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Logistic regression of online risks on academic stress and performance undergraduates

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ABSTRACT

The progression of technology could lead to online risks, such as accidental exposure to harmful content by undergraduates. Investigating how this exposure affects their mental health, particularly academic stress, and in turn, their academic performance, is critically important. This study aims to examine the impact and predictability of online risks on undergraduates' academic stress and performance, using logistic regression as the main method of analysis. The findings show that online risks have a significant effect on academic stress ($p<0.05$), but there is no significant impact on academic performance ($p>0.05$). Students who frequently encounter scam or bullying content are 2.317 and 2.400 times more likely, respectively, to suffer from academic stress compared to those who encounter it less. Additionally, demographic factors, especially gender, are significant ($p<0.05$) in terms of academic stress and performance. The analysis predicts that females are 4.210 times more likely to experience academic stress than males, while males are 2.768 times (in model 4) and 2.601 times (model 5) more likely to achieve cum laude honors than females. This research provides valuable insights for academic policy makers to improve education quality and offers a basis for further studies in this area.

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1. INTRODUCTION

The accelerating advancement of technology nowadays facilitates the ease of accessing information and a variety of content within the grasp of undergraduates. In this context, the term "grasp" refers to the individualized management of information in the hands of each individual, including undergraduates. The ease of seeking and disseminating information through online media, while being able to provide positive impacts in the educational sector as well as other fields [1]–[6], also entails risks [7], [8] that could be accessed or received by users against their will. Examples include sexual content, scam content, bullying content, and hoax content that enters the devices of undergraduates without their consent. This situation is commonly termed as online risk, where the said online risk denotes a condition in which an individual

receives negative content [9] without the individual's consent [10], [11] and the individual may be negatively impacted by such content [7], [8]. As discovered by earlier experts, online risks like sexual content [12], [13], scams content [14], [15], bullying content [16]–[18], and hoax content [19], [20] can affect individuals, one of the impacts being stress. For instance, a research [19] conducted on nurses during the COVID-19 era and discovered stress caused by fake news on online media. Another research [17] articulated findings that bullying through online media significantly causes stress as it threatens the need for acceptance. A report by Norris and Brookes [21] using qualitative techniques mentioned that individuals experiencing online scams feel severe stress upon losing money.

Nonetheless, other research by Alhujailli *et al*. [22] found the contrary, where online bullying content socially isolating individuals does not significantly impact negative emotions, one of which is stress. Xing *et al*. [23] posited that older individuals with good cognitive understanding are less likely to be impacted by scams and subsequently stressed because of it. Besides these diverging findings, the research still focuses on the general mental stress conditions induced by online risk. Studies or findings on whether online risks affect and predict academic stress of undergraduates, and the impact and prediction of such variables on undergraduate academic performance are still scarce. Considering the existing research gap and the necessity of this analysis in the academic domain, this research aims to fill the gap left by previous studies by analyzing the impact and prediction of online risk on academic stress and undergraduate academic performance. The analytical technique deemed suitable for the objectives of this research is logistic regression. This analytical technique can be utilized to analyze the impact and prediction if there are changes in conditions on certain variables through its value exp (B) [24], [25].

Besides the mentioned variables, this research will also include demographic variables as supporting components in this analysis. As stated by previous experts [26]–[29], it is recommended and crucial for a study to include demographic variables such as gender, environment, and well-being reflected through salary and occupation. The outcomes of this research are hoped to contribute to policymakers in the academic field to enhance education quality and provide further research opportunities for other researchers through the findings in this research. The hypothesis from this study is examining the impact and predictability of online risks on undergraduates' academic stress and performance. Specifically, the study hypothesizes that exposure to online risks, such as scams or bullying content, significantly affects academic stress levels among undergraduates. It further explores the role of demographic factors, notably gender, in influencing academic stress and performance.

2. METHOD

This research uses non-probability sampling with quota sampling technique by considering the similarity of characteristics and the minimum number that can be analyzed. The sample size for this study was determined following Verma guidelines [30]. Verma recommends a minimum sample size of 200 for logistic regression analyses to detect medium effect sizes with a statistical power of 0.80 at a significance level of 0.05. Therefore, the sample size of 219 participants in this study meets this requirement, ensuring the robustness and reliability of the findings. This research gathered 219 participants from state universities in Indonesia and employed the primary analytical technique of binary logistic regression as shown Figure 1, alongside supplementary analytical techniques as a robustness check of the research instrument as presented in Table 1, encompassing exploratory factor analysis (EFA), product moment validity, Cronbach's alpha reliability, Pearson correlation, Kendall's, and Spearman with the aid of SPSS 26 tool.

In this study, the researchers utilized the variables of online risk and demographics to analyze and predict their impacts on the variables of academic stress and academic performance of undergraduates in Indonesia using the aforementioned analytical techniques. The research process begins with phase-1, collecting and tabulating data, followed by phase-2, where EFA and tests for validity and reliability are conducted. To ensure the validity and reliability of the questionnaire, the study conducted EFA, product moment validity tests, and Cronbach's alpha reliability tests. The EFA confirmed the factor structure of the questionnaire items, with a Kaiser-Meyer-Olkin (KMO) value of 0.635 and a significant Bartlett's test (χ^2=161.513, $p<0.001$). All items showed significant correlations ($p<0.05$) in Pearson, Kendall's tau_b, and Spearman's rho tests. The Cronbach's alpha value of 0.701 indicated acceptable internal consistency. In phase-3, correlation is assessed using Pearson, Kendall's tau_b, and Spearman's rho tests. Phase-4 involves a logistic regression test and is split into model fit analysis and variable analysis across multiple models. The process culminates in data interpretation and the preparation of a final report, with iterative feedback loops suggesting potential revisions to earlier phases. Figure 1 illustrates the flow.

Furthermore, this research employs four phases (Figure 1) starting from phase-1 data collection and tabulation, where the researcher conducted data collection from one of the state universities in Indonesia using a constructed instrument (Table 1). Participants, who were undergraduates, were randomly contacted to

voluntarily fill the instrument, with each participant being assured that filling out this instrument would not affect their academic grades and their identities would be kept confidential and protected by the researcher [31]. Participants were coded in data tabulation to avoid duplicate data entry.

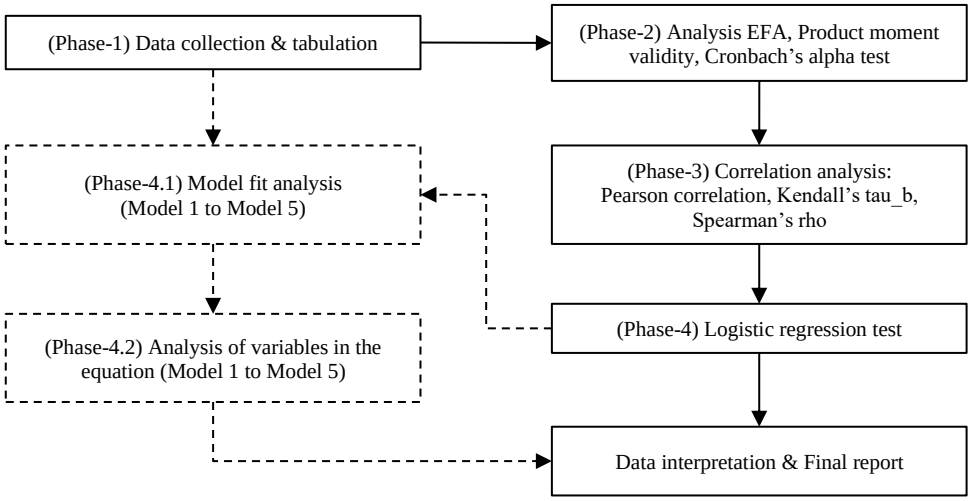

Figure 1. Research phase

Table 1. Research instrument

Variable/model	Indicator	Code var/item	Question	Response (response code)
Academic stress	Academic stress	Stress	Have you experienced stress due to coursework in the last 12 months?	Yes (1); No (2)
Academic performance	Achievement of Cum Laude	PA	What is your latest GPA?	e.g. 3.76
Online risk	Sexual content	Cse	In the last 12 months, I have received digital content with sexual material	Likert scale coded binary for logistic analysis: strongly disagree (1), disagree (1), agree (2), strongly agree (2)
Online risk	Sexual content	Cse	In the last 12 months, I have received digital content with sexual material	
	Bullying content	Bullying	In the last 12 months, I have received digital content with bullying material	
	Hoax content	Hoax	In the last 12 months, I have received digital content with hoax material	
Age	Age	Age	Enter your age	e.g., 19
Environment	Environment	Env	You were raised in which environment?	Urban (1), Rural (2), Mix (3)
Gender	Gender	Gender	Enter your gender	Male (1), Female (2)
Parent salary	Parent salary	Psalary	My parents' salary falls under which category?	<(UMR) (1), =UMR, (2), >UMR (3)
Parent work	Parent work	Pwork	My parents' occupation	e.g., Entrepreneur or Employee
Model 1	Analyzing online risk on stress			
Model 2	Analyzing online risk on academic performance			
Model 3	Analyzing demographics on stress			
Model 4	Analyzing demographics on academic performance			
Model 5	Analyzing online risk, demographics, and stress on academic performance			

Note
For the parent work section: the researcher identifies the parents' occupation entered by the participant into independent categories (1) for jobs that are self-employed and not under contract with other organizations or the like, and un-independent (2) for parents' jobs that have service bonds or contracts with other organizations or the like.
For the academic performance section: the researcher converts the GPA with the cum laude category >=3.51 (2) and <=3.50 (1). This section corresponds to the cum laude predicate set by the government education sector in Indonesia.
UMR in Indonesian "*Upah Minmun Regional*" or regional minimum wage is referred to as the regional minimum wage set as the minimum financial income standard to sustain a decent living in a region.

Phase-2 consists of EFA, product moment validity, and Cronbach's alpha reliability test, conducted by the researcher for the robustness check analysis of the research instrument, particularly the online risk variable, to ensure the validity and reliability of the data to avoid justification bias. Several criteria needed to be met in this phase, including EFA criteria, where the first requirement to perform factor analysis is KMO>0.50 and sig.<0.05. The second requirement is anti-image correlation measures of sampling adequacy (MSA)>0.50. If MSA<0.50, then the statement item must be eliminated and retested. The third condition is

communalities >0.50. If communalities <0.50, then the item must be eliminated and retested. These conditions must be met before describing how many factors or dimensions appear based on the total initial eigenvalues >1, and to determine the items that are factors or dimensions through the max rotated component matrix value per dimension component that appears with a loading factor of 0.40 [32]. The product moment validity criteria then use Pearson, Kendall's, and Spearman's correlation techniques with the condition of table r value being used with df 190 (r>0.119) and minimum r sig. value<0.05 or 5%; if the value of Sig. (2-tailed) <0.05 and the correlation is positive, then the questionnaire item is declared valid. If the value of Sig. (2-tailed) <0.05 and the correlation is negative, then the questionnaire item is declared invalid. If the value of Sig. (2-tailed) >0.05 then the questionnaire item is declared invalid. The final criteria in this part is Cronbach's alpha reliability which requires a Cronbach's alpha value >60. Phase 3 encompasses correlation analysis: Pearson correlation, Kendall's tau_b, Spearman's rho to determine the correlation of online risk and demographics with academic stress and academic performance. The conditions are if the correlation coefficient values (+/-) 0.1<=r<=0.399 (weak), 0.4<=r<=0.699 (moderate), 0.7<=r<=0.999 (strong), and r=1 (perfect) [33], [34]. The table r value is used with df 190 (r>0.119) and minimum r sig. value.

Phase-4 logistic regression test is conducted to analyze and predict the influence of independent variables on dependent variables with six models (Table 1), carried out in two sub-phases. The first sub-phase, phase 4.1 model fit analysis, is performed on models 1 to 5 to obtain justification if the constructed model is fit and suitable for further logistic analysis. The criteria that must be met in this phase are Omnibus tests of model coefficients with a value of sig.<0.05, Hosmer and Lemeshow test with a value of sig>0.05, while Nagelkerke R Square is used to know how large the likelihood of changes will be converted into a percentage form.

Lastly, in sub-phase 4.2 analysis of variables in the equation on each model uses the first reference for analysis from the first binary on all available independent variables, and with each iteration eliminates the most insignificant variable [24]. The criteria of parameter estimates with a value of sig. p<0.05 to get interpretation in the form of "intercept in the category of independent variables affects the category in the dependent variable" and if the criteria of parameter estimates are met then what needs to be observed as the next interpretation is the value of Exp (B) if Exp (B)<1.000 then the dependent variable first reference will be affected by the intercept of the category of independent variables and will apply vice versa if Exp (B)>1.000 then the category in the dependent variable "second or third category on independent variables compared to the first category" will be affected by the intercept of the category of independent variables.

3. RESULTS

3.1. Phase-1: data collection and tabulation

During the execution of data collection, the researcher successfully obtained 219 participants, however, those who completed the instrument filling perfectly without any empty question items were 192 participants (Table 1). The majority of the participants as shown in Table 2 were under 19 years old (74%) followed by participants over 20 years old (26%). A large proportion of the participants parents' occupations were independent (88.5%), where the parents had jobs that were not contract-bound or the like with other parties or organizations, while the parents' jobs that had contracts or the like with other parties or organizations were categorized into un-independent (11.5%). The demographic proportion distribution in terms of urban environment (38.55%), rural (31.3%), male gender (40.1%), female (59.9%), parent salary <UMR (20.8%)=UMR (41.7%), and >UMR (37.5%). The data tabulation obtained was then analyzed starting from phase-2.

3.2. Phase-2: EFA analysis, product moment validity, and Cronbach's alpha test

The EFA analysis is aimed to test the online risk question items in the research instrument (Table 1) against the standards set in this research method. The EFA analysis was successfully carried out in two phases to obtain valid and reliable question items. Both EFA phases yielded KMO values (0.635; 0.636>0.50) and significance (0.000<0.05) and Cronbach's alpha (0.711; 0.701>0.50). In EFA phase 1, as presented in Table 3, question items were obtained with values that resulted in decisions for elimination and not to be used in this research. The question item in question is the "Hoax" item which obtained a communalities value of 0.416<0.50. Then, in EFA phase 2, it was found that all items met the required values starting from Cse question item with MSA value (0.599>0.50), Communalities (0.722), and loading factor (0.850>0.700). Then the scam question item (0.720; 0.517; 0.801) and the bullying question item (0.629; 0.641; 0.719). All question items in the final phase in this section have a loading factor>0.700, meaning that these question items can reflect the component very well [35].

Table 2. Demographic data

Demographics	Category	%	Mean	SD	Variance
Age	<=19	74	1.26	0.440	0.194
	>=20	26			
Environment	Urban	38.5	1.92	0.827	0.684
	Rural	31.3			
	Mix	30.2			
Gender	Male	40.1	1.60	0.491	0.241
	Female	59.9			
Psalary	<UMR	20.8	2.17	0.747	0.558
	=UMR	41.7			
	>UMR	37.5			
Pwork	Independent	88.5	1.11	0.319	0.102
	Unindependent	11.5			
N		192 participants			

Note: N is total participant, % is percent of sample, SD is standard deviation

Table 3. EFA test result

KMO and Bartlett's test			Anti-image matrices		Communalities	Loading factor	Cronbach's alpha	Description
Value KMO	Chi-square	Sig	Item	MSA	Value	Component1		
EFA phase 1								
0.635	161.513	0.000	Cse	0.609	0.582	0.763	0.711	Valid
			Scam	0.657	0.581	0.762		Valid
			Bullying	0.650	0.571	0.756		Valid
			Hoax	0.626	0.416	0.645		In valid
EFA phase 2								
0.636	109.314	0.000	Cse	0.599	0.722	0.850	0.701	Valid
			Scam	0.720	0.517	0.801		Valid
			Bullying	0.629	0.641	0.719		Valid

Note: MSA is measures of sampling adequacy; extraction method: principal component analysis.

Continuing in phase-2, the researcher conducted a robustness check again to understand the justification resilience on the previous EFA analysis. The results show that in product moment validity with Pearson correlation, all items have a significance value of (0.000<0.05) Cse with scam (0.430), Cse with bullying (0.547), scam with bullying (0.333). In the Kendall's tau and Spearman's rho techniques as shown in Table 4, the same values were obtained and then the reliability value of Cronbach's alpha (0.701>0.60) was obtained. The entire phase-2 demonstrates that the question items have excellent validity resilience, as evidenced by the three question items that endured through the analysis techniques in phase-2. Hence, the researcher proceeded with the analysis in phase-3.

Table 4. Product moment validity and reliability test

Item	Pearson correlation			Kendall's tau_b			Spearman's rho			Sig.	Cronbach's alpha	
	Cse	Scam	Bullying	Cse	Scam	Bullying	Cse	Scam	Bullying			
Cse		0.430	0.547		0.430	0.547		0.430	0.547	0.000	0.701	Valid
Scam	0.430		0.333	0.430		0.333	0.430		0.333			Valid
Bullying	0.547	0.333		0.547	0.333		0.547	0.333				Valid

3.3. Phase-3: correlation analysis

The objective of phase-3 is to ascertain the correlation between online risk and demographics towards academic stress and academic performance. The results show that online risk, reflected through the question items Cse (0.165; 0.022<0.05), scam (0.221; 0.002<0.05), and bullying (0.237; 0.001<0.05), has a significant correlation with students' academic stress, found across Pearson, Kendall's, and Spearman techniques. Conversely, online risk reflected through Cse (0.036; 0.620>0.05), scam (0.045; 0.536>0.05), and bullying (0.414; 0.051>0.05) did not show a significant correlation with students' academic performance, using the same techniques. Furthermore, the gender variable has a significant correlation with stress (0.337; 0.000) and academic performance (0.223; 0.000), across all three techniques. The parent salary variable also showed a significant correlation with stress (0.158; 0.029), but not with academic performance (0.087; 0.230). Besides the gender and parent salary variables, no significant correlation was found between environment and parent work towards students' academic stress and academic performance as shown in Table 5.

Table 5. Correlation test

Item/var	Pearson correlation				Kendall's tau_b				Spearman's rho			
	Stress		PA		Stress		PA		Stress		PA	
	Value	Sig.	Value	Sig.	Value	Sig.	Value	Sig.	Value	Sig	Value	Sig
Cse	0.165	0.022	0.036	0.620	0.165	0.022	0.036	0.618	0.165	0.022	0.036	0.620
Scam	0.221	0.002	0.045	0.536	0.221	0.002	0.045	0.535	0.221	0.002	0.045	0.536
Bullying	0.237	0.001	0.141	0.051	0.237	0.001	0.141	0.051	0.237	0.001	0.141	0.051
Gender	0.337	0.000	0.223	0.002	0.337	0.000	0.223	0.002	0.337	0.000	0.223	0.002
Env	0.050	0.492	0.037	0.610	0.050	0.464	0.034	0.623	0.053	0.465	0.036	0.624
Psalary	0.158	0.029	0.087	0.230	0.154	0.025	0.075	0.274	0.162	0.025	0.079	0.275
Pwork	0.016	0.824	0.093	0.200	0.016	0.823	0.093	0.199	0.016	0.824	0.093	0.200
Stress			0.111	0.126			0.111	0.126			0.111	0.126

Note: PA is performance academic

3.4. Phase-4: logistic regression testing

3.4.1. Phase-4.1: model fit analysis (model 1-model 5)

The model fit analysis found that aside from model 2 as presented in Table 6, all models were deemed fit and had a significant impact on students' academic stress and performance. Model 2 did not meet the model fit criteria due to the significant value of Omnibus tests of model coefficients (0.128>0.05), implying that online risk did not significantly affect academic performance. Specifically, the values of Omnibus tests of model coefficients for model 1 (0.001<.05), model 3 (0.000<.05), model 4 (0.026<0.05), and model 5 (0.048<0.05), along with the values of Hosmer and Lemeshow test for model 1 (0.866>0.05), model 3 (0.333>0.05), model 4 (0.599>0.05), and model 5 (0.596>0.05) indicated that these models were fit. Based on the Nagelkerke R square value, the impact of independent variables on the respective dependent variables was 10.4% for model 1, 4.2% for model 3, 10.3% for model 4, and 13.1% for model 5.

Table 6. Model fit test

Model	Omnibus tests of model coefficients		Hosmer and Lemeshow		Nagelkerke
	Chi-square	Sig.	Chi-square	Sig.	R square
Model 1	15.541	0.001	0.731	0.866	0.104
Model 2	5.689	0.128	1.161	0.884	0.042
Model 3	30.306	0.000	9.112	0.333	0.196
Model 4	14.327	0.026	6.431	0.599	0.103
Model 5	18.426	0.048	6.458	0.596	0.131

3.4.2. Phase-4.2: analysis of variables in the equation (model 1-model 5)

Following the analysis in sub-phase 4.1, logistic analysis as shown in Table 7 found in model 1 that two out of three online risk statement items significantly affected <0.05 students' academic stress. Scam (1) with a value of sig 0.040<0.05 and Exp(B) of 2.317, indicates that students with claim code scam (1) have a significant effect (0.040) on the likelihood of experiencing academic stress 2.317 times more compared to students on claim code scam (2). Then bullying (1) with a value of sig 0.036<0.05 and Exp(B) of 2.400, indicates that students with claim code bullying (1) significantly affect (0.036) the likelihood of experiencing academic stress 2.400 times more compared to students on claim code bullying (2). However, claim code Cse (1) did not show a significant effect (0.945>0.05). Model 2 obtained a justification of unfit model (Table 6), so interpretation and justification in model 2 could not be performed, although bullying sig. (0.035) with Exp(B) of 0.387.

Model 3 showed the demographic variable of gender (2) with a value of sig. 0.000<0.05 and exp(B) of 4.210, where female students have a significant effect (0.000) on the likelihood of experiencing academic stress 4.210 times more than male students. Then, environment (1) showed that students from urban environments significantly affect (0.025) the likelihood of experiencing academic stress 2.452 times compared to students from mixed environments. Besides that, no significant effect was found from other demographic variables on the likelihood of experiencing academic stress. In model 4, gender (1) with a value of sig 0.003<0.05 and exp(B) of 2.768 can be interpreted those male students have a significant effect (0.003) on students' academic performance 2.768 times compared to female students. Besides gender, no significant effect was found from other demographic variables on students' academic performance. Lastly, in model 5, gender (1) still showed that male students significantly affect (0.009) students' academic performance compared to female students, but with a decreased value of exp(B) to 2.601. Besides gender, no significant effect was found from academic stress, online risk, or other demographic variables on students' academic performance as presented in Table 7.

Table 7. Logistic regression analysis results

Model	Variable	Variables in the Equation					95% C.I.for Exp(B)	
		B	S.E.	Wald	Sig.	Exp(B)	Lower	Upper
Model1	Cse (1)	0.026	0.380	0.005	0.945	0.974	0.462	2.052
	Scam (1)	0.840	0.409	4.227	0.040	2.317	1.040	5.163
	Bullying (1)	0.875	0.417	4.408	0.036	2.400	1.060	5.432
Model 2	Cse (1)	0.123	0.432	0.081	0.776	1.131	0.485	2.639
	Scam (1)	0.511	0.413	1.533	0.216	1.667	0.742	3.746
	Bullying (1)	0.950	0.450	4.463	0.035	0.387	0.160	0.934
Model 3	Gender (2)	1.437	0.326	19.406	0.000	4.210	2.221	7.980
	Env (1)	0.897	0.400	5.031	0.025	2.452	1.120	5.368
	Env (2)	0.243	0.389	0.390	0.532	1.275	0.595	2.730
	Psalary (1)	0.215	0.439	0.241	0.624	1.240	0.525	2.932
	Psalary (2)	0.861	0.463	3.463	0.063	2.366	0.955	5.862
	Pwork (1)	0.135	0.507	0.071	0.790	0.874	0.324	2.359
Model 4	Gender (1)	1.018	0.337	9.107	0.003	2.768	1.429	5.361
	Env (1)	0.041	0.413	0.010	0.922	0.960	0.427	2.159
	Env (2)	0.130	0.396	0.108	0.743	0.878	0.404	1.910
	Psalary (1)	0.840	0.497	2.860	0.091	0.432	0.163	1.143
	Psalary (2)	0.458	0.522	0.769	0.381	0.633	0.227	1.761
	Pwork (1)	0.494	0.495	0.993	0.319	0.610	0.231	1.611
Model 5	Stress (1)	0.199	0.373	0.285	0.593	0.820	0.395	1.702
	Gender (1)	0.956	0.365	6.851	0.009	2.601	1.271	5.323
	Cse (1)	0.227	0.452	0.251	0.616	1.254	0.517	3.044
	Scam (1)	0.576	0.443	1.689	0.194	1.780	0.746	4.244
	Bullying (1)	0.742	0.473	2.459	0.117	0.476	0.188	1.204
	Env (1)	0.031	0.425	0.005	0.941	0.969	0.422	2.228
	Env (2)	0.064	0.403	0.025	0.874	0.938	0.426	2.067
	Psalary (1)	0.776	0.502	2.397	0.122	0.460	0.172	1.229
	Psalary (2)	0.453	0.534	0.720	0.396	0.636	0.223	1.809
	Pwork (1)	0.422	0.502	0.705	0.401	0.656	0.245	1.755

4. DISCUSSION

Based on the analysis results (phase-1), a study involving 219 students in Indonesia with usable data of 192 and demographic data distribution age, gender, environment, parent salary, and parent work. It was found (phase-2), the question items that could be used to reflect online risk with a strong loading factor (loading factor>0.700) are Cse (0.850>0.700), scam, (0.801) and bullying (0.719) from the analysis of EFA technique [36]. These three question items have also been through the validity test of product moment with Pearson correlation, Kendall's tau, and Spearman's rho techniques [33], [34] obtaining significance value<0.05 with most having a value in the moderate category and passing the reliability test with Cronbach's alpha (0.701>0.60). This result supports previous research concerning online risk including sexual content [37]–[39], scam content [15], [40]–[42] and bullying content [9], [43], [44] in online risk investigation.

Further findings (phase-3), the online risk variables reflected through the question items Cse, scam, and bullying significantly correlated with students' academic stress but no significant correlation was found with students' academic performance. Then demographic variables, gender significantly correlated with academic stress and academic performance. Parent salary only significantly correlated with academic stress but not with academic performance. Besides these two variables, other demographic variables "Env and Pwork" did not find a significant correlation with academic stress and academic performance. This result is in line with previous research finding sexual content [12], [13], scam content [14], [15] and bullying content [16]–[18] are related to and affect stress. The findings in phase-3 can be compared for their resilience in phase-4, where the correlation of Cse to academic stress did not hold. We did not find a significant effect of Cse (model 1 is: 0.945>0.05) on academic stress. This finding is interesting to investigate further, as the correlation with three techniques showed a significant correlation but no significant effect was found between Cse and students' academic stress. This investigation will be reported in the study by the researcher or other researchers in the next report. In phase-4 which used the main technique of binary logistic regression used five analysis models to know every effect that needs to be analyzed further. In this analysis, we found one "model 2" of the five models stated as not fit, meaning there is no significant effect from demographic variables on academic stress tested in that model. To obtain systematic understanding, in this discussion session discussion in phase 4 starts from analysis model 1 to model 5 after the model fit test.

Analysis model 1 on scam (1), showed students who claim strongly disagree and disagree on the statement obtaining scam in the last 12 months (category 1) have a significant effect on the likelihood of students experiencing academic stress 2.317 times compared to students who claim agree and strongly agree on the statement obtaining scam in the last 12 months. Then, on bullying (1) showed students who claim

strongly disagree and disagree on the statement obtaining bullying in the last 12 months (category 1) have a significant effect on the likelihood of students experiencing academic stress 2.400 times compared to students who claim agree and strongly agree on the statement obtaining bullying in the last 12 months. Both of these findings can be interpreted, students who tend to have little experience of online risk in the fields of scam and bullying have a likelihood of 2.317 times "scam" and 2.400 times "bullying" more likely to experience academic stress compared to students who more often receive such content. There is a possibility that experience with something negative for mental can increase a person's mental resilience [45] p to an individual's emotional condition when receiving it [17]. Other experts [46], [47] also indicate when negative emotions arise at the same time positive emotions also arise, it's up to the individual to strengthen which one when facing a problem. This is in line with the theory of the two continua model which shows that mental health and mental illness are related but have different dimensions [48] focusing more on self-control in facing mental problems. Analysis model 2, found the model fit result (phase 4.1) is not significant for academic performance, this is similar to research. Perhaps this happened because of mental conditions, ego, to the inner state that is good from bad influences so they can still control themselves [46] in achieving academic performance. Of course, the assumption with the foundation of previous research needs to be proven in the next study to prove the truth of the assumption.

Analysis model 3, found a significant effect (0.000) of female gender on students' academic stress. We found female students have a greater likelihood of 4.210 times more risk of experiencing academic stress compared to male students. This finding is in line with Plessis and McDonagh [49] which found that women have higher stress compared to men. With the highest range according to Plessis and McDonagh [49] found at ages 18 to 25 years with a peak at ages 22 to 25 years. Besides, Martínez *et al*. [50] also found a significant effect of gender in managing stress. In demographic variables urban showed students coming from the city have a significant effect on the likelihood of students experiencing academic stress compared to students coming from mixed environments. Then we did not find a significant effect from parent salary and parent work which became one of the demographic data to see the financial welfare of participants on students' academic stress. This is contrary to the findings of previous researchers stating Individuals with low socioeconomic conditions experience daily hassles more often [51] and experience more severe hassles [14]. The cumulative effect of daily stress is an important predictor of the emergence of depression symptoms and mental health decrease [52].

Analysis model 4 showed gender remains (analysis phase 3) in this model 4, the researcher found a significant effect of male gender on academic performance in achieving cumlaude predicate as many as 2.768 times compared to female students. While other demographic variables did not significantly affect academic performance. Research in the field of gender on academic performance still found varied results. Where in this study and other researchers [26] found male gender has a higher effect than women. Other researchers found there is no significant difference [53], female gender significantly more dominant [54]. According to Martínez *et al*. [50], women show a higher level of coping seeking support while men show a higher level of coping focused on meaning. Similar to this research result but with bad academic performance dependent variable, where female gender significantly positive affects with Exp(B) 3.141 [27]. Analysis model 5 showed gender remains, found a significant effect of male gender on students' academic performance achievement compared to female students. We did not find the effect of stress, online risk, and several other demographic variables besides gender on academic performance achievement. Like previous findings, students or individuals could have a concern but they might have resilience in facing college activities when they have ever experienced academic stress [17], [46], [47].

Based on the analysis in phase 1 to phase 5 and analysis on model 1 to model 5, the main interesting finding in this study is online risk significantly correlates and significantly affects specifically item scam and bullying on academic stress. More specifically students who experience less in receiving scam and bullying content "condition of receiving unwanted content or getting the content intentionally" have a likelihood of 2.317 times "scam" and 2.400 times "bullying" more likely to experience academic stress compared to students who more often receive the content. Then not finding correlation and significant effect from online risk and academic stress on students' academic performance. Both findings referred to previous experts discussing mental health studies where mental health is a state of wellbeing in which someone realizes their own abilities, can deal with normal pressures in life, can work productively, and can contribute to their community [55]. Another view by Zachrisson [56] about mental health is an ego process or inner state in holding anxiety, depression, and self-confusion to become "normal". When the process is not bearable then it turns into "not normal" heading towards mental illness. The word normal directs to something positive "like healthy" and not normal directs to something negative "like crazy or mentally unhealthy". With that theory foundation arises a new hypothesis that needs to be tested in the next study. Perhaps the cause of students who have less experience about receiving online risk have worse mental resilience because they are less

trained to face online risk problems and students who tend to receive online risk more than them to have good mental resilience because they are trained to face online risk problems.

Furthermore, related to the finding of no correlation and significant effect from online risk and academic stress on students' academic performance. Strengthen the statement [56] where every individual has ego and inner condition to control the existence of stress to depression to become normal. The absence of a significant effect, maybe shows that their self-control is in good condition to be normal where both they who claim to have academic stress experience and not can achieve their academic performance as an individual "normal condition". Like other research findings [45], [57], with good or strong self-control an individual will not experience stuttering on their job and activity even though they experience stress. This is also in line with model two continua as shown in Figure 2 [58], where someone might experience pressure or stress (which might be an early sign of mental disorder or maybe not, depending on its intensity and duration), but if they have good mental health (adaptation ability and psychological wellbeing), so they might still be able to cope with that stress and maintain their academic performance.

In an Indonesian context, the study investigated the effects of online risks on undergraduates' academic stress and performance, using logistic regression to predict and analyze these impacts. It was found that exposure to online risks such as scams and bullying content is significantly associated with increased academic stress. However, such online risks did not show a significant impact on the students' academic performance. The study also revealed gender differences, indicating that female students are more susceptible to academic stress compared to their male counterparts. Conversely, male students were more likely to excel academically, achieving cum laude honors more frequently than females. Demographic factors like environment and parental income were examined but showed no significant correlation with academic stress or performance. These results provide crucial implications for educational policy and practice, emphasizing the need for targeted strategies to support students' mental health and academic success in the face of online risks.

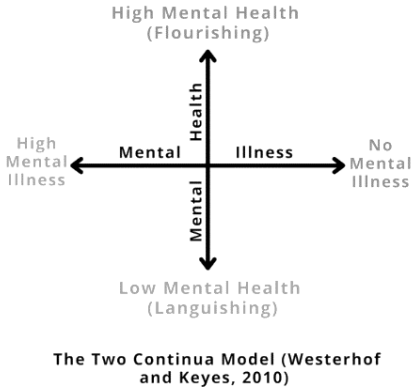

Figure 2. The two continua model [58]

5. CONCLUSION

The study analyzed the link between online risk, academic stress, and performance among Indonesian students through four phases. Initially, the study narrowed down to 192 participants from 219, identifying online risk through specific indicators. It was established that online risk significantly increased academic stress but had no impact on academic performance. Gender differences emerged, with female students and those with lower parental income experiencing more stress. A deeper examination with logistic regression revealed that lesser exposure to scams and bullying increased academic stress. However, the lack of fit in model 2 indicated no significant impact of online risk on academic performance. Model 3 showed that female students were over four times more likely to experience stress than males. Urban students also reported higher stress levels, independent of parental income or occupation. In model 4, gender, not online risk, influenced academic performance, with males more likely to achieve cum laude. No other demographic factors significantly affected performance. Model 5 reinforced the significant positive effect of gender on performance, with males again more likely to excel academically. The researchers propose that mental resilience may vary based on individuals' experiences with online risk. This study suggests new avenues for research into the complex interplay between online risk, stress, academic outcomes, and demographic factors. The insights call for more focused strategies to support students' mental well-being and academic success amidst online challenges.

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