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Analysis of Academic Stress Factors and Their Impact on Academic Achievement of Mathematics Education Students

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Abstract. *Changes in the learning system and high academic demands put pressure on first- and second-year bachelor's mathematics education students and, therefore, can affect students' academic achievement. The purpose of this study was to examine academic stress factors and their impact on the educational achievement of mathematics education students in 80 respondents using a descriptive quantitative approach. This study discusses adolescent academic stress factors and covers students' physical and psychological well-being. The data obtained were analyzed using factor analysis. Exploratory factor analysis extracted 30 daily stress factors of students into three specific stress factors: stress on lecture material, environment, and time management. The results of this study indicate that students have moderate levels of stress. Then, Pearson analysis was conducted to see the correlation between stress factors and cumulative grade point average. The results showed that the three factors did not significantly correlate to grades with a correlation power below 0.5. This means that students can manage their academic stress well. Student stress management approaches can focus on each factor separately, depending on individual needs. Internal and external support, strengthening academic literacy, improving conducive learning environment facilities, relevant skills development programs, and strengthening social networks can help reduce student stress.*

Keywords*: academic performance, academic stress, mathematics*

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Introduction

Stress arises when internal and external pressures exceed an individual's coping ability. Internal stressors include physical, conflict, emotional, and behavioral conditions (Bhargava & Trivedi, 2018), while external factors involve the environment, family, economic, and legal issues (Iis et al., 2022). Anyone, including students, can experience stress. University students have a high risk of getting stressed from various stressors. Stress experienced by students at university is called academic stress (Roli, 2018). Stress in first-year university students is usually caused by the academic burden and differences from the school period, parental expectations, the resulting pressure, and peer conflicts (Cornwall et al., 2019). The study's results by Cornwall et al. (2019) indicate that early-level university students experience higher stress levels than final-year

students. Cornwall et al. (2019) noted first-year students experience more stress than final-year students due to the challenging adaptation phase to university.

The initial period of being a university student is the starting point for adjusting social relations, economic problems, and choosing academic majors. Problems that university students often experience are curriculum changes, changes in learning environmental conditions, learning climate, and various other factors that can cause student stress (Niemi, 2021). For example, stress in medical students includes normal stress at 43%, moderate at 23.4%, and high at 2.8% (Isnayanti & Harahap, 2018). Students majoring in science are generally more stressed than those in other majors. The differences in the characteristics of science and social science majors impact students' mental, physical, and emotional states (Aafreen et al., 2018). Stress can interfere with students' learning and memory and, as a result, has the potential to interfere with academic achievement (Tibus & Ledesma, 2021). The results of these studies show that students from various majors experience stress symptoms at varying levels, and these conditions interfere with their academic achievement.

For many students, mathematics is among the most challenging and anxiety-inducing subjects (Ukwuije & Eteng-Uket, 2024). Mathematics is a particularly challenging (Ukwuije & Eteng-Uket, 2024), requiring logical problem-solving and systematic understanding. Heavy workloads, exams, and assignments increase stress levels (Bedewy & Gabriel, 2015; Prihaswati & Rahmawati, 2014). Mathematics education students are not only trained to be experts in mathematics but are also expected to teach students in schools (Turmuzi & Kurniawan, 2021). Although their goal is to become educators, negative experiences with mathematics courses during their studies can affect their ability to teach effectively in the future (Bates et al., 2013; Dewanto, 2018; Itter & Meyers, 2017). Furthermore, their personal experiences with academic stress during their studies can influence their future teaching approach. By understanding the specific challenges students face in Indonesia, research on academic stress can produce more appropriate recommendations to improve the quality of education and reduce the negative impacts of academic stress.

Previous research is the primary reference in this study (García-Ros et al., 2018). Through the cross-validation method, the multifactorial structure of the academic stress questionnaire in secondary education produces four first-level factors: academic load, interaction with classmates, family pressure, and future-oriented perspective. Furthermore, the second-level factor of academic stress shows a significant and intense relationship with the psychological and physical well-being of adolescents. From the four previous studies, researchers are interested in looking at the academic stress factors of mathematics education students. From the study results (Effendi et al., 2021; Fatonah et al., 2017; Fukui, 2024), the stress level of mathematics education students

needs to be studied because it is the number one obstacle in achieving learning achievement. In addition, stress at the beginning of university will significantly impact the preparation of the thesis in the final semester.

The World Health Organization states that students should be healthy and emotionally safe to participate fully in education (Akman, 2020). A student who cannot manage academic stress well has substantial psychosocial and mental health implications (Pascoe et al., 2020). The Organization for Economic Co-operation and Development (OECD) survey reports that anxiety about schoolwork, homework, and exams harms students' academic performance in science, math, and reading (OECD, 2016). Meanwhile, Barbar et al. found that the most dominant stressors were academics and exams (Shaikh et al., 2004).

Yussop et al. (2019) conducted a study to analyze the causes of learning stress with 116 mathematics teachers through an online questionnaire based on a 4-point Likert scale. The study found five factors that cause academic stress: teachers' workload, the public's perspectives of a teacher, financial burden, students' behavior and performance, and managing workload stress. Furthermore, a previous study (Emamjomeh & Bahrami, 2015) studied academic stress in mathematics with 50 respondents of junior high school students on the third level.

Based on the information above, no study exists on the academic stress factors in bachelor students majoring in mathematics education. This study aims to identify academic stress factors and their impact on achievement in first- and second-year mathematics education students. The questions in this study are: (1) What factors influence the academic stress of first and second-year students in the Bachelor of Mathematics Education program? (2) How does academic stress affect the educational achievement of first and second-year Bachelor of Mathematics Education program students?

Method

This study employed a quantitative descriptive design. The population was bachelor the first and the second-year students in the mathematics study program (semesters 1 and 3) at four universities in Lampung Province, Indonesia. The next step was using a simple random-by-spin wheel (https://wheelofnames.com/), and we found 20 students. The research questionnaire was sent online to 20 respondents through several lecturers for each university. So, 80 respondents were obtained, consisting of 28.75% male students and 71.25% female students. The student responses expressed their level of stress in different academic situations on a Likert-type scale with five response options (1=”Very low” to 5=“Very high”). In addition, they also shared their grade point average (GPA) across all their major subjects to be used in determining the effect of academic stress on students' mathematics academic achievement. In this study, the instrument

(questionnaires) was built by adapting the Garcia-Ros, Perez-Gonzalez, and Tomas Academic Stress Questionnaire (QAS) (García-Ros et al., 2018). The instrument focused on adolescent academic stress factors and their relationship to students' physical and psychological well-being. The adaptation stage is carried out by modifying the questionnaire according to the objectives of the research to be carried out. The questionnaire was validated by distributing it online to 15 research students in their first and second years of mathematics. Furthermore, a list of questions was obtained that would be distributed to the research objects in general. There are 30 daily stress factors for students in an academic environment, as shown in Table 1.

Table 1. The component factor of academic stress

No.	Component
1	I took the math exam quietly.
2	I report the results of completing math assignments in front of the class well
3	I ask if there is a material that is not clear or give responses to other student's answers when in the discussion process
4	I consult with my academic supervisor or course lecturer when I have certain difficulties
5	I compete with my classmates to complete assignments on time and get better grades
6	I do well on assignments for professional courses (e.g., linear programming, real analysis, matrix algebra, group theory)
7	I am actively involved in discussions and work on assignments in groups in class when asked by the lecturer
8	I feel I have too many responsibilities to fulfill my every obligation in university
9	I got high marks in different subjects
10	I have a good academic point of view and a planned career path
11	I make sure that I pass all the prerequisite materials to take the course plans for the next semester
12	I get a scholarship or continue the scholarship program that I had in the previous year
13	I finished taking the full course from semesters 1-4
14	I have a problem or conflict with the lecturer
15	I have a problem or conflict with a classmate
16	I feel that the lecturers do not support me in understanding the material or other academic consultations
17	I once had a discussion with my family regarding my university and had a conflict regarding the discussion
18	My lecturer has conflicts with me regarding my assignments and behavior while in class
19	I did poorly on the exam
20	I get a scholarship or continue the scholarship program that I had in the previous year
21	I have too many exams and assignments to complete
22	I don't have time to complete university assignments or other student activities
23	I try to fulfill the schedule set by the lecturer on time
24	I can attend every class in the lecture
25	I get pressure from my family to have good grades
26	I always take part in activities related to academics and do the assigned tasks well
27	I have a good relationship with my classmates
28	I do good things in all subjects in mathematics education
29	I can create free time and make my academic tasks quite complete
30	My parents keep reminding me and following up on every assignment, campus activity, or grades I get

This study used factor analysis, the Kaiser-Meyer-Olkin (KMO) test, and Bartlett’s Test of Sphericity to analyze the instrument. The KMO test assessed the suitability of the data for factor analysis, while Bartlett's test evaluated variance equality across populations (Arsham & Lovric,

2011). Factor analysis aimed to reduce the number of stress factors shown in Table 1 and group them into new combined factors. Using the extraction method, factors were grouped based on their close relationships. Pearson correlation was then used to examine the relationship between factors and GPA due to its simplicity and widespread use in educational research.

Results and Discussion

The results of data calculations using factor and parallel analyses and factors generated through statistical tools are presented here.

Academic Stress Factors Among Students

The KMO test resulted in a value of 0.721. This value was in the range of 0.50 to 1.00. This means that the factor analysis stage was appropriate. Furthermore, the Bartletts Test of Sphecharity resulted in p<.05). The existing stress factors did not correlate in the population, so they can be reduced to a smaller group of factors. The calculation results are shown in Table 2.

Table 2. Measurement of KMO and Bartlett's test of sphericity

Kaiser-Meyer-Olkin (KMO)	0.721
Bartletts Test of Sphecharity	0.000
Chi-Square Approximation	1043.989
Df	435

The number of factors to be formed was determined by combining several criteria to get the number of factors that best fit the data. The decision to take the first number of factors was based on the eigenvalues. From the 30 stress factors (Table 1), it turned out that the extraction method resulted in nine factors having eigenvalues more than 1.0, as shown in Table 3. Overall, the nine factors formed can explain 68.95 % of the stress factors (30 stress factors).

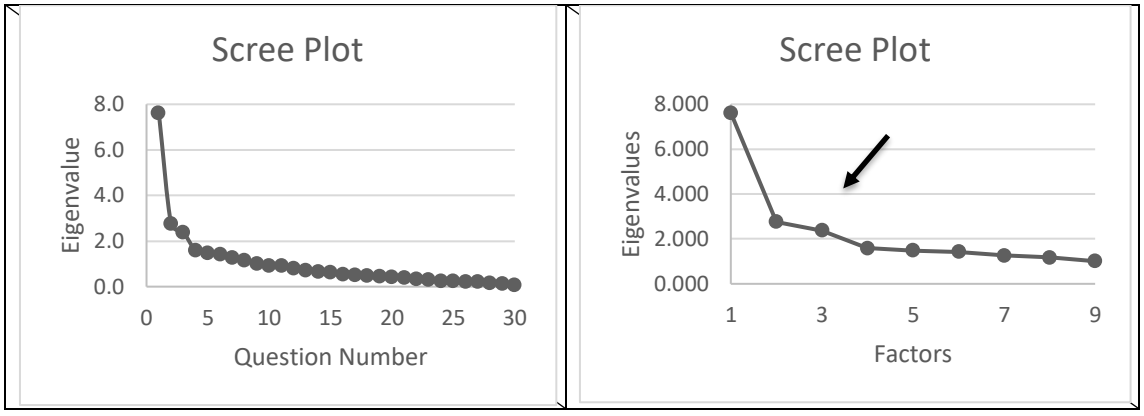
Table 3. Eigenvalues and variance

Question	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.621	25.402	25.402	7.621	25.402	25.402
2	2.761	9.204	34.606	2.761	9.204	34.606
3	2.374	7.914	42.520	2.374	7.914	42.520
4	1.589	5.298	47.818	1.589	5.298	47.818
5	1.486	4.954	52.773	1.486	4.954	52.773
6	1.422	4.741	57.514	1.422	4.741	57.514
7	1.258	4.193	61.706	1.258	4.193	61.706
8	1.166	3.886	65.593	1.166	3.886	65.593
9	1.007	3.357	68.949	1.007	3.357	68.949
10	.932	3.107	72.057			
11	.908	3.028	75.085			
12	.803	2.678	77.763			
13	.710	2.368	80.131			
14	.666	2.219	82.350			
15	.616	2.054	84.405			
16	.553	1.845	86.249			
17	.502	1.672	87.922			
18	.470	1.567	89.489			

Question	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
19	.456	1.519	91.008			
20	.416	1.388	92.396			
21	.382	1.272	93.668			
22	.329	1.097	94.765			
23	.304	1.012	95.777			
24	.257	.858	96.635			
25	.240	.801	97.436			
26	.221	.738	98.174			
27	.205	.683	98.856			
28	.148	.492	99.348			
29	.115	.384	99.733			
30	.080	.267	100.000			

Extraction Method: Principal Component Analysis

In addition, the scree plot in Figure 1(a) shows the plot eigenvalues against the 30 stress factors. The point at which the screen began to show the number of reduced factors was when the screen started to look flat. The scree point started to level off at the initial factor extraction at the ninth point. Figure 1(b) shows the scree plot of 9 stress factors.



(a) (b)

Figure 1. Scree plot results: (a) all indicators, and (b) 9 factors

Furthermore, because the number of factors produced was still significant and the scree plot showed a gap with the eigenvalues (see Figure 1(b)), a parallel analysis was carried out to strengthen the scree plot and obtain fewer factors. The results of the parallel analysis are shown in Table 4.

Table 4. Parallel analysis

Eigenvalues	Parallel Analysis
7.621	6.964
2.761	1.912
2.374	1.604
1.589	0.783
1.486	0.642
1.422	0.576
1.258	0.454
1.166	0.338
1.007	0.264

Table 4 shows that parallel analysis retains factors with values greater than 1, suggesting three factors extracted from nine stress factors. Through rotation, the distribution of stress factors became clearer and more accurate, with significant factor loadings increasing. After rotating the matrix components, the first factor included 15 items, the second contained 6 items, and the third had 9 items. Table 5 shows the component matrix of the parallel analysis after rotation.

Table 5. Component matrix of parallel analysis after rotation

Component	Factor 1	Factor 2	Factor 3
I took the math exam quietly.	0.70		
I report the results of completing math assignments in front of the class well	0.75		
I ask if there is a material that is not clear or give responses to other student's answers when in the discussion process	0.61		
I consult with my academic supervisor or course lecturer when I have certain difficulties	0.61		
I compete with my classmates to complete assignments on time and get better grades	0.65		
I do well on assignments for professional courses (e.g., linear programming, real analysis, matrix algebra, group theory)	0.58		
I am actively involved in discussions and work on assignments in groups in class when asked by the lecturer	0.59		
I feel I have too many responsibilities to fulfill my every obligation in university	0.40		
I got high marks in different subjects	0.44		
I have a good academic point of view and a planned career path	0.67		
I make sure that I pass all the prerequisite materials to take the course plans for the next semester	0.67		
I get a scholarship or continue the scholarship program that I had in the previous year	0.29		
I finished taking the full course from semesters 1-4	0.48		
I have a problem or conflict with the lecturer	0.55		
I have a problem or conflict with a classmate	0.34		
The lecturers do not support me understanding the material or other academic consultations.		0.88	
I once had a discussion with my family regarding my university and had a conflict regarding the discussion		0.77	
My lecturer has conflicts with me regarding my assignments and behavior while in class		0.65	
I did poorly on the exam		0.67	
I get a scholarship or continue the scholarship program that I had in the previous year		0.47	
I have too many exams and assignments to complete		0.42	
I don't have time to complete university assignments or other student activities			0.42
I try to fulfill the schedule set by the lecturer on time			0.38
I can attend every class in the lecture			0.67
I get pressure from my family to have good grades			0.68
I always take part in activities related to academics and do the assigned tasks well			0.45
I have a good relationship with my classmates			0.55
I do good things in all subjects in mathematics education			0.72
I can create free time and make my academic tasks quite complete			0.46
My parents keep reminding me and following up on every assignment, campus activity, or grades I get			0.47

From the 30 factors (Table 1), nine factors were generated. However, because nine factors seem too many, the parallel analysis method was applied to determine the number of factors maintained in the study. With this parallel analysis, three new factors were successfully retained from the nine factors that were previously generated. The three factors obtained from the previous 30 stress factors were named according to their grouping and represented the original factor. Based on this, the names of the factors were stress on the lecture material (factor 1), stress on the environment (factor 2), and stress on time management (factor 3). The three factors are maintained based on the similarity of the types of questions asked. The more similar the types of questions asked, the greater the chance of being on the same factor.

Stress on Lecture Material

The poor understanding of students toward lecture materials was one of the academic stress factors. The difficulties were finding materials for the class, preparing the related media presentation, or finishing a mid and final-term examination (Kurniasih et al., 2020). According to previous studies, the assignment to do a test or exam was one of the main causes of academic stress (Rafidah et al., 2009). In addition, students who have difficulty understanding lecture material will also have their academic scores affected (Arsham & Lovric, 2011). A study by Košir et al. (2015) highlighted that a disturbance in the balance between the cognitive-emotional-environmental system and external influences is defined as stress. Students who are overwhelmed in balancing internal or external forces result in further academic stress. Items that represent these factors include internal conditions such as students' motivation and desire to ask questions regarding their difficulties, a sense of competition with friends, and a desire to understand the material being studied.

Stress on the Environment

Mullins et al. (2016) stated that stress is a form of interaction between the individual and the assessed environment that burdens or exceeds one's abilities and threatens his or her well-being. According to Busari (2012), stress occurs when there are demands on someone beyond their capabilities. Environmental conditions around students, such as class situations, lectures, relationships with lecturers, and parents, become an essential role. A healthy environment can lead to academic development and student behavior, while a hostile environment can reduce students' interest in university and academic performance (Akman, 2020; Lätsch, 2017). Items that are part of these factors include demands and support from parents and teachers. In addition, the number of assignments teachers give is also one of the supporting items.

Stress on Time Management

Students' inability to manage time can harm emotions, cause stress, and interfere with daily activities. Most students procrastinate when completing assignments, so the assignments become piled up, and students become panicked, emotional, and even stressed when their schedule for collecting assignments gets closer. Heavy academic workloads, little study time while constantly racing to meet other targets, and preparing for exams are why students are anxious about their time management skills (Jain & Singhai, 2017; Yikealo et al., 2018; Bataineh, 2013). Items supporting these factors include task deadlines, activity schedules that sometimes coincide, and efficiency in utilizing free time. The analysis results of the academic stress level of bachelor students in the Mathematics Education study program are reflected in Table 6.

Table 6. Component matrix of parallel analysis after rotation

Factor	mean	Stress Level
Stress on lecture material	3.749	High
Stress on the environment	1.733	Very low
Stress on time management	3.625	High
Overall	3.036	Moderate

Cut-off points:
1.00–1.79 (Very low); 1.80–2.59 (Low); 2.60–3.39 (moderate) 3.40–4.19 (High); 4.20–5.00 (Very high)

Based on Table 6, student's responses were analyzed using the mean and interpreted using the mean score interpretation scale (Abirin, 2023). The stress factors of lecture material and time management were high, while the environmental stress factor was very low**.** Overall, this study found that the level of academic stress was moderate. It was in line with a previous study reporting that mathematics produces relatively high anxiety in higher education of the mathematics course program (Wahid et al., 2014). It is also corroborated by the other previous studies by García-Ros et al. (2018) and Elias et al. (2011). Both previous studies revealed that almost all high school students from all schools and bachelor students from every faculty experienced moderate stress levels.

Factor Correlation Analysis and Mathematical Values

The correlation test was conducted using Pearson r with three stress factors, namely stress on lecture material, stress on the environment, and stress on time management, with a significant level of 1%. The results of the calculation of correlation analysis are presented in Table 7.

Table 7. Results of factor correlation analysis and grades scores

	Factor 1	Factor 2	Factor 3	Grades
Factor 1	1			
Factor 2	-0.312	1		
Factor 3	0.364	-0.108	1	
Grades	0.416	-0.081	-0.114	1

Based on Table 7, the results of the correlation analysis showed that there was no significant correlation between the three stress factors. The result of the correlation analysis between factor 1 and factor 2 was -0.312, and between factor 1 and factor 3 was 0.3644. Meanwhile, the correlation value between factor 2 and factor 3 was -0.108. It means that each factor had no correlation with other factors. The finding that coursework-related stress does not significantly correlate with stress from the environment or time management highlights the importance of a separate focus on coursework. Coursework-related stress among students may be linked to a lack of understanding or academic skills. Academic literacy programs, such as critical reading training, effective study techniques, and foundational skills enhancement, can help students address academic stress tied to understanding course material. A separate focus on the quality of the learning environment is also crucial. Institutions might consider creating supportive study spaces, improving campus facilities, or developing a positive academic community. A supportive environment can calm students, helping them manage stress and increase their focus on academic tasks. Although time management does not significantly correlate with other stress factors, it remains important for stress management. Time management and organizational skills training programs could be offered to students. This can help students optimize their time management, reduce stress caused by time constraints, and improve their efficiency in meeting academic demands.

Likewise, the three academic stress factors and GPA was not correlated significantly. It means that the increase or decrease in academic stress factors did not affect the increase or decrease in the student's GPA. The students had a moderate level of academic stress, which is presented in Table 6. Therefore, the students can cope with these three academic stress factors so the academic stress factors did not affect their GPA scores. Given that academic stress can be managed well and does not significantly impact GPA, the campus can continue enhancing or maintaining support programs, such as counseling services or tutoring. Emphasizing mental health support that encourages students to manage stress effectively will further help them face academic pressures without compromising their performance. Internal and external support can lower students' stress levels, and strengthening the social network on campus is essential. The campus can promote study group activities that allow students to support each other. Targeted support for students struggling with coursework or specific strategies to improve time management may also be provided. This tailored approach can be more effective than a generalized approach in managing academic stress.

Comparison between This Study and the Other Studies

Studies about academic stress with various respondent levels are shown in Table 8.

Table 8. Summary of the study of academic stress

Student Level	Major	Academic stress factors	Overall level of the academic stress factors	Correlation of the academic stress factors with the student's achievement	Reff.
First-year students of the graduate program	Faculty of Medicine	Socio-cultural factors, gender, ethnicity, and education system	High	There is a significant correlation	(Isnayanti & Haraharap, 2018)
Math teachers in Brunei Darussalam	Math teachers of primary, secondary, post-secondary school levels, and tertiary levels in Brunei Darussalam.	Teachers' workload, the public's perspective of a teacher, financial burden, students' behavior and performance.	Moderate	There is no significant correlation	(Yussop et al., 2019)
Undergraduate, graduate, and graduate students	English education department	Academic demand, parent-child relationship, traumatic experience, peer pressure, financial matters, self-expectancy	High	There is a significant correlation	(Kurniasih et al., 2020)
Third-year students	Educational Psychology class at Tanta University Egypt	Factor 1: pressures to perform. Factor 2: perceptions of workload. Factor 3: academic self-perceptions. Factor 4: time restraints.	Low	There is a significant correlation	(Bedewy & Gabriel, 2015)
First-second-year students	Mathematics education bachelor	Factor 1: stress on the lecture material Factor 2: stress on the environment Factor 3: stress on time management	Moderate	There is no significant correlation	This study

High academic stress occurred in Isnayanti and Harahap (2018) and Kurniasih et al. (2020) studies. Most students in the first year will experience great difficulties changing the learning system to be more student-centered. The high target or expectation of the educational outcomes is also a factor in students' high academic stress level. This study concluded that students in years 1-2 of the bachelor mathematics education program experienced moderate academic stress, as in Table 8. So, english and medical students from other studies, such as Table 8, experienced high levels of academic stress because medical and English education students generally learn something newer and need to apply theory rather than mathematics.

Higher stress levels in English and medical students compared to mathematics students are due to the complexity and subjectivity of the subjects, the demand for broader practical skills, high social expectations, and more significant academic pressure. English students are exposed to more diverse material, and more considerable anxiety is often felt due to concerns about the appropriate use of the foreign language and the fear of making mistakes in communication, which require universal and essential skills in a globalized world. Physicians are faced with more significant pressure to not only understand concepts but also to master a wealth of medical theory and practical skills that are critical to patient safety, which adds to the anxiety. Students often face highly competitive exams and long study times, triggering higher stress. Math students can rely on more structured formulas and methods, and students can measure their level of understanding more clearly so that their psychological burden is lower.

A study by Yussop et al. (2019) concluded that moderate academic stress can occur in mathematics teachers. Teachers experienced academic stress with various workloads accompanied by other administrative obligations. Meanwhile, in the study by (Rafidah et al., 2009), academic stress was also experienced by science students. However, there was a very good ratio of science teachers and students, so teachers and students can be very close. Table 8 shows students' academic stress levels in mathematics education and science majors were similar (moderate level).

In a study by Bedewy and Gabriel (2015), academic stress experienced by psychology students was low. It showed that the academic stress level in mathematics education students was higher than in psychological students. Discussion between teachers and students related to lecture constraints is a step to anticipate the emergence of high academic stress. Stress academic can be overcome with more innovative learning media and technology. Educators need to consider appropriate learning designs for students in terms of selecting methods, media, and learning evaluation. According to Parta (2009), mathematics educators are communicators of mathematical ideas so that they become meaningful information for students, and this communication gives the impression of whether the idea is easy or difficult to understand.

Learning mathematics is often challenging due to its abstract nature, the use of many formulas, the need for logical thinking, and the stigma of a complex subject, which can significantly affect students' stress levels (Tamrin et al., 2024). Difficulty understanding abstract concepts can lead to clarity and satisfaction. Students who feel pressured to memorize are more prone to anxiety, especially before exams. Students who lack confidence or are not trained in problem-solving often feel overwhelmed, and difficulty understanding logical steps in complex problems can trigger fear of failure. The perception of being a complex subject can affect students' self-confidence before they try to learn mathematics, thus causing disproportionate fear (Winarso,

2016). Many students feel stressed when learning mathematics, especially if they face academic pressure, lack of basic understanding, or less supportive learning methods.

Mathematics students learn to moderate their stress levels by creating a balanced, supportive, and flexible learning approach. Some strategies that can help students learn mathematics without feeling too stressed are: 1) Focus on understanding concepts by teaching students to understand the "why" behind formulas or methods, not just memorizing; this helps reduce anxiety when facing different problems. 2) Create realistic and gradual Learning Objectives so that students feel the learning process is more structured and not overwhelmed with too much material at once. 3) Use Active and Interactive Learning Methods using technology, visual aids, and project-based approaches to explain abstract concepts. 4) Manage expectations and build self-confidence, focus on the learning process and individual progress. 5) Students use a variety of learning styles, and they find it easier to understand the material because it suits how they learn. 6) Practice regularly with the appropriate load, gradually starting from simple to more complex problems. 7) By connecting mathematics with real life, students see the relevance of mathematics, so they are more motivated to learn (Saraswati et al., 2020).

The limitations of this study are the small sample size and the finding of several academic stress factors at moderate levels. This means that the findings related to academic stress factors of certain students alone do not apply to all students from various departments or universities with different backgrounds and characteristics. Given the more significant inter-individual variability in a larger population, many contextual factors may need to appear more clearly in a small sample. If the sample is more significant, it is possible to analyze factors representing students in general so that their stress levels can be low. Therefore, it is necessary to conduct broader research with a larger sample to analyze academic stress factors and their impact on academic achievement in mathematics study program students and outside the program.

Conclusion

Pearson's analysis examined the correlation between stress factors related to lecture material, environment, and time management. The correlation values were -0.3119 between factor 1 and factor 2, 0.3644 between factor 1 and factor 3, and -0.1079 between factor 2 and factor 3. Hence, the three factors did not show a significant correlation, meaning that stress levels in one factor do not directly affect stress levels in another. Consequently, this study highlights that student stress management approaches can be focused on each factor separately, depending on individual needs. Strategies such as strengthening academic literacy, improving learning environments, developing relevant skills programs, and enhancing social support networks can

reduce students' stress levels. Academic stress experienced by bachelor students in a mathematics e-education program was moderate.

Academic stress among mathematics education students was moderate and did not correlate with GPA, indicating no direct impact on academic performance. Academic stress consists of three stress factors that students can manage well. The study contributes to mathematics education by providing insights for curriculum development that prioritizes mental well-being, strategies to reduce stress, and recommendations for improving academic achievement in mathematics-related courses. Students should actively seek information or insight to avoid academic stress when completing their final thesis assignment. Further research is needed to analyze academic stress factors and their impact on academic achievement in students outside the study program.

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