Available online at http://journal.uny.ac.id/index.php/jrpm

Jurnal Riset Pendidikan Matematika 11 (2), 2024, 77-89

A Meta-Analysis: The Effect of Emotional Intelligence on Students' Mathematics Learning Outcomes in Indonesia

Ahmad Naufal Aljura[a], Heri Retnawati[*,b], Djamilah Bondan Widjajanti[c]

Mathematics Education Department, Universitas Negeri Yogyakarta, Jl. Colombo No.1 Yogyakarta, 55281, Indonesia

E-mail: [a]ahmadnaufal.2023@student.uny.ac.id, [b]heri_retnawati@uny.ac.id, [c]djamilah_bw@uny.ac.id

* Corresponding Author

ARTICLE INFO

Article history
Received: January 2024
Revised: May 2024
Accepted: September 2024

Keywords
Meta-Analysis,
Mathematics Learning Outcome,
Emotional Intelligence.

Scan me:

ABSTRACT

Penelitian ini bertujuan untuk mendeskripsikan tren penelitian berdasarkan kategori, menentukan ukuran pengaruh dari kecerdasan emosional terhadap hasil belajar siswa pada pembelajaran Matematika, dan mendeskripsikan skala (instrumen) kecerdasan emosional yang digunakan dalam pembelajaran Matematika. Penelitian ini menggunakan pendekatan kuantitatif dengan metode Kajian Literatur Sistematis dengan MetaAnalysis. Data yang terhimpun untuk deskriptif kualitatifnya adalah 14 artikel penelitian dan untuk analisis ukuran pengaruh gabungannya adalah 11 artikel. Didapatkan bahwa tren penelitian pengaruh kecerdasan emosional terhadap hsail belajar Matematika mengalami peningkatan dari tahun 2015 sampai dengan 2022. Terlihat juga, penelitian tersebut diminati di daerah Sumatra dan Sulawesi, dan dilakukan pada jenjang SMP Sederajat. Hasil analisis menunjukkan pengaruh signifikan Kecerdasan Emosional terhadap hasil belajar Matematika siswa berkriteria ”pengaruh sedang”. Untuk kategori jenjang pendidikan, SMP Sederajat memiliki nilai pengaruh gabungan tertinggi (1,120) di subgrupnya berkriteria ”pengaruh sangat tinggi”. Untuk kategori demografi, daerah Kalimantan, Nusa Tenggara, Maluku memiliki nilai pengaruh gabungan (0,806) tertinggi di subgrupnya berkriteria ”pengaruh tinggi”. Untuk jenis skala kecerdasan emosional, studi dengan skala terstandarisasi (0,659) dan tidak spesifik (0,698) memiliki pengaruh yang relatif sama berkriteria ”pengaruh sedang”, serta dominasi penggunaanya berdasarkan standar Solovey dan Mayer.

This study aimed to described research trends based on categories, determine the effect size of emotional intelligence on student learning outcomes in Mathematics learning, and described emotional intelligence scales (instruments) used in Mathematics learning. This research used a quantitative approach with the method of Systematic Literature Review with Meta-Analysis. The data collected for the qualitative descriptive were 14 research articles and for the combined effect size analysis were 11 articles. It was found that the research trend on the effect of emotional intelligence on Mathematics learning outcomes has increased from 2015 to 2022. The results of the analysis showed that the significant effect of Emotional Intelligence on students' Mathematics learning outcomes was categorized as " medium impact". For the category of education level, junior high school has the highest combined effect value (1.120) in its subgroup, which is categorized as "very high impact". For the demographic category, Kalimantan, Nusa Tenggara, and Maluku regions have the highest combined effect value (0.806) in their subgroups categorized as "high impact". For the type of emotional intelligence scale, articles with standardized (0.659) and unspecified (0.698) scales have relatively the same effect categorized as "medium impact", and the dominance of its use is based on Solovey and Mayer.

How to Cite: Aljura, A. N., Retnawati, H., Widjajanti, D. B. (2024). A Meta-Analysis: The Effect of Emotional Intelligence on Students' Mathematics Learning Outcomes. *Jurnal Riset Pendidikan Matematika,* 11(2), 77-89. doi: http://dx.doi.org/10.21831/jrpm.v11i2.71116

INTRODUCTION

Adaptation is essential for human survival on Earth (Piantadosi, 2003), and developing an "adaptive mentality" is crucial for learning. Mathematics as a subject of learning is a powerful mental adaptation tool (Skemp, 1987, p.6). Therefore, humans require intellectual intelligence, emotional intelligence, and other forms of intelligence to effectively learn it.

Mathematics is a powerful component of human intelligence. Skemp (1987, p.7) described it as a tool for enhancing reasoning abilities. Strong reasoning skills are essential for intellectual intelligence, which involves the analysis and evaluation of information to gain knowledge and understanding (Hughes, 2021). However, is intellectual intelligence alone the most crucial factor?

Goleman (1997) explained the value of intelligence (in this case, intellectual) when emotions can easily become unstable. He claimed that IQ (Intelligence Quotient) contributes only around 20% to fruitfulness, with the remaining 80% attributed to other factors. It is assumed that one of these factors must be emotional intelligence. Emotional Intelligence (EI), as defined by Goleman (1997), is the skill to motivate oneself, face feelings of frustration without backing down, control urges and delay gratification, regulate mood to prevent stress from affecting thinking skills, and empathize and maintain hope. He argued that EI can be as powerful as, or even more powerful than, IQ in shaping one's life path, although the exact extent of its impact remains uncertain.

In response to Goleman's claims, Matthews (2002) described EI as the ability to identify and express emotions, understand emotions, integrate emotions into thought processes, and manage positive and negative emotions in oneself and others. In his book "Emotional Intelligence: Science and Myth," Matthews critiqued Goleman's claims for lacking empirical support and appearing unreasonable (Matthews, 2002, p. 10-15). Waterhouse (2006), in her critical review, also strongly criticized Goleman's claims. Despite facing criticism, some of Goleman's claims are still considered to have strong evidence (Cherniss et al., 2006). While many of Goleman's claims are questioned, his role in popularizing the concept of EI has been a significant breakthrough, prompting other researchers to investigate and validate his assertions.

Wong & Law (2002) defined EI as a four-dimensional construction that contains self emotional appraisal (SEA), others' emotional appraisal (OEA), regulation of emotion (ROE), and use of emotion (UOE). Those are based on Salovey & Mayer's (1990) conceptual frame. EI has been researched in numerous studies, and scales (instruments to assess EI) have also been extensively studied (refer to Siegling et al., 2015). An example of a workplace-oriented scale is provided by Wong & Law (2002) in Table 1.

Table 1. Wong & Law EI Scale (WLEIS)

No.	Statement	Scale						
1.	I have a good sense of why I often have certain feelings	1	2	3	4	5	6	7
2.	I have a good understanding of my own emotions	1	2	3	4	5	6	7
3.	I comprehend how I feel	1	2	3	4	5	6	7
4.	I always know the timing when or not for me to feel happy	1	2	3	4	5	6	7
5.	I always know my friends' emotions from their habits	1	2	3	4	5	6	7
6.	I am a good observer of other people's emotions	1	2	3	4	5	6	7
7.	I am sensitive regarding other people's feelings and emotions	1	2	3	4	5	6	7
8.	I have a good comprehension of the emotions of the people around me	1	2	3	4	5	6	7
9.	I always set goals for myself and then try my best to achieve those goals	1	2	3	4	5	6	7
10.	I always tell myself that I am a competent person	1	2	3	4	5	6	7
11.	I am a person who can motivate myself	1	2	3	4	5	6	7
12.	I will always push myself to try my best	1	2	3	4	5	6	7
13.	I can control my temperament and handle difficulties rationally	1	2	3	4	5	6	7
14.	I have enough capacity to control my emotions	1	2	3	4	5	6	7

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

15.	I can always quickly calm down when I'm very angry	1	2	3	4	5	6	7
16.	I have good control over my own emotions	1	2	3	4	5	6	7

1: Strongly Disagree, 2: Disagree, 3: Slightly Disagree,
4: Between Agree and Disagree, 5: Slightly Agree, 6: Agree,
7: Strongly Agree

Note:
Dimension: SEA=1-4; OEA=5-8; ROE=9-12; UOE=13-16
Reproduction requires permission

In the context of Mathematics learning, Aqillamaba & Puspaningtyas (2022) emphasized the importance of EI for students to effectively regulate their emotions. They highlighted that maintaining stable emotions is crucial for students, as those with lower EI may struggle to manage their emotions, potentially impacting their Mathematics learning outcomes. Additionally, learning mathematics involves mental engagement to analyze mathematical structures (Rosida, 2015).

Rosida (2015) suggested that mental involvement leads to knowledge acquisition in Math that can be applied in students' daily lives. To address potential biases in individual studies, a systematic literature review (SLR) with a meta-analysis approach is utilized to provide a comprehensive overview of the topic in the field of education.

Gough et al. explained that Meta-Analysis is kind of "evidentiary study" that reviews primary data from existing studies, using rigor and systematic research methods to answer research questions (Zawacki-Richter et al., 2020, p. 4). No meta-analysis study has been conducted on the effect of EI on students' Mathematics learning outcomes in Indonesia before.

Based on the collection of articles from the last 8 years (from the year 2015 to 2022), this meta-analysis involves selecting, conducting, assessing, and systematically interpreting research articles based on predefined standards (Syafii et al., 2022). Therefore, this research aimed to describe research trends based on categories, determine the size effect of EI on student learning outcomes in Mathematics learning, and describe the EI scale (instrument) used in Mathematics learning. Therefore, the study focuses on the following research questions:

1. What are the trends in research related to the effect of EI on student Mathematics learning outcomes?
2. What is the significance of the effect of EI on students' Mathematics learning outcomes?
3. What is the significance of the effect of EI on students' Mathematics learning outcomes in terms on selected categories?
4. What kind of EI scale should be used in a research instrument for Mathematics learning?

METHOD

Research Design

This research employs a quantitative approach using the Systematic Literature Review (SLR) method with Meta-Analysis. An SLR involves reviewing all relevant studies to address a specific question (Torres-Carrion et al., 2018). Juandi (2021, p.2) emphasized the comprehensive and systematic selection of studies to evaluate their validity, minimize bias, and provide a clear synthesis. The analysis focuses on primary data collected in the research, specifically examining the effect of EI on Mathematics learning outcomes. The reviewed studies consist of research articles exploring to the effect of EI on learning outcomes.

The stages in this SLR research refer to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) model (Lämsä et al., 2021; Page et al., 2021) which consists of (1) Identification, this step is searching for as many research articles as possible in the database used; (2) Screening, step focuses on the process of filtering or selecting research articles that have been collected; (3) Feasibility, all findings from selected research articles are then further analyzed and evaluated; (4) Inclusion, this step is the final one, namely the selected research articles are made in the form of data tabulation and the findings become the basis for answering the questions that have been previously determined.

The meta-analysis method that is carried out with the stages of identifying, reviewing, evaluating, and interpreting research articles is systematically based on predetermined standards (Afsari et al., 2021; Triandini et al., 2019). The design of the meta-analysis research procedure begins with developing the

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

research questions and selection criteria, developing the research strategy, studying the selection process, and assessing the quality of the studies (Cohen et al., 2018, p. 432). The data is sourced from primary research published in indexed journals.

Inclusion Criteria

To gather research data, the following inclusion criteria were applied for primary research data:

1. The selected research articles were conducted in Indonesia
2. Research articles published between 2015 and 2022 were included.
3. Articles had to be published in a minimum-indexed journal in SINTA.
4. The research in the selected articles is research into the effect of EI on learning outcomes.
5. Samples from the research in the selected articles were from elementary school, middle school, or high school education levels, or equivalent.

Literature Search Strategy

Research began by opening the Publish or Perish 8 application, and then selecting the Google Scholar database. Then type in the keywords "emotional intelligence, learning outcomes, Mathematics learning". Then, enter the time range 2015-2022. After implementing all of these things, the study process was carried out based on the inclusion criteria that had been applied to the subjects of this research.

Research Instruments

This research instrument is a form of coding that contains statistical data (sample size and correlation coefficient) and study characteristics (year of publication in the journal, level of education, type of instrument/scale, and demographics) from the primary data that had been obtained.

Research Subject

The subjects of this research are previous articles that have been published in national journals in the field of Mathematics Education by searching through the Google Scholar database and cross-checking through the SINTA, Garuda Portal, DOAJ, and Crossref databases for the 2015-2022 timeline. The following is the process based on the PRISMA model in Figure 1.

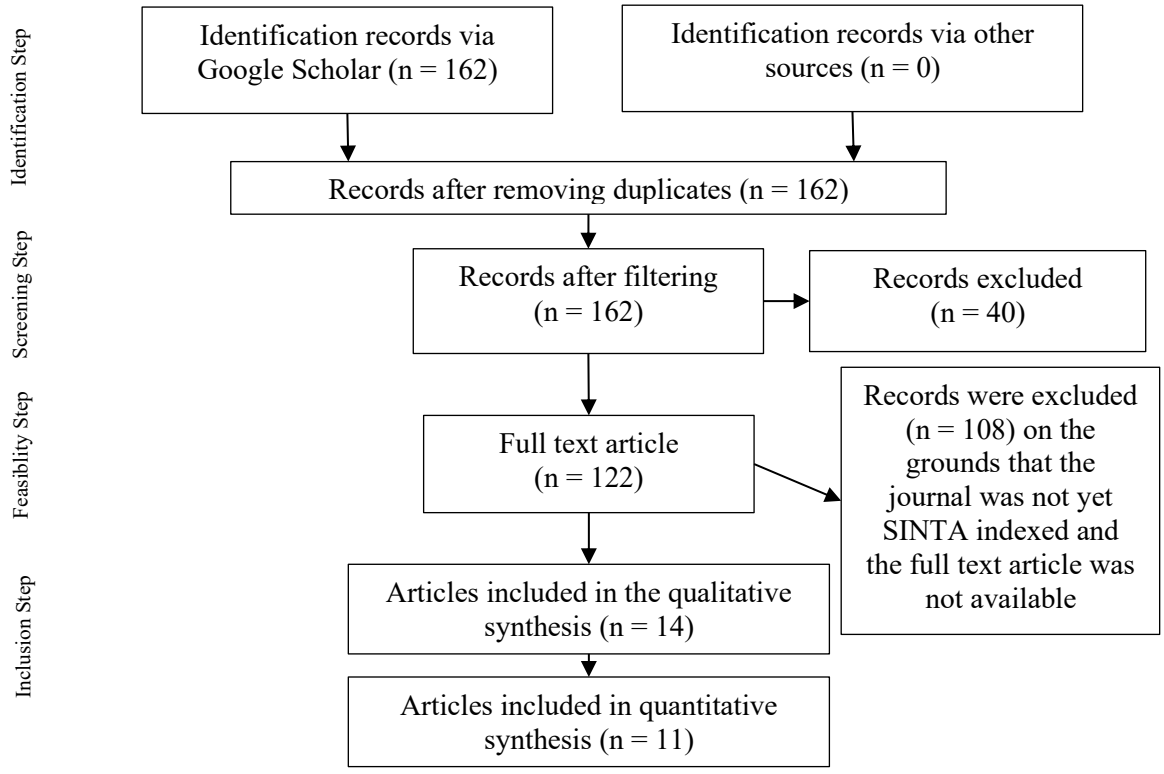

Figure 1. PRISMA Flowchart

Data Analysis Technique

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

To get a measure of the Effect Size of EI on student learning outcomes, data bias analysis uses Fisher's Z Transformation, so that the data is normally distributed. The Fisher's Z Transformation formula is as follows:

$$Z_{r_n} = 0.5 \times \ln\left(\frac{1+r_n}{1-r_n}\right) = 0.5 \times [\ln(1+r_n) - \ln(1-r_n)]$$

with:
r_n = correlation coefficient value of each study.

Data analysis for this research was supported by the OpenMEE application, which is freely accessible and has the capability to calculate similar to other Meta-Analysis applications. The estimated Effect Size (UP) values were then categorized into five groups as shown in Table 2.

Table 2. Effect Size Category

Effect Size Interval (UP)	Category
$-0.15 \leq UP < 0.15$	Negligible Impact
$0.15 \leq UP < 0.40$	Low Impact
$0.40 \leq UP < 0.75$	Medium Impact
$0.75 \leq UP < 1.10$	High Impact
$1.10 \leq UP < 1.45$	Very High Impact
$UP \geq 1.45$	Very Good Impact

(Juandi et al., 2021; Khairunnisa & Juandi, 2022)

RESULTS AND DISCUSSION

Results

Research Trends

Research trends were seen in articles that have been collected based on 4 categories, namely based on year of publication, demographics, level of education, and type of scale (instrument) used. A description of the data is in Table 3.

Table 3. Number of Articles Based on Categories

Category	Criteria	Number of Articles
Year of publication	2015-2016	4
	2017-2018	3
	2019-2022	7
Demographics	Sumatra	5
	Kalimantan, Nusa Tenggara, Maluku	3
	Java	1
	Sulawesi	5
Level of Education	Elementary School (SD)	4
	Middle School (SMP sederajat)	6
	High School (SMA sederajat)	4
Type of Scale	Standardized	9
	Unspesified	5

The data from Table 3 can be visually represented in graphs to illustrate the research trend more effectively. Figures 2 to 5 provide descriptions and graphs depicting the number or percentage of research studies conducted over the years. Figure 2 shows the percentage of articles based on year of publication category.

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

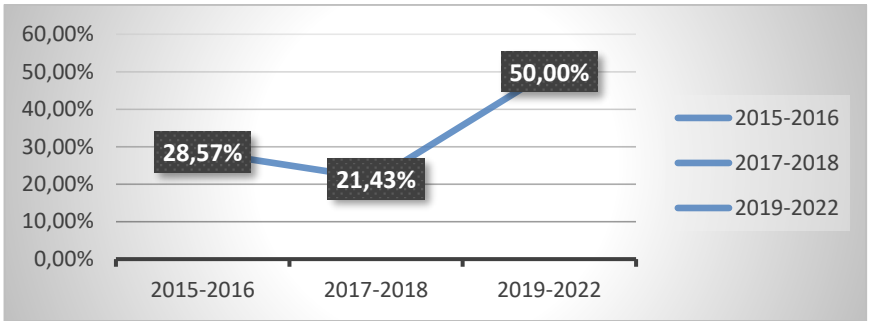

Figure 2. The Percentage of Articles Based on Year of Publication

Figure 2 illustrates an increasing trend in the percentage of articles based on the year of publication. However, there has been a decline in the percentage of articles focusing on the effect of EI on students' Mathematics learning outcomes in 2017-2018. The highest percentage of articles falls within the range of 2019-2022. Next, Figure 3 shows the number of article based on demographics category.

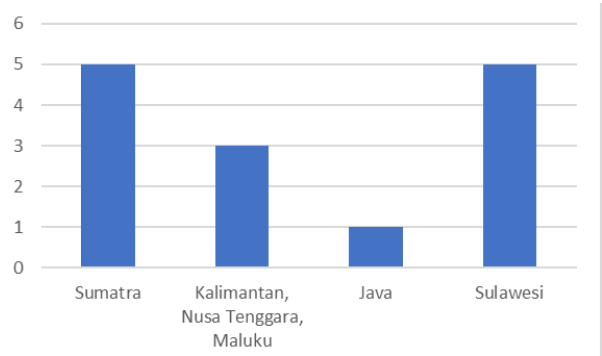

Figure 3. The Number of Articles Based on Demographics

According to Figure 3, extensive research was carried out in Sumatra and Sulawesi, with only one study identified in Java, specifically in Jakarta. Research interest in the effect of EI on students' Mathematics learning outcomes seems to be concentrated in Sumatra (North Sumatra) and Sulawesi (South Sulawesi). Next, Figure 4 show the percentage of articles based on level of education category.

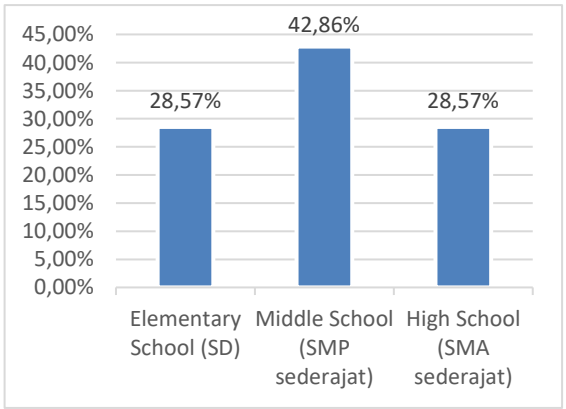

Figure 4. The Percentage of Articles Based on Level of Education

Figure 4 portrays the majority of research was carried out at the middle school level, with a similar percentage at the elementary and high school levels. This suggests a potentially significant effect of EI on the academic performance of middle school students. Lastly, Figure 5 shows the percentage of articles based on type of EI scale.

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

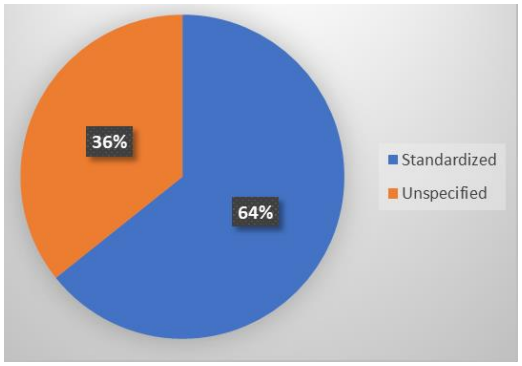

Figure 5. The Percentage of Articles Based on Type of Scale

Based on Figure 5, it can be seen that more research has been carried out with standardized instrument scales. What is meant by standardized is that the instrument scale is created based on previous theories, such as those based on Goleman, Salovey and Mayer, and others. It will be discussed further in the **EI Scale (Instrument) in the Mathematics Learning** section.

Combined Effect Size (Significance of The Effect of EI)

Before calculating all effect sizes, it is essential to verify the availability of data. Out of 14 articles, 11 were included in the calculation. Three articles were excluded: two utilized path analysis, and one did not provide data on the correlation coefficient or determination coefficient. Prior to conduct a bias test using a funnel plot, as shown in Figure 6.

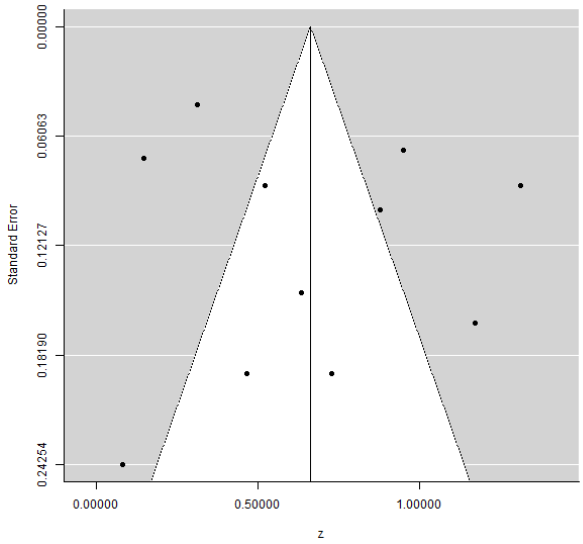

Figure 6. Funnel Plot of Efect Sizes

Based on Figure 6, it can be seen that the funnel plot is quite symmetrical. To strengthen this, based on the Fail-Safe N test (Rosenthal's approach), the value obtained was 1830 ($\alpha = 0.05$ *and* $p < 0.0001$). This means, if $k = 11$ is taken, then $5(11) + 10 = 65 < 1830$. So, it can be concluded that there is no bias in this meta-analysis so that it can proceed to the heterogeneity test. The following are the results of the heterogeneity calculation in Table 4.

Table 4. Heterogeneity Test Results

Value of Q	df (Q)	Value of Het. P	I-Squared
199.658	10	<0.001	94.991

According to Table 4, the P value is less than 0.001 or in other words the P value $(0.000) < \alpha\ (0.05)$. So, obtained from the data that has been analyzed is the *Random Effect Model* and the data is very heterogeneous based on the I-Square value $= 94.991\% > 75\%$ (Huedo-Medina et al., 2006). Next, the combined effect size was calculated using the Random Effect model in Table 5.

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

Table 5. Results of Combined Effect Size Test

Number of Studies	Estimation	Std. Error	Lower Bound	Upper Bound
11	0.662	0.129	0.410	0.915

Subgroup Combined Effect Size (Significance of The Effect of EI Based on Selected Categories)

After finding a generally significant effect of Emotional Intelligence (EI) on Matehmatics learning outcomes, subgroup analysis was conducted to address the significant differences between the included studies (Eyeberu et al., 2024; Mihiretu et al., 2024). The subgroups here are based on predetermined category, namely educational level, demographics, and type of instrument scale. Subgroups were based on predetermined categories, including educational level, demographics, and type of instrument scale. The year of publication was not tested due to being within the range. It is important to note that the demographic subgroup, specifically the Java region, will be excluded from this test as only one article represents it. The results of the combined effect test for each subgroup from the selected category are shown in Table 6.

Table 6. The Results of Combined Effect Size Tests for Each Selected Category

Category	Criteria	Estimation	Std. Error	Lower Bound	Upper Bound
Level of Education	Elemantary School	0.550	0.175	0.207	0.892
	Middle School	1.120	0.151	0.825	1.415
	High School	0.394	0.103	0.193	0.596
Demographics	Sumatra	0.470	0.161	0.155	0.785
	Sulawesi	0.635	0.191	0.261	1.008
	Kalimantan, Nusa Tenggara, Maluku	0.806	0.268	0.281	1.330
Type of Scale	Standardized	0.659	0.161	0.344	0.975
	Unspecified	0.698	0.122	0.459	0.938

EI Scale (Instrument) in the Mathematics Learning

Based on the results of the analysis, it was found that 10 studies used a standardized EI scale, and the rest did not write it specifically (unspecified). The following Table 7 presents the specific standards used in the 10 articles.

Table 7. Articles and Types of EI Scales Used

No	Author(s)	Year	Type of Scale (Instrument)
1	T. P. Anggraini, et al,	2022	Unspecified
2	K. Aqillamaba, ND Puspaningtyas	2022	Unspecified
3	A. A. Setyawan, D. Simbolon	2018	Solovey dan Mayer
4	V. Rosida	2015	Solovey dan Mayer
5	S. Sukriadi, A. Basir, R. Rusdiana	2016	Solovey dan Mayer
6	S. Prafitriani, M. C. B. Umanailo, N. Indrayani	2019	Unspecified
7	M. Mirnawati, M. Basri	2018	Rafika Dewi Satriani
8	Y. A. Asikin, I. Istiqamah, A. Abbas	2022	Solovey dan Mayer
9	L. Sitorus, N. Purba, M. Panjaitan	2022	Unspecified
10	R. Muti'ah	2017	Solovey dan Mayer
11	M. H. A. Shidiqi, K. Sasmita	2022	Solovey dan Mayer
12	Y. H. Simbolon, S. Dewi, S. Fitriani	2022	Solovey dan Mayer
13	S. Arti Suwardi, S. Suwardi	2015	Solovey dan Mayer
14	E. Nurdiansyah	2016	Solovey dan Mayer

(Sources: Anggraini et al., 2022; Aqillamaba & Puspaningtyas, 2022; Asikin et al., 2022; Hasbi As Shidiqi & Sasmita, 2022; Mirnawati & Basri, 2018; Muti'ah & Anggraini, 2017; Nurdiansyah, 2016; Prafitriani et al., 2019; Rosida, 2015; Setyawan & Simbolon, 2018; Simbolon et al., 2022; Sitorus et al., 2022; Sukriadi et al., 2016; Suwardi & Suwardi, 2015)

Discussion

This meta-analysis study of 11 heterogeneous and unbiased studies in Indonesia found that emotional intelligence (EI) had a positive impact on students' mathematics learning outcomes. According to Table 5, the combined effect size is 0.662, falling within the "medium impact" category as shown in Table 2. Therefore, it

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

can be concluded that EI significantly affects students' mathematics learning outcomes with a medium impact. This result aligns with meta-analysis conducted by MacCann et al. (2020), which reported that a low to medium association between EI and students' academic performance. Additionally, meta-analysis conducted by Somaa et al. (2021) found a positive and significant association between Emotional Intelligence (EI) and students' academic performance. This result also complements with meta-analysis on the impact of EI on students' Mathematic achievement conducted by Muhtadi et al. (2022).

After analyzing the combined effect size results, subgroup analysis was conducted to address the variability among the included studies. Table 6 displays the significant combined subgroup effect size for each criteria of level of education category. The middle school criteria, with a value of 1.120, falls under the "very high impact" category. The elementary school criteria, with a value of 0.550, falls under the "medium impact" category. Lastly, the high school criteria, with a value of 0.394, falls under the "low impact" category. The result of the middle school criteria effect size aligns with a meta-analysis conducted by Sánchez-Álvarez et al. (2020), which found that EI significantly affects secondary students' academic performance.

Furthermore, Table 6 shows that sequentially, for each criteria of demographics category analyzed, there is a significant combined subgroup effect size. The "high impact" criteria, such as Kalimantan, Nusa Tenggara, and Maluku, show a value of 0.806. The "medium impact" criteria, like the Sulawesi region, have a value of 0.635. The "low impact" criteria, such as the Sumatra region, show a value of 0.470. Furthermore, Table 6 displays that, for each criteria of type of scale category tested, there is a significant combined subgroup effect size. The criteria of "medium impact" for type of scale, including unspecified and standardized scales, have effect sizes of 0.698 and 0.659, indicating similar effects. These results complement the meta-analysis conducted by Muhtadi et al. (2022), which used publication type, level of education, and year of publication for the subgroup analysis.

Based on Table 7, eight out of ten studies utilized the Salovey and Mayer criteria. Salovey & Mayer (1990) defined EI as the ability to recognize one's emotions, manage emotions, motivate oneself, empathize with others, and build relationships. Therefore, it is important to consider using a standardized scale adapted from Wong & Law that follows the Salovey & Mayer principles of EI, specifically tailored for Mathematics learning, as shown in Table 8.

Table 8. Modified-Wong & Law EI Scale-Mathematics Learning Oriented (M-WLEIS-MLO)

No.	Statement	Scale						
1.	When studying Mathematics, I have a good sensitivity, characterized by the desire that arises, such as wanting to answer questions asked by the teacher.	1	2	3	4	5	6	7
2.	I understand how I feel, especially when studying Mathematics.	1	2	3	4	5	6	7
3.	I always know when I feel happy or not, like when I receive praise from the teacher or get a bad test score.	1	2	3	4	5	6	7
4.	I always set goals for myself and then try my best to achieve those goals, such as aiming to get the highest score in a Mathematics exam, so I study hard.	1	2	3	4	5	6	7
5.	I can always sense my friends' emotions from their habits when discussing things.	1	2	3	4	5	6	7
6.	I have a good ability to observe other people's emotions.	1	2	3	4	5	6	7
7.	I am sensitive to other people's feelings and emotions.	1	2	3	4	5	6	7
8.	I have a good understanding of the emotions of the people around me, especially in a Mathematics learning environment.	1	2	3	4	5	6	7
9.	I always set goals for myself and then try my best to achieve them, such as aiming to get the highest score in a Mathematics exam, so I study hard.	1	2	3	4	5	6	7
10.	I always remind myself that I am competent in Mathematics.	1	2	3	4	5	6	7
11.	I am someone who can self-motivate; for instance, Mathematics is not challenging for me.	1	2	3	4	5	6	7
12.	I will consistently push myself to do my best and excel in Mathematics.	1	2	3	4	5	6	7
13.	I can manage my emotions and handle challenges rationally, even during intense discussions in Mathematics classes.	1	2	3	4	5	6	7

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

14.	I have the ability to regulate my emotions effectively.	1	2	3	4	5	6	7
15.	I can easily calm down when feeling very angry in class.	1	2	3	4	5	6	7
16.	I demonstrate good emotional control when learning Mathematics.	1	2	3	4	5	6	7
	1: Strongly Disagree, 2: Disagree, 3: Slightly Disagree, 4: Between Agree and Disagree, 5: Slightly Agree, 6: Agree, 7: Strongly Agree							

Note:
Dimension: SEA=1-4; OEA=5-8; ROE=9-12; UOE=13-16

CONCLUSION

The research trend on the effect of emotional intelligence (EI) on students' Mathematics learning outcomes has increased from 2015 to 2022, particularly in the Sumatra and Sulawesi regions at the middle school level. The combined effect size analysis shows a significant effect of EI on students' Mathematics learning outcomes, with a "moderate impact" criteria. Middle school criteria has the highest combined impact value (1.120) with a "very high impact" criteria in level of education category. In terms of demographic category, the Kalimantan, Nusa Tenggara, and Maluku regions have the highest combined effect size (0.806) with a "high impact" criteria. Studies using standardized (0.659) and unspecified (0.698) scales show a similar effect size with a "moderate impact" criteria. Research on the effect of EI on Mathematics learning outcomes predominantly uses standardized scales based on Solovey and Mayer.

RECOMMENDATION

We recommend that schools in Indonesia consider enhancing students' emotional intelligence (EI) to achieve optimal learning outcomes in Mathematics subject. For further research, it is important to conduct studies at the elementary and high school levels using a standardized EI scale in regions other than Sumatera and Sulawesi regions. The M-WLEIS-MLO scale can be considered for developing an EI assessment instrument. While it is optional to create the instrument from scratch, it is still crucial to adhere to Salovey & Mayer's principles. We hope that a specialized instrument will be developed and tested for assessing students' EI in Mathematics learning.

REFERENCES

Afsari, S., Safitri, I., Harahap, S. K., & Munthe, L. S. (2021). Systematic Literature Review: Efektivitas Pendekatan Pendidikan Matematika Realistik Pada Pembelajaran Matematika. *Indonesian Journal of Intellectual Publication*, *1*(3), 189–197. https://doi.org/10.51577/ijipublication.v1i3.117

Anggraini, T. P., Abbas, N., Oroh, F. A., & Pauweni, K. A. Y. (2022). Pengaruh Kecerdasan Emosional dan Motivasi Belajar Terhadap Hasil Belajar Matematika Siswa. *Jambura Journal of Mathematics Education*, *3*(1), 1–9. https://doi.org/10.34312/jmathedu.v3i1.11807

Aqillamaba, K., & Puspaningtyas, N. D. (2022). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Siswa Dalam Pembelajaran Matematika. *Jurnal Ilmiah Matematika Realistik (JI-MR*, *3*(2), 54–61. https://doi.org/https://doi.org/10.33365/ji-mr.v3i2.2162

Asikin, Y. A., Istiqamah, I., & Abbas, A. (2022). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Sekolah Dasar. *AL-ASASIYYA: Journal Of Basic Education*, *6*(2), 112–128. https://doi.org/10.24269/ajbe.v6i2.5053

Cherniss, C., Extein, M., Goleman, D., & Weissberg, R. P. (2006). Emotional Intelligence: What Does the Research Really Indicate? *Educational Psychologist*, *41*(4), 239–245. https://doi.org/10.1207/s15326985ep4104_4

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge. https://doi.org/10.4324/9781315456539

Eyeberu, A., Getachew, T., Kebad, A., & Debella, A. (2024). Early newborn bathing practice and its determinants among postpartum women in Ethiopia: a systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, *24*(1), 87. https://doi.org/10.1186/s12884-024-06280-x

Goleman, D. (1997). *Emotional Intelligence Why It Can Matter More Than IQ*. Bantam.

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

Hasbi As Shidiqi, M., & Sasmita, K. (2022). Pengaruh Minat Belajar Dan Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Kelas V Sekolah Dasar Di Gugus Dewi Sartika Jakarta Utara. *JURNAL EDUCATION AND DEVELOPMENT*, *10*(1), 566–570. https://doi.org/https://doi.org/10.37081/ed.v10i1

Huedo-Medina, T. B., Sánchez-Meca, J., Marín-Martínez, F., & Botella, J. (2006). Assessing heterogeneity in meta-analysis: Q statistic or I 2 Index? *Psychological Methods*, *11*(2), 193–206. https://doi.org/10.1037/1082-989X.11.2.193

Hughes, C. (2021). *Implementation Strategies for Improving Diversity in Organizations* (pp. 1–38). IGI Global. https://doi.org/10.4018/978-1-7998-4745-8.ch001

Juandi, D. (2021). Heterogeneity of problem-based learning outcomes for improving mathematical competence: A systematic literature review. *Journal of Physics: Conference Series*, *1722*(1), 1–7. https://doi.org/10.1088/1742-6596/1722/1/012108

Juandi, D., Kusumah, Y. S., Tamur, M., Perbowo, K. S., & Wijaya, T. T. (2021). A meta-analysis of Geogebra software decade of assisted mathematics learning: what to learn and where to go? *Heliyon*, *7*(5), e06953. https://doi.org/10.1016/j.heliyon.2021.e06953

Khairunnisa, K., & Juandi, D. (2022). Meta-Analysis: The Effect of Discovery Learning Models on Students' Mathematical Ability. *Jurnal Riset Pendidikan Matematika*, *9*(2), 201–211. https://doi.org/10.21831/jrpm.v9i2.49147

Lämsä, J., Hämäläinen, R., Koskinen, P., Viiri, J., & Lampi, E. (2021). What do we do when we analyse the temporal aspects of computer-supported collaborative learning? A systematic literature review. In *Educational Research Review* (Vol. 33). Elsevier Ltd. https://doi.org/10.1016/j.edurev.2021.100387

MacCann, C., Jiang, Y., Brown, L. E. R., Double, K. S., Bucich, M., & Minbashian, A. (2020). Emotional intelligence predicts academic performance: A meta-analysis. *Psychological Bulletin*, *146*(2), 150–186. https://doi.org/10.1037/bul0000219

Matthews, G. (2002). *Emotional intelligence Science and Myth*. MIT Press.

Mihiretu, M. M., Bekele, E., Ayele, K., Asmare, L., Bayou, F. D., Arefaynie, M., Tsega, Y., Endawkie, A., Kebede, S. D., & Kebede, N. (2024). Patient knowledge of surgical informed consent and shared decision-making process among surgical patients in Ethiopia: a systematic review and meta-analysis. *Patient Safety in Surgery*, *18*(1), 2. https://doi.org/10.1186/s13037-023-00386-5

Mirnawati, M., & Basri, M. (2018). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Sekolah Dasar. *JRPD (Jurnal Riset Pendidikan Dasar)*, *1*(1), 56–64. https://doi.org/10.26618/jrpd.v1i1.1240

Muhtadi, A., Pujiriyanto, P., Kaliky, S., Hukom, J., & Samal, D. (2022). A Meta-Analysis: Emotional Intelligence and its Effect on Mathematics Achievement. *International Journal of Instruction*, *15*(4), 745–762. https://doi.org/10.29333/iji.2022.15440a

Muti'ah, R., & Anggraini, N. (2017). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Menggunakan Metode Diskusi Di Kelas VII SMP Negeri 1 Aek Natas. *Edu Science*, *4*(2), 1–7. https://doi.org/https://doi.org/10.36987/jes.v4i2.929

Nurdiansyah, E. (2016). Pengaruh Kecerdasan Spiritual, Kecerdasan Emosional, Dampak Negatif Jejaring Sosial Dan Kemampuan Berpikir Divergen Terhadap Hasil Belajar Matematika Siswa. *Journal of Educational Science and Technology (EST)*, *2*(3), 171–184. https://doi.org/10.26858/est.v2i3.3216

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. In *The BMJ* (Vol. 372). BMJ Publishing Group. https://doi.org/10.1136/bmj.n71

Piantadosi, C. A. (2003). *The Biology of Human Survival*. Oxford University PressNew York, NY. https://doi.org/10.1093/oso/9780195165012.001.0001

Prafitriani, S., Chairul, M., Umanailo, B., Indrayani, N., Lisaholit, S., & Chamidah, D. (2019). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Kelas VII SMP Negeri 9 Buru. *JISPO*, *9*(2), 567–580. https://doi.org/https://doi.org/10.15575/jispo.v9i2.6207

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

Rosida, V. (2015). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Kelas VII2 SMP Negeri 1 Makassar. *Jurnal Sainsmat*, *IV*(2), 87–101. https://doi.org/https://doi.org/10.35580/sainsmat4218362015

Salovey, P., & Mayer, J. D. (1990). Emotional Intelligence. *Imagination, Cognition and Personality*, *9*(3), 185–211. https://doi.org/10.2190/DUGG-P24E-52WK-6CDG

Sánchez-Álvarez, N., Berrios Martos, M. P., & Extremera, N. (2020). A Meta-Analysis of the Relationship Between Emotional Intelligence and Academic Performance in Secondary Education: A Multi-Stream Comparison. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.01517

Setyawan, A. A., & Simbolon, D. (2018). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa SMK Kansai Pekanbaru. *Jurnal Penelitian Dan Pembelajaran Matematika*, *11*(1), 11–18. https://doi.org/10.30870/jppm.v11i1.2980

Siegling, A. B., Saklofske, D. H., & Petrides, K. V. (2015). Measures of Ability and Trait Emotional Intelligence. In *Measures of Personality and Social Psychological Constructs* (pp. 381–414). Elsevier Inc. https://doi.org/10.1016/B978-0-12-386915-9.00014-0

Simbolon, Y. H., Dewi, S., & Fitriani, S. (2022). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Kelas XI Tataboga Di SMK Negeri 4 Kota Jambi. *PHI: Jurnal Pendidikan Matematika*, *6*(1), 153–158. https://doi.org/10.33087/phi.v6i1.200

Sitorus, L., Purba, N., & Panjaitan, M. (2022). Pengaruh Kecerdasan Emosional (EQ) terhadap Hasil Belajar Matematika Siswa Kelas IV SD Negeri 102034 Gempolan Tahun Ajaran 2022/2023. *Jurnal Pendidikan Dan Konseling*, *4*(6), 4392–4397. https://doi.org/https://doi.org/10.31004/jpdk.v4i6.8959

Skemp, R. R. (1987). *The psychology of learning mathematics* (Expanded American ed). L. Erlbaum Associates. https://archive.org/details/psychologyoflear0000skem

Somaa, F., Asghar, A., & Hamid, P. F. (2021). Academic Performance and Emotional Intelligence with Age and Gender as Moderators: A Meta-analysis. *Developmental Neuropsychology*, *46*(8), 537–554. https://doi.org/10.1080/87565641.2021.1999455

Sukriadi, S., Basir, A., & Rusdiana, R. (2016). Pengaruh Kecerdasan Emosional Terhadap Hasil Belajar Matematika Siswa Pada Materi Sudut Dan Garis Di Kelas VII MTs Normal Islam Samarinda. *JPMI (Jurnal Pendidikan Matematika Indonesia)*, *1*(2), 65–73. https://doi.org/10.26737/jpmi.v1i2.85

Suwardi, S. A., & Suwardi, S. (2015). Pengaruh Pola Asuh Demokratis, Interaksi Sosial Teman Sebaya, Kecerdasan Emosional Dan Efikasi Diri Terhadap Hasil Belajar Matematika Siswa Kelas VIII SMPN Se Kecamatan Manggala Di Kota Makassar. *Daya Matematis: Jurnal Inovasi Pendidikan Matematika*, *3*(1), 10–19. https://doi.org/10.26858/jds.v3i1.1292

Syafii, A., Machali, I., Putro, N. H. P. S., Retnawati, H., & 'Aziz, H. (2022). The effects of multiple intelligences theory on learning success: A meta-analysis in social science. *International Journal of Evaluation and Research in Education (IJERE)*, *11*(2), 736. https://doi.org/10.11591/ijere.v11i2.22223

Torres-Carrion, P. V., Gonzalez-Gonzalez, C. S., Aciar, S., & Rodriguez-Morales, G. (2018). Methodology for systematic literature review applied to engineering and education. *2018 IEEE Global Engineering Education Conference (EDUCON)*, 1364–1373. https://doi.org/10.1109/EDUCON.2018.8363388

Triandini, E., Jayanatha, S., Indrawan, A., Werla Putra, G., & Iswara, B. (2019). Metode Systematic Literature Review untuk Identifikasi Platform dan Metode Pengembangan Sistem Informasi di Indonesia. *Indonesian Journal of Information Systems*, *1*(2), 63. https://doi.org/10.24002/ijis.v1i2.1916

Waterhouse, L. (2006). Multiple Intelligences, the Mozart Effect, and Emotional Intelligence: A Critical Review. *Educational Psychologist*, *41*(4), 207–225. https://doi.org/10.1207/s15326985ep4104_1

Wong, C.-S., & Law, K. S. (2002). The effects of leader and follower emotional intelligence on performance and attitude. *The Leadership Quarterly*, *13*(3), 243–274. https://doi.org/10.1016/S1048-9843(02)00099-1

Zawacki-Richter, O., Kerres, M., Bedenlier, S., Bond, M., & Buntins, K. (2020). *Systematic Reviews in Educational Research* (O. Zawacki-Richter, M. Kerres, S. Bedenlier, M. Bond, & K. Buntins, Eds.). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-27602-7

ISSN 2356-2684 (print), ISSN 2477-1503 (online)

BRIEF PROFILE

Ahmad Naufal Aljura is a graduate student at Yogyakarta State University in the Mathematics Education Study Program.

APPENDIX

Table 9. Statistical Data for Quantitative Analysis

No	Code	Author(s)	Year	Sample Size (N)	Correlation coefficient (r)	Effect Size (Z_r)	Effect Size Variance (Var $[Z_r]$)
1	EI2	K. Aqillamaba, et. al.	2022	49	0.562	0.636	0.022
2	EI3	A. A. Setyawan, D. Simbolon	2018	191	0.146	0.147	0.005
3	EI4	V. Rosida	2015	40	0.825	1.172	0.027
4	EI5	S. Sukriadi, et. al.	2016	132	0.865	1.313	0.008
5	EI6	S. Prafitriani, et. al.	2019	100	0.705	0.877	0.010
6	EI7	M. Mirnawati, M. Basri	2018	132	0.479	0.522	0.008
7	EI8	Y. A. Asikin, , et. al.	2022	20	0.080	0.080	0.059
8	EI9	L. Sitorus, et. al.	2022	30	0.434	0.465	0.037
9	EI11	M. H. A. Shidiqi, K. Sasmita	2022	216	0.740	0.950	0.005
10	EI12	Y. H. Simbolon, et. al.	2015	30	0.621	0.727	0.037
11	EI14	E. Nurdiansyah	2016	541	0.302	0.312	0.002

ISSN 2356-2684 (print), ISSN 2477-1503 (online)