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Mathematics Anxiety And Stress Coping Strategies Among Preservice Mathematics Teachers

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Abstract

Although numerous studies have examined mathematics anxiety among preservice teachers, research focusing on its association with stress coping strategies remains limited. This study collected data on mathematics anxiety and stress coping from 211 preservice mathematics teachers to investigate whether differences in mathematics anxiety exist based on the coping strategies they employed. A quantitative approach with a cross-sectional design was applied. The instruments included the Revised Mathematics Anxiety Survey (R-MANX) to assess mathematics anxiety and a stress coping questionnaire based on Lazarus and Folkman's theory, categorized into Problem-Focused Coping (PFC) and Emotion-Focused Coping (EFC). Data were analyzed using descriptive statistics, cross-tabulation, and the Kruskal–Wallis H test. The findings revealed that most preservice mathematics teachers experienced moderate levels of mathematics anxiety. The majority of respondents predominantly relied on Emotion-Focused Coping (EFC) to manage stress, and this tendency was consistent across all levels of anxiety—low, moderate, and high. Although descriptive results indicated differences in coping preferences, statistical analysis showed no significant differences in mathematics anxiety across coping strategy types. Therefore, it can be concluded that coping strategies did not emerge as significant differentiating factors for mathematics anxiety among preservice mathematics teachers in this study.
Keywords: *Mathematics Anxiety, Preservice Mathematics Teachers, Stress Coping*

1. Introduction

One of the key roles of Teacher Education Institutions, as higher education institutions mandated by the government to educate and train prospective teachers, is to produce competent and professional educators and to advance the field of education, including mathematics education (Purwanti, 2024). In addition to mastering conceptual understanding and teaching skills, preservice mathematics teachers are expected to develop strong mental resilience and psychological readiness to overcome various challenges that may arise during the teaching and learning of mathematics (Stoeber & Rennert, 2008; Zee & Koomen, 2016). Mathematics is often perceived as a difficult and intimidating subject (Simms, 2016), which can trigger symptoms of anxiety during learning and examinations (Ashcraft & Krause, 2007), ultimately undermining academic performance (Ashcraft & Moore, 2009).

Mathematics anxiety is defined as an emotional reaction characterized by fear, stress, and discomfort when confronted with mathematical problems or situations, often accompanied by a tendency to avoid tasks related to mathematics (Ashcraft, 2002; Ma & Xu, 2004). This condition affects students' motivation, concentration, and even academic achievement. Students with high levels of mathematics anxiety tend to exhibit lower motivation and self-confidence (Dowker et al., 2016; Wang et al., 2014). Other studies have shown that mathematics anxiety is negatively correlated with learning achievement: the higher the anxiety, the lower the academic performance (Ramirez et al., 2016).

Mathematics anxiety is experienced not only by school students but also by preservice mathematics teachers (Irfan, 2016; Zhang et al., 2019). In Indonesia, several studies have shown that both in-service and preservice mathematics teachers exhibit moderate to high levels of mathematics anxiety, which may influence their teaching confidence and instructional practices (Hapsari et al., 2022; Yuliani et al., 2020). Those with high anxiety levels are less likely to enjoy learning mathematics and therefore may struggle to teach the subject effectively in classroom settings (Swars et al., 2006). Conversely, preservice teachers with low mathematics anxiety tend to display greater confidence in teaching mathematics than those with high anxiety (Bursal & Paznokas, 2006). Teacher anxiety can also be transmitted to students through teaching behaviors, such as avoiding complex mathematical topics or creating a negative classroom climate around mathematics (Maloney & Beilock, 2012), thereby reinforcing gender stereotypes such as the belief that females are less capable in mathematics (Beilock et al., 2009).

To minimize the impact of mathematics anxiety, preservice teachers need to adopt effective self-regulation strategies. According to Lazarus and Folkman, the ability to manage stress-inducing pressures in psychology is referred to as coping stress (Stanisławski, 2019). Coping stress refers to the efforts individuals make to respond to and manage internal or external demands, problems, and emotions in stressful situations (DeLongis & Holtzman, 2005; Skinner et al., 2003). Previous studies have shown that coping-based interventions such as stress-management workshops (Pahmi, 2025), expressive writing exercises (Brewster & Miller, 2022), mindfulness-based interventions (Victor-aigbodion, 2023), and mindfulness-based cognitive therapy (Nzeadibe & Egara, 2024) contribute to reductions in academic and pedagogical anxiety. Research findings indicate that students who employ stress-coping strategies such as problem-solving, cognitive restructuring, and seeking social support tend to exhibit lower levels of anxiety (Aljaffer et al., 2025; Onieva-Zafra et al., 2020).

The relationship between mathematics anxiety and stress coping is important to investigate because coping strategies determine how individuals respond to mathematics anxiety. Çiftçi & Karadag (2021), using MANOVA, found differences in mathematics anxiety levels among Turkish preservice teachers depending on their coping strategies. For example, those employing adaptive strategies such as problem-focused coping reported lower levels of mathematics anxiety. In contrast, individuals who frequently relied on maladaptive strategies such as emotion-focused coping tended to report higher anxiety (Putwain et al., 2010). Similar findings were reported by Skaalvik (2018) in a study of secondary school students in Norway, where problem-focused coping was negatively associated with mathematics anxiety, indicating that anxiety decreased when problem-focused coping strategies were applied. Likewise, Pizzie (2023) found that students with high anxiety who relied on emotion-focused coping performed worse academically compared to those who employed adaptive coping strategies. These findings highlight the strong connection between coping strategies and the levels of mathematics anxiety experienced. However, research focusing specifically on the relationship between mathematics anxiety and coping strategies among preservice mathematics teachers remains limited, particularly in the Indonesian context. Therefore, this study aims to examine whether statistically significant differences exist in coping strategies among preservice mathematics teachers when classified according to their levels of mathematics anxiety.

2. Method

This study employed a quantitative design with a cross-sectional approach. The design was chosen to examine the relationship between variables at a single point of measurement. The independent variable was the dominance of stress coping strategies, while the dependent variable was the level of mathematics anxiety. The participants were undergraduate students enrolled in the Mathematics Education Program at four Indonesian universities: Universitas Islam Negeri Alauddin Makassar, Universitas Muhammadiyah Makassar, Universitas Khairun Ternate, and Institut Agama Islam Negeri Ternate. The sample in this study consisted of 211 students who voluntarily completed the research instrument. The sample comprised 41 male and 170 female students. In terms of academic standing, the respondents included 83 second-semester, 66 fourth-semester, and 62 sixth-semester students. A non-probability sampling technique (*convenience sampling*) was employed, in which all students who were willing to participate and met the inclusion criteria were included as research participants.

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Mathematics anxiety was measured using the Revised Mathematics Anxiety Survey (R-MANX) developed by Bursal & Paznokas (2006), which consists of 30 items rated on a 5-point Likert scale ranging from 1 (no anxiety) to 5 (high anxiety). The items represent everyday and academic situations requiring mathematical reasoning or tasks and were rated based on the respondents' perceived anxiety in those situations. The total score ranged from 30 to 150, with higher scores indicating greater mathematics anxiety. The instrument demonstrated high reliability, with a Cronbach's alpha coefficient of 0.91 (Yosafat & Manapa, 2021).

The questionnaire used to collect data on participants' stress-coping strategies was developed based on the coping categories proposed by Folkman and Lazarus, namely Problem-Focused Coping (PFC), which consists of three aspects: planful problem solving (e.g., "When facing academic problems, I look for various possible solutions"), confrontive coping (e.g., "I express negative feelings when experiencing pressure to complete mathematics assignments"), and seeking social support (e.g., "I do not tell anyone about the problems I experience"). The second category is Emotion-Focused Coping (EFC), which comprises five aspects: distancing, escape–avoidance (e.g., "I tend to avoid other people when facing problems"), self-control (e.g., "I try to calm myself before taking action when dealing with academic stress"), accepting responsibility (e.g., "I acknowledge my mistakes and try to improve my performance when facing difficulties"), and positive reappraisal (e.g., "I try to see the positive side of the difficulties I encounter"). The instrument consists of 42 items rated on a five-point Likert scale ranging from 1 (Never) to 5 (Always). The possible scores range from 42 to 210, with higher scores indicating better levels of stress-coping ability. The internal reliability analysis of the stress-coping questionnaire yielded a Cronbach's alpha coefficient of 0.78.

Before conducting further analyses, the data collected from the mathematics anxiety and stress coping questionnaires were categorized. Coping strategies were classified into three dominance groups for each respondent based on mean score comparisons: PFC dominant (PFC > EFC), EFC dominant (EFC > PFC), and balanced (PFC = EFC). Mathematics anxiety scores were also categorized into three groups: low, moderate, and high. Categorization was based on the mean (78,52) and standard deviation (12,07) of the mathematics anxiety scores, where scores below 66.6 (M - 1SD = 78,52-12,07) indicated low anxiety, scores of 90.6 (M + 1SD = 78,52+12,07) or above indicated high anxiety, and scores between 66.6 and 90.6 represented moderate anxiety.

Descriptive statistics and cross-tabulations were performed to explore the profiles and tendencies of coping strategies within each mathematics anxiety group. To test whether differences in mathematics anxiety across the three coping strategy groups were statistically significant, the Kruskal–Wallis H test was conducted. This non-parametric test was chosen because the independent variable of coping strategies was measured on an ordinal scale.

3. Results and Discussion

The distribution of respondents across each mathematics anxiety group is presented in Table 1 below.

Table 1. Summary of Mathematics Preservice Teachers' Math Anxiety in Low, Moderate, and High Math Anxiety Groups

Interval Value	Category	*n*	%
X < 66,6	Low	35	16,6
66,6 ≤ X < 90,6	Moderate	146	69,2
90,6 ≤ X	High	30	14,2
Total		211	100

According to Table 1, most preservice mathematics teachers reported moderate levels of mathematics anxiety, with only a small proportion experiencing low or high levels. This aligns with M. Ashcraft and Krause (2007), who noted that students typically fall within the moderate category, as they can still perform academically despite frequent feelings of anxiety toward mathematics. Such moderate anxiety often emerges from a discrepancy between task demands and students' self-confidence in solving mathematical problems (Ramirez et al., 2018).

The moderate level of mathematics anxiety observed among preservice mathematics teachers may be regarded as a natural response to academic challenges, where anxiety remains within boundaries

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that do not fully impede achievement. However, if not effectively managed, such anxiety may escalate to higher levels and generate adverse consequences for both the learning process and the professional readiness of students as future educators. Accordingly, it is imperative for higher education institutions to implement supportive strategies that strengthen students' stress management skills and enhance their self-confidence in addressing mathematical challenges.

The categorization of stress coping scores among preservice mathematics teachers, based on the dominant coping strategy they employed, is presented in Table 2 below.

Table 2. Summary of Mathematics Preservice Teachers' Stress Coping in the Dominant Stress Coping Group

Criteria	Category	*n*	%
PFC score > EFC score	PFC Dominant	71	33,65
PFC score < EFC score	EFC Dominant	135	63,98
PFC score = EFC score	Balanced	5	2,37
Total		211	100

The table above indicates that the majority of preservice mathematics teachers employed Emotion-Focused Coping (EFC) strategies. This finding is consistent with Austin et al (2005), reported that preservice teachers tend to adopt emotion-focused coping. In contrast, the relatively low proportion of students categorized under Problem-Focused Coping (PFC) aligns with Skaalvik, E. M., and Skaalvik (2016), who noted that problem-focused coping is less frequently utilized in complex academic situations, despite being considered more supportive of improved learning outcomes.

The profile and tendencies of coping stress strategies at each level of mathematics anxiety were analyzed descriptively and through cross-tabulation (Crosstabs), with the results presented in Table 3.

Table 3. Distribution and Tendency of Dominant Coping Strategies in the Mathematics Anxiety Group

Level of Mathematics Anxiety	Dominant Coping Strategy						Total	
	PFC		Balanced		EFC			
	n	%	n	%	n	%	n	%
Low	15	42,9	1	2,9	19	54,3	35	100
Moderate	48	32,9	3	2,1	95	65,1	146	100
High	8	26,7	1	3,3	21	70,0	30	100

Based on the analysis presented in the table above, it can be observed that preservice mathematics teachers were more dominant in applying Emotion-Focused Coping (EFC) strategies across all levels of mathematics anxiety, with the highest percentage found in the high-anxiety category (70.0%), followed by the moderate (65.1%) and low (54.3%) categories. These findings reinforce previous research indicating that individuals with high anxiety tend to rely on Emotion-Focused Coping (EFC) strategies when responding to the pressures they face (Ashcraft & Moore, 2009; Jain & Dowson, 2009; Putwain et al., 2010)). Conversely, the percentage of preservice mathematics teachers adopting Problem-Focused Coping (PFC) strategies was relatively higher in the low-anxiety group (42.9%), followed by moderate anxiety (32.9%) and high anxiety (26.7%). This pattern is consistent with prior studies suggesting that individuals who employ coping strategies focused on problem-solving tend to experience lower levels of anxiety (Çiftçi & Karadag, 2021; Pizzie, 2023; Skaalvik, 2018).

Based on the results of the Kruskal–Wallis H test, Table 4 descriptively indicates that the ranked scores of mathematics anxiety differed across coping strategy groups. The balanced coping group demonstrated the highest mean rank score (115.90), followed by the Emotion-Focused Coping (EFC) group (109.05), and the Problem-Focused Coping (PFC) group (99.51).

Table 4. Distribution of Mean Math Anxiety Score Rankings Based on Coping Strategy Groups

	Coping Strategy	N	Mean Rank
Mathematics Anxiety	PFC	71	99,51
	Balanced	5	115,90
	EFC	135	109.05

	Total	211	100

Although descriptive results suggested differences in mean rank scores across groups, these differences were not statistically significant. As shown in Table 5, the Kruskal–Wallis H test yielded a value of 1.272 with a significance level (Asymp. Sig.) of 0.529. Since the significance value exceeded the alpha level ($\alpha = 0.05$), the null hypothesis stating that there is no significant difference in mathematics anxiety scores among the groups could not be rejected. In other words, the observed differences in mean ranks across the three groups are more likely attributable to other factors rather than genuine differences within the population.

Table 5. Results of the Kruskal-Wallis H Test for Differences in Mathematics Anxiety Scores Based on the Dominance of Coping Strategies

	Mathematics Anxiety
Kruskal-Wallis H	1,272
Df	2
Asymp. Sig.	,529

a. Kruskal Wallis Test
b. Grouping Variable: Coping_Stres

The non-significant result is likely attributable to the highly unequal sample sizes across groups, as the 'Balanced' group consisted of only five participants. In the Kruskal–Wallis H test, groups with very small sample sizes are particularly sensitive to outliers, whose rankings can be disproportionately high or low, thereby skewing the group's mean rank and potentially altering the test outcome (Peat & Barton, 2008). Moreover, statistical tests have very limited power to detect true effects when one group is severely underrepresented (Field, 2012). In other words, the absence of significant evidence does not necessarily imply the absence of actual differences in the population. Therefore, it can be concluded that in this study, the type of coping strategy employed did not emerge as a statistically significant differentiating factor in mathematics anxiety levels.

4. Conclusion

Based on the findings, it can be concluded that the majority of preservice mathematics teachers experienced a moderate level of mathematics anxiety. Most of them tended to employ Emotion-Focused Coping (EFC) strategies, which emphasize managing emotions rather than addressing the problem directly. This tendency was consistent across all anxiety levels—low, moderate, and high.

Although some differences were observed in coping preferences across anxiety groups, the type of coping strategy used did not statistically distinguish mathematics anxiety levels. This suggests that other factors may play a more substantial role in shaping mathematics anxiety within this population. Accordingly, it is recommended that teacher education institutions place greater emphasis on developing Problem-Focused Coping (PFC) skills as part of efforts to support students' mental health and academic readiness. Furthermore, future research with a more balanced design and sample distribution is needed to gain deeper insights into the relationship between coping strategies and mathematics anxiety.

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