

Relationship between Mathematics Performance and Anxiety

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Annotation: The purpose of this study was to explore the relationship between the indicator of mathematics anxiety and mathematics performance. The results indicated that the grade 12 students display a moderate level of anxiety in the subject. Moreover, small positive correlation between mathematics performance and when the students are worried that will not be able to use mathematics in their future careers when needed and if they will not be able to complete every assignment. Also, a small positive correlation between mathematics performance was noted when students feel stressed when listening to their instructor or teacher and when working on their homework. Lastly, a small positive correlation between mathematics performance was revealed when the student gets nervous when asking questions in mathematics class. From the context of this study, it was noted that we cannot simply say that automatically there is a negative correlation between MA and mathematics performance for it was revealed in this study that there are indicators of MA that correlates positively to the performance of students in a mathematics course. However, there were other indicators of MA that contribute negatively but were noted as having no relation to the mathematics performance.

Key words: mathematic anxiety, mathematics performance, mathematics education, correlational research.

Introduction

In the classroom setting, a challenge that many students of all grades and levels experience is poor mathematics performance (Buzzai et. al., 2020). Moreover, they went on to say that "mathematics anxiety" is one of the elements that can be an obstacle to studying mathematics, and that positive factors are related with it. Math anxiety is a widespread condition around the world (Foley et al., 2017). According to Finlayson (2014), math anxiety is frequently correlated with the presence of teaching approaches used in the classroom, which frequently emphasize memorization and rote recitation. Their early arithmetic instruction could have come from teachers who were concerned about their students and compensated by emphasizing a black-and-white, right-or-wrong approach (Marshall, Mann., & Wilson, 2016). Math anxiety has been found to decrease adults' ability to solve math problems in both every day and academic situations (Ashcraft, 2002; Beilock, Schaeffer, & Rozek, 2017). According to Sokolowski and Ansari (2017), people who have math anxiety had increased brain activation in brain regions associated with negative emotions and less brain activation in brain regions associated with mathematical reasoning.

Namkung, Peng, and Lin (2019) found a significant negative correlation between mathematics anxiety (MA) and performance in their study. They also reported that the dimensions of MA, the difficulty of mathematical activities, and the consequences on student grades all had distinct effects on the relationship between MA and mathematics performance. Despite the fact that the study laid the foundation for understanding the relationship between MA and mathematics performance, as well as other relevant factors. The study focuses solely on the relationship between MA and mathematics performance among school-aged students. Given the negative association, a question such as which specific MA indicator is related to mathematical

performance was left unanswered. Furthermore, potential MA contributing indicators that may influence its relationship to mathematics performance have received little attention.

From the researcher's experiences in the field of teaching mathematics, it had been noticed that there are students who are afraid to enter the class because of fear of their teacher in mathematics or hesitant to participate because they are afraid to give the wrong answer and get scolded by their teacher or are afraid to enter the class because they are not prepared for the lesson or they have no assignment or any activity assigned by the teacher.

To address the constraints, this study provided a correlation between MA and mathematics performance. Describe hypotheses pertaining to the relationship between MA and mathematics performance that may be significant to consider in each section below. A relationship between MA indicators and mathematics performance of grade 12 students was specifically investigated.

Theories on the Relation Between MA and Mathematics Performance

Understanding the relationship between MA and mathematics performance is essential not just theoretically, but also practically for intervention. That is, if poor math performance leads to MA, intervention efforts should focus on increasing mathematical skills. If, on the other hand, MA causes poor mathematics performance, intervention efforts should be directed toward reducing MA and thus improving mathematics performance.

Cycle of Math Avoidance

The cycle of math avoidance proposed by Preis and Biggs (2001) was embraced as another model to explain why students experience mathematics anxiety. In the first phase, the person has negative reactions to math situations, according to this paradigm. These could be the result of earlier unpleasant mathematics encounters, leading to the second phase in which a person avoids mathematics settings. This avoidance results in phase three, insufficient mathematical preparation, phase four, and poor math performance. This leads to further bad math encounters, bringing one back to square one. This loop can be repeated so many times that the math-phobic individual believes they cannot do the mathematics, and it is rarely broken.

Bidirectional Theory

The difficulty in determining whether MA is the cause or outcome of poor mathematical performance is a common research issue. The relationship between MA and mathematics performance appears to be bidirectional (Dowker, 2019). If, on the other hand, MA and mathematics performance have a bidirectional relation, we should expect comparable strength in concurrent and longitudinal MA and mathematics performance correlations (Namkung, Peng & Lin, 2019). As a result, there is evidence that MA influences mathematics performance as well as being influenced by it. According to Jansen et al. (2013), this produces a vicious cycle in which increased anxiety leads to poor strategy deployment or avoidance behavior, which in turn has a detrimental impact on mathematics performance and increases worry.

Methodology

Research Design

The descriptive-correlational research design was used in this study. Using statistical analysis, the researcher can investigate and analyze the direction and strength of the relationship between MA and mathematics performance and draw broad generalizations. However, because it does not look for cause and effect, it is primarily observational in terms of data collection (Creswell & Creswell, 2017).

Research Respondents

The study's original respondents were 300 randomly selected Grade 12 students from seven national high schools in Western Visayas, Philippines, but they were reduced to 217 students due to some suggestions based on preliminary analysis results, which were required before analyzing the relationship between the two variables.

Ethical Considerations

Before the study's implementation, written approval was obtained from the school heads. The involvement of identified research respondents was guaranteed to be voluntary. The parents of the students in the participating grade 12 classrooms gave their full consent as well. The study objectives were explicitly disclosed to the research respondents, and precautions were made to ensure that the respondent students were not coerced or damaged in any manner during the period of the research. All produced data was treated with strict confidentiality and was only used for the study.

Results and Discussion

Table 1 indicated that Grade 12 students have a "Moderate" level of anxiety. This amount of anxiety was observed in the following situations: when they were studying for the mathematics exam. They become anxious while using mathematics outside of school, when asking questions, and when taking the mathematics test. They are worried that they will be unable to apply mathematics in their future careers, obtain a good grade or "95" in the mathematics course, perform well on the test, have sufficient knowledge to perform well in future mathematical courses, finish all assignments, and learn well in the course. Furthermore, they experience stress when listening to instructors or teachers and working on their homework. Lastly, they were afraid to give an incorrect answer during the class.

Table 1. Level of Mathematics Anxiety

Mathematics Anxiety	SD	Mean	Level of Anxiety
Get tense when preparing for a mathematics test.	0.84	2.88	Moderate
Get nervous when to use mathematics outside of school.	0.96	2.58	Moderate
Worried that will not be able to use mathematics in future career when needed.	1.16	3.17	Moderate
Worried that will not be able to get a good grade in mathematics course.	1.08	2.87	Moderate
Worried that will not be able to do well on mathematics tests.	0.92	2.89	Moderate
Feel stressed when listening to mathematics instructors in class.	0.92	3.25	Moderate
Get nervous when asking questions in class.	0.86	3.34	Moderate
Stressed when working on mathematics homework	0.92	3.20	Moderate
Worried that do not know enough mathematics to do well in future mathematics courses.	1.02	3.04	Moderate
Worried that will not be able to understand the mathematics.	1.01	2.99	Moderate
Worried that will not be able to complete every assignment in a mathematics course.	0.92	3.13	Moderate
Worried that will not be able to get a "95" in mathematics course.	1.16	3.13	Moderate
Worried that will not be able to learn well in mathematics course.	0.92	2.95	Moderate
Get nervous when taking a mathematics test.	0.86	3.10	Moderate
Afraid to give an incorrect answer during mathematics class.	1.01	2.82	Moderate

Note: Very Low (1.00 – 1.50), Low (1.51 – 2.50), Moderate (2.51 – 3.50), High (3.51 – 4.50), Very High (4.51 – 5.00)

In table 2 it is evident that there is a small positive correlation between mathematics performance and when the students are worried that will not be able to use mathematics in their future careers when needed ($r = 0.289$; $p < .0005$) and if they will not be able to complete every assignment ($r = 0.289$; $p = .002$). A small positive correlation between mathematics performance was also noted when students feel stressed when listening to their instructor or teacher ($r = 0.204$; $p = .003$) and when working on their homework ($r = 0.193$; $p = .004$). Lastly, a small positive correlation between mathematics performance was revealed when the student gets nervous when asking questions in mathematics class ($r = 0.161$; $p = .017$).

Table 2. Relationship between Mathematics Anxiety and Performance

		Mathematics Performance
Get tense when preparing for a mathematics test.	r	-0.108
	p	.113
Get nervous when to use mathematics outside of school.	r	-0.098
	p	.152
Worried that will not be able to use mathematics in future career when needed.	r	0.286 ^{**}
	p	.000
Worried that will not be able to get a good grade in mathematics course.	r	0.121
	p	.075
Worried that will not be able to do well on mathematics tests.	r	0.113
	p	.098
Feel stressed when listening to mathematics instructors in class.	r	.204 ^{**}
	p	.003
Get nervous when asking questions in class.	r	.161 [*]
	p	.017
Stressed when working on mathematics homework	r	.193 ^{**}
	p	.004
Worried that do not know enough mathematics to do well in future mathematics courses.	r	0.049
	p	.470
Worried that will not be able to understand the mathematics.	r	0.039
	p	.566
Worried that will not be able to complete every assignment in a mathematics course.	r	.207 ^{**}
	p	.002
Worried that will not be able to get a “95” in mathematics course.	r	-0.095
	p	.162
Worried that will not be able to learn well in my mathematics course.	r	0.016
	p	.819
Get nervous when taking a mathematics test.	r	0.001
	p	.993
Afraid to give an incorrect answer during mathematics class.	r	-0.009
	p	.891

The study by Namkung, Peng & Lin (2019) found that there was a moderate, negative relation between MA and mathematics performance. From the context of this study, it was noted that we cannot simply say that automatically there is a negative correlation between MA and mathematics performance for it was revealed in this study that there are indicators of MA that correlates positively to the performance of students in a mathematics course. However, there were other indicators of MA that contribute negatively but were noted as having no relation to the mathematics performance.



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