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Ordinal Logistic Modeling in the Case of Academic Anxiety: The Dominance of Time Management Factors in Final-Level Students

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Abstract: Academic anxiety is a psychological barrier often experienced by final-year students during their thesis creation. This study aims to construct and evaluate a mathematical model using the Ordinal Logistic Regression approach to predict the probability of student anxiety levels based on four predictor factors: thesis advisor support (X_1), time management (X_2), moral support (X_3), and environmental factors (X_4). Data were obtained from 115 final-year student respondents whose anxiety was measured through the Anxiety subscale of the DASS-21 instrument transformed into an ordinal scale. The parameter estimation results show that the mathematical model of the cumulative logit function fits the empirical data ($p>0.05$). Partially, only the time management variable (X_2) has a significant inverse effect on anxiety ($0.002>0.05$) with an Odds Ratio value of 0.488. These findings conclude that internal intervention through time management regulation algebraically reduces the probability of severe anxiety by 51.2% in final-year students.

Keywords: Academic Anxiety; Cumulative logit model; DASS-21; Odds Ratio.

Introduction

Drafting phase task end is one of the period critical in cycle academic college demanding height independence think cognitive and resilience regulations emotions (Adeoye-Agboola, 2015). Pressure For finish research, facing revision and management deadline time often triggers phenomenon psychological in the form of anxiety academic (academic anxiety) (Luo et al., 2025). Although anxiety is variables psychological, mapping and prediction to level severity disturbance This can approached through modeling stochastics and mathematics applied For find pattern behavior based on empirical data (Asogwa et al., 2015).

A number of study previously generally analyze anxiety student use analysis descriptive percentage or a simple linear correlation test (Mayawi et al., 2023). However, the linear approach is considered not enough accurate Because variables level anxiety people in the field nature categorical multilevel (ordinal scale) (French et al., 2022). The use of ordinary linear regression models on ordinal data violates assumptions continuity and homoscedasticity, so that produce biased parameter estimates (Lewis-Beck et al., 2012). Therefore that, is necessary non-linear approach in the form of Ordinal Logistic Regression with function logit link function (Nisa, 2026).

Research Gap (gap) research) in studies This lies in the lack of modeling mathematics that integrates external stimuli (support) lecturers, moral support, environment) with internal capabilities (management time) in simultaneous in One system cumulative logit equation in students clump science (Tiarawati et al., 2025). Research This aim For construct function cumulative logit mathematics from data from 115 students level end, test feasibility of the model in general algebra, and count magnitude risk (Odds Ratio) of each factor determinant anxiety the (Sari et al., 2022).

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Literature Review/ Theoretical Basis

Ordinal Logistic Regression Model

Regression ordinal logistics is a mathematical model statistics used For analyze connection between One variables dependent ordinal scale that has $k = 5$ categories with one or more independent variables (Albulescu et al., 2023). This model is based on cumulative probability $P(Y \leq j)$, namely the probability of the response variable being in or below the category $-(j)$ (Atinafu et al., 2023). The general formula for the cumulative logit function is formulated as follows (Triswiandi et al., 2026):

$$logit\,[P(Y \leq j)] = ln\left(\frac{P(Y \leq j)}{1 - P(Y \leq j)}\right) = \propto_j - (\beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k) \quad (1)$$

Where $j = 1,2,\ldots,k - 1$ states the category index;$\propto_j$ is constant *threshold* (threshold) for category to $-j$; β is a vector of regression coefficients; and X is a vector variables free (Chen et al., 2022).

Parallelism and Odds Ratio Test

Fundamental assumptions in the cumulative logit model is parallel line assumption (proportional odds assumption) (Edlinger et al., 2022). This state that effect variables independent β is constant/identical at each level of the cumulative logit function (Główka, 2014). The likelihood ratio or Odds Ratio (OR) is calculated through transformation exponential mark coefficient regression (Mensah et al., 2023).

$$OR = e^{\beta} \quad (2)$$

If the value $OR > 1$, the predictor variable increases the chance of a higher category occurring. If$OR < 1$ happen inverse effect (reduction opportunity) (Cronbach, 1951; et al., 2020).

Method

Research Design

Study This use design quantitative analytic based modeling mathematics with approach cross-sectional (Jeong et al., 2022). Research sample A total of 115 respondents were drawn from population student level end (Campbell, 2024; Lewis-Beck et al., 2012).

Population and Sample

Research sample is student level the middle end go through task end or thesis totaling 115 respondents, considering group This prone to pressure psychological (Cronbach, 1951). Taking sample done through questionnaire structured distributed online (Hair et al., 2019).

Instruments and Variables Study

Data collected using two parts instruments: (a) Dependent Variables (Y): Anxiety level students who were measured past 7 grains using standard instrument DASS-21 (Depression Anxiety Stress Scales) (Atinafu et al., 2023). The total instrument score is multiplied by two and categories ordinals into five ordinal levels (1= Normal, 2= Mild, 3= Moderate, 4= Severe, 5=Very Severe). (b) Independent Variables (X): Support from Supervisor (X1), Time Management (X2), Moral Support (X3), Environment (X4), This variable is measured using a Likert scale. (1 = Very Bad, 2 = not good, 3 = quite good, 4 = good 5 = very good).

Quality Test Instrument Study

For ensure accuracy and consistency of data before done modeling cumulative logit mathematics, performed testing quality of questionnaire instrument variables independent (X_1, X_2, X_3, X_4) and dependent (Y) which consist from the validity test and reliability test of the questionnaire data (Dauba, 2024).

Validity test grains question counted use method correlation Pearson Product Moment with compare mark coefficient correlation (r_{count}) to at the level significance $\propto = 0.05$. The Pearson correlation coefficient formula is formulated mathematically as follows (Adeoye-Agboola, 2015):

$$r_{xy} = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}} \quad (3)$$

Variables bound level anxiety (Y) measured using the multi-item subscales of the DASS-21 of 7 grains question (Y1 to Y7) (Allam, 2026; Zanin, 2022). The validity test for this variable was evaluated internally using the Pearson Product Moment correlation method. with correlate score each grains question to variables sum special total score Y (total score Y validity). The question item is declared valid if it fulfills the criteria mark significance statistics $p<0.05$.

Temporary that, variable free covering Supervisor Support X_1, Time Management X_2, Moral Support X_3, and Environmental Factors $X_4$are measured where each variable is operationalized use indicator scale single - item scale based scale Likert. In terms of methodological statistics, testing validity internal construct using correlation Pearson Product Moment total combined No applicable (inapplicable) for single indicators Because No own variance inter -item variance for correlated (Islam et al., 2022)

Therefore that, validation to variables X_1 to X_4 be based on face validity (validity) appearance) and content validity (validity) content) in axiomatic, considering grains instrument single the has constructed in a way explicit For represent all operational domains from each

variable without the presence of attenuation bias (Gambarota et al., 2024). Validity This reinforced by facts mathematical that indicator single own efficient parameter estimation and minimization saturation respondent fatigue in modeling non- parametric logistics (Seretew et al., 2024; Zakaria, 2022).

Reliability test in study this implemented for measure internal consistency of the entire integrated instrument system that forms the mathematical model use coefficient Cronbach's Alpha r_{11}. An instrument is declared reliable if it has a value of $r_{11} > 0{,}60$. The mathematical formulation of Cronbach's Alpha is:

$$r_{11} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum {\sigma^2}_b}{{\sigma^2}_t}\right) \quad (4)$$

Where k is the number of questions, $\sum {\sigma^2}_b$ representing the amount of variance score grains, and ${\sigma^2}_t$ symbolizes total variance.

Stages Functional data analysis carried out in the SPSS program includes (Alrumaidhi et al., 2022): (a) Calculating total score and formation variables ordinal Y categories. (b) Do parameter estimation using method Maximum Likelihood Estimation (MLE) via the Ordinal Regression menu (Berhanu et al., 2023). (c) Evaluating eligibility parameters function via Pearson's Goodness-of-Fit test and assumption test parallelity (Test of Parallel Lines).

Result and Discussion

Validity and Reliability Test Results Instrument

Testing quality instrument was carried out against real data from 115 student respondents at end level. Based on the distribution table rtable Pearson for n=115 in level significance of 5%, obtained critical limit value rtable = 0.183, and (rcount) range between 0.672 to 0.905.

Table 1. Validity Test Instrument ($n = 115$)

Item	r_{couunt}	R_{table}	Sig.(p)	Description
Question (Y1)	0.672	0.183	0.000	Valid
Question (Y2)	0.770	0.183	0.000	Valid
Question (Y3)	0.881	0.183	0.000	Valid
Question (Y4)	0.905	0.183	0.000	Valid
Question (Y5)	0.837	0.183	0.000	Valid
Question (Y6)	0.830	0.183	0.000	Valid
Question (Y7)	0.865	0.183	0.000	Valid

Test results validity for the dependent variable (Y) using SPSS software shows that seventh grains question from subscale DASS-21 (Y1 to Y7) anxiety produce coefficient correlation rcount > rtable, 0.672 to 0.905 > 0.183. Inter- variable proof This is strengthened with see mark significance (sig.(2-tailed)) as big as 0.000, Where the value sig 0.000 < 0.05. Based on these parameters, all measurement instrument items independent variables are stated valid and have high construction accuracy. For use in analysis more carry on (Bekelcho et al., 2023; Leem, 2023).

Next, the results evaluation to internal consistency of the instrument through coefficient Cronbach's Alpha summarized in the following table:

Table 2. Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.719	11

Based on data visualization in Table 2, range coefficient valuable correlation positive strong signify accuracy high construction For used in analysis stage Next. Next, testing to internal consistency of the instrument through function statistics produce coefficient Cronbach's Alpha combination of 0.719 (Fullerton et al., 2023). The coefficient value the proven exceeding the minimum critical limits of the review $0{,}719 > 0.60$, justifying that the regression modeling system Ordinal logistics states that the data used is valid and reliable (Ocak et al., 2013).

Testing Eligibility Mathematical Model Function

Based on visualization sheet SPSS software output for 115 sample data, obtained metric model testing as following. (a) Assumption Test: Test of Parallel Lines Table produce mark significance $p > 0.05$, which means the null hypothesis is accepted. This is prove vector coefficient direction (β) is identical in each logit model formation (Lelisho, Merera, et al., 2022). (b) Goodness - of-Fit Test: Pearson's statistic shows mark p>0,05, this indicates that the constructed mathematical model is fit and adaptive to the distribution of real data in the field.

Construction System Equality Cumulative Logic Mathematics

Based on mark component Threshold (∝) and Location (β) obtained from the SPSS Parameter Estimates table, summary mark presented in the table 3 (Triswiandi et al., 2026).

Table 3. Construction System Equality Cumulative Logic Mathematics

Variables/ Parameters	Estimate Coefficient(∝)	Significance ($p - value$)	Odds Ratio(e^{β})
Threshold(∝)			
Threshold($Y = 1$)	-5.759	0.000	-
Threshold($Y = 2$)	-5.119	0.001	-

Variables/ Parameters	Estimate Coefficient($\propto$)	Significance ($p-value$)	Odds Ratio(e^{β})
Threshold($Y=3$)	-4.053	0.010	-
Threshold($Y=4$)	-3.630	0.020	-

With substitute the above parameter values, the system equality mathematics cumulative logit function formed is (Halat et al., 2023):

$$ln\left(\frac{P(Y\leq 1)}{1-P(Y\leq 1)}\right) = -5{,}759 - (0{,}024X_1 - 0{,}718X_2 - 0{,}258X_3 - 0{,}123X_4)$$

$$ln\left(\frac{P(Y\leq 2)}{1-P(Y\leq 1)}\right) = -5{,}119 - (0{,}024X_1 - 0{,}718X_2 - 0{,}258X_3 - 0{,}123X_4)$$

$$ln\left(\frac{P(Y\leq 3)}{1-P(Y\leq 1)}\right) = -4{,}053 - (0{,}024X_1 - 0{,}718X_2 - 0{,}258X_3 - 0{,}123X_4)$$

$$ln\left(\frac{P(Y\leq 4)}{1-P(Y\leq 1)}\right) = -3{,}630 - (0{,}024X_1 - 0{,}718X_2 - 0{,}258X_3 - 0{,}123X_4)$$

Discussion

Analysis structural to parameter values indicate findings empirical mathematics. Variables time (X_2) Management is the only one predictor dominant which is proven to have a significant partial influence on fluctuations in the level of anxiety students, with mark statistics $p = 0.002 < 0.05$.

In a way algebra, value coefficient location management time worth negative ($\beta_2 = -0{,}718$) . Through the exponential operation of natural numbers, the Odds Ratio (OR) value is obtained as ($e^{-0{,}718} = 0{,}488$). An OR value below 1 confirms a strong inverse relationship (Tutz, 2022). The mathematical interpretation states that for every one-unit increase in a student's time management score, their tendency to shift to a higher level of anxiety will be reduced by 0,488only a factor of (Lelisho, Wogi, et al., 2022), with management structured time own internal protection capable of pressing risk experience anxiety critical as big as 1-0.488 =0.512 or 512% more low compared to students who have poor time management.

On the other hand, the parameters for variables Supervisor Support ($X_1, p = 0.929$) Moral Support ($X_2, p = 0.250$), and Environmental Factors ($X_4, p = 0.506$) produce mark significance far above alpha 5% ($p > 0{,}05$) threshold (Tiarawati et al., 2025). In mathematical statistical modeling, these three external interpersonal variables do not contribute to a significant change in probability in this cumulative logit model (Nisa, 2026). This result shows a logical implication that in context student level Finally, the internal control stimulus is in the form of self-regulation in organize time guidance and implementation script Far more determine stability psychological they compared to external stimuli from environment surrounding area (Sari et al., 2022).

Table 4. Logistic Regression Analysis Results

Location	Estimate Coefficient(β)	Significance ($p-value$)	Odds Ratio(e^{β})
(X_1)(Lecturer Support)	0.024	0.929	1.024
(X_2)(Time Management)	-0.718	0.002	0.488
(X_3) (Moral Support)	-0.258	0.250	0.773
(X_4)(Environment)	-0.123	0.506	0.884

Conclusion

Mathematical model regression ordinal logistics based cumulative logit function has succeed constructed valid and fit for predict probability level anxiety 115 final year students. Parameter evaluation mathematically proves that time management (X_2)is the single dominant and significant determining factor in mitigating the escalation of respondents' academic anxiety with an opportunity reduction effectiveness of 51.2%.

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