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The Effect of Mathematics Disposition (Confidence, Monitor, Interest, Perseverance, Application, Perceived Value, and Flexible in Mathematics) Towards 7th Grade Students' Mathematics Anxiety

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ABSTRACT
The aims of this research are (1) to analyse the factors between aspects of mathematical disposition, namely self-confidence, reflection, interest, perseverance, application, perceived value and flexibility in mathematics, (2) to examine the effect of mathematics disposition toward 7th grade students' mathematics anxiety that have just passed the national examination. The research utilized a survey design with quantitative approach. The population in this research were 16 students in 7th grade from one of junior high school in South Tangerang and using saturation sampling technique. The instruments composed of disposition and mathematics anxiety scale. The quantitative analyses used were factor analysis and regression. The result of factor analysis showed that the aspect of disposition correlated with each other except the mathematics flexible aspects. In addition, the results of the regression test showed that there was no influence of mathematics disposition toward mathematics anxiety of 7th grade students who have just passed the national examination.

Keywords: *Mathematics Disposition, Mathematics Anxiety, Mathematics Self-Confidence, Mathematics Reflection, Mathematics Perseverance, Mathematics Application, Perceived Value in Mathematics, Flexible in Mathematics*

1. INTRODUCTION

Mathematical anxiety is a condition that can be felt by everyone. In general, mathematical anxiety will directly affect when dealing with situation such as examinations [1]. Furthermore, Luttenberger, et al (2018) suggests the consequences of mathematical anxiety [1], which can be seen in the following Figure 1.

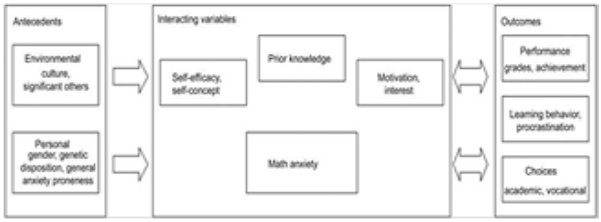

Figure 1 Antecendents, Interacting Variables, and Outcome of Mathematics Anxiety

Based on the Figure 1, it can be seen that one of the consequences that can be influenced by mathematical anxiety is performance or achievement. It will have a considerable impact on students who will face the exam. Based on the Law No. 20 of 2003 and Government's Regulation No. 19 of 2005, Indonesian students on 6th grade will face national exam to continue on their secondary level. At 6th grade, students will try their best to prepare themselves to face on national examination. The result of their exam will affect to the school chosen by them at the next level.

There are two types of schools in Indonesia, namely public and private. Generally, parents will choose the school for their children by some factors such as the quality of the school, curriculum offered, distance, costs, and so on. Some parents choose to enrol their children in private schools as an alternative if their children are not accepted into public school. This is to give a sense of security to their children that they can continue their education higher. Even though some students have been

accepted into private school but they are still charged with giving the best results on their national exam. One of the subjects that students will face is mathematics. To pass mathematics exam, students are prepared by doing some training/drilling given by the teacher so the students will be better in understanding mathematics and more familiar with the questions they will face. In addition, having training/ drilling can give a good effect on the disposition of students towards mathematics.

Since the 80s, experts have seen that dispositions play a role in the learning process at schools, especially in mathematics learning. This is because disposition is seen as a positive way for a student to be able to create a good habit in learning mathematics [2]. Through the continuous effort it can make students' mindset more positive towards mathematics [3]. This can affect their performance in the field of mathematics. Kusmaryono, et al (2019) showed there was an influence of mathematical disposition on student performance [4]. Based on the previous explanation, it can be concluded that a continuous effort, in this case in the form of drilling, can improve students' disposition, which will have an effect on students' learning achievement and also can suppress students' anxiety. To develop mathematical dispositions, there are several indicators that can be used as references by educators. Many experts or institutions propose indicators in disposition. One of the institutions, namely NCTM, proposed the 7 indicators revealed in the disposition, they are: self-confidence (SC), monitor (M), interest (I), perseverance (P), and flexible (F) in learning mathematics, as well as a perceived value (PV) of mathematics and applications in other fields.

Based on the explanation above, it can be concluded that the 6th grade student will have a good disposition through continuous effort in learning mathematics. They will carry the disposition attitude into the next class, where the disposition will mature with the increasing of age. This is because generally the more a child gets older, the better emotional, cognitive, and social maturity will be. Furthermore, at 7th grade student will have lower mathematical anxiety due to the assumption that they have passed the national examination phase at 6th grade. Based on these explanations, the purpose of this study was to find out the influence of students' mathematical disposition on mathematical anxiety of 7th grade student who had finished through national examination and had enrolled at private school, and sought relationships between indicator variables in mutually influential mathematical disposition.

2. METHODS

This research is a quantitative study with a survey approach on 16 students of 7th grade in a private school. The reason for choosing a private school is the feeling of security described on the previous chapter. The instrument used in this study was an instrument of anxiety by Aulia's research instruments [5] as well as mathematical disposition instruments by Widyasari's research instrument [6]. The data analysis techniques used were regression analysis and factor analysis. Regression analysis was used to find the influence of mathematical disposition on mathematical anxiety, while factor analysis was used to find the relationship among variables of indicators in mathematical disposition.

3. RESULTS AND DISCUSSION

3.1. Regression Analysis

The formed factor is regressed with the measured anxiety variable from 16 of 7th grade students. Before the regression analysis was carried out, the normality of the two data was tested as the basic assumptions that must be fulfilled. Based on the normality test using Kolmogrov Smirnov and Shapiro Wilk, it was known that the two variables are normally distributed, as shown in the following Table 1.

Table 1 Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
REGR factor score 1 for analysis 1	0.150	16	0.200*	0.954	16	0.550
Math Anxiety	0.132	16	0.200*	0.970	16	0.836

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Because both data were stated to be normally distributed, then regression analysis could be performed on both anxiety variables and disposition factors. The following are the results of the regression analysis presented in Table 2.

Table 2 Anaysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23.620	1	23.620	0.494	0.493[b]
	Residual	668.818	14	47.773		
	Total	692.438	15			

a. Dependent Variable: Kecemasan
b. Predictors: (Constant), REGR factor score 1 for analysis 1

Based on the ANOVA result in Table 2, the calculated F value was 0.494 and the Sig value was 0.493 greater than = 0.05, so it can be concluded that the hypothesis that disposition affects anxiety cannot be accepted, or in other words there is no effect of disposition on anxiety. This can also be seen in the following coefficient's table for partial analysis. It was known that the significant value of 0.493 was greater than the value of the score (disposition). It means, the factor does not affect anxiety = 0.05.

Table 3 Coeficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	26.813	1.728		15.517	0.000
	REGR factor score 1 for analysis 1	-1.255	1.785	-0.185	-0.703	0.493

a. Dependent Variable: Math Anxiety

3.2. Factor Analysis

Before the factor analysis was carried out, KMO and Bartlett's were tested to show whether the sample data is considered sufficient or not. The result of KMO and Bartletts test can be seen in Table 4.

Table 4 KMO and Barlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.751
Bartlett's Test of Sphericity	Approx. Chi-Square	45.023
	df	21
	Sig.	0.002

Based on the Table 4 it appears that the value of Measure of sampling Adequacy (MSA) is 0.751> 0.5. This shows that the sample data is considered sufficient. In the chi-square value obtained a value of 45.023 with a degree of freedom 21 and a significance value of 0.002, which means there is a correlation between variables and a feasible process to proceed.

Table 5 Anti-Images Matrices

		SC	M	I	P	A	PV	F
Anti-image Covariance	C	0.283	-0.041	-0.105	-0.152	-0.142	-0.099	0.130
	M	-0.041	0.252	-0.150	-0.061	-0.042	-0.124	-0.033
	I	-0.105	-0.150	0.329	0.084	0.098	0.003	-0.129
	P	-0.152	-0.061	0.084	0.667	-0.012	0.016	-0.053
	A	-0.142	-0.042	0.098	-0.012	0.488	0.003	-0.294
	PV	-0.099	-0.124	0.003	0.016	0.003	0.446	0.083
	F	0.130	-0.033	-0.129	-0.053	-0.294	0.083	0.557
Anti-image Correlation	C	0.767[a]	-0.152	-0.343	-0.350	-0.383	-0.278	0.328
	M	-0.152	0.814[a]	-0.522	-0.149	-0.120	-0.371	-0.087
	I	-0.343	-0.522	0.741[a]	0.180	0.244	0.007	-0.301
	P	-0.350	-0.149	0.180	0.823[a]	-0.021	0.029	-0.088
	A	-0.383	-0.120	0.244	-0.021	0.662[a]	0.006	-0.563
	PV	-0.278	-0.371	0.007	0.029	0.006	0.855[a]	0.167
	F	0.328	-0.087	-0.301	-0.088	-0.563	0.167	0.472[a]

a. Measures of Sampling Adequacy (MSA)

The correlation among variables can be seen based on the Measure of Sampling Adequacy (MSA) value in the anti-image matrices table above. The MSA value is shown in the Anti-image correlation line and each value has an 'a' sign, which is known that all MSA values for 6 variables are greater than 0.5. Their results are; the confidence variables obtained value 0.767, monitor 0.814, interest 0.741, perseverance 0.823, application 0.662, and perceived value 0.855. Whereas the flexible variable MSA 0.472 is smaller than 0.5 which results in the flexible variable not being included in the next analysis as shown in Table 6 and Figure

Table 6 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.730	53.290	53.290	3.730	53.290	53.290
2	1.247	17.819	71.108	1.247	17.819	71.108
3	0.788	11.254	82.363			
4	0.512	7.321	89.684			
5	0.353	5.037	94.721			
6	0.208	2.966	97.687			
7	0.162	2.313	100.000			

Extraction Method: Principal Component Analysis.

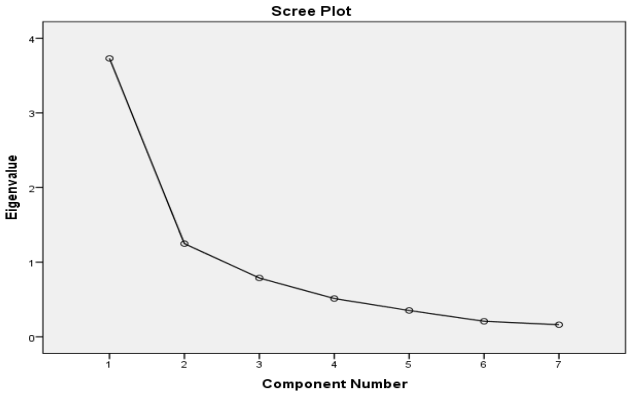

Figure 2 Scree Plot Eigen Value and Component Number Phase 1

The seven fixed variables are analysed based on the table of total variance explained. There are 2 factors formed from the scree plot, because there are only 2 components that get eigenvalues of more than 1, namely 3.370 and 1.247. The variables formed into these two factors can be seen in the following matrix component.

Table 7 Componen Matrix

	Component	
	1	2
C	0.873	0.225
M	0.900	0.106
I	0.808	0.074
P	0.615	0.040
A	0.641	0.554
PV	0.755	0.402
F	0.384	0.843

Extraction Method: Principal Component A
a. 2 components extracted.

From the 2 factors formed, the six variables fall into the factor 1 category because the correlation value of the six variables is higher in factor 1 compared to factor 2, while 1 variable is flexible in the factor 2 category. Because flexible variable does not form factors with other variables and based on MSA value obtained it is less than 0.5 thus for the next analysis flexible variables are not included (written off). The results of the analysis after the variables were eliminated, the MSA value for all variables was greater than 0.5, as shown in the following anti-figure table

Table 8 Anti Image Matrices

		C	M	I	P	A	PV
Anti-image Covariance	C	0.317	-0.037	-0.092	-0.157	-0.121	-0.136
	M	-0.037	0.254	-0.175	-0.065	-0.088	-0.124
	I	-0.092	-0.175	0.362	0.080	0.048	0.025
	P	-0.157	-0.065	0.080	0.672	-0.059	0.024
	A	-0.121	-0.088	0.048	-0.059	0.715	0.070
	PV	-0.136	-0.124	0.025	0.024	0.070	0.459
Anti-image Correlation	C	0.830[a]	-0.131	-0.271	-0.341	-0.254	-0.357
	M	-0.131	0.786[a]	-0.577	-0.158	-0.205	-0.363
	I	-0.271	-0.577	0.776[a]	0.162	0.095	0.061
	P	-0.341	-,158	,162	,827[a]	-,086	,044
	A	-0.254	-,205	,095	-,086	,847[a]	,123
	PV	-0.357	-,363	,061	,044	,123	,837[a]

a. Measures of Sampling Adequacy (MSA)

While the eigenvalues obtained to see the numbers of factors formed are shown in the total variance table described in the following scree plot image.

Table 9 Total Variance Explained

Component	Initial Eigenvalues	
	Total	% of Variance
1	3.621	60.342
2	0.840	14.001
3	0.659	10.979
4	0.452	7.536
5	0.257	4.281
6	0.172	2.860

Extraction Method: Principal Component Analysis.

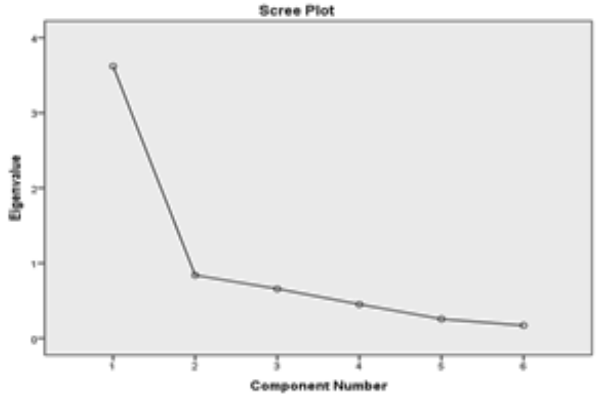

Figure 3 Scree Plot Eigen Value and Component Number Phase 2

Based on the results of the study, it can be concluded that there is no influence of mathematical disposition on mathematical anxiety in the new 7th grade students through the stages of the national examination. These results are different from some of the results of previous studies [7], which indicate that there is a negative and significant relationship between mathematical dispositions and mathematical deficiencies. This shows that preparation before the exam does not significantly affect mathematical anxiety, even though students have a good mathematical disposition, which is included in the high disposition category. One of the factors that can influence it is the anxiety of a high child despite having a good disposition attitude. It is an antecedent factor as seen in Figure 1, where parents have a role in mathematical anxiety [8]. Indirectly parents have a strong influence to their children about how to assess themselves through the formation of educational values and children's self-assessment through parents' attitudes towards mathematics itself [1].

Furthermore, the results of the study also show that from the 7 indicators, 6 indicators are interrelated, namely self-confidence, monitoring, interest, perseverance, application, and appreciation for mathematics. However, there is flexible aspect, which does not have a correlation with other aspects. According to National Council of Teachers of Mathematics, Commission on Standards for School Mathematics (1989), flexibility is an attitude to be adjustable in investigating mathematical ideas and trying to find alternative methods in solving problems [9]. This attitude is included in a difficult attitude to be developed for 6th grade students who are faced with mechanistic problem exercises and lack of high-order thinking skills. This is what can be expected to cause flexible aspects do not have a correlation with other aspects.

4. CONCLUSIONS

Based on the previous explanation it can be concluded that:

1) There is no influence between mathematical dispositions on mathematical anxiety for 7th grade students, especially to those who have just passed the national examination at 6th grade
2) The flexible aspects of students who have just passed the national exam do not have a correlation with other aspects such as self-confidence, monitoring, interest, perseverance, application, and appreciation for mathematics.

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REFERENCES

[1] S. Luttenberger, S. Wimmer, and M. Paechter, "Spotlight on math anxiety," *Psychology research and behavior management*, vol. 11, p. 311, 2018.

[2] G. Lappan. "Fostering a Good Mathematical Disposition - National Council of Teachers of Mathematics." National Council of Teachers of Mathematics. https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Glenda-Lappan/Fostering-a-Good-Mathematical-Disposition/ (accessed 07 July, 2019).

[3] J. Kilpatrick, J. Swafford, B. Findell, and N. r. council, *Adding it up: Helping children learn mathematics*. Citeseer, 2001.

[4] I. Kusmaryono, H. Suyitno, D. Dwijanto, and N. Dwidayati, "The Effect of Mathematical Disposition on Mathematical Power Formation: Review of Dispositional Mental Functions," *International Journal of Instruction*, vol. 12, no. 1, pp. 343-356, 2019.

[5] R. N. Auliya, "Pengaruh Model Pembelajaran Kooperatif Tipe CRH (Course, Review, Hurray) Terhadap Kemampuan Pemahaman Matematis dan Kecemasan Matematika Siswa SMP," Universitas Pendidikan Indonesia, 2013.

[6] N. Widyasari, "Meningkatkan kemampuan penalaran dan disposisi matematis siswa smp melalui pendekatan metaphorical thinking," Universitas Pendidikan Indonesia, 2013.

[7] E. Wibowo, "Hubungan antara kecemasan belajar matematika dengan disposisi matematis siswa di SMP Negeri 2 luwuk," *PYTHAGORAS: Jurnal Program Studi Pendidikan Matematika*, vol. 7, no. 1, pp. 47-54, 2018.

[8] B. J. Casad, P. Hale, and F. L. Wachs, "Parent-child math anxiety and math-gender stereotypes

predict adolescents' math education outcomes," *Frontiers in psychology*, vol. 6, p. 1597, 2015.

[9] National, Council, of, Teachers, of, and Mathematics, "Curriculum and evaluation standards for school mathematics," T. Council, Ed., ed: Commission on Standards for School Mathematics, 1989.