

## Rasch Analysis: Students' Mathematics Anxiety and Symptoms

Rahmita Sonia<sup>1</sup>, Alizamar Alizamar<sup>1</sup>, Alwen Betri<sup>1</sup>, Febri Wandha Putra<sup>1</sup>

<sup>1</sup>Universitas Negeri Padang

\*Corresponding author, e-mail: rahmitasonia@gmail.com

**Abstract:** Ideally students follow mathematics learning effectively without any disturbance. But the phenomenon that is happening is that there are students who experience anxiety about mathematics, which causes students to not be able to follow mathematics learning effectively. The purpose of this study is to describe the level of mathematics anxiety experienced by students as a whole and also based on the aspects studied. This study involved 32 students in class XII consisting of 18 female students and 14 male students. The instrument used in this research in the form of a questionnaire containing statements about mathematical anxiety equipped with a Likert scale model. Data analysis using frequency distribution techniques and Rasch Model analysis. The results of the analysis of research data indicate that some students experience mathematical anxiety. In addition, the results of data analysis also showed that there were differences in anxiety between female students and male students both overall and based on aspects of the mathematics anxiety studied.

**Keywords:** Learning, Anxiety, Mathematics Anxiety

Received December 25<sup>th</sup>, 2019;  
Revised January 11<sup>th</sup>, 2020;  
Accepted January 15<sup>th</sup>, 2020;  
Published February 12<sup>th</sup>, 2020

**Conflict of Interest Disclosures:**

The authors declare that they have no significant competing financial, professional or personal interests that might have influenced the performance or presentation of the work described in this manuscript.



This is an open access article distributed under the Creative Commons 4.0 Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. ©2020 by author

**How to Cite:** Sonia, R., Alizamar, A., Bentri, A., & Putra, F.W., (2020). Rasch Analysis: Students' Mathematics Anxiety and Symptoms. *Jurnal Aplikasi IPTEK Indonesia*. 4 (1): pp. 12-18, DOI: 10.24036/4.14342

## Introduction

Learning is a primary need for students to be able to know new things from knowledge learned in school. Every learning process does not escape the learning evaluation system. Learning evaluation aims to determine the number of progress and success of students in achieving good results. Kingsley (Ahmadi & Supriyono, 2013) explain that learning is the process by which behavior (in the broader sense) is originated or changes through practice or training. In evaluating student learning abilities in the academic field can be found both good learning outcomes and low learning outcomes. Low learning outcomes cause problems that make it difficult for students and sometimes also have an impact on students' psychological conditions.

---

Psychological problems experienced by students cause the inability of students to regulate the stimulus associated with the learning process and learning outcomes. Davison (2010) Explained that the psychological problems experienced by students have an impact on anxiety so that arises feelings of fear and worry that is not fun and student behavior during the learning process. Past Research, Promising Interventions Programme for International Students Assesment (PISA, 2015) explained that 59% of students experienced anxiety about difficult examinations, 66% of students experienced anxiety about poor grades, and about 55% of students were eager for exams if prepared properly by professional educators.

Anxiety arises in students when the readiness and focus of the mind for learning is wrong, especially in the academic field of mathematics. Daharnis, Ardi, Alizamar, Ifdil, Rangka, Suranata, (2018); Sheffield & Hunt, (2006) revealed that mathematics anxiety is a feeling of anxiety that arises automatically from unpleasant experiences in learning mathematics. This has a negative impact on students understanding and understanding with learning. Mathematical anxiety is marked by a warning in being aware of the dangers that will occur so it requires self-readiness to overcome such students difficulties in thinking solving math problems (Bazargan & Amiri, 2018). Past Research, Promising Interventions Programme for International Students Assesment (PISA, 2015) explained that anxiety mathematics is characterized by feelings of tension, the anxiety that interferes with the manipulation of numbers and solving mathematical problems in the academic field to be applied in everyday life. Alexander & Martray (1989); Daane, Judy, & Tina (Karimi & Venkatesan, 2009) explain that mathematics anxiety is seen in the evaluation as well as the result of low self-esteem, decreased self-esteem and a fear of failure that results in failure, leading to students' thinking patterns to avoid mathematics whenever and wherever possible.

Ashcraft & Kirk (2001); Erdoğan, Kesici, & Şahin (2001); Haylock & Thangata (2007) menyebutkan gejala yang sering dialami oleh siswa saat ketika berhadapan dengan mata mention the symptoms that are often experienced by students when dealing with mathematics including 1) students panic when confronted with math assignments, 2) students cannot think and remember things they know and can do, 3) students have feelings of fear when confronted with math assignments and excessive worries about getting wrong answers, 4) students develop a belief that they cannot do the task so expect help from others to do it, and 5) students have irrational thoughts about all forms of mathematical assessment. Furthermore Hadfield & McNcil (1994); Whyte & Anthony (2012) states that mathematics anxiety consists of four aspects: 1) cognitive aspects, 2) physiological aspects, 3) affective aspects, and 4) psychomotor aspects. This study describes the analysis of students' anxiety towards mathematics and the differences in mathematics anxiety between male and female students

## Method

This research uses a quantitative approach with descriptive design (Yusuf, 2014). The sample in this study amounted to 32 students (grade XII, consisting of 18 female students and 14 male students) (Sugiyono, 2012). The instrument used was a mathematics anxiety questionnaire that was equipped with a Likert scale. The questionnaire with three alternative answers high, medium, and low. Analysis of research data using the frequency distribution combined with Rasch model fit statistics. The results of the Rasch model analysis show that the Cronbach Alpha (KR-20) reliability score is 0.90 The results of personal reliability is 0.89. These results show that there is good interaction between items and people. Besides that, the sensitivity value of the person answers pattern +0.99 logit (INFIT MNSQ) and the sensitivity value of the overall person answer pattern +0.98 logit (OUTFIT MNSQ) shows that it is still in the ideal range (+0.5 > MNSQ < +1.5) (Alagumalai, Curtis, D, & Hungi, 2005; Bond & Fox, 2007; Sumintono & Widhiarso, 2015). Furthermore, data analysis regarding mathematical anxiety uses the frequency distribution and Rasch model stacking.

## Results and Discussion

The results of the analysis of the data of this study aim to describe; (1) Mathematical anxiety (2) describe based on the indicator aspects, namely; cognitive, physiological, affective and psychomotor aspects.

### *Overall Mathematical Anxiety*

The following is a discussion of the results of research on students' mathematical anxiety and test analysis can be seen in the following Table 1.

Table 1. Distribution of Mathematics Anxiety Frequency Students (N=32)

Kategori	Interval (%)	Frequency	Frequency (%)
Tinggi	68-83	3	9,375
Sedang	52-67	15	46,875
Rendah	36-51	14	43,75
<b>Total</b>		<b>32</b>	<b>100</b>

Table 1 shows that over 50% of students have math anxiety. With details of 3 (9.37%) students are in the high category, 15 (46.875%) students are in the medium category and 14 (43.75%) students have low mathematical anxiety. In other words, one of the factors causing the low learning outcomes of mathematics is caused by anxiety about mathematics experienced by students. This data also supports the results of the study Suranata, Rangka, Ifdil, Ardi, Dharsana, Suarni, Gading (2019) which states that many students experience problems in learning mathematics. Anxiety towards mathematics makes students experience difficult conditions in the reception of mathematics learning materials (Daharnis et al., 2018).

**Cognitive aspects**

Furthermore, the analysis of mathematical anxiety based on cognitive aspects is explained as follows.

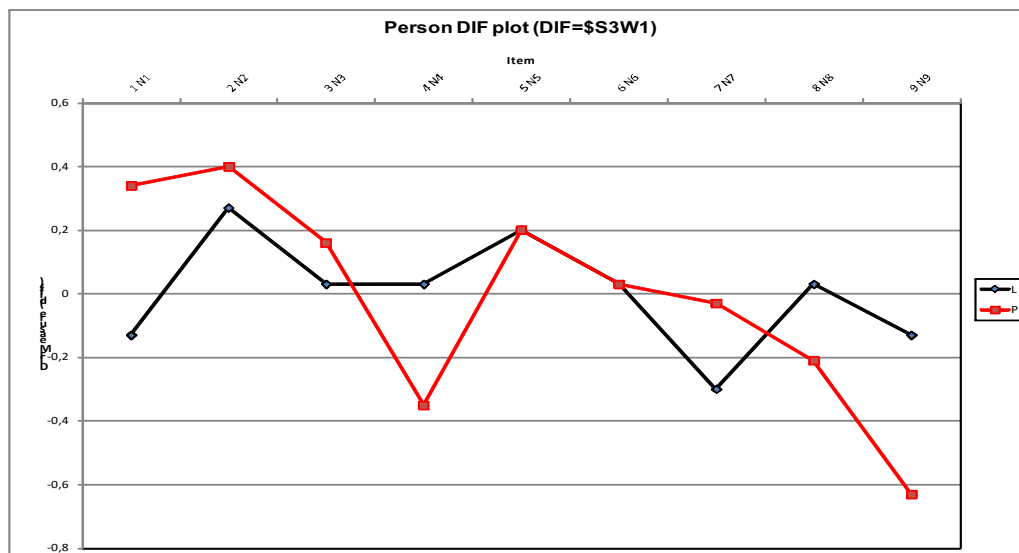


Figure 1. Mathematical Anxiety Based on Cognitive Aspects

The picture above shows that mathematics anxiety between male and female students is based on different cognitive aspects. Can be seen from the red line is higher than the blue line. In addition there are female students who do not experience anxiety about mathematics, this can be seen from the score (-0.65 Logit). While there are male students as a whole who experience math anxiety and some are not experiencing anxiety. This can be seen from the score of male students who are not higher than the score of female students and not lower than the score of female students. This shows that the mindset of female students in learning mathematics is irrational thinking, and it is difficult to concentrate in mathematical learning activities (Rismayanti, 2018). In addition, female students also experience difficulties in solving problems related to logic (Kusumawati & Nayazik, 2017).

**Physiological aspects**

Furthermore, to see students' mathematical anxiety based on physiological aspects, it can be seen in the following figure.



Figure 2. Kecemasan Mathematical Anxiety Based on Physiological Aspects

Figure 2 above shows the analysis of mathematical anxiety based on physiological aspects. From this picture, information can be obtained that the psychological symptoms of male students are higher than female students. The physiological symptoms shown by male students are in the form of increased heartbeat, the emergence of tension that is not conducive (Stoehr, 2017). Other symptoms that appear sweat that appear in the body when facing a count of nausea and stomach (Lyons & Beilock, 2012).

**Affective Aspects**

The results of the analysis of mathematics anxiety based on affective aspects are explained as follows.



Figure 3. Mathematics Anxiety Based on Affective Aspects

The picture above explains that the mathematics anxiety of female students is higher than male students. This can be seen from the red line, which is higher than the blue line. Affective aspects related to students' emotional self (Faust, Ashcraft, & Fleck, 1996; Huang, Zhang, & Hudson, 2018). Female students doubt their own abilities, afraid that they will look stupid and afraid of losing their self-esteem (Bessant, 1996; Hembree, 1990)

---

### *Behavioral Aspects*

For the analysis of the last aspect in mathematics anxiety, the behavioral aspects can be seen in the following figure.

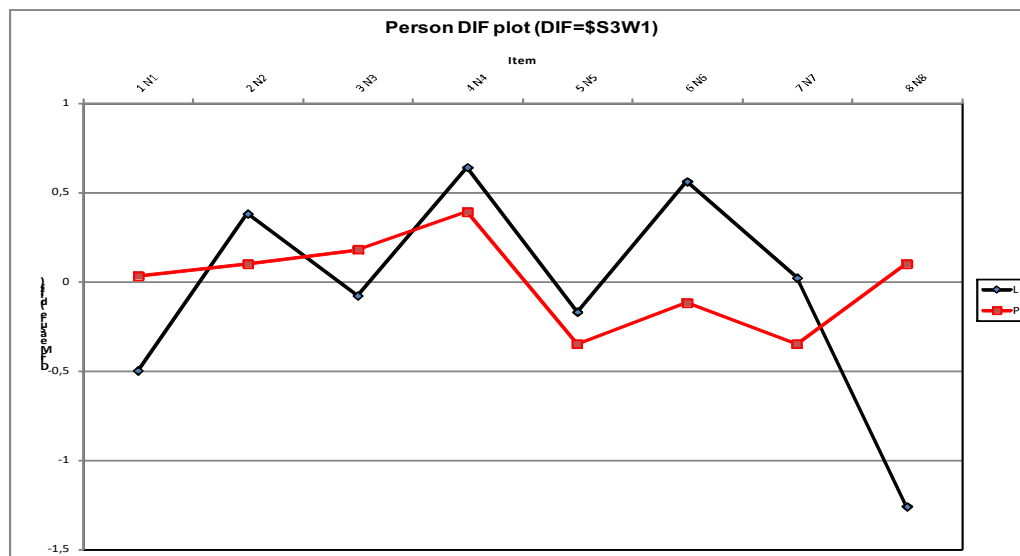


Figure 4. Mathematical Anxiety Based on Behavioral Aspects

Based on Figure 4 above, it is known that male students are higher in mathematics anxiety than female students in terms of behavioral aspects. Behavioral symptoms are shown from mathematical anxiety in the form of drowsiness, and playing truant to avoid mathematics (Zakaria & Nordin, 2008). Another symptom that arises is that male students postpone doing tasks related to mathematics (Kusumawati & Nayazik, 2017).

## Conclusion

The results of the analysis of the data above show that there is still a high level of mathematical anxiety experienced by students. We know mathematical anxiety experienced by students based on 4 aspects, namely cognitive aspects, physiological aspects, affective aspects and behavioral aspects. The analysis also shows the differences in mathematics anxiety between female students and male students. We can group differences in mathematics anxiety between female students and male students based on the aspects studied. For female students experiencing mathematical anxiety on cognitive and affective aspects. Whereas male students experience mathematical anxiety in physiological aspects and behavioral aspects. This does not mean that only female students experience mathematical anxiety in cognitive and affective aspects, male students also experience this, but the symptoms are not as experienced by female students. Likewise, mathematical anxiety for physiological and behavioral aspects, it does not mean female students do not experience it, it's just that the symptoms shown are weaker than male students (Delgado & Kassim, 2019; Newstead, 1998; Rismayanti, 2018). The results of this study are supported by the results of the study Devine, Fawcett, Szűcs, & Dowker, (2012); Goetz, Beig, Lüdtke, Pekrun & Hall (2013); Hunsley & Flessati (1988) which states that there are differences in mathematical anxiety between female students and male students related to the aspects of mathematics anxiety studied, both in terms of cognitive aspects, physiological aspects, affective aspects and behavioral aspects (Hoffman, 2010; Jain & Dowson, 2009; Maloney, Ansari, & Fugelsang, 2011). ). The results of data analysis also reject the results of research from Mwamwenda (Onyeizugbo, 2010) and research results Sari (2019) which states that there is no difference in mathematical anxiety in female students and male students.

## Acknowledgment

Acknowledge anyone who has helped you with the study, including: Researchers who supplied materials, reagents, or computer programs; anyone who helped with the writing or English, or offered critical comments about the content, or anyone who provided technical help. State why people have been acknowledged and ask their permission. Acknowledge sources of funding, including any grant or reference numbers. Please avoid apologize for doing a poor job of presenting the manuscript.

## References

- Ahmadi, A., & Supriyono, W. (2013). *Psikologi Belajar*. Jakarta: Rineka Cipta.
- Alagumalai, S., Curtis, D. D., & Hungi, N. (2005). *Applied Rasch Measurement: A Book of Exemplars: Papers in Honour of John P. Keeves (Education in the Asia-Pacific Region: Issues, Concerns and Prospects)*. Netherlands: Springer. <https://doi.org/140203072X>, 9781402030727
- Alexander, L., & Martray, C. (1989). The development of an abbreviated version of the mathematics anxiety rating scale. *Measurement and Evaluation in Counseling and Development*, 22(3), 143–150.
- Ashcraft, M. H., & Kirk, E. P. (2001). The relationships among working memory, math anxiety, and performance. *Journal of Experimental Psychology*, 130(2).
- Bazargan, M., & Amiri, M. (2018). The effectiveness of modular cognitive behavioral therapy on mathematical anxiety and assertiveness in students. *Journal of Fundamentals of Mental Health*, 20(6), 417–428. Retrieved from <http://0-search.ebscohost.com.wam.city.ac.uk/login.aspx?direct=true&db=a9h&AN=133515572&site=ehost-live>
- Bessant, K. C. (1996). FACTORS ASSOCIATED WITH TYPES ANXIETY OF MATHEMATICS IN COLLEGE STUDENTS Dimensionality of Mathematics Anxiety. *Journal for Research in Mathematics Education*, 26(4), 327–345.
- Bond, T. G., & Fox, C. M. (2007). *Applying the Rasch Model, Fundamentals Measurement in the Human Science* (2nd ed.). London: Lawrence Erlbaum Associates.
- Daharnis, D., Ardi, Z., Alizamar, A., Ifdil, I., Rangka, I. B., & Suranata, K. (2018). Adaptation and Validation of Mathematics Anxiety: Rasch and Network Psychometrics Analysis. *Journal of Physics: Conference Series*, 1114(1). <https://doi.org/10.1088/1742-6596/1114/1/012113>
- Davison, G. C. (2010). *Psikologi Abnormal* (9th ed.). Jakarta: Rajawali Pers.
- Delgado, K. D. D., & Kassim, S. R. (2019). MATHEMATICS ANXIETY AMONG YOUNG FILIPINO LEARNERS: INVESTIGATING THE INFLUENCE OF GENDER AND SOCIO-ECONOMIC STATUS. *Sci.Int.(Lahore)*, 31(3), 575–579.
- Devine, A., Fawcett, K., Szücs, D., & Dowker, A. (2012). Gender differences in mathematics anxiety and the relation to mathematics performance while controlling for test anxiety. *Devine et Al. Behavioral and Brain Functions*, 8(33), 1–9.
- Erdoğan, A., Kesici, Ş., & Şahin, İ. (2001). Prediction of high school students' mathematics anxiety by their achievement motivation and social comparison. *İlköğretim Online*, 10(2).
- Faust, M. W., Ashcraft, M. H., & Fleck, D. E. (1996). Mathematics Anxiety Effects in Simple and Complex Addition. *Mathematical Cognition*, 2(1), 25–62.
- Goetz, T., Bieg, M., Lüdtke, O., Pekrun, R., Hall, N. C., Goetz, T., ... Hall, N. C. (2013). Do Girls Really Experience More Anxiety in Mathematics? *Psychological Science*, 24(10), 2079–2087. <https://doi.org/10.1177/0956797613486989>
- Hadfield, O. D., & McNcil, K. (1994). The relationship between Myers-Briggs personality type and mathematics anxiety among preservice elementary teachers. *Journal of Instructional Psychology*, 21(4), 375.
- Haylock, D., & Thangata, F. (2007). *Key concept in Teaching Primary Mathematics*. London: Sage Publications Sd.
- Hembree, R. A. Y. (1990). THE NATURE , EFFECTS , AND RELIEF OF ANXIETY MATHEMATICS. *Journal for Research in Mathematics Education*, 21(1), 33–46.
- Hoffman, B. (2010). “ I think I can , but I ’ m afraid to try ” : The role of self-ef fi cacy beliefs and mathematics anxiety in mathematics problem-solving efficiency. *Learning and Individual Differences*, 20(3), 276–283. <https://doi.org/10.1016/j.lindif.2010.02.001>
- Huang, X., Zhang, J., & Hudson, L. (2018). Impact of math self-efficacy , math anxiety , and growth

- 
- mindset on math and science career interest for middle school students : the gender moderating effect.
- Hunsley, J., & Flessati, S. L. (1988). Anxiety Research : An International Gender and mathematics anxiety : The role of math-related experiences and opinions GENDER AND MATHEMATICS ANXIETY : THE ROLE OF MATH-RELATED EXPERIENCES AND OPINIONS. *Anxiety Research*, 1, 215–224.
- Jain, S., & Dowson, M. (2009). Mathematics anxiety as a function of multidimensional self-regulation and self-efficacy. *Contemporary Educational Psychology*, 34(3), 240–249. <https://doi.org/10.1016/j.cedpsych.2009.05.004>
- Karimi, A., & Venkatesan, S. (2009). Cognitive behavior group therapy in mathematics anxiety. *Journal of the Indian Academy of Applied Psychology*, 35(2), 299–303.
- Kusumawati, R., & Nayazik, A. (2017). KECEMASAN MATEMATIKA SISWA SMP. *Journal of Mathematics Education IKIP Veteran Semarang*, 1(2), 92–99.
- Lyons, I. M., & Beilock, S. L. (2012). Mathematics Anxiety : Separating the Math from the Anxiety, (September), 2102–2110. <https://doi.org/10.1093/cercor/bhr289>
- Maloney, E. A., Ansari, D., & Fugelsang, J. A. (2011). Rapid Communication The effect of mathematics anxiety on the processing of numerical magnitude. *THE QUARTERLY JOURNAL OF EXPERIMENTAL PSYCHOLOGY*, 64(1), 10–16. <https://doi.org/10.1080/17470218.2010.533278>
- Newstead, K. (1998). Aspects of children's mathematics anxiety, 36, 53–71.
- Onyeizugbo, E. U. (2010). Self-Efficacy, Gender and Trait Anxiety as Moderators of Test Anxiety. *Electronic Journal of Research in Educational Psychology*, 8(1), 299–312.
- PISA. Excellence and Equity in Education (2015).
- Rismayanti, R. (2018). *PERBEDAAN KECEMASAN DAN APRESIASI MATEMATIKA DITINJAU DARI GENDER PADA SISWA MA BAHAUUDIN NGELOM SIDOARJO*. UNIVERSITAS ISLAM NEGERI SUNAN AMPEL SURABAYA.
- Sari, F. D. D. R. A. (2019). *Hubungan Aktivitas Fisik dengan Kecemasan Matematika Pada Siswa Sekolah Menengah Atas*. Universitas Gajah Mada. Retrieved from <http://etd.repository.ugm.ac.id/>
- Sheffield, D., & Hunt, T. (2006). How Does Anxiety Influence Maths Performance and What Can We do About It? *MSOR Connections*, 6(4), 19–23. <https://doi.org/10.11120/msor.2006.06040019>
- Stoehr, K. J. (2017). Mathematics Anxiety : One Size Does Not Fit All. *Journal of Teacher Education*, 68(1), 69–84. <https://doi.org/10.1177/0022487116676316>
- Sugiyono. (2012). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (17th ed.). Bandung: Alfabeta.
- Sumintono, B., & Widhiarso, W. (2015). *Aplikasi Pemodelan Rasch pada Assessment Pendidikan*. Bandung: Trim Komunikata.
- Suranata, K., Rangka, I. B., Ifdil, I., Ardi, Z., Dharsana, I. K., Suarni, N. K., & Gading, I. K. (2019). Exploring of mathematics learning difficulties for students based on heterogeneous group and cognitive style in elementary school Exploring of mathematics learning difficulties for students based on heterogeneous group and cognitive style in elementary sc. <https://doi.org/10.1088/1742-6596/1157/3/032091>
- Whyte, J., & Anthony, G. (2012). Maths anxiety: The fear factor in the mathematics classroom. *New Zealand Journal of Teachers' Work*, 9(1), 6–15.
- Yusuf, A. M. (2014). *Metode Penelitian: Kuantitatif, Kualitatif, dan Penelitian Gabungan* (1st ed.). Jakarta: Pustaka Media Group.
- Zakaria, E., & Nordin, N. M. (2008). The Effects of Mathematics Anxiety on Matriculation Students as Related to Motivation and. *Eurasia Journal of Mathematics, Science & Technology Education*, 4(1), 27–30.
-