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Emotional Intelligence and Numerical Abilities: How are They Related?

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Abstract: This Ex Post Facto research aims to determine the correlation between emotional intelligence and students' numerical abilities and the strength of the correlation between the two variables. Data collection was carried out on seventh-grade students at MTS N 7 Sleman Yogyakarta with a total of 35 respondents. The sampling technique used was simple random sampling. Respondents were given an emotional intelligence questionnaire and a numerical ability test whereas previously the instruments were tested for validity and reliability. The data analysis technique in this study uses Simple Linear Correlation. Prerequisites that must be met before the significance test is a linearity test and a normality test. Using the product moment/Pearson correlation, the result is that the rxy value is 0.547. Also, obtained the value of sig. of 0.001 < 0.05 or the value of F = 12.824 > 4.17 as a result H0 is rejected. This study concludes that there is a positive correlation between emotional intelligence and students' numerical ability with a strength of 0.547. This means that the higher the emotional intelligence possessed, the higher the student's numerical ability. The value of the coefficient of determination (R2) is 29.90%, which means that the emotional intelligence variable affects students' numerical abilities by 29.90%, thus 71.10% is influenced by other variables.

Keywords: emotional intelligence, numerical abilities, Pearson correlation.

Abstrak: *Penelitian Ex Post Facto ini bertujuan untuk mengetahui hubungan dari kecerdasan emosional dan kemampuan numerik siswa serta besarnya kekuatan hubungan dari kedua variabel tersebut. Pengambilan data dilakukan pada siswa kelas VII di MTS N 7 Sleman Yogyakarta dengan jumlah responden sebanyak 35. Teknik sampling yang digunakan ialah simple random sampling. Responden diberikan instrumen angket kecerdasan emosional dan tes kemampuan numerik di mana sebelumnya instrumen diuji validitas dan reliabilitasnya. Teknik analisis data dalam penelitian ini menggunakan Korelasi Linear Sederhana dengan prasyarat analisis uji linearitas dan uji normalitas. Menggunakan korelasi product moment/pearson diperoleh bahwa rxy sebesar 0.547. Serta, didapatkan nilai sig. sebesar 0.001<0.05 atau nilai F=12.824 > 4.17 akibatnya H0 ditolak. Kesimpulan penelitian ini ialah terdapat korelasi positif antara kecerdasan emosional dan kemampuan numerik siswa dengan kekuatan hubungannya sebesar 0.547. Hal ini berarti bahwa semakin tinggi kecerdasan emosional yang dimiliki, akan berakibat semakin tinggi pula kemampuan numerik siswa. Besarnya nilai koefisien determinasi (R2) sebesar 29.90% yang berarti variabel kecerdasan emosional mempengaruhi kemampuan numerik siswa sebesar 29.90%, dengan demikian sebesar 71.10% dipengaruhi oleh variabel lainnya.*

Kata kunci: *kecerdasan emosional, kemampuan numerik , Pearson correlation.*

▪ INTRODUCTION

Mathematics is one of the important sciences for all fields of science. Mathematics is the basis of science for various fields of science, among others of industrial technology, economics, and the field of computer science. The development of increasingly advanced technology is very dependent on the development of mathematical theories that can be applied to the development of other fields of science.

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Mathematics is the science of reasoning. By learning mathematics, you can improve your ability to think logically, creatively, and innovatively in yourself. The importance of learning mathematics has begun with the existence of mathematics subjects from early childhood education to high/vocational high school. Mathematics learning at each level of education has a fairly large percentage of learning hours. For example, at the junior high school level it is 5 hours a week according that the regulation of the Minister of Education and Culture of the Republic of Indonesia Number 35 of 2018. This means the importance of great efforts to improve students' mathematical abilities.

Each student has different characteristics in understanding a mathematical problem. Some students like to learn mathematics, but some students make mathematics a scourge. There is an interest in learning mathematics which is very necessary for an effort to improve the quality of learning mathematics. This is in line with the results of research which explains that there is a significant influence on student learning interest on mathematics learning outcomes (Sirait & Apriyani, 2021). Likewise, high motivation will affect the ability to solve mathematical problems. As in the results of research which explains that high achievement motivation in students will increase their ability to solve mathematical problems (Aspriyani, 2017). For this reason, the interest and motivation of students in learning mathematics need to be increased. In addition, the self-confidence that exists in students can affect student learning achievement according to the results of research that higher students' self-confidence will have an impact on the higher their communication skills (Aspriyani, 2020).

The student learning process is largely determined by the willingness to learn. Students with a high willingness to learn are possible to have a good effect on the learning process. The student learning process will be organized and systematic with a supportive learning environment. For this reason, it is necessary to pay attention to how teachers can provide fun and effective learning in order to explore students' mathematical abilities. Teachers have a big task in educating students to develop their potential of students, especially in their ability to learn mathematics. Students' mathematical abilities can be seen in aspects of students' ability to communicate both verbally and in writing, ability to solve mathematical problems, ability to count and reason, student visual abilities, ability to understand mathematics, and so on. This is in accordance with the explanation given that there are several aspects of mathematical skills that students need to have, namely (1) learning to communicate; (2) learning to reason; (3) learning to solve problems; (4) learning to relate ideas and; (5) the formation of positive attitudes towards mathematics (NCTM, 2000).

In education, students' abilities are honed through problems so that students are able to improve their various competencies (Sumartini, 2016). This relates to the importance of the ability to solve mathematical problems, (NCTM, 2000) also explains that in the implementation of mathematics learning, one must pay attention to five mathematical abilities, namely: connections, reasoning, communication, problem-solving, and representations. For this reason, in solving a mathematical problem, students must be able to understand the problem first, then plan problem-solving strategies, carry out problem-solving procedures, and check the correctness of the answers obtained (Purnamasari & Setiawan, 2019). The process of finding answers is very concerned with aspects of mathematical understanding ability, mathematical communication skills, and mathematical arithmetic abilities. For example, there is a

mathematical problem in the form of a story problem on the material of a linear equation of two students to be able to solve the problem, they must make a problem identification table, then a mathematical model is formed and in the end, it is solved according to the right mathematical method.

On the other hand, an important ability that must be present in students to be able to improve students' mathematical critical thinking skills is the student's numerical ability. However, nowadays many students have difficulty learning mathematics because of their low numerical abilities (Gunur, Parinters Makur, & Hendrice Ramda, 2018). Numerical abilities involve numbers to be solved using appropriate mathematical operations both calculated and measured. Numerical ability can be described as the basic ability to use numbers which includes numeracy skills, logical thinking skills, mathematical problem-solving skills, and reasoning (Jelatu, Emensia M, & San, 2019). Numerical ability is also a part of counting operations in mathematics and is very much needed in solving problems in mathematics (Alpadery, Astriyani, & Wathoni, 2020). A good student's numerical ability can be seen from the achievement of several indicators, namely mathematical calculations, ability to think logically, ability to solve problem-solving, and ability to distinguish numerical patterns and their relationships (Alpadery et al., 2020). Someone who has numerical abilities generally has an orderly way of thinking in doing things and solving problems. In addition, low numeracy skills have a negative impact on career opportunities in employment (Cohen Kadosh, Dowker, Heine, Kaufmann, & Kucian, 2013). This is because numerical abilities have sensitivity and the ability to distinguish patterns of numbers or numbers and the ability to handle long series of reasoning (Indrawati, 2015). Giving assignments by teachers to students correctly and appropriately also makes a good contribution to the development of students' numerical abilities (Gardes, Croset, & Courtier, 2019). Therefore, an increase in numerical ability will have an impact on student learning outcomes (Huda et al., 2020). The ability to count can help students understand the material, analyze problems, and apply mathematical concepts in everyday life so that it has a huge impact on student learning outcomes (Munifah et al., 2019).

Numerical ability can be supported by students' learning motivation. With the students' learning motivation, students will be active to work on math problems. In addition, regular practice questions can improve students' arithmetic abilities (Khanum, Hanif, Spelke, Berteletti, & Hyde, 2016). The results of the study explain that there is a significant relationship between learning motivation and students' numerical abilities, which is 46% (Noviarti, Utami, & Prihatiningtyas, 2020). With the motivation to learn in students, students will have the drive to study well to achieve the expected learning outcomes. Every student has a desire to succeed, what makes the difference is the percentage of desire to excel. This is the teacher's goal, how students can improve their learning achievement through learning media, student learning processes in schools, and other variables that can have a good impact on student learning outcomes.

In addition, another variable that may have a positive relationship is emotional intelligence. Emotional intelligence is a set of abilities, competencies, and non-cognitive skills that affect a person's ability to understand feelings and their meanings, and to control feelings deeply to help emotional and intellectual development (Uno, 2016). Goleman explains that emotional intelligence is the ability to recognize self feelings and the feelings of others, the ability to motivate oneself, and the ability to manage emotions

well in oneself and in relationships with others (Goleman, 2007). There are five main aspects of emotional intelligence are (1) Recognizing self emotions; (2) Managing emotions; (3) Motivating yourself; (4) Recognizing the emotions of others; (5) Building relationships (Goleman, 2007). Emotional intelligence is important for students because a high ability to manage emotions will have an impact on increasing student achievement (Achdiyat & Utomo, 2017). To add value to success, students must also be able to understand and manage emotions to succeed in school (Maccann, Jiang, Brown, Double, & Bucich, 2020). With the emotional intelligence possessed by students, students can recognize conditions and a good learning environment for them, be able to encourage themselves to continue to succeed, and be able to communicate well when studying in class. This is following the results of research which state that there is a strong positive correlation between emotional intelligence and learning outcomes with a correlation value of 0.73 (Saputri, 2018).

Each student has emotional intelligence with different level categories. If grouped into three categories in general, some students have high, medium, or low intelligence categories. If students believe that they can understand and regulate emotions, they will show higher emotional intelligence (Kanesan & Fauzan, 2019). Good emotional management is possible to have a good impact on student learning. Emotional intelligence is the main determinant of students' achievement in learning mathematics (Ugwuanyi, Okeke, & Asomugha, 2020). Thus, students must be able to recognize and manage their emotions to survive all forms of problems in learning both at school and learning independently. Thus, students with higher emotional intelligence tend to get higher achievement test scores (Maccann et al., 2020). For this reason, it is hoped that the presence of good emotional intelligence possessed by students can improve students' learning achievement in mathematics with better numerical abilities. Thus, the purpose of this study was to determine the relationship between students' emotional intelligence and students' numerical abilities.

▪ METHOD

This research is Ex Post Facto research with correlation research type (Causal Research). Correlation research is research that aims to see the relationship and level of relationship between two or more variables. In this study, there are two variables, namely one independent variable and one dependent variable. The independent variable is emotional intelligence while the dependent variable is numerical ability. The data measurement scale used is the interval scale.

The population in this study were all seventh-grade students at MTS N 7 Sleman Yogyakarta as many as 175 students. The sampling technique uses simple random sampling using a lottery so that all students can have the same opportunity. Obtained a sample of 35 students. The instrument in this study used an emotional intelligence questionnaire based on Goleman's theory and a student's numerical ability test. The emotional intelligence questionnaire consists of 16 items, while the numerical ability test consists of 5 essay questions. Before being given to students, the instrument was tested first to analyze its feasibility of the instrument using the Validity Test and Reliability Test.

He data analysis technique used is a simple linear correlation analysis using the Pearson/Product Moment correlation to determine the strength of the relationship

between the independent variables and the dependent variable. The product moment formula is as follows (Budiyono, 2009).

$$r_{xy} = \frac{n\sum_{i=1}^{n} x_i y_i - (\sum_{i=1}^{n} x_i)(\sum_{i=1}^{n} y_i)}{\sqrt{(n\sum_{i=1}^{n} {x_i}^2 - (\sum_{i=1}^{n} x_i)^2)(n\sum_{i=1}^{n} {y_i}^2 - (\sum_{i=1}^{n} y_i)^2)}}$$

Correlation coefficient r_xy and linear determination coefficient (R2) to see the magnitude of the relationship between Emotional Intelligence and Numerical Ability. The value of r_xy is -1<r_xy<1. If r_xy>0 then the correlation is positive and if r_xy<0 then the correlation is negative. If the correlation is positive, the regression line will be skewed to the right, while for a negative correlation the regression line will be skewed to the left. The graph of the correlation type can be shown below.

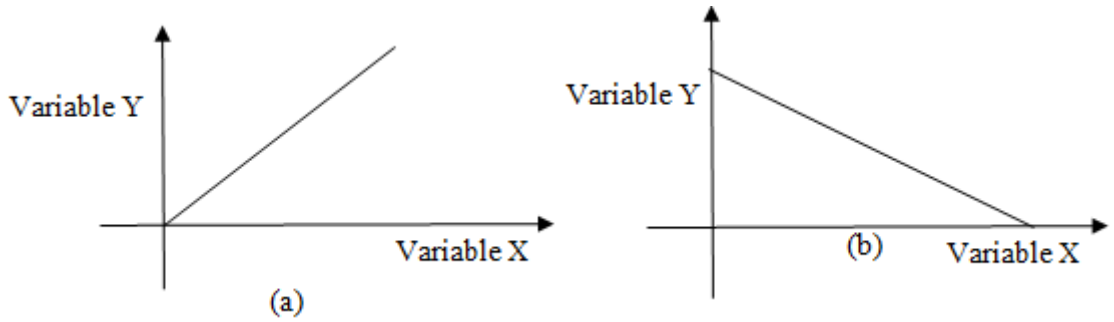

Figure 1. The Graph of the positive correlation (a) and negative correlation (b)

From the picture above, it is known that when the value of r_xy is positive, it has a relationship as shown in Figure (a) which means that the higher the value in the X variable, the higher the value of the Y variable. While in Figure (b) is an image of a negative correlation. With a negative r_xy, which means that the higher the value on the X variable, the lower the value on the Y variable. In this study, the relationship between students' Emotional Intelligence (X) and their numerical ability (Y) will be seen.

Figure 2. Design of Relationship between independent and dependent variables

Meanwhile, to test the significance of the simple linear correlation hypothesis using a statistical test with an F distribution. This significance test aims to determine whether the relationship between the independent and dependent variables is significant or not. Before testing the hypothesis, the prerequisites for the analysis are carried out, namely the linearity test and normality test with the help of the SPSS (Statistical Product and Service Solutions) statistical program. The following is a simple linear correlation coefficient significance test (Budiyono, 2009).

▪ RESULT AND DISSCUSSION

The master data was obtained from data collection on students' numerical abilities and Emotional Intelligence using instruments that were feasible and reliable to be given to students. It was obtained for the emotional intelligence questionnaire that 16 items had item validity values greater than 0.3388 so 16 items were declared valid. And the reliability value of r_11=0.897 which means that the emotional intelligence questionnaire has a very high reliable category. As for the numerical ability test instrument, it was obtained that the validity value of each item was greater than 0.3388 so all test items were declared valid. For the reliability value of the numerical ability test instrument, it has a highly reliable category of r_11=0.790. Thus, the two instruments are feasible to use.

The master data is used to test the prerequisite analysis, namely the normality test and linearity test before testing the significance of the hypothesis. The prerequisite test for normality analysis using the Kolmogorov Smirnov test, the SPSS output results are shown in Table 1 as follows.

Table 1. Summary of normality analysis of kolmogorov smirnov test

Sumber		**EI**	**Numerical Ability**
N		32	32
Normal Parameters[a]	Mean	76.84	67.97
	Std. Deviation	13.150	18.666
Most Extreme Differences	Absolute	0.092	0.165
	Positive	0.088	0.165
	Negative	-0.092	-0.108
Kolmogorov-Smirnov Z		0.518	0.935
Asymp. Sig. (2-tailed)		**0.952**	**0.346**

Based on Table 1, it is found that the significance value is 0.952 > 0.05 for Emotional Intelligence and 0.346 > 0.05 for students' numerical abilities so the data comes from a normally distributed population. The application of the normality test is carried out because many statistical procedures require or assume normality (Steinskog, Tjøtheim, & Kvamstø, 2007). In this study, a normality test is required for the prerequisites for linear correlation. The graph of the distribution of normal data in this study is as follows.

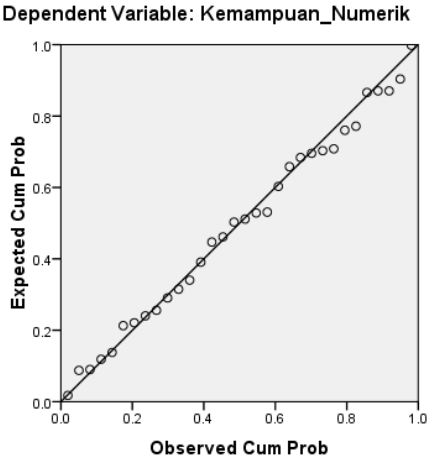

Figure 3. Data normality graph

Based on the graph, it is known that the data points spread along a diagonal line so that the data is normal. Furthermore, a linearity test was carried out using SPSS with the result that the significance value of Deviation from Linearity was 0.514 > 0.05, which means that the two variables of Emotional Intelligence and Numerical Ability are linear as shown in Table 2.

Table 2. Summary of linearity test analysis

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	7775.719	19	409.248	1.623	0.197
	Linearity	3234.494	1	3234.494	12.830	0.004
	Deviation from Linearity	4541.225	18	252.290	1.001	**0.514**
Within Groups		3025.250	12	252.104		
Total		10800.969	31			

Thus, the linear correlation significance test can be performed because the analysis prerequisites have been met. In determining the strength of the r_xy relationship using the Pearson/Product Moment Correlation (Shibila Sabir & Thomas, 2020) and (Harun, 2017). It is known that the data measurement scale of the two variables in this study is an interval. The following is the output of SPSS.

Table 3. Summary of pearson correlation analysis

		EI	Numerical Ability
EI	Pearson Correlation	1	**0.547**
	Sig. (2-tailed)		0.001
	N	32	32
Numerical Ability	Pearson Correlation	**0.547**	1
	Sig. (2-tailed)	0.001	
	N	32	32

Table 3 explains that the value of the correlation coefficient r_xy=0.547. As a result, it is found that the correlation of the two variables between Emotional Intelligence and Numerical Ability has a positive relationship. These results are following the results of research that explain that there is a relationship between emotional intelligence and academic achievement (Sünbül, 2007). For this reason, emotional intelligence is one indicator of academic success, where students who have high emotional intelligence will be active and work better in their groups (Gunawan, Ramdani, & Hadisaputra, 2022). So it is very good if there is an emotional management exercise to be able to increase emotional intelligence (Hisli Şahin, Güler, & Basim, 2009). Meanwhile, to find out the significance of the linear correlation, statistical tests were carried out in simple terms with Table 4, the summary of the analysis is as follows:

Table 4. Summary of analysis on simple linear correlation

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3234.494	1	3234.494	12.824	0.001
Residual	7566.475	30	252.216		
Total	10800.969	31			

Based on Table 4 above, with a significance level of α=5%, it is obtained that the value of sig. of 0.001 < 0.05 or it is known that the value of F=12.824>4.17 so that H_o is rejected, which means that there is a significant correlation of Emotional Intelligence with students' numerical abilities. These results indicate that the higher the emotional intelligence of students, the higher their numerical ability of students. This is following the results of research that explain that there is a significant positive correlation between emotional intelligence and students' academic performance (Meher, Baral, & Bankira, 2021). Other studies also explain that there is a correlation between emotional intelligence and student achievement (Mulawarman, Huda, Suharso, & Muslikah, 2020). In addition, the results of other studies explain that emotional intelligence predicts students' mathematical competence significantly, but with a correlational value that is not high (Nor, Ismail, & Yusof, 2016). Meanwhile, in this study, the strength of the relationship between emotional intelligence and numerical ability is 0.547 with a coefficient of determination (R2) of 29.90%. The strength of the relationship between the two variables is 0.547 with a coefficient of determination (R2) of 29.90%. The coefficient of determination means that emotional intelligence affects students' numerical ability by 29.90% so 70.10% is influenced by other variables which are shown in the summary of results below.

Table 5. Coefficient of determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.547[a]	0.299	0.276	15.881

a. Predictors: (Constant), EI

The results of the relationship between emotional intelligence and numerical ability are following the results of research which explains that there is a significant influence between emotional intelligence on mathematical problem-solving abilities (Brahmansyah, 2019). Other studies also suggest that there is a significant positive relationship between students' emotional intelligence levels on learning achievement (Al-Qadri & Zhao, 2021). In addition, the results of the regression analysis show that there is a relationship or causality between Emotional Intelligence and Academic Skills (Altunkaya, 2021). The results of other studies show that there is a significant correlation between Grit and Emotional Intelligence (Özer, 2021). Thus, the presence of emotional intelligence in students will have a good impact on their numerical abilities of students. The better the students' emotional intelligence, the better the students' numerical abilities. On the other hand, the results of the study show that there is a positive relationship between emotional intelligence and teacher leadership style (Füsun, 2017). Therefore, to be able to increase students' emotional intelligence, they can go through interesting learning with good leadership from the teacher. The existence of high emotional intelligence can have a good impact on the success of students' mathematics learning (Prafitriyani, Magfirah, Amir, Irmawati, & Umanailo, 2019). One of the results of learning mathematics is the numerical ability of good students.

▪ CONCLUSION

This study concludes that by using simple linear correlation analysis (Pearson/Product Moment Correlation) the r_xy value is 0.547. The relationship between emotional intelligence and numerical ability has a positive correlation, which means that the higher the emotional intelligence possessed, the higher the student's numerical ability. The value of the coefficient of determination (R2) is 29.90%, which means that the emotional intelligence variable affects students' numerical abilities by 29.90%, thus 71.10% is influenced by other variables. Emotional intelligence and numerical ability provide a fairly strong positive relationship based on the correlation criteria (Sugiyono, 2018).

The results of this study as consideration or reference knowledge for teachers as educators that students' emotional intelligence can be improved. Likewise, in solving mathematical problems, teachers must improve students' numerical abilities. This is because, with the presence of good emotional intelligence in students, they can understand, process, know, and manage emotional information accurately and effectively (Meher et al., 2021). So that students' thinking and their mathematics learning process can be regulated properly good.

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