PARAMETER
JURNAL MATEMATIKA, STATISTIKA DAN TERAPANNYA

e-ISSN. 2829-6303
Vol 04 No 1, April 2025
Page 111-122

FACTORS THAT INFLUENCE STUDENT STRES LEVELS IN COMPLETING THESIS USING ORDINAL LOGISTIC REGRESSION

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Abstract

Environmental pressure that exceeds a person's capacity can cause stress. Writing a thesis at UINSU causes varying levels of stress. However, stress that cannot be determined will improve student performance. This study investigates the factors influencing the stress levels of thesis students at the State Islamic University of North Sumatra (UINSU) using ordinal logistic regression. The findings reveal that self-mootivation significantly increases stress levels by 2.6 times compared to students who do not consistently motivate themselves. The study provides insights intro how students can manage academic stress effectively .

Keywords: *ordinal logistic regression, stress, college students*

: https://doi.org/10.30598/parameterv4i1pp111-122

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1. INTRODUCTION

Stress is a psychological state that arises in response to pressures or demands from the environment that are perceived to exceed the individual's ability to cope with them. For students, stress is often unavoidable, especially when they are preparing their final project, namely a thesis as one of the graduation conditions in higher education, which is a source of stress for many students. The causes of stress for students can be seen back in their academic life, especially externally and internally. Stressors can also come from individuals, such as self-esteem and self-concept. This depends on how each person analyzes and interprets certain events.

Eustress refers to positively charged stress and distressed refers to negatively charged stress. However, stress is not always negative because it can encourage people to think more positively **[1].** According to researchers, stress can be understood in several different ways, such as triggers, responses, and processes that relieve stress and tension. Some types of stress that cannot be explained include physical, psychological, and social stress. Vomiting, headache, decreased appetite, cold sweats, heart palpitations, and including physical symptoms **[2].**

At the State Islamic University of North Sumatra (UINSU), the level of stress experienced by students when compiling their thesis is also different. The stress experienced by students may have several different levels. However, the undetermined level of stress will make the student's work more effective. In this situation, they argue that the task assigned are not difficult and also simple **[3]**. Some of the factors that affect stress in students include difficulties in managing finances, changes in daily life, difficulties in adjusting to personal life, and difficulties in academic life.

The pressure that comes from the expectations of parents and institutions often creates a fear of failure, which can reduce confidence and self-esteem, so it becomes one of the triggers of stress. Students who are working on their final thesis are in a situation that is vulnerable to such pressure. In a university setting, a thesis or final project is a course with a weight of six credits. One or two instructors will supervise each student as they complete their final project. Students usually face a number of requirements when working on their final project, which serves to motivate and stress them in order to complete the assignment within the specified semester. An unhealthy relationship between students and their lecturers is one of the things that can increase student stress levels **[4].** On the other hand, the difficulties of final students in doing their final assignments are partly due to a lack of motivation to study and, more specifically, to a lack of desire to carry out family responsibilities **[5]**. The results are in line with the statement of Subramani & Venkatachalam (2019) that the pressure and impact on student achievement can increase if they are unable to meet the expectations of their parents **[6].** Moreover, there is no difference at all between the stressors that men and women face as students **[7]**.

Logistic regression is a possible analytical approach to explain the factors that affect students' stress levels. One statistical technique applied when the dependent variables are categorical sequentially, rordinal logistic regression divides stress levels into three groups: low, medium, and high. Using ordinal logistic regression, we were able to identify each factor based on how significant their influence was on students' stress levels. To further clarify the relationship between these variables, ordinal logistic regression can be used.

Stress, particularly during thesis writing , can either be motivating (eustress) or debilitating (distress), depending on the individual’s coping mechanisms. While some level of stress can enhance performance, excessive strress can hinder progress. This study

aims to indentify the key stressors faced by thesis students at UINSU and analyze their impact using ordinal logistic regression.

2. RESEARCH METHODS

2.1. Types of Research

This study employs ordinal logistic regression to analyze the relationship between independent variables (e.g., self-motivation, financial support) and the dependent variable, which is student stress level, categorized as low, medium, and high.

2.2. Data Collection

The data was unified through the distribution of questionnaires to S1 program students at the State Islamic University of North Sumatra batch of the 2021 Northern Force. This study analyzed six variables, namely: Stress Level, Understanding Methods, Telling Theories, Finding Literature, Self-Motivation, Income in Meeting Supervisors, and Limited Funds. [8]. The following is a description table of each variable used, namely in **Table 1**:

Table 1. Independent and Dependent Variables

Variable	Description	Category	Variable measurement scale
Y	Stress Levels	1 = Light 2 = Medium 3 = Weight	Ordinal
X1	Understanding Methods	0 = lack of understanding 1 = understand	Nominal
X2	Developing theory	0 = Confused 1 = Not Confused	Nominal
X3	Finding Literature/References	0 = Difficulty 1 = No difficulty	Nominal
X4	Self-Motivation	0 = Always 1 = No	Nominal
X5	Supervisors Difficult to Find	0 = Difficult 1 = Not Difficult	Nominal
X6	Funding Limitations	0 = Yes 1 = No	Nominal

This study used 15 statements and 6 questions to determine the level of student stress and the variables that affect thesis writing. One way to measure students' stress levels is to count the number of problems they face. They are made up of physical, emotional, intellectual, and interpersonal, and are the four signs of stress in **Table 2**:

Table 2. Signs of Stres

Signs	Statement
Physical	I feel my nerves tense in my neck and shoulders
	I feel tired quickly or lose energy
	I often feel headaches and dizziness when working on my thesis
	I couldn't sleep regularly, had insomnia, and woke up too early
Emotional	I often feel restless/anxious
	I feel depressed and hopeless when I think about my thesis
	I get angry easily and like to find fault with others
	I feel easily offended if someone asks me about the progress of my thesis
Intellectual property	I find it difficult to concentrate on my thesis
	Productivity in learning decreases
	My mind gets messed up when I think about the thesis
	I feel confused in looking for book references
Interpersonal	Taking an attitude that is too fortified and defensive
	It is easy to cancel an appointment if there is a friend who invites you to cooperate in working on your thesis
	Likes to silence others if someone discusses their thesis

Information:
Y = Stress Level
0 – 5 = Light (1)
6 – 10 = Medium (2)
11 – 15 = Weight (3)

2.3. Analysis Methods

2.3.1 Ordinal Logistic Regression

The cumulative logit model is used in ordinal regression. This model analyzes the ordinal value of Y over time. The cumulative logit model compares the probability of a response category. The cumulative probability is the greater probability of the j-answer category on the p-predictor variable in the x vector, and the chance of less than or equal to the j response category $P(Y > j \mid \mathbf{x})$ [10].

The common ordinal logistic regression equations are as follows.

$$P(Y \le j \mid \mathbf{x}) = \frac{\exp\left(\alpha_j + \sum_{k=1}^{p} \beta_k x_k\right)}{1 + \exp\left(\alpha_j + \sum_{k=1}^{p} \beta_k x_k\right)}$$

If j = 1, 2, 3, ..., j is the **response** group.

Logit transform from is used to assess regression parameters. $P(Y > j \mid \mathbf{x})$

$$Logit\ P(Y \le j \mid \mathbf{x}) = g_j(x) = \log\left(\frac{P(Y \le j \mid x)}{P(Y > j \mid x)}\right)$$
$$= \log\left(\frac{P(Y \le j \mid x)}{1 - P(Y \le j \mid x)}\right)$$
$$= \alpha_j + \sum_{k=1}^{p} \beta_k x_k$$

Where β_k Each ordinal regression model is the same for each k = 1, 2, 3,....., p. For example, if j = 1, 2, and 3, then the logit model is as follows.

$$Logit\ P(Y \le 1 \mid \mathbf{x}) = g_1(x) = \log\left(\frac{P(Y \le 1 \mid x)}{P(Y > 1 \mid x)}\right)$$
$$= \alpha_1 + \sum_{k=1}^{p} \beta_k x_k$$
$$Logit\ P(Y \le 2 \mid \mathbf{x}) = g_2(x) = \log\left(\frac{P(Y \le 2 \mid x)}{P(Y > 2 \mid x)}\right)$$
$$= \alpha_2 + \sum_{k=1}^{p} \beta_k x_k$$

After obtaining the logistics model, the following equation will describe the cumulative odds for the j response.

$$P(Y \le 1 \mid \mathbf{x}) = \frac{\exp\left(\alpha_1 + \sum_{k=1}^{p} \beta_k x_k\right)}{1 + \exp\left(\alpha_1 + \sum_{k=1}^{p} \beta_k x_k\right)}$$
$$P(Y \le 2 \mid \mathbf{x}) = \frac{\exp\left(\alpha_2 + \sum_{k=1}^{p} \beta_k x_k\right)}{1 + \exp\left(\alpha_2 + \sum_{k=1}^{p} \beta_k x_k\right)}$$

2.3.2 Model Parameter Assessment

The parameters of the logistic regression model are measured through the estimation value obtained by the Maximum Likelihood Estimator μετηοδ β, with the aim of maximizing the likelihood function**.**

2.3.3 Test Parameter Significance

After obtaining the model estimation parameters, the next step is to test the significance of the parameters. To understand the predictors of variable contribution in the model as a whole, the significance analysis of model parameters is performed collectively through a likelihood ratio test, also known as comparative likelihood. The G-test makes use of statistics to make comparisons between the complete model, which includes the predictor

variable, as well as the model consisting only of constants, i.e. the model without the predictor variable. [11].

$$G = -2\ln\left[\frac{likelihood\left(\text{model } B\right)}{likelihood\left(\text{model A}\right)}\right]$$

While model A contains all the necessary components, including the predictor variables, model B consists only of constants. This is a theory that is proposed based on the equation given above.

$$H_0 : \beta_1 = \beta_2 = ... = \beta_p = 0 \text{ and}$$
$$H_1 : \text{At least there is one } \beta_p \neq 0, = 1, 2, ... p$$

2.3.4 Model Conformance Testing (Goodness of Fit)

The extent to which the model is created according to the data is the goal of this test [12]. *Goodness of Fit* is tested using the statistics of *Deviance,* where the value of the *Deviance* statistic follows the distribution X^2 with n-p degrees of freedom. Kdecision is taken by refusing H_0 if $D_{\text{count}} > X^2_{a(n-p)}$.

2.3.5 Partial Testing

The existence of one particular parameter is tested by the Wald test [13]. The parameter estimation section with the standard estimation error is used to calculate the Wald test statistics. To perform partial testing of the significance of the parameters, the Wald Test can be used. The Wald test is used to ascertain the benefits and significance of the predictor variables to be included in the model.

Proposed hypothesis:

$H_0 : \beta_k = 0$

$H_0 : \beta_k \neq 0, k = 1, 2, ..., p; p =$ number of predictors in the model

Test W $= \dfrac{\beta_k}{SE(\beta_k)}$

Where $SE(\beta_k)$ is the default error from beta.

Test Criteria:

Reject H_0 if $W^2 > X^2_{(a,p)}$ or p-value $< a$ [14].

2.3.6 Model Interpretation

After the logistic regression model is tested and shows good and significant results, the interpretation of the data can be done through the odds ratio test. The chance ratio measures the probability of an outcome in response to an increase of one unit in the predictor variable. The value of the odds ratio can also be called $e^{(predictor\ coefficient)}$ [15].

Properties of odds ratio: s

1. OR = 1 means that both groups have the same chance of occurrence.
2. OR > 1 implies that the first group has a higher chance of an event occurring than the second group.

3. OR < 1 showed a lower chance of occurrence in the first group compared to the second group.
4. The opportunity ratio should be zero or greater.
5. The chance ratio will be close to 0 if the chance of the first group occurrence is close to zero.
6. The chance ratio will be close to infinitely positive if the probability of the second group event is close to zero.

3. RESULTS AND DISCUSSION

3.1 Data Explanation

This research involved 100 respondents from seven faculties, namely 12 people from the Faculty of Da'wah and Communication, 3 people from the Faculty of Ushuluddin and Islamic Studies, 2 people from the Faculty of Sharia and Law, 7 people from the Faculty of Social Sciences, 14 people from the Faculty of Tarbiyah and Teacher Training, 7 people from the Faculty of Economics and Business, and 55 people from the Faculty of Science and Technology.

One Da'wah and Communication teaching staff experienced mild stress. Four Social Sciences teaching staff experienced moderate stress, and three experienced severe stress. In the Faculty of Tarbiyah and Teacher Training, one person experienced mild stress, six people moderately, and seven people were severe. In the Faculty of Economics and Business, one person experiences mild stress, three people moderately, and three people are severe. At the Faculty of Science and Technology, 8 people experienced mild stress, 22 people moderately, and 25 people were severe. These findings show mild stress in the Faculty of Da'wah and Communication and Social Sciences. The Department of Science and Technology, the Faculty of Tarbiyah and Teacher Training, and the Faculty of Ushuluddin and Islamic Studies are also experiencing stress.

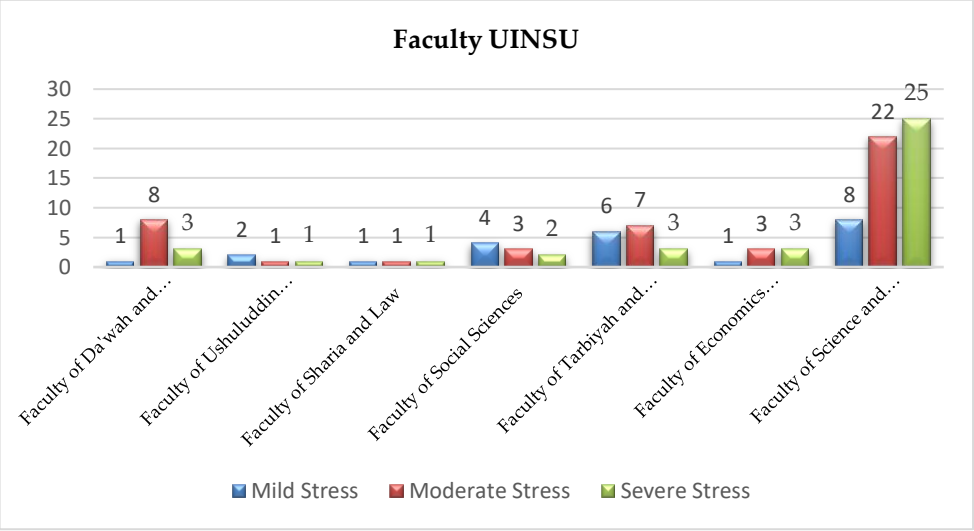

Figure 1. Faculty Diagram on Respondents' Stress Levels

Figure 1. Provides a breakdown of stress levels across faculties, revealing that the Faculty of Da'wah and Communication experienced lower levels of stress compared to the Faculty of Science and Technology, which showed higher stress levels. The survey collected primary data from 100 undergraduate students at UINSU who were in the process of

completing their thesis in 2021. The questionnaire included 15 statements related to stress and 6 questions that assessed factors influencing stress levels.

3.2 Initial Assumption Test

Multicollinearity tests are used to meet the requirements. Finding correlations between the predictor variables is at the heart of this analysis, as shown in the **Table 3**. Here are the hypotheses proposed:

H_0: The predictor variable shows multicollinearity (VIF > 10).

H_1: The predictor variable does not show multicolinarity (VIF ≤ 10)

Table 3. Results of the Multicollinearity Test

Model	VIF
(constan)	
X_1	1.068
X_2	1.075
X_3	1.062
X_4	1.051
X_5	1.054
X_6	1.064

Based on the results that have been taken into account in **Table 3**. Above that the results of the criteria that have been determined meet the calculation of multicollinearity between variables, i.e. VIF value ≤ 10, then multicollinearity is minus H_0 and accepted H_1. It can be concluded that there is no multicollinearity.

3.3 Regression Model

The most likely method is used for parameter estimation. The following table displays the results of parameter estimates. **Table 4**:

Table 4. Estimation of Regression Parameters

	Estimate
$[y=1]$	-1.587
$[y=2]$	0.878
$[x_1=0]$	-0.158
$[x_1=1]$	0[a]
$[x_2=0]$	-0.455
$[x_2=1]$	0[a]
$[x_3=0]$	0.558
$[x_3=1]$	0[a]
$[x_4=0]$	1.161
$[x_4=1]$	0[a]
$[x_5=0]$	0.583
$[x_5=1]$	0[a]

	Estimate
$[x_6 = 0]$	-0.619
$[x_6 = 1]$	0[a]

The initial model of the resulting ordinal logistic regression is:

$$P(Y \le 1 \mid X) = p_1 = \frac{e^{(-1.587 - 0.158_{x1} + -0.455_{x2} + 0.558_{x3} + 1.161_{x4} + 0.583_{x5} - 0.619_{x6})}}{1 + e^{(-1.587 - 0.158_{x1} + -0.455_{x2} + 0.558_{x3} + 1.161_{x4} + 0.583_{x5} - 0.619_{x6})}}$$

$$P(Y \le 2 \mid X) = p_2 = \frac{e^{(0.878 - 0.158_{x1} + -0.455_{x2} + 0.558_{x3} + 1.161_{x4} + 0.583_{x5} - 0.619_{x6})}}{1 + e^{(0.878 - 0.158_{x1} + -0.455_{x2} + 0.558_{x3} + 1.161_{x4} + 0.583_{x5} - 0.619_{x6})}}$$

3.4 Parameter Significance Experiment

The probability ratio test, also called the statistical test G, is carried out in conjunction with the paramete significance test. As a result, the results of the parameter significance test are shown in the table.**Table 5**.

Table 5. Significance Test Results

Model	Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	138.514	12.895	6	0.045
Final	125.618			

The hypothesis tested is H_0 : No independent variable affects the model and H_1: There is at least one independent variable that affects the model. Model B (without the predictor variable) has a probability of -2 ln of 138.514 and model A has 125.618. The chi-squared distribution table yields X2(0.05.6) = 12.6 at a = 0.05. The statistical values of G( ) > X2(0.05.6)(12.6) indicate that independent variables affect the model.

The significance test of the predictor parameters was carried out separately using the Wald test. The results of the Wald test can be seen in the following table: **Table6**:

Table 6. Wald Testing

	Estimate	Wald	df	Sig.
$[x_1 = 0]$	-0.158	0.252	1	0.696
$[x_1 = 1]$	0[a]		0	
$[x_2 = 0]$	-0.455	1.165	1	0.280
$[x_2 = 1]$	0[a]		0	
$[x_3 = 0]$	0.558	1.735	1	0.188
$[x_3 = 1]$	0[a]		0	
$[x_4 = 0]$	1.161	7.397	1	0.007
$[x_4 = 1]$	0[a]		0	
$[x_5 = 0]$	0.583	2.037	1	0.153
$[x_5 = 1]$	0[a]		0	

	Estimate	Wald	df	Sig.
$[x_6 = 0]$	-0.619	2.253	1	0.133
$[x_6 = 1]$	0[a]		0	

The test results are shown in **Table 6** above, which states that the variable only X_4 has a big impact on the stress level of students of the State Islamic University of North Sumatra who complete the thesis because the variable has a significant value < *a*(0.05) or minus H_0 if $Z^2 > X^2_{(a,1)}$ (3.48). The cumulative logit model used in this study evaluates the odds of being in a higher stress category (e.g., medium vs low, high vs medium). The model shows that for each unit increase in self-motivation, the odds of being in a higher stress category increase by a factor of 2.6. The test results of the parameters are shown in **Table 7**:

Table 7. Significant retest

	Estimate	Wald	Df	Sig
$[y = 1]$	-1.468	15.734	1	<0.001
$[Y = 2]$	0.868	6.641	1	0.10
$[x_4 = 0]$	0.966	0.406	1	0.017
$[x_4 = 1]$	0[a]		0	

See **Table 7** a newordinal logistic regression model:

$$P(Y \le 1 \mid X) = p_1 = \frac{e^{(-1.468+0.966_{x4})}}{1+e^{(-1.468+0.966_{x4})}}$$

$$P(Y \le 2 \mid X) = p_2 = \frac{e^{(0.868+0.966_{x4})}}{1+e^{(0.868+0.966_{x4})}}$$

3.5 Model Fit Testing (*Goodness Of Fit*)

Model fit is tested by the deviation method, which can be seen in **Table 8**:

Table 8. Deviation Test Results

	Chi-Square	Df	Sig
Deviance	0.004	1	0.950

It is known that the *chie square* value of *the Deviance* method is 0.004. The criteria for this test is H_0 accepted if $D > X^2_{(0.05;\,6)}$=3.8 or if the significance value is greater than 0.05. Therefore, if the significance value is less than 0.05, H_0 is rejected, which means that the resulting logit model cannot be used.

3.6 Model Interpretation

If the findings of the ordinal logistic regression model are significant, then the data can be interpreted using the opportunity ratio test.

Table 9. Odds Ratio Variable Predictor

Peubah	Koefisien	*OR*
(X4)	0.966	2.6

According to the Odds Ratio value shown in **Table 9**., the interpretation is carried out on each predictor variable. According to the results, students who are always self-motivated usually experience a stress level of 2.6 compared to students who are not always self-motivated.

4. CONCLUSION

This study highlights self-motivation as a significant factor influencing stress levels during thesis completion. Institutions could consider offering more structured support to help students manage stress, particularly by fostering self-motivation. Future studies should explore other potential stressors, such as workload and time management. In addition, the results of the Wald test show that factor X4 (always motivating) has a great influence on the stress level of UINSU students. For example, an ordinal logistic regression model is created:

$$P(Y \leq 1 \mid X) = p_1 = \frac{e^{(-1.468+0.966_{x4})}}{1+e^{(-1.468+0.966_{x4})}}$$

$$P(Y \leq 2 \mid X) = p_2 = \frac{e^{(0.868+0.966_{x4})}}{1+e^{(0.868+0.966_{x4})}}$$

ACKNOWLEDGMENTS

The success of this research depends on the support of various parties. The author would like to thank Rima Aprillia, M.Si., the supervisor, for her input and assistance during the writing. The author also thanked all parties who had contributed data and references for this research. Hopefully this journal will be useful for readers and advance related science.

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