



Influences on Perceived Stress Among Undergraduates During COVID-19-Induced Transition to Open Distance Learning: A Multiple Linear Regression Analysis

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ABSTRACT

Due to the COVID-19 pandemic, numerous institutions, encompassing both public and private universities, have shifted their focus towards open and distance learning (ODL) as a replacement method of teaching. This rapid evolution of the education system has brought to the forefront a concerning increase in students' mental health issues. Therefore, this study endeavors to identify the factors that contribute to the perceived stress levels experienced by undergraduate students during ODL. A total of 630 undergraduate students were involved in this research, chosen using a convenience sampling approach. The survey instrument encompassed inquiries about demographic characteristics and employed the Perceived Stress Scale-10 to gauge stress levels. Multiple Linear Regression analysis was employed to scrutinize the data in pursuit of our research objective. The findings underscore the significance of several factors in influencing perceived stress among undergraduate students in the ODL context. Specifically, network condition, level of semester, and gender emerged as noteworthy contributors to the perceived stress experienced by undergraduate students.

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1. Introduction

The COVID-19 outbreak, which began in China in December 2019, is a global disaster that has spread at the speed of light [1]. Malaysia is also no exception. Almost every government has established public health measures to limit illness transmission [2] where Movement Control Order (MCO) was implemented. However, teaching and learning must still be delivered despite the pandemic. This is why it has been taken into consideration to adopt nationwide open and distance



learning (ODL) to replace the face-to-face teaching and learning method. This way, the students will not be left behind by the education system and will be able to catch up with the syllabus.

The education sector has undergone significant transformation due to the profound impact of the COVID-19 pandemic, with a notable shift from conventional methods to online and distance learning (ODL). ODL is characterized as the utilization of diverse digital platforms for educational delivery, encompassing the Internet, email, chat, newsgroups, messaging, as well as video and audio conferencing [3]. Although ODL is not new in higher education, the sudden shift to full ODL has caused issues with not just educators, but also impacted psychological illnesses among students, other researchers, [4] claimed that rapid change in the environment has led to stress and panic.

In Malaysia, students have been facing frustration with online learning due to increased workload and stress from lecturers, as compared to in-person classes [5]. Additionally, internet connectivity has been a major issue, especially for students living in rural areas, who face difficulties attending online lectures and completing assessments [6],[7]. Research conducted by [8] revealed that students encountered challenges in adapting to online learning, which encompassed difficulties related to technology usage, inadequate home infrastructure for effective online learning, and inconsistent internet access, particularly among those residing in rural regions. These challenges have the potential to yield adverse outcomes for students' academic pursuits and psychological well-being, encompassing reduced motivation for study, heightened stress associated with self-directed learning, the disruption of daily routines, and potentially an elevated likelihood of dropping out. Hence, the aim of this study is to explore and elucidate which factors significantly influence perceived stress among undergraduate students during Open and Distance Learning. This study is crucial to mitigating the adverse outcomes for undergraduate students in Malaysia, including reducing stress, enhancing academic performance, and preventing dropouts.

2. Literature Review

The swift escalation of global COVID-19 cases has instilled a pervasive atmosphere of uncertainty and apprehension regarding the future, thereby generating substantial stress within the university community, including students [9]. The COVID-19 pandemic has exerted a profound influence on the lives of affected individuals, resulting in multiple stressors that contribute to heightened anxiety and stress levels, particularly among university students [10],[11]. A study found that 70% of respondents showed an increase in stress and anxiety because of the COVID-19 pandemic [12]. The unexpected cancellation of face-to-face lessons in response to the COVID-19 outbreak has heightened students' stress levels, as they may encounter challenges adapting to the use of online teaching lectures and tutorials [10]. Numerous students in Malaysia have conveyed their frustration with the online learning format owing to heightened stress levels, as instructors appear to assign a greater volume of tasks within the e-learning environment compared to traditional classes [13]. This occurred because, as universities swiftly transitioned to remote online courses, many professors persisted in utilizing the same syllabus and learning objectives originally crafted for in-person instruction. Unfortunately, these approaches were not well-suited to students, who found themselves burdened with frequent alternative assessments, thereby exacerbating their stress and anxiety levels [9].

A study conducted in Malaysia explained that 36.4% of students experienced moderate stress symptoms, and 20.5% experienced severe stress symptoms during ODL [7]. Likewise, research conducted in Oman revealed that 96.9% of students reported encountering stress during the period of COVID-19-induced e-learning. Additionally, the study identified a noteworthy negative correlation between perceived stress and academic performance [12]. Another study in Bangladesh reported that most students were at sub-optimal levels of readiness and suffered from moderate to high levels of perceived e-learning stress [14]. Although the levels of perceived stress among distance-learning students were comparable to those of on-campus students, qualitative analysis revealed that distance-learning students faced unique stress-behaviors, such as difficulties with technology and isolation [15].

In a study conducted by [16], it was found that several factors contribute to students' inability to have a stable learning environment, potentially leading to face a downfall in their grades. These factors include budget limitations, poor internet access, and time management challenges. These findings highlight the significant impact of the factors on students' learning experiences during the COVID-19 pandemic. The lack of a stable learning environment can contribute to increased stress and anxiety among students, further affecting their academic performance. Furthermore, academic factors such as increased frequency of exams during online distance learning were identified as the

most influential factor contributing to stress among students [14]. Among the causes of stress identified were students' lack of preparation to deal with ODL and insufficient time to get used to the abrupt transition from physical class sessions to ODL lessons at home [17].

As mentioned by [18], stress being an unavoidable aspect of life, affects a diverse variety of people regardless of age, gender, educational level, or financial background. Despite this, stress, sadness, and anxiety are the most common mental health issues among college students. As per the data provided by the International Islamic University Malaysia (IIUM), a greater number of students sought counselling services during the period of the Movement Control Order (MCO), as reported by [19]. This data encompassed instances of depression and anxiety, which were attributed to various factors including solitary living, the inability to meet friends, and concerns regarding alterations in their study arrangements. Overall, perceived stress is a significant issue for students during ODL, and it can have negative consequences for their learning and mental health. It is essential to provide support and resources to help students cope with the stressors of ODL, such as family and institutional support, stress management programs, and online counseling. The aim of this study is to explore and elucidate which factors significantly influence perceived stress among undergraduate students during Open and Distance Learning. Previous studies have shown that stress can have negative consequences for academic performance, physical and psychological health, and overall well-being among university students. Therefore, it is important to understand the factors that contribute to stress among students and to develop strategies to mitigate its effects. By identifying the causes of stress and coping strategies adopted among distance education students in Malaysia, this study can provide valuable insights for policymakers, educators, and other relevant stakeholders in their efforts to promote student success and well-being.

3. Methodology

3.1 Sampling Technique

Data has been collected primarily among 630 undergraduate students through a direct questionnaire. A questionnaire was adopted from [7] regarding perceived stress. The respondents conveniently participated in this study.

3.2 Instrument

Perceived stress is the subjective experience of stress, which is influenced by an individual's appraisal of a situation and their ability to cope with it [20]. The Perceived Stress Scale (PSS) was developed by [21] to measure stress by asking a series of questions about people's experiences and emotions during the previous month, as well as how intensely people experienced them [22]. The PSS is a widely used psychological instrument for measuring the perception of stress and is a measure of the degree to which situations in an individual's life are appraised as stress [20]; [22].

The PSS instrument used in this study was developed by [7]. This instrument is divided into three parts which are Part A, Part B, and Part C. Part A is focused on the demographic profile. For example, gender, age, network condition. Part B is focused on perceived stress during ODL, what students are feeling and thought during the last months and is composed of 10 items. For example, the item PS1 "How often have you been upset because of something that happened unexpectedly during online learning?". Finally, Part C is focused on students' opinion about ODL and consists of two items. A 5-point frequency Likert scale was used to measure perceived stress, where the value 1 referred to "Never" and the value 5 referred to "Always".

3.3 Data Analysis

The Statistical Package for the Social Sciences (SPSS) software was used to perform statistical analysis on the collected data. In this study, the factor that influenced perceived stress among undergraduate students during ODL has been investigated. There are six variables included in this study which are Gender, Level of semester, CGPA, Location during ODL, Network condition, and Number of online courses for the current semester. Table 1 shows the description of variables in the study.

Table 1. Description of variables

Type of variable	Variable's name	Categories
Dependent	Perceived stress	Total scores (in number)
Independent	Gender	1=female, 0=male
	Level of semester	1=less than 3, 0=more than 3
	CGPA	Continuous
	Location during ODL	1=urban, 0=rural
	Network condition	1=Good, 0=poor to bad
	Number of online courses	Continuous

Based on the literature review the research framework has been constructed (Figure 1) to examine how specific demographic variables influence perceived stress during ODL among undergraduate students in Malaysia. Figure 1 shows a conceptual framework for this study.

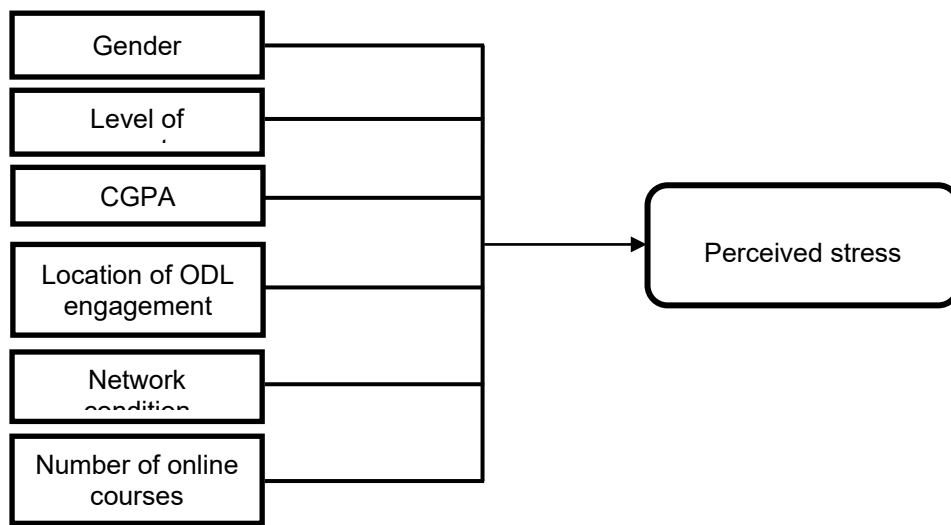


Figure 1. Conceptual framework

3.4 Hypothesis

The objective of this study is to identify the relationships that exist between demographic variables and perceived stress. To this end, six hypotheses have been developed, based on the five relationships identified in the previous section:

- H₁: There is a relationship between Gender and perceived stress during ODL among undergraduate students.
- H₂: There is a relationship between Level of semester and perceived stress during ODL among undergraduate students.
- H₃: There is a relationship between CGPA and perceived stress during ODL among undergraduate students.
- H₄: There is a relationship between Location during ODL and perceived stress during ODL among undergraduate students.
- H₅: There is a relationship between Network condition and perceived stress during ODL among undergraduate students.
- H₆: There is a relationship between Number of online courses and perceived stress during ODL among undergraduate students.

This study carried out Multiple Linear Regression (MLR) using forward stepwise regression techniques. Multiple regression will help determine the extent to which independent variables predict variations in dependent variable while controlling for potential confounding variables. The

interpretation of the regression coefficients will provide information regarding the strength and direction of these relationships, possibly indicating positive or negative associations between demographic variables, and perceived stress. The general multiple linear regression model is as in Equation (1).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon \quad (1)$$

where

Y is the dependent variable,

X_1, X_2, \dots, X_n are the independent variables,

ε is the error term,

β 's are the regression coefficients with β_0 is the constant term

There are four assumptions that must be met before conducting a Multiple Regression analysis in order to guarantee the reliability and validity of the findings. The assumptions are as follows:

- a) The error terms are normally distributed.
- b) The error terms have constant variance.
- c) No multicollinearity exists.

Firstly, it was attempted to evaluate whether the data from the multiple regression analysis met the assumptions by using a P-P plot of standardized residuals. Regression assumes that dependent variables have normal distributions which can be seen when all plots fall approximately along a straight line, or it can be tested by using histogram. Next, test homogeneity of variance can be tested using a scatter plot residual vs. predicted value. Homoscedasticity indicates that the error variance is same across all independent variable levels meanwhile heteroscedasticity is evident when the variance of errors differs at different independent variable levels [23]. Lastly, multicollinearity was tested by using VIF and Tolerance values to check the presence of correlations between independent variables. Multicollinearity is present when $VIF > 10$ and tolerance < 0.1 .

The objective of multiple linear regression is to find the optimal model that predicts the association between independent variables and a response variable using the principle of parsimony (with the fewest significant factors explaining the greatest proportion of an event's occurrence) [24]. Once the data obtained from the study was found to fit the assumptions of multiple regression analysis, forward stepwise regression was used to examine the predictive power of independent variables in predicting the factors that influence the dependent variable [24]. It is a method of fitting regression models in which the choice of predictive variables is carried out by an automatic procedure. Forward stepwise begins with no independent variables in the model. Then starts adding the most significant variables one by one with the largest F value of the independent variables will be selected. The procedures kept on repeating until no further improvement is possible. The model can be said as significant if p-value is less than 0.05.

4. Results and Discussion

4.1 The model assumptions

To obtain the regression model, it is necessary to ensure that the assumptions were met. The assumptions of multivariate normality, constant variance, and multicollinearity were investigated separately.

4.1.1 Results of error terms are normally distributed

The normal P-P plot for the residuals of the model was used to test the normality assumption as shown in Figure 2.

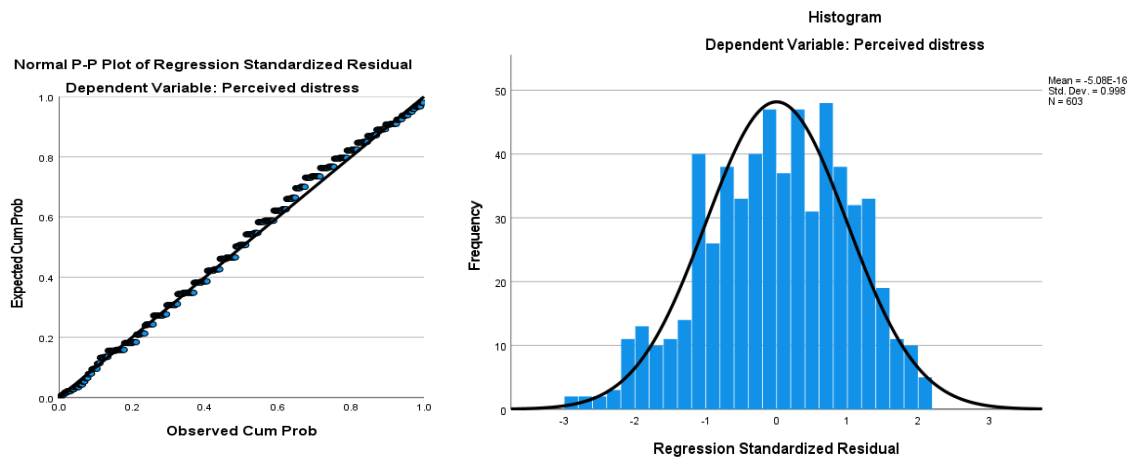


Figure 2. P-P plot of standardized residuals and Histogram

It can be seen in Figure 2 that all points lie approximately along a straight line. The histogram also shows a symmetrical. Hence, since all the point lies approximately along a straight line and the histogram is normally distributed, it can be concluded that the error term is normally distributed (Figure 2).

4.1.2 The error terms exhibit constant variance

To examine the variance of the residuals, a scatter plot was created to compare the Standardized Residual against Standardized Predicted Value. Figure 3 visualize the variance of the residuals.

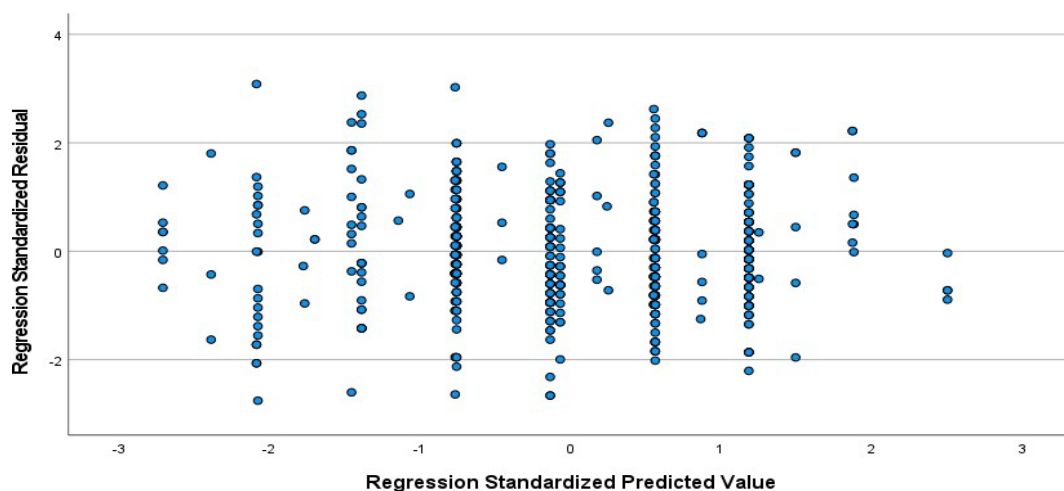


Figure 3. Scatter plot of Standardized Residual against Standardized Predicted Value

The assumption of homoscedasticity was fulfilled since the error terms were randomly scattered and there was no obvious pattern in the plot. This enhances the reliability of the study's statistical analysis and findings.

4.1.3 Results of multicollinearity test

Table 2 displays the collinearity statistics to analyze multicollinearity problem in the dataset. The collinearity analysis indicates that this assumption has been met, as the Tolerance scores were above 0.2 and the Variance Inflation Factor (VIF) scores were below 10. Therefore, there is no evidence of multicollinearity in the dataset.

Table 2. Collinearity Statistics

Model	Tolerance	VIF
Gender	0.997	1.003
Level of semester	0.997	1.003
Network condition	0.996	1.004

4.1.4 Results of regression model using forward stepwise method

The forward stepwise method was used to examine the predictive power of independent variables in predicting the factors influencing perceived stress among students. The summary of the inclusion procedures is displayed in Table 3.

Table 3. Forward stepwise procedures

Variables Entered/ Removed			
Model	Variables Entered	Variables Removed	Method
1	Network Condition	-	Stepwise. (Criteria: Probability of F-to-enter <= 0.050, Probability of F-to-remove >= 0.100)
2	Level of semester	-	Stepwise. (Criteria: Probability of F-to-enter <= 0.050, Probability of F-to-remove >= 0.100)
3	Gender	-	Stepwise. (Criteria: Probability of F-to-enter <= 0.050, Probability of F-to-remove >= 0.100)

As given in Table 3, this method successively included variables such as Network Condition, Level of semester, and Gender based on predetermined criteria (Probability of F-to-enter <= 0.050) while removing those with a lower impact (Probability of F-to-remove >= 0.100), providing valuable insights into the key determinants of perceived stress in the study. Moreover, the creation of an analysis of variance (ANOVA) table served to assess the significance of the regression model. The F-Statistics, which yielded a value of 18.427 with a p-value of 0.001 (as indicated in Table 4), was found to be less than the conventional significance threshold of 0.05, signifying the validity and statistical significance of the estimated regression model. This suggests that the model effectively explains the variance in perceived stress among students based on the selected independent variables.

Table 4. ANOVA table

Model	SS	df	MS	F	p-value
Regression	1876.139	3	625.380	18.427	0.001
Residual	20023.364	590	33.938		
Total	21899.503	593			

Based on the Regression results outline in Table 5, all the variables significant influences the perceived stress among undergraduate students during ODL: Network Condition (B=-2.347; t = - 6.567; p < 0.001), level of semester (B=0.553; t = 2.434; p < 0.001), and Gender (B=1.122; t = 1.970; p < 0.001). However, perceived stress for good network conditions is 2.347 times less than those for bad network conditions, while other variables held constant. On the other hand, perceived stress for semester 3 and above and females had higher perceived stress compared to semester less than 3 and males, while other variables held constant. The final equation of the multiple linear regression model is written as:

$$\text{Perceived stress} = 26.081 - 2.347 (\text{Network Condition}) + 0.553 (\text{Semester}) + 1.122 (\text{Gender})$$

Table 5. Regression model

Model	Unstandardized		Standardized	t	p-value
	B	Std. Error	Beta		
(Constant)	26.081	1.599		16.308	<0.001
Network Condition	-2.347	0.357	-0.259	-6.567	<0.001
Level of Semester	0.553	0.227	0.096	2.434	0.015
Gender	1.122	0.570	0.078	1.970	0.049

The R-squared value represents the percentage of variance in the dependent variable explained by the independent variables. In this study, the R-squared value, as shown in Table 6, indicates the extent to which the study accounts for this percentage of variance. Specifically, the combined influence of network condition, gender, and level of semester explains 69.3% of the total variation in perceived stress. The remaining 31.7% represents unexplored factors that warrant investigation in future research.

Table 6. Model Summary

R	R Square	Adjusted R Square	Std. Error of Estimate
0.833	0.693	0.677	1.87984

5. Conclusion

This study essentially focused on the potential factors that may influence perceived stress among undergraduate students during Open and Distance Learning (ODL). Multiple Linear Regression has been performed to achieve the objective stated in this study. Based on the findings it indicates that Network Condition, Level of semester, and Gender contribute significantly to the perceived stress among undergraduate students during ODL. Since perceived stress plays a crucial role in determining the success of students in their academic pursuits, the findings of this study can provide valuable insights into the causes of stress and coping strategies adopted among distance education students in Malaysia. The study can also contribute to the development of effective interventions to help students manage stress and improve their academic performance.

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Conflict of Interest

The authors declare no conflict of interest in the subject matter or materials discussed in this manuscript. Additionally, the authors declare no conflict of interest related to authorship or editorial responsibility for this manuscript.

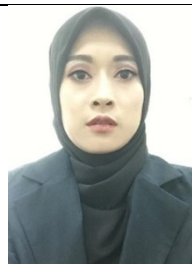



References

- [1] A. Hafeez, S. Ahmad, S. A. Siddqui, M. Ahmad, & S. Mishra, "A review of COVID-(Coronavirus Disease-2019) diagnosis, treatments and prevention", *In Eurasian Journal of Medicine and Oncology*, vol. 4, no. 2, pp. 116–125, 2020.
- [2] S. Sundarasan, K. Chinna, K. Kamaludin, M. Nurunnabi, G. M. Baloch, H. B. Khoshaim, S. F. A. Hossain, & A. Sukayt, "Psychological impact of COVID-19 and lockdown among university

- students in Malaysia: Implications and policy recommendations", *International Journal Environmental Research and Public Health*, vol.17(17) pp. 1-13, 2020.
- [3] I. Dhull, & S. Arora, "Online Learning", *International Education & Research Journal*, vol. 3, no. 8, pp. 32-34, 2019.
- [4] N. Mheidly, M. Y. Fares, & J. Fares, "Coping with stress and burnout associated with telecommunication and online learning", *Front. Public Health*, vol. 8, pp. 1-7, 2020.
- [5] Y. Palansamy, "Higher Education Ministry: All university lectures to be online-only until the end of 2020, with a few exceptions. Retrieved from <https://www.malaymail.com/news/malaysia/2020/05/27/higher-education-ministry-alluniversity-lectures-to-be-online-only-until-e/1869975>, 2020.
- [6] I. Lim, "The reality for Malaysia's university students: Online learning challenges, stress, workload; possible solutions for fully digital future until Dec. Retrieved from <https://core.ac.uk/download/pdf/328815293.pdf>, 2020.
- [7] N. M. Abdul Ghafar, N. F. Jamal, & N. I. Abu Hasan, "Perceived stress among UiTM students during open and distance learning (ODL)", *International Journal of Academic Research in Business and Social Sciences*, vol. 11, no. 8., 2021.
- [8] P. Sahu, "Closure of universities due to Coronavirus Disease 2019 (COVID-19): Impact on education and mental health of students and academic staff", *Cureus*, 12, e7541. <https://doi.org/10.7759/cureus.7541>, 2020.
- [9] J. de la Fuente, M. Pachón-Basallo, F. H. Santos, F. J. Peralta-Sánchez, M. C. González-Torres, R. Artuch-Garde, P. V. Paoloni & M. L. Gaetha, "How has the COVID-19 crisis affected the academic stress of university students? The role of teachers and students", *Front. Psychol.*, vol. 12, no. 626340, 2021.
- [10] E. Radwan, A. Radwan, W. Radwan, & D. Pandey, "Perceived stress among school students in distance learning during the COVID-19 pandemic in the Gaza Strip, Palestine", *Augmented Human Research*, 6(1):12, pp. 1-13, 2021.
- [11] O. P. Sari, N. Mediatati, "Students resilience: The impact of online learning policies during the Covid-19 pandemic on academic stress", *Journal of Educational Social Studies*, vol. 12, no., 1, 2023.
- [12] M. Malik, & S. Javed, "Perceived stress among university students in Oman during COVID-19-induced e-learning", *Middle East Current Psychiatry*, vol. 28, no. 49, 2021.
- [13] M. Jafari, M. D. Roche, & M. R. Eshaghi, "COVID-19, stress and mental health: What students expect from academic institutions during a pandemic", *Journal of American College Health*, pp. 1-8, 2021.
- [14] H. Kabir, M. K. Hasan & D. K. Mitra, "E-learning readiness and perceived stress among the university students of Bangladesh during COVID-19: A countrywide cross-sectional study", *Annals of Medicine*, vol. 53, no. 1, 2021.
- [15] M. Drüge, L. Fritsche, C. Bögemann, J. Apolinário-Hagen & C. Salewski, "Comparing stress, areas of stress and coping-strategies between distance-learning and on-campus students – A mixed-methods approach", *Frontiers in Psychology*, 2022.
- [16] N. I. Jamil, S. K. Yoke, & N. C. Him, "Assessing undergraduate student's perceived stress during open distance learning", *International Conference on Artificial Intelligence and Data Sciences*, 2021.
- [17] M. M. Mohamad, L. S. May, A. S. Azmi, & S. K. Omar, "A review on language anxiety in open and distance learning (ODL) classes and its pedagogical implications. *e-Proceedings of International Conference on Language, Education, Humanities & Social Sciences*, pp. 536-542, 2021.
- [18] D. Yikealo, W. Tareke, & I. Karvinen, "The level of stress among college students: A case in the College of Education, Eritrea Institute of Technology", *Open Science Journal*, vol. 3, no. 4, 2018.
- [19] M. A. F. Abdullah, "Covid 19 outbreak spoiled students & mental health restrictions of the truth. <https://medium.com/@adibbtp/covid-19-outbreak-spoiled-students-mental-healthrestrictions-of-the-truth-1da04180247e>, 2020.
- [20] C. Y. Kwaah & G. Essilfie, "Stress and coping strategies among distance education students at the University Of Cape Coast, Ghana", *Turkish Online Journal of Distance Education*, vol. 18, no. 3, pp. 120-134, 2017.
- [21] J. Cohen, & P. Cohen, "Applied multiple regression/ correlation analysis for the behavioral sciences (2nd ed.)" Hillsdale NJ: Erlbaum, 1983.
- [22] J. Cohen, "The earth is round ($p < .05$)", *American Psychologist*, vol. 49, no. 12, 997–

- 1003, 1994.
- [23] J. W. Osborne, & E. Waters, "Four assumptions of multiple regression that researchers should always test", *Practical Assessment, Research, and Evaluation*, 8(2), 2002.
- [24] F. D. Guillén-Gámez & M. J. Mayorga-Fernández, " Identification of variables that predict teachers' attitudes toward ICT in higher education for teaching and research: A study with regression", *Sustainability*, vol. 12, no. 1312, 2020.

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