

Portrait of Mathematical Anxiety in Early Youth Ages

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ABSTRACT

Mathematical anxiety is considered as one of the psychological obstacles that shall be considered by every mathematics teacher. Symptoms that felt by students are in various forms. This can also influence the student's interests and learning outcomes of mathematics. But in fact, teachers are giveless attention to this problem so students tend to learn with less supported conditions and situations. This study aims to describe the level of mathematical anxiety and the forms of symptoms of mathematical anxiety that occur in early adolescents, and their influence on learning interest by gender consideration. The quantitative approach with the survey design of 404 students in junior high schools spread across Central Java and Yogyakarta Special Province was used in this study. Anxiety test instruments were used to collect premier data and interviews were used as supporting data. The results of the study showed that the mathematics anxiety level of the teenage as follows: Forget about mathematic lesson, more frekwntly breathing, having a thinking disorder such as difficulty concentrating and more afraid toface math test than other subjects The findings also show that gender influences mathematical anxiety, but mathematics anxiety does not significantly affect in learning interest.

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1. INTRODUCTION.

Anxiety becomes one of the psychological symptoms may occur to anyone, including students. It is common for students to feel anxious about mathematics subjects, in both during the learning process and evaluation activities. As Trujillo and Hadfield (1999) said that mathematics anxiety is a state of discomfort that occurs as a response to situations involving mathematical tasks that are considered threatening the students themselves. This does not happen only to students who have good mathematical interests.

In recent years, many researchers have tried to link the level of anxiety with mathematics learning outcomes, where students with high mathematics anxiety are predicted to have lower learning outcomes (Zakaria et al., 2012; Mohamed and Tarmizi, 2010). Even Aarnos and Perkkila (2012) have also said that mathematical anxiety as a negative effect on someone when dealing with numbers and questions involving mathematics. However, this fact doesn't convince to mathematics teachers that anxiety caused by students when learning or evaluation activities need attention.

A Malaysian study mentions that math anxiety is found among students in tertiary education (Usop et al., 2012), matriculation students (Zakaria and Nordin, 2008) and middle school students (Zakaria et al., 2012). This is true that the psychological problem can occur at every society level ranging from basic education to higher education (Esa and Mohamed, 2017). However, the reality that in Indonesia math anxiety often occurs in teenage students. At the age of adolescents, students will undergo psychosocial changes which are divided into three stages, namely early adolescent, -

middle adolescent, and late adolescent. The age of the first period of adolescence (early adolescent) occurs at the age of 12-15 years (Santrock, 2002; Hurlock 2003).

The characteristics of the early adolescence period are indicated by psychological changes such as an unstable soul, increased ability to express themselves, the importance of friends, parents are often the place to be blamed, tend to be childish, and so on. Strong anxiety in this first period which is : characteristics of a labile soul and form of self-expression. Ages 12 to 15 years old are in junior high school age. Therefore, the age of adolescents chosen to study is the age of students at junior high school level.

A study of mathematical anxiety with engineering student respondents showed that these anxiety symptoms were highly correlated with poor mathematical performance. Some of them need high concentration with some other subjects (Sachin, 1997). This is made possible by the anxiety they feel when performing tasks. Those who respond to mathematics are usually in the form of fear, loss of concentration, confusion, tension, etc. (Vitasari et al., 2010). Adolescents at high education level are only able to feel anxious in such a way that they are in their early teens, such as junior high school level. At this age, they begin to dare to express and express what they feel.

An analysis has also been shown from the results of Vukovic et al (2013), which shows that the packaging of mathematics becomes a unique source of individual differences with other individuals in calculating skills and mathematical applications, but not in terms of

geometrical reasoning. Besides mathematics anxiety that occurs in second and third grade students has a low level of anxiety in terms of math applications, but only for students with higher memory strength. This shows that there is indeed mathematical anxiety in students, in any form. However, this has not been much revealed by previous research, the symptoms and how high the level of anxiety of students in junior high school. This study aims to describe the level of mathematical anxiety and describe the forms of symptoms of mathematical anxiety that occur in students at the level of junior high school (SMP), as well as their influence on the interests and learning outcomes of mathematics.

2. RESEARCH METHOD

This study involved 404 students spread across the province of Central Java. The research respondents were junior high school students in Surakarta, Klaten, and Yogyakarta. The mathematics anxiety scale questionnaire was developed based on previous research on mathematical anxiety in junior high school students. The questionnaire contained 35 items asking respondents to answer questions based on what they felt when facing math learning activities and mathematics evaluation at school. Scale format uses answers ranging from 1 (always), 2 (often), 3 (rarely), 4 (never). The content validity test was carried out by involving seven rater with three scale choices, and the items received had a minimum Aiken value of 0.86 (Aiken, 1985; Ramadani, Supahar, and Rosana, 2017).

Then the item compatibility test with the model (fit) has met the requirements for all items, where (1) the value of received outfit mean square (MNSQ): $0.5 < MNSQ < 1.5$; (2) the value of the z-standard (ZTSD) outfit received: $-2.0 < ZTSD < +2.0$; and (3) the correlation value of the received point: $0.4 < Pt. MeasurCorr < 0.85$ (Vitasari and Supahar, 2017). Furthermore, the construct validity test is done by Confirmatory Factor Analysis. The factor analysis test resulted in the value of KMO-MSA of 0.703 (> 0.5), Chi Square of 1069.7 and significance of 0.000 (< 0.5) indicating a correlation between items. Then each item gives a significant contribution to the factors formed, where the influence is in the range of 44% to 69.7%. In addition, there are 13 factors that have eigenvalues values in excess of 1. This proves that the developed questionnaire instruments have been unidimensional (Kaiser, 1970; Hattie, 1985). The reliability test of the math anxiety questionnaire is worth 0.756, which means that 75.6% of the score variance appears to be a picture of pure score variance and the developed instrument has good reliability.

The anxiety theory used in the study is the theory of response to anxiety according to Stuart and Sunden (2006) which includes four aspects, namely physiological response (cardiovascular symptoms, impaired consciousness, respiratory symptoms, repetitive behavior, erratic expression, gastrointestinal symptoms, urogenital symptoms, symptoms sensory, somatic symptoms), behavioral responses (shocked, quick talk. overdone), cognitive response (loss of objectivity, often determining wrong answers, sleeping badly, easily confused, losing concentration, fear of receiving results, forgetfulness), and response affective (keeping guilt too long, worrying if something bad happens, shame asking). The questionnaire asks also students about class names and levels.

The survey was conducted before mathematics learning started and was opened by the mathematics teacher who would teach at the meeting. This activity is carried out approximately 35 minutes for each class. The data analysis technique used in this study is

quantitative descriptive, where quantitative data are calculated Mean and Standard Deviation to determine norm results. Then norm result is used to find out how much anxiety and symptoms of mathematical anxiety of students in junior high school level. The interview data for selected students was also described as supporting data from the premier data.

3. RESULT AND DISCUSSION

3.1 Norm Result

Mathematical anxiety is one of the symptoms that may arise in early adolescents when one of them is at the level of junior high school (SMP). Through the calculation, the average response of students is 2.15. While the standard deviation is 1.08. Thus, the determination of norms based on Azwar (2007) for the mathematics anxiety questionnaire is as follows:

Table 1. Results of Mathematical Anxiety Norms

Category of Anxiety	Mean Score
High	$X > 3,22$
Middle	$1,07 \geq X \geq 3,22$
Low	$X < 1,07$

Based on the results of these norms, it is known that all respondents are in the category of moderate math anxiety. That is due to the average score of the response of students is in the range of 1,31 to 3,06.

3.2 Grid of Mathematics Anxiety Scale

The mathematics anxiety questionnaire which consists of four aspects of anxiety has been distributed into 35 items in the form of positive and negative statements. Following is the distribution of math anxiety items.

Table 2. Mathematical Anxiety Scale Framework

Theory	Aspects	Indicators
Students' Mathematical Anxiety	Physiological Responses in Mathematics learning or evaluation process	Faster heartbeat
		Heavy head feeling
		Feeling like about to faint
		A more frequentbreathing activity
		Breathless
		Feeling a chest
		Walking back and forth in the classroom
		Facial tension
		Having a stomachache
		Twisted stomach
		Difficulty swallowing
		Often asking for permission to use the restroom
		Blushing face
		Sudden sweaty hands
		Cold sweats
Muscle ache		
Teething teeth		
Unstable Voice		
Faster heartbeat		

3.3 Symptoms of Mathematical Anxiety in Students

Symptoms of mathematical anxiety shown by students in various forms. The following graph shows the quantity of symptoms of mathematics anxiety in students.

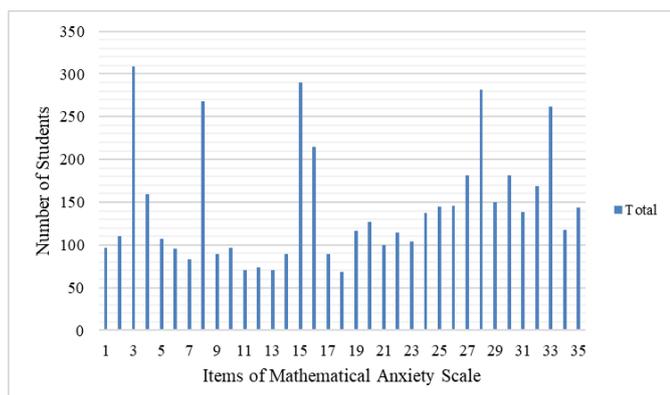


Figure 1. Mathematical Anxiety of Students

The most anxiety items received a "frequent" response, namely number 30. A total of 119 students claimed to often experience forgetfulness to mathematical material at the end of implementation of mathematical evaluation activities. Both in formative and summative tests students often undergo memory loss suddenly, especially if they are stressed by the limited time. Even 62 students claimed to always experience this. However, some others do not make this a problem.

Based on interviews with three students, forgetting about the material when the math exam will end is normal. However some of students are ignorant if in the end they have to answer the question carelessly without the right way and reason. This is closely related to how students' interest in mathematical tasks and will affect the learning outcomes of mathematics in the future. This fact is supported by Carey et al (2016) study, which states that it turns out that poor mathematical performance can lead to mathematical anxiety, and mathematical anxiety can reduce the quality of mathematical performance in the future.

The second symptom of anxiety that is often experienced by students is the large quantity of breath taking. A total of 105 students admitted that they often took breath both when learning or mathematical evaluation activities. It is clear that mathematics is still a frightening specter for some students. Three of them admitted, mathematics learning is one of the activities that are not expected. When math teachers ask for non-teaching permission, they feel happy and calm. However, most of the others, namely a total of 145 students continued to try to be calm and not anxious when the mathematics learning or examination took place.

In addition, 25.25% of 404 students also often experience thinking disorders when mathematics learning takes place. One of the causes of this thinking disorder is that there are more interesting discussions than the mathematical material that they must understand at that time. This was supported by 145 students who claimed to have difficulty concentrating especially when the math exam took place. According to five students, they often experience this because of a lack of interest in this one lesson or other topics that are more interesting than forcing themselves to think about the material being studied. The motivation for learning mathematics in this case is very instrumental and clearly contributes to the amount of mathematical material that has been learned. This fact is supported by the research of Vukovic et al (2013) where

mathematical anxiety does not only affect how students do mathematical tasks, but also how much mathematics is learned.

Another frequent anxiety for some students is that they always feel guilty when they remember that the answers they wrote when the exam turned out to be wrong. According to the results of interviews with five students, this was influenced by their sense of interest and high expectations to get good grades. High expectations for good grades are also driven by the needs and demands of parents. But unfortunately, 235 students admitted that they seldom regretted the answers they had made on the mathematics exam, even though they were wrong even though they were based on discussions with their friends.

As many as 89 people out of 404 students based on observations from their peers, it turns out their faces look tense when they face mathematical learning or evaluation activities. However, this phenomenon only occurs only a few moments when the activity will take place, and does not last long. Not only did their faces look tense because of mathematics learning or examinations, but also when they would just meet the math teacher they claimed they were quite tense. So it is clear that the specter and the low interest in mathematics is not only from being felt because of difficult material, but also the teacher factors.

In addition, 82 students claimed not to go to the restroom often. However, 189 others apparently claimed that they often experienced this. This is normal. A health article says, doctors are not sure about why people tend to feel the call of nature during anxiety, especially because the need to urinate is controlled by many factors including nerves along the spinal cord, brain, and emotions. One famous idea among doctors is when someone is anxious or nervous, the body enters into fight or flight mode, which is a mode in the body when faced with threats. This tense and adrenaline response can stimulate the need to relieve yourself. According to Dr. Tom Chi, a professor of Urology from the University of California, San Francisco, said that this could increase urine production in the kidneys. He explained that when nervous the muscles become tense and maybe the muscles are the bladder muscles. If that happens, then someone will feel like urinating (Prasasti, 2018).

In addition, 33.17% or 134 out of 404 students felt horrified and nervous when they imagined they would work on difficult math problems and 137 students felt more afraid of facing math tests than other subjects. That made most of them feel embarrassed when they asked questions about mathematical material. The results of the study by Vitasari et al. (2010) also show that two mathematical anxieties that often occur at the same level of students are also anxious if they do not understand, causing a loss of interest in mathematics. So that they still feel confused and have no solution to the problems they experience.

However, 114 students still feel often nervous if there is a sudden math test. According to six of the 114 students who were interviewed by researchers, the sudden math test made them feel a little panicked. They will reflexively open a notebook or sample questions in the exercise book to read a glimpse of the material to be tested. However, in reality it did not significantly help to explore their memories of the material to be tested. Not only the moment of the sudden procurement of math exams, even 138 students claimed to be anxious at the moment the teacher shared the results of the math exam. This usually happens to students who have a concern for their academic values, so the possibility of hope to get good grades not only in mathematics but also in other subjects.

On the other hand, 187 out of 404 students turned out to still have an optimistic attitude towards the answers or decisions they made when working on the exercises during mathematics learning. Similar to that, in the exam they were not much pessimistic about the answers given, because 132 students often felt guilty when they remembered that they had given the wrong answer or how to solve an inappropriate problem.

are still many other symptoms that are also felt by students both when learning and mathematical evaluation activities take place. But unfortunately, this has resulted in how high their interest and motivation for learning mathematics. Based on ten randomly selected students, they confessed how their interest in learning mathematics even though they had different mathematical anxiety.

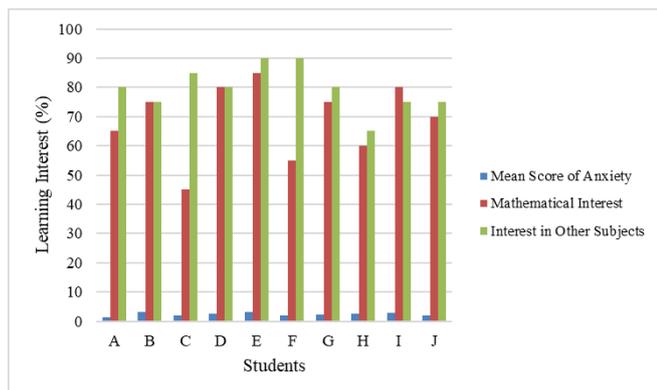


Figure 2. Effect of Anxiety with Interest

In the graph above, please note that students A, C, F, and G are male students. While students B, D, E, G, H, and I are female students. This shows that math anxiety that occurs in female students is higher than male students. Research conducted by Karimi and Venkatesan (2009) also shows that mathematics anxiety in secondary school students is also different for men and women, where the average score of women is higher than that of men. According to Nicole et al (2003), female students always try to show good results on each of their jobs when given the right education, especially in mathematics. Vitasari et al. (2010) also showed that at the college level, women were also more anxious with higher mean scores than men. Thus, it is very clear that women are more anxious than men at any level of education.

Based on above graph, it was consider that students with low mathematics learning interests usually have a high interest in learning on other subjects. Students with low mathematics learning interest are usually owned by male gender. This clearly shows that when some body has low anxiety, the interest in learning mathematics is also low. But this is not always low in other subjects.

However female students have high anxiety, they still have a high interest in learning mathematic and other subject. Thus the level of anxiety does not significantly influence the high and low interest in learning mathematics. However, both male and female students in average have lower interest in learning mathematics than other subjects.

4. CONCLUSION

Based on the results and discussion, this study concluded that the mathematics anxiety level of early adolescents was moderate. This is based on the calculation of the average and standard deviation of the students' response data. Forgetting the mathematical material, the quantity of breathing increased, experiencing thinking disorders

such as difficulty concentrating and feeling more afraid of facing a math test than other subjects became the most common symptom of mathematical anxiety. Even though it did not occur in the majority of students.

In addition, gender differences also result in different levels of anxiety. Female students are considered more anxious than male students. When male students are low in interest in learning mathematics and female students are high interest in learning mathematics. They also have high interest in learning in other subjects. However, both male and female students in average have lower interest in learning mathematics than other subjects.

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