaly in the depression, anxiety, and stress appraisals in the current investigation's information [43]. There was no alternative method to clean the data. Transparent factual analysis was utilised to gauge the populace's recurrence and the segment per cent attributes.

Moreover, the investigation offered essential data on tension, stress, and misery factors. The discoveries included methods, standard deviations, standard blunders, skewness, and kurtosis. The free examples t-test showed no critical mean hole (see the outcomes). CFA was the essential instrument used to approve DASS-21. The refreshed one-factor model of DASS-21's merged, discriminant, and nomological validity was researched utilising CFA in this investigation. The current examination tested the static variable of mental pain's merged legitimacy to perceive how the subscales of wretchedness, anxiety, and stress could be utilised as markers for the static variable of mental trouble. The CFA looked at whether the relationship between the pointers upheld Lovibond's case, where downturn, uneasiness, and stress are specific components with clear connections (nomological validity).

The merged legitimacy was evaluated by how well the downturn, nervousness, and stress measures were utilised to gauge the static variable of mental misery [44–46]. The indices used to measure convergent validity were the concurrent validity coefficient and the average variance extracted (AVE). The factor-loading values in the latent variable (psychological distress) and the three measures were used to determine the concurrent validity coefficient and AVE (anxiety, stress, and depression). The discriminant validity test assessed if the three depression, anxiety, and stress indicators were distinct variables. A Pearson's coefficient of less than 0.85 established the variables' discriminant validity [44–46]. However, when r was 0.85 or higher, the discriminant validity was denied. To assess the discriminant validity, the researchers looked at all the correlations between anxiety, stress, and depression. The nomological validity of the CFA model dictated whether the theoretical relationships between the indicators were expressed in the model [44–46]. As indicated by the DASS's unique creators (Lovibond and Lovibond, 1995), the momentum research speculated that tension, wretchedness, and stress have solid positive connections of r = 0.50 or higher, but also r = 0.85 or lower. The present study utilised IBM Statistical Package for the Social Sciences (SPSS-24) for information cleaning and illustrative factual examination. In this investigation, an IBM examination of second designs (Amos 24) was utilised in the CFA.

4. Results

4.1. CFA: Confirmative Factor Analysis of DASS-21

The best-fit model was used to examine the invariance calculation after we used confirmatory factor analysis (CFA) to compare conflicting DASS-21 models. As seen in

Table 2, indicator variables were handled categorically rather than continuously. The weighted least square mean and variance (WLSMV) estimator and theta parameters were used in both CFAs, based on the answer from the DASS-21 scale. If the comparative fit index (CFI) is less than 0.95, it suggests an appropriate match according to [47]. The fit is appropriate if the root mean square error approximation (RMSEA) value is between 0.06 and 0.10. An excellent match is described as an SRMR less than 0.05. As seen in Table 2, in the CFA results of DASS-21, we found the following: comparative fit index (CFI) = 0.978, goodness of fit index (GFI) = 0.875, root mean square error approximation (RMSEA) = 0.059, Tucker–Lewis index (TLI) = 0.974, standardised root square residual (SRMR) = 0.027.

Table 2. Model fit measure.

Measure	Values	Cut of Point	Interpretation
CMIN	307.337	–	–
DF	180	–	–
CMIN/DF	1.707	Between 1 and 3	Excellent
CFI	0.978	>0.95	Excellent
SRMR	0.027	<0.08	Excellent
RMSEA	0.059	<0.06	Excellent

Note: CFA > 0.95, SRMR < 0.08, and RMSEA < 0.06.

We can demonstrate the updated one-factor DASS-21 model established in this research. The latent variable was psychological distress, and the markers for the latent variable were depression, anxiety, and stress. The CFA model's X^2 statistic was used in the model fit evaluation.

Psychological distress is an underlying variable that is reflected in all three indicators of depression (β = 0.97, $p < 0.001$), anxiety (β = 0.82, $p < 0.001$), and stress (β = 0.76, $p < 0.001$). The concurrent validity coefficient for the psychological distress variable (Figure 2) was 0.87. $(> 0.70) = \frac{(0.97+0.82+0.76)^2}{(0.97+0.82+0.76)^2+(1-0.97^2)+(1-0.82^2)+(1-0.76^2)}$, and the latent variable of AVE was 0.68 $(> 0.50) = \frac{(0.97+0.82+0.76)^2}{(0.97+0.82+0.76)^2+(1-0.97^2)+(1-0.82^2)+(1-0.76^2)}$. As a result, RH1 and RH 2 were supported by the concurrent validity coefficient and AVE result. The factors' discriminant validity was controlled by the extent of the relationship between stress, wretchedness, and tension (Figure 3). The variable discriminant legitimacy was defined by its connections, with different factors under r = 0.85. As demonstrated in Figure 3, every one of the relationships had r esteems under 0.85, showing that RH 3 was upheld. The level of correspondence between the theoretical discussion and the measurable investigation discoveries was utilised to survey the nomological validity of stress, depression, and anxiety. Depression, anxiety, and stress must have strong correlations of r = 0.50 or greater with one another, based on [20]. All variables in Figures 3 and 4 were strongly correlated as $0.5 < r < 0.75$ ($p < 0.001$). This finding is consistent with the theoretical claim of [20], which supports RH 4.

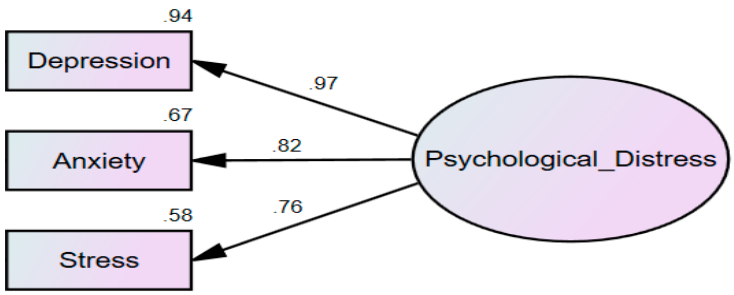

Figure 2. Model of CFA (DASS-21).

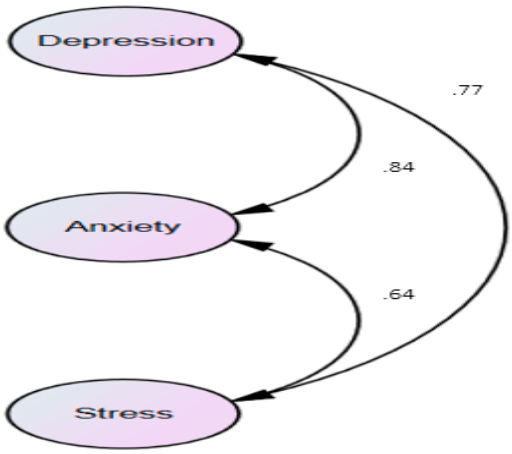

Figure 3. The discriminant and nomological validity of depression, anxiety, and stress was investigated. The numbers on the arrows are Pearson's r values, and the two-way arrows are correlations.

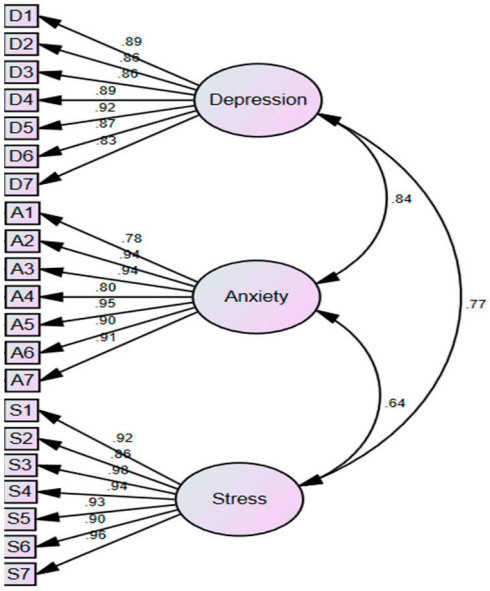

Figure 4. CFA scale model diagram for DASS-21.

Furthermore, the present study used depression, anxiety, and stress three-factor framework as latent variables and the twenty-one items as measures (seven items for each latent variable).

The three latent variables with correlations were more significant than r = 0.85. In the three-factor CFA model, they were depression and anxiety (r = 0.87, $p < 0.001$), anxiety and stress (r = 0.86, $p < 0.001$), and stress and depression (r = 0.87, $p < 0.001$). As a result, the three-factor models were not used in the current analysis.

4.2. Descriptive Statistics

4.2.1. The Depression, Anxiety, and Stress Descriptive Statistics

Table 3 presents the standard deviations, means, standard errors, skewness, and kurtosis of the DASS-21 scales. The typical values for depression, anxiety, and stress are shown in Table 4. For the demographic variable, we took only the student's age as a variable, and the average age of our respondents was 21 years.

Table 3. Depression, anxiety, and stress (descriptive statistics).

Measure	N	Mean	Standard Deviation	Standard Error	Skewness	Kurtosis
Depression	201	1.62	0.88	0.62	1.92	2.63
Anxiety	201	1.72	0.97	0.69	1.66	1.33
Stress	201	1.46	0.80	0.57	1.28	4.40

Table 4. Values of depression, anxiety, and stress for measurement.

Ranges	Depression	Anxiety	Stress
Normal	0–4	0–3	0–7
Mild	5–6	4–5	8–9
Moderate	7–10	6–7	10–12
Severe	11–13	8–9	13–16
Extremely Severe	14+	10+	17+

4.2.2. Depression, Anxiety, and Stress during May 2020

According to May 2020 results, we can see the distribution of the pre-test scores during COVID-19 on each scale of the 21 items. The depression-type percentages among the students were normal at 51%, mild at 14%, moderate at 22%, severe at 7%, and highly severe at 6%. Anxiety was 23% normal, 24% mild, 30% modest, 8% severe, and 15% extremely severe. However, for stress, 59% had normal stress, 14% mild, 12% moderate, 9% severe, and 6% extremely severe. Figure 5 shows the distribution of pre-test scores for students during COVID-19 for each of the 21-item depression, anxiety, and stress scales, and Figure 6 shows the overall first data interval.

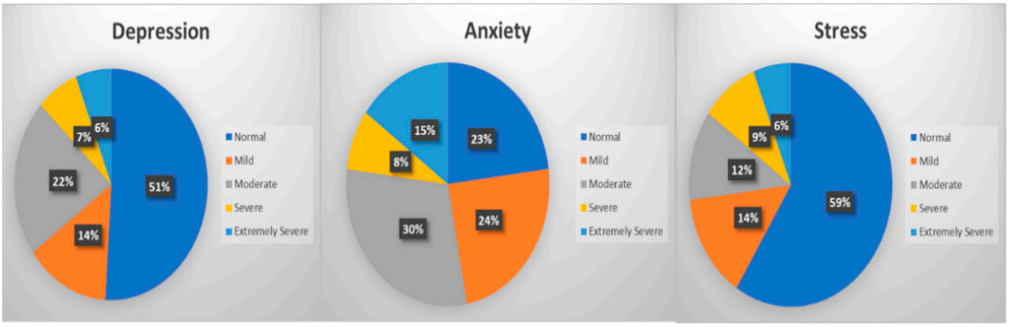

Figure 5. Distribution of pre-test scores for students during COVID-19 (May 2020) for each of the 21-item depression, anxiety, and stress scales.

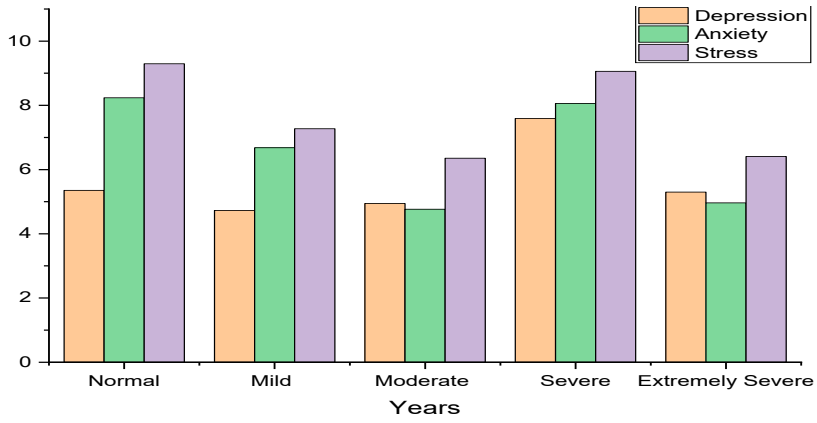

Figure 6. Overall chart for the first data interval.

4.2.3. Depression, Anxiety, and Stress during September 2020

The September 2020 results show the distribution of pre-test scores during COVID-19 for each scale of the 21 items. The depression-type percentages among the students were normal at 35%, mild at 19%, moderate at 19%, severe at 12%, and highly severe at 15%. Anxiety was 26% normal, 17% mild, 20% moderate, 15% severe, and 22% extremely severe. However, for stress, students had 54% normal stress, 16% mild, 8% moderate, 12% severe, and 10% extremely severe (shown in Figure 7). Figure 7 also shows the distribution of pre-test scores for students during COVID-19 for each of the 21-item depression, anxiety, and stress scales for the September semester, and Figure 8 shows the overall second data interval. Where Table 5 shows the Comparison of average scores for depression, anxiety, and stress in two different time intervals.

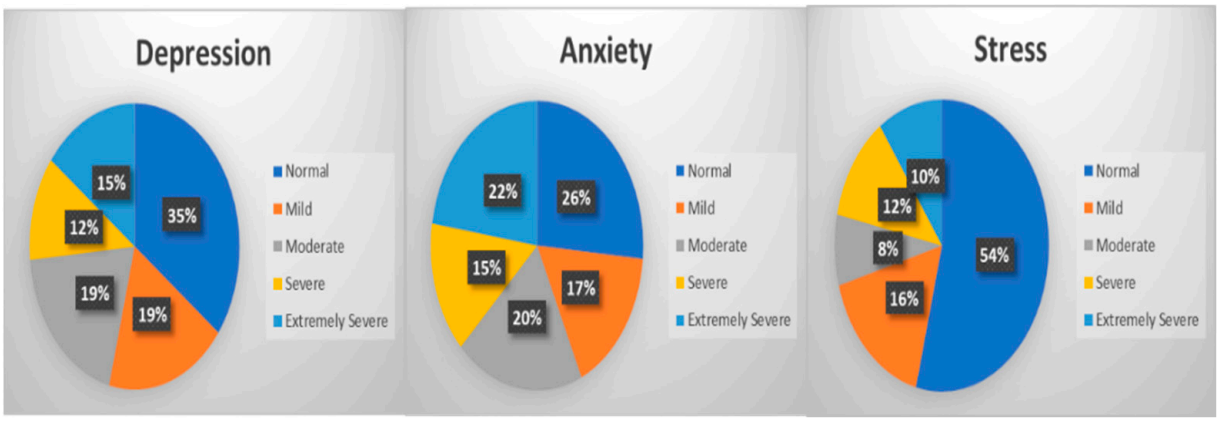

Figure 7. Distribution of pre-test scores for students during COVID-19 (September 2020) for each of the 21-item depression, anxiety, and stress scales.

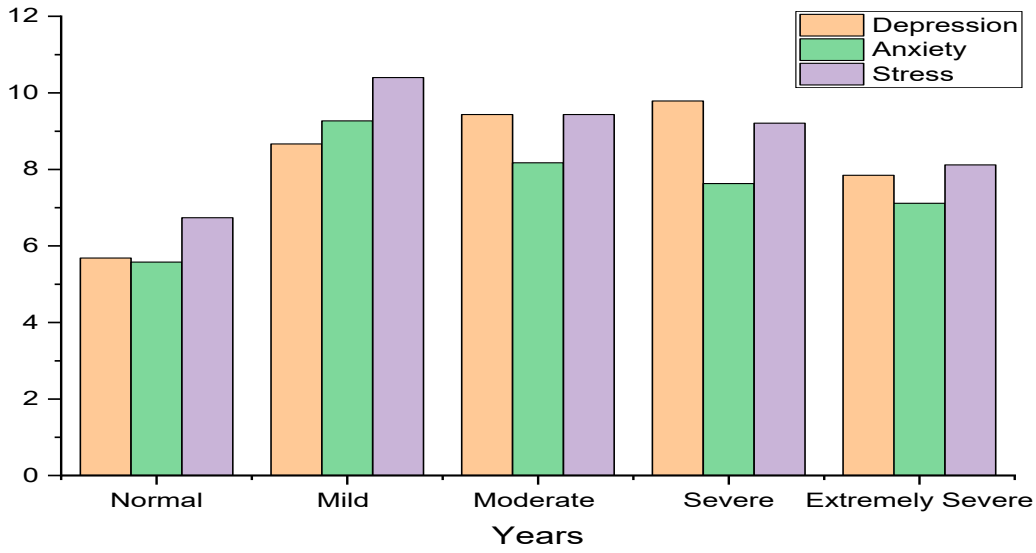

Figure 8. Overall chart for the second data interval.

Table 5. Comparison of scores for depression, anxiety, and stress in two different time intervals.

	Depression		Anxiety		Stress		% Change in Depression	% Change in Anxiety	% Change in Stress
	Score 1st Time	Score 2nd Time	Score 1st Time	Score 2nd Time	Score 1st Time	Score 2nd Time			
Normal	50	34	23	25	57	51	−32%	9%	−11%
Mild	13	18	23	16	14	17	38%	−30%	21%
Moderate	21	19	28	18	11	8	−10%	−36%	−27%
Severe	7	11	8	15	9	11	57%	88%	22%
Extremely Severe	6	15	15	23	6	10	150%	53%	67%
Sum of Average Scores							204%	83%	73%

5. Discussion

This study is the first to examine the convergent and discriminant validity of DASS-21 via CFA in a Malaysian context. Without the validation process, DASS-21 could have resulted in incorrect findings. To achieve its goals, the current research introduced a question: Can DASS-21 be validated through CFA in terms of convergent, discriminant, and nomological validity? In a CFA model that was articulated by changing the DASS-21 single-factor model, four research hypotheses, presented in Table 6, associated with the research question were tested. One of the key findings of this research was the confirmatory factor analysis of the DASS-21 scale. Based on the findings, all of the factor loadings of our research variables were significant, with a desired factor loading of 0.7 or greater. Pertinently, the correlation between a variable and a factor is represented by factor loading. The variable's factor loading indicates the percentage of that factor's variance, which the variable accounts for. Keeping such research findings in view, the incremental validity of our research constructs/variables was achieved, meaning that the utilisation of such a scale in this cultural context is expected to yield reliable results.

Table 6. Test results for research hypotheses.

Research Hypothesis	If Supported
RH-1: The latent variable psychological distress has a concurrent validity coefficient of 0.70 or higher, suggesting that DASS-21 has convergent validity.	Yes
RH-2: The latent variable psychological distress has an average variance extracted (AVE) of 0.50 or higher, suggesting that DASS-21 has convergent validity.	Yes
RH3: The relationships between the variables measured for "depression, anxiety, and stress" are less than r = 0.85, validating the discriminative validity of DASS-21.	Yes
RH-4: Correlations between the variables measured for "depression, anxiety, and stress" are r = 0.50 or greater (nomological validity).	Yes

In terms of the descriptive statistics, it was easy to see through the comparative study that there was a definite change in the depression score of the university students, i.e., an overall 200% change in depression, for example (36 per cent in the mild category, 71 per cent in the severe category, and 150 per cent in the extremely severe category, as shown in Table 5). The ratings for anxiousness were also discovered to be not particularly encouraging, increasing by 85% overall (i.e., by 88% in the severe category and 47% in the really severe category). In addition, as was anticipated, the acute effect of COVID-19 on the mental health of university students resulted in an increase of 72% in the level of overstress (i.e., 14% in the mild category, 33% in the severe category, and 67% in the extremely severe category). The results of our study, presented as descriptive statistics, show that the overall

rise in depression, anxiety, and stress in the mental health of university students was notable. This conclusion is concerning and calls for immediate action.

Before the pandemic, students were supposed to go to university, socialise with their friends and colleagues, and engage in physical activities, such as walking, sports, and exercise, all of which they are now deprived of. This could be one of the reasons why there has been such an increase in the overall level of psychological distress among our respondents during this entire COVID-19 scenario. Another possible explanation for this rise in psychological distress could be their daily routines during this COVID-19 scenario. University students typically have their own mobile phones, laptops, and other electronic devices, which may contribute to their habit of making excessive use of technology while primarily residing in their own homes. This may be another factor that has contributed to the observed increase. Because of this pandemic, the conditions imposed, such as movement control in cities and districts, staying at home (mostly), practising social distancing, avoiding social meetings, and not engaging in physical activities, are some of the possible reasons that call for mitigating actions. During times such as these, the student's immediate family has the potential to play a pivotal role in providing them with the necessary amount of time, care, and consultation. This may be accomplished by actively listening to what they have to say, providing them with helpful feedback, and introducing them to healthier ways of living.

5.1. Model Fit

In our study, the modified one-factor model of the DASS-21 scale was the structural model in which the estimation parameters and the given information remained the same as the measurement models. To assess the structural validity of the model, absolute indices and incremental fit indices were used, and they yielded appropriate fit results representing a one-factor model. Our one-factor model was perpetually better compared with the past measurable models created in the literature [17,22,42]. This previous literature could not provide a compelling fit model because of the restricted measures of factor load estimates ($\beta < 0.70$).

5.2. Convergent Validity

In the revised single-factor model, the latent variable's convergent validity coefficient is more noteworthy than 0.70, and the variable's AVE is more prominent than 0.50, meeting the concurrent validity criteria standards (Table 2). The findings upheld RH1 and RH2. Because the factor-stacking values restricted extents (β 0.70), most previous DASS-21 investigations could not check convergent validity in the acknowledgement models. For instance, in [45,48,49], owing to the limited magnitudes of the factor-loading values of $\beta < 0.70$, the findings did not meet the convergent validity acceptance norms.

5.3. Discriminant Validity

CFA was used to investigate the variables' discriminant validity in the modified one-factor model. A variable's associations with other components may be less than $r = 0.85$ to obtain discriminant validity. Otherwise, the element will not be able to function as a separate variable within the same structural model. The current study's updated one-factor model indicated that the correlations between depression, anxiety, and stress were less than $r = 0.85$ (Table 2). The findings supported RH3 as shown in Table 6. Previous research has not investigated the discriminant validity of DASS-21 or used the standard approach in their CFA operation. Antony et al. [41] did not mention discriminant validity in their DASS-21 research. Asghari et al. [42] investigated discriminant validity, but their interpretation of it was more to do with the sensitivity of DASS-21 than CFA's discriminant validity.

5.4. Nomological Validity

The current examination researched whether the revised one-factor model of DASS-21 addressed the speculative relationships between the factors of anxiety, stress, and depres-

sion to determine their nomological validity. Since the creators of DASS-21, Lovibond and Lovibond [20], asserted that stress anxiety and depression are distinct elements, yet exceptionally related, the current investigation was used to yield results in which every one of the three estimated factors showed solid relationships of $0.50 < r < 0.85$ to check legitimacy. The current examination's CFA discoveries affirmed the creators' hypothetical demand, showing that the three factors had solid relationships of $0.65 < r < 0.75$ with each other. Subsequently, the momentum research upheld RH 4 (Table 2). For specialists and experts, the current examination's confirmation of DASS-21's nomological validity suggests that people's depression, anxiety, and stress conditions should be considered in light of the variables' independence and high correlations.

6. Conclusions

Due to the prolonged pandemic situation, burdensome measures (such as lockdowns and stay-at-home orders), and the COVID-19 pandemic having negatively affected university students, the study provided preliminary evidence on the psychological effects of depression, anxiety, and stress among college students. As a result, the elements of depression, anxiety, and stress that affected university students during the closure time were highlighted in this study. We did this since the results of the study mentioned these factors. We have observed, on the basis of the findings, that a CFA model for DASS-21 (i.e., a modified single-factor model) has the potential to create factor loading that is more than 0.70. A model with just one element can more accurately reflect the DASS-21's CFA impact. We employed the factor model to assess the students' psychological well-being by evaluating their levels of stress, anxiety, and depression using the DASS-21 scale. This model made use of the various categories provided by the CFA. Every one of the RMSEA values was lower than 0.06, while every one of the CFI values was significantly higher than 0.78.

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Data Availability Statement: We are still working on this project and need to use the data for further work and analysis. However, any researcher who needs the data for further investigations can contact the corresponding author via email.

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