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Interrelationships Between Emotional Intelligence, Academic Self-Efficacy, and Physics Performance: Evidence from Indonesian Secondary School Students

Andi Hikma Wardani*, **Kaharuddin Arafah, & Khaeruddin**
Physics Education Study Program, Universitas Negeri Makassar, Indonesia

*Corresponding email: hikma.wardani95@gmail.com

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Abstract: This study aims to analyze the relationship between emotional intelligence, self-efficacy, and physics learning outcomes of tenth-grade students at public high schools in Wajo Regency. This research used a quantitative correlational design. The study population was tenth-grade students at public high schools in Wajo Regency, with a sample of 472 students from five public high schools. Data were collected using questionnaires on emotional intelligence and self-efficacy, as well as physics learning test results. Data were analyzed using Spearman's rank correlation and multiple linear regression in Jamovi. The results show that there is a positive and significant relationship between emotional intelligence and physics learning outcomes (ñ = 0.193; $p < 0.001$), a positive and significant relationship between self-efficacy and physics learning outcomes (ñ = 0.203; $p < 0.001$), and a positive, significant, and strong relationship between emotional intelligence and self-efficacy (ñ = 0.769; $p < 0.001$). The regression results indicate that emotional intelligence and self-efficacy contribute significantly to physics learning outcomes, with an R^2 value of 0.0528 (5.28%). These findings suggest that emotional intelligence and self-efficacy are psychological factors that support students' learning outcomes.

Keywords: emotional intelligence, self-efficacy, physics learning outcomes, correlation, students.

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INTRODUCTION

Education plays a fundamental role in developing students' knowledge, skills, attitudes, and competencies required to face the challenges of the twenty-first century. The success of educational processes is commonly reflected in students' learning outcomes, which indicate the extent to which intended learning objectives have been achieved. Learning outcomes represent not only students' mastery of subject content but also their ability to apply knowledge, solve problems, and adapt to various learning situations. Consequently, improving learning outcomes has become a primary goal of educational institutions worldwide.

Physics is a core science subject that requires students to integrate conceptual understanding, mathematical reasoning, analytical thinking, and scientific problem-solving skills. Because of these characteristics, physics is often perceived as one of the more challenging subjects in secondary education. Students often struggle to understand abstract concepts, apply mathematical principles, and solve complex physics problems. As a result, students' success in learning physics is influenced not only by cognitive ability but also by various psychological factors that support effective learning.

Previous educational research has demonstrated that non-cognitive characteristics play an important role in determining students' academic achievement. Di Giunta et al. (2021) reported that psychological characteristics contribute substantially to students' academic performance beyond cognitive ability alone. Similarly, Duckworth and Yeager (2015) emphasized that non-cognitive competencies, including emotional regulation, motivation, perseverance, and self-belief, are important factors associated with educational success. These findings suggest that psychological factors deserve greater attention in efforts to improve students' learning outcomes.

Among the various psychological factors associated with academic achievement, emotional intelligence has received considerable attention. Goleman (1995) defined emotional intelligence as an individual's ability to recognize, understand, regulate, and appropriately utilize emotions in oneself and others. Emotional intelligence encompasses self-awareness, self-regulation, motivation, empathy, and social skills. Students with higher emotional intelligence may be better able to manage academic stress, maintain learning motivation, communicate effectively, and establish positive social relationships, thereby creating more favorable conditions for academic success. Previous research has provided empirical support for the relationship between emotional intelligence and academic achievement. Parker et al. (2004) reported an association between emotional intelligence and academic success among students transitioning from high school to university. More recently, MacCann et al. (2020), through a meta-analysis, found that emotional intelligence was positively associated with academic performance. Similarly, Quílez-Robres et al. (2023), through a systematic review and meta-analysis, found that emotional intelligence was positively associated with academic performance across various educational settings.

Another important psychological factor is self-efficacy. According to Bandura (1997), self-efficacy refers to an individual's belief in his or her capability to organize and execute the actions necessary to achieve specific goals. Students with strong self-efficacy tend to demonstrate greater confidence in completing academic tasks, persist when facing learning difficulties, and recover more effectively from setbacks. Research on academic self-efficacy has shown that students' beliefs about their capabilities are closely associated with motivation, self-regulated learning, and academic performance (Pajares, 1996; Schunk, 1991; Pintrich & De Groot, 1990). Consequently, self-efficacy plays an important role in shaping students' motivation, learning strategies, and academic performance (Zimmerman, 2000; Usher & Pajares, 2008). In addition, academic self-concept and self-efficacy are important motivational constructs associated with students' academic functioning and achievement (Bong & Skaalvik, 2003).

Self-efficacy is particularly relevant in science learning. Students' beliefs about their ability to understand and perform scientific tasks may influence their persistence, engagement, and willingness to cope with challenging learning activities. Research on science self-efficacy has shown that students' beliefs about their capabilities are associated with their engagement and performance in science-related learning contexts (Britner & Pajares, 2006). Thus, self-efficacy may be an important psychological factor in supporting students' learning of physics, which requires persistence, conceptual reasoning, and problem-solving.

Although previous studies have established associations between emotional intelligence, self-efficacy, and academic achievement, important gaps remain. Existing research has predominantly examined general academic achievement rather than subject-specific outcomes, and many studies have investigated emotional intelligence or self-efficacy separately. Moreover, relatively limited research has examined these two psychological variables simultaneously in relation to physics learning outcomes, particularly among Indonesian public senior high school students. This gap is particularly relevant because physics learning requires students to combine conceptual understanding, mathematical reasoning, persistence, and problem-solving skills. Therefore, examining emotional intelligence and self-efficacy simultaneously may provide a more comprehensive understanding of psychological factors associated with students' physics learning outcomes.

This study addresses this gap by investigating the relationships between emotional intelligence, self-efficacy, and physics learning outcomes among tenth-grade students enrolled in public senior high schools in Wajo Regency, South Sulawesi, Indonesia. Unlike studies that examine these variables separately or focus on general academic achievement, the present study simultaneously examines the relationship between emotional intelligence and physics learning outcomes, the relationship between self-efficacy and physics learning outcomes, the relationship between emotional intelligence and self-efficacy, and the simultaneous contribution of emotional intelligence and self-efficacy to physics learning outcomes. The study is expected to contribute empirical evidence regarding psychological factors associated with physics learning and provide practical implications for supporting students' learning in secondary-school physics education.

Based on the identified research gap and the importance of understanding psychological factors associated with students' academic achievement, this study aims to analyze the relationships between emotional intelligence, self-efficacy, and physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency.

Research Questions

Accordingly, this study was designed to address the following research questions:

1. Is there a significant relationship between emotional intelligence and the physics learning outcomes of tenth-grade students at public senior high schools in Wajo Regency?
2. Is there a significant relationship between self-efficacy and the physics learning outcomes of tenth-grade students at public senior high schools in Wajo Regency?
3. Is there a significant relationship between emotional intelligence and self-efficacy among tenth-grade students at public senior high schools in Wajo Regency?
4. To what extent do emotional intelligence and self-efficacy simultaneously contribute to the variance in physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency?

Research Hypotheses

Based on the theoretical framework, previous empirical findings, and the research questions formulated above, the following null and alternative hypotheses were proposed:

H_{01} : There is no significant relationship between emotional intelligence and physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency.

H_{11} : There is a significant relationship between emotional intelligence and physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency.

H_{02}: There is no significant relationship between self-efficacy and physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency.

H_{12} : There is a significant relationship between self-efficacy and physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency.

H_{03} : There is no significant relationship between emotional intelligence and self-efficacy among tenth-grade students at public senior high schools in Wajo Regency.

H_{13} : There is a significant relationship between emotional intelligence and self-efficacy among tenth-grade students at public senior high schools in Wajo Regency.

H_{04} : Emotional intelligence and self-efficacy do not simultaneously contribute significantly to the variance in physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency.

H_{14} : Emotional intelligence and self-efficacy simultaneously contribute significantly to the variance in physics learning outcomes among tenth-grade students at public senior high schools in Wajo Regency.

METHOD

Research Design

This study used a quantitative correlational design with a cross-sectional approach to examine the relationships between emotional intelligence, self-efficacy, and physics learning outcomes among tenth-grade students. The study was designed to address four research questions concerning (1) the relationship between emotional intelligence and physics learning outcomes, (2) the relationship between self-efficacy and physics learning outcomes, (3) the relationship between emotional intelligence and self-efficacy, and (4) the simultaneous contribution of emotional intelligence and self-efficacy to physics learning outcomes. A correlational design was considered appropriate because the study aimed to examine naturally occurring relationships among variables without manipulating the research setting or administering any experimental treatment.

The research was conducted during the second semester of the 2024/2025 academic year at five public senior high schools in Wajo Regency, South Sulawesi, Indonesia, namely SMA Negeri 3 Wajo, SMA Negeri 4 Wajo, SMA Negeri 6 Wajo, SMA Negeri 8 Wajo, and SMA Negeri 13 Wajo.

Research Participants

The population consisted of all tenth-grade students enrolled in public senior high schools in Wajo Regency during the 2024/2025 academic year.

A cluster sampling technique was employed because the population was naturally organized into schools and classes. Schools served as naturally occurring clusters, and five public senior high schools were selected as the research sites. Subsequently, all eligible Grade X students from the selected schools were included in the study, resulting in a final sample of 472 students. This sample size was considered adequate for correlational and multiple regression analyses. All completed questionnaires and achievement tests were included in the final statistical analysis.

Before data collection, permission to conduct the study was obtained from the principals of the participating schools. Participation was voluntary, and all participants were informed that their responses would remain confidential and would be used solely for research purposes.

Research Instruments

Emotional intelligence questionnaire

The Emotional Intelligence Questionnaire was developed based on Goleman's (1995) theory of emotional intelligence. Initially, the instrument consisted of 65 positive and negative statements representing five dimensions: self-awareness, self-regulation, motivation, empathy, and social skills. Responses were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of emotional intelligence.

Self-efficacy questionnaire

The Self-Efficacy Questionnaire was developed based on Bandura's (1997) theory of self-efficacy. Initially, the questionnaire consisted of 32 positive and negative statements representing three dimensions: magnitude, strength, and generality. Responses were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of self-efficacy.

Physics learning achievement test

Physics learning outcomes were measured using a researcher-developed achievement test based on the Grade X Physics Learning Outcomes of the Merdeka Curriculum. Initially, the instrument consisted of 20 multiple-choice questions designed to assess students' conceptual understanding of the physics topics taught during the study.

Instrument Validation and Reliability

Prior to data collection, all research instruments underwent content validation by a panel of experts using Aiken's V coefficient. Based on the experts' recommendations, several items were revised to improve their wording, clarity, and contextual appropriateness for Indonesian senior high school students. The revised instruments were subsequently subjected to empirical validation.

Following the empirical validation process, 49 of the initial 65 items of the Emotional Intelligence Questionnaire, 24 of the initial 32 items of the Self-Efficacy Questionnaire, and 10 of the initial 20 items of the Physics Learning Achievement Test met the established validity criteria and were retained for the main study.

The Emotional Intelligence Questionnaire demonstrated satisfactory content validity (Aiken's V = 0.83) and high internal consistency (Cronbach's á = 0.87). Likewise, the Self-Efficacy Questionnaire obtained an Aiken's V coefficient of 0.96 and a Cronbach's á coefficient of 0.93. In contrast, the Physics Learning Achievement Test achieved an Aiken's V coefficient of 0.81 and a Cronbach's á coefficient of 0.91. These results provide evidence that the instruments demonstrated acceptable content validity and internal consistency and were considered suitable for use in the main study.

Research Procedures

The research was conducted in four sequential stages.

Preparation stage

An extensive literature review was conducted to establish the theoretical framework. Subsequently, the researcher prepared the research proposal, developed the research instruments, conducted expert validation, revised the instruments based on expert recommendations, and carried out empirical testing to determine their validity and reliability.

Sampling stage

The participating schools were selected using cluster sampling. Research permission was then obtained from each participating school. The selected participants consisted of tenth-grade students who met the predetermined eligibility criteria, resulting in a final sample of 472 students.

Data collection stage

The Emotional Intelligence Questionnaire and the Self-Efficacy Questionnaire were administered under the supervision of the researcher. Subsequently, participants completed the Physics Learning Achievement Test following standardized testing procedures. All instruments were administered during the same period to ensure consistency in data collection. Participants were instructed to complete the questionnaires independently and were informed that their responses would be kept confidential and used solely for research purposes.

Data analysis stage

The collected data were first checked for completeness and coded before being entered into Jamovi. Descriptive statistics were then calculated to summarize emotional intelligence, self-efficacy, and physics learning outcomes. The normality of the data was assessed using the

Shapiro–Wilk test. Spearman's rank correlation was used to examine the relationships between emotional intelligence, self-efficacy, and physics learning outcomes. To examine the simultaneous contribution of emotional intelligence and self-efficacy to physics learning outcomes, multiple linear regression was conducted using 5,000 bootstrap resamples with 95% confidence intervals. The regression model was further evaluated using multicollinearity and heteroscedasticity diagnostics. The results were subsequently interpreted in accordance with the research questions and reported in the research findings.

Data Analysis

All statistical analyses were performed using Jamovi statistical software with a significance level of á = 0.05.

Descriptive statistics were first computed to summarize emotional intelligence, self-efficacy, and physics learning outcomes using the mean, median, standard deviation, minimum score, maximum score, frequency, and percentage. To facilitate interpretation, the scores for each variable were further classified into five categories: Very Low, Low, Moderate, High, and Very High, based on their respective score intervals. Table 1 presents the score classification criteria for each variable.

Table 1. Score classification criteria for descriptive analysis

Category	Emotional Intelligence	Self-Efficacy	Physics Learning Outcomes
Very Low	49-88	24-43	0-2
Low	89-127	44-62	3-4
Moderate	128-166	63-81	5-6
High	167-205	82-100	7-8
Very High	206-245	101-120	9-10

The score intervals were determined based on the theoretical minimum and maximum scores of each instrument. Emotional intelligence consisted of 49 valid items, and self-efficacy consisted of 24 valid items, both measured using a five-point Likert scale ranging from 1 to 5. Therefore, the theoretical score ranges were 49–245 for emotional intelligence and 24–120 for self-efficacy. Physics learning outcomes had a theoretical score range of 0–10. The interval width was calculated using the formula I=(X_{max} "X_{min})/k, where I is the interval width, X_{max} is the theoretical maximum score, X_{min} is the theoretical minimum score, and k is the number of categories. With five categories, the resulting interval widths were 39.2 for emotional intelligence, 19.2 for self-efficacy, and 2 for physics learning outcomes. Because the resulting widths for emotional intelligence and self-efficacy were decimal values, the category boundaries were adjusted to whole-number scores to cover the full theoretical score range without overlap or gaps.

Prior to hypothesis testing, the normality of the data was examined using the Shapiro–Wilk test. The results indicated that none of the observed variables were normally distributed ($p < 0.05$). Therefore, Spearman's rank correlation (Spearman's rho) was employed to examine the relationships between emotional intelligence and physics learning outcomes, self-efficacy and physics learning outcomes, and emotional intelligence and self-efficacy.

To address the fourth research question, multiple linear regression (MLR) was employed to estimate the simultaneous contribution of emotional intelligence and self-efficacy to physics learning outcomes. Because the Shapiro–Wilk test indicated that the observed variables were not normally distributed, the regression analysis was conducted using a bootstrap procedure to obtain confidence intervals that are less dependent on the assumption of normally distributed sampling distributions. The analysis was performed in Jamovi using 5,000 bootstrap resamples with 95% confidence intervals based on the percentile method. Emotional intelligence and self-efficacy were entered as predictor variables, while physics learning outcomes were treated as the dependent variable.

Before interpreting the regression model, multicollinearity was assessed using the Variance Inflation Factor (VIF) and Tolerance values. The obtained VIF (2.75) and Tolerance (0.363) indicated no evidence of serious multicollinearity. In addition, heteroscedasticity was evaluated using the Breusch–Pagan, Goldfeld–Quandt, and Harrison–McCabe tests, all of which produced non-significant results ($p > 0.05$), indicating that the homoscedasticity assumption was satisfied.

Finally, the regression model was evaluated using the overall F-test, the coefficient of determination (R^2), adjusted R^2, and the regression coefficients for each predictor. The predictor estimates were interpreted together with their 95% bootstrap confidence intervals. Although bootstrapping reduced reliance on the normality assumption, the regression findings were interpreted cautiously, particularly given the model's relatively small explanatory power.

RESULT AND DISCUSSION

Descriptive Statistics

The descriptive analysis included 472 tenth-grade students from five public senior high schools in Wajo Regency. Overall, the participants demonstrated relatively high levels of emotional intelligence and self-efficacy. More than half of the students were classified in the High category for both emotional intelligence (57%) and self-efficacy (57%). In contrast, physics learning outcomes showed greater variation across the five performance categories, although the largest proportion of students (38%) was classified in the Very High category.

To provide a clearer overview of the distribution of students across the five categories, Figure 1 presents the percentage distributions of emotional intelligence, self-efficacy, and physics learning outcomes.

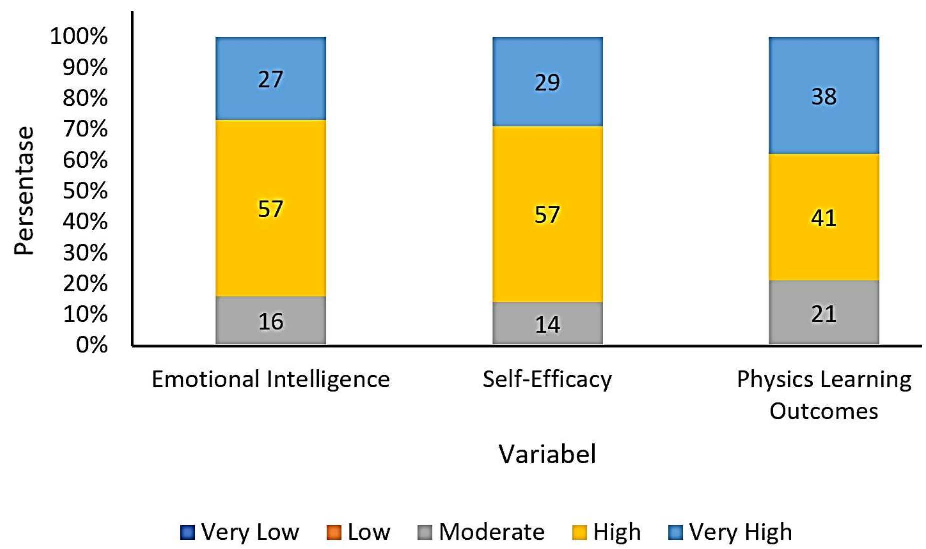

Figure 1. Percentage distribution of emotional intelligence, self-efficacy, and physics learning outcomes. Note: The figure presents the proportional distribution of 472 students across five classification categories using a 100% stacked bar chart.

Figure 1 presents the distribution of students across the five classification categories for emotional intelligence, self-efficacy, and physics learning outcomes using a 100% stacked bar chart. The chart allows comparison of the proportional distribution of each category across the three variables. For emotional intelligence, the largest proportion of students was classified as High (57%), followed by Moderate (24%), Very High (12%), Low (6%), and Very Low (1%). For self-efficacy, the largest proportion was also classified as High (57%), followed by Very High (20%), Moderate (20%), Low (3%), and Very Low (1%). Regarding physics learning outcomes, 38% of students were classified as Very High, 23% as Low, 15% as High, 15% as Moderate, and 9% as Very Low. Overall, the 100% stacked bar chart provides a clearer visualization of the relative proportion of students in each category across the three variables.

Normality Test

Prior to hypothesis testing, the normality assumption was examined using the Shapiro–Wilk test. The results are presented in Table 2.

Table 2. Results of the shapiro-wilk normality Test

Variable	W	p-value	Decision
Emotional Intelligence	0.978	<0.001	Not normally distributed
Self-Efficacy	0.965	<0.001	Not normally distributed
Physics Learning Outcomes	0.942	<0.001	Not normally distributed

The Shapiro–Wilk test indicated that the distributions of emotional intelligence, self-efficacy, and physics learning outcomes significantly deviated from normality ($p < 0.05$). Therefore, Spearman's Rank Correlation was employed to examine the relationships among the variables for the first three research questions.

Correlation Analysis

The relationships among emotional intelligence, self-efficacy, and physics learning outcomes were examined using Spearman's Rank Correlation. The results are presented in Table 3.

Table 3. Spearman's rank correlation matrix

Variables	EI	SE	PLO
Emotional Intelligence (EI)	—		
Self-Efficacy (SE)	0.769	—	
Physics Learning Outcomes (PLO)	0.193	0.203	—

As presented in Table 3, emotional intelligence was positively and significantly correlated with physics learning outcomes (ñ = 0.193, $p < 0.001$), indicating a very weak positive relationship. Similarly, self-efficacy showed a positive and significant relationship with physics learning outcomes (ñ = 0.203, $p < 0.001$), indicating a weak positive relationship. The strongest correlation was observed between emotional intelligence and self-efficacy (ñ = 0.769, $p < 0.001$), indicating a strong positive relationship.

Scatter Plot Analysis

To visually represent the relationships identified through Spearman's Rank Correlation, scatter plots were used to display the distribution of individual scores for the 472 students. Figure 2 presents the relationship between emotional intelligence and physics learning outcomes, while Figure 3 presents the relationship between self-efficacy and physics learning outcomes.

Figure 2 shows the distribution of individual scores for emotional intelligence and physics learning outcomes among the 472 students. The scatter plot indicates a positive tendency, as reflected by the upward direction of the trend line. However, the relatively wide distribution of the data points indicates that the relationship between the two variables is weak. This visual

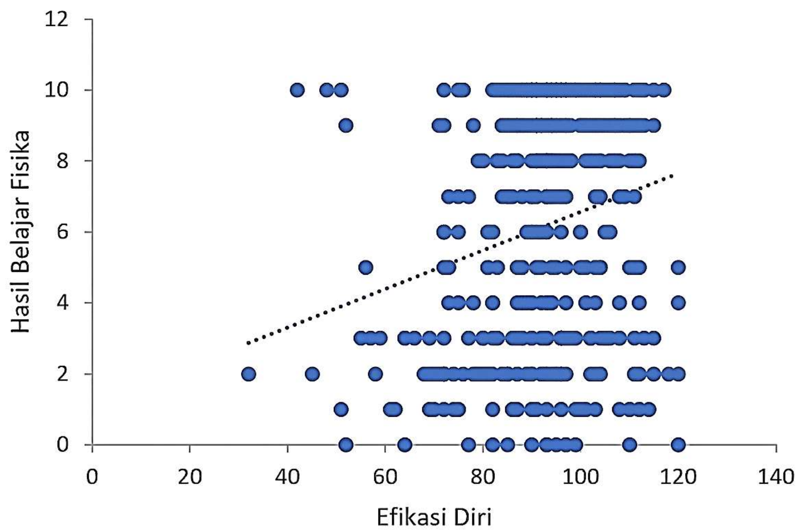

Figure 2. Scatter plot of the relationship between emotional intelligence and physics learning outcomes among 472 students

pattern is consistent with the Spearman correlation result, which indicated a positive and statistically significant relationship between emotional intelligence and physics learning outcomes (ñ = 0.193, $p < 0.001$).

Figure 3 shows the distribution of individual scores for self-efficacy and physics learning outcomes among the 472 students. The scatter plot indicates a positive tendency between the two variables, as shown by the upward trend line.

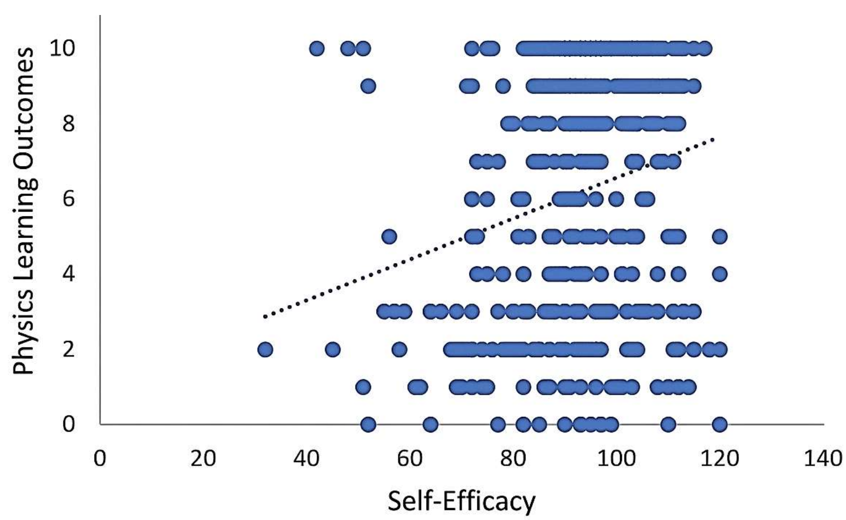

Figure 3. Scatter plot of the relationship between self-efficacy and physics learning outcomes among 472 students.

Nevertheless, the data points remain relatively spread out, indicating a weak relationship. This visual pattern is consistent with the Spearman correlation result, which showed a positive and statistically significant relationship between self-efficacy and physics learning outcomes (ñ = 0.203, $p < 0.001$).

Multiple Linear Regression Analysis

To estimate the simultaneous contribution of emotional intelligence and self-efficacy to physics learning outcomes, a multiple linear regression (MLR) analysis was performed. Prior to interpreting the regression model, the assumptions of multicollinearity and heteroscedasticity were examined and found to be satisfactory. The regression summary is presented in Table 4.

Table 4. Summary of multiple linear regression analysis

Statistic	Value
R	0.230
R^2	0.0528
F	13.10
p-value	< 0.001

As presented in Table 4, the regression model was statistically significant ($F = 13.10$, $p < 0.001$). The coefficient of determination ($R^2 = 0.0528$) indicates that emotional intelligence and self-efficacy jointly explained 5.28% of the variance in students' physics learning outcomes. To assess the magnitude of the regression effect, Cohen's f^2 was calculated using the formula $f^2 = R^2/(1$ " $R^2)$. Based on $R^2 = 0.0528$, the resulting Cohen's f^2 was 0.056, indicating a small effect size. Thus, although the regression model was statistically significant, its practical explanatory contribution was relatively limited.

Table 5. Regression coefficients

Predictor	B	t	p-value
Emotional Intelligence	0.0134	1.263	0.207
Self-Efficacy	0.0365	2.006	0.045

The regression coefficients are presented in Table 5. Self-efficacy significantly contributed to physics learning outcomes ($B = 0.0365$, $t = 2.006$, $p = 0.045$), whereas emotional intelligence did not show a statistically significant contribution ($B = 0.0134$, $t = 1.263$, $p = 0.207$). These results indicate that, when emotional intelligence and self-efficacy were analyzed simultaneously, only self-efficacy showed a statistically significant association with physics learning outcomes.

Relationship between Emotional Intelligence and Physics Learning Outcomes

The results revealed a positive and statistically significant relationship between emotional intelligence and physics learning outcomes, although the relationship was very weak (ñ = 0.193, $p < 0.001$). This finding suggests that students with higher emotional intelligence tended to achieve better physics learning outcomes. However, the relatively weak correlation indicates that emotional intelligence is only one of many factors associated with students' academic achievement.

According to Goleman (1995), emotional intelligence comprises the ability to recognize, regulate, and manage emotions; motivate oneself; understand others' emotions; and establish positive social relationships. These competencies enable students to cope with academic challenges, reduce learning-related stress, and maintain motivation during the learning process. Consequently, students with higher emotional intelligence are generally better prepared to participate actively in classroom activities and complete learning tasks effectively.

The present finding is consistent with previous studies reporting that emotional intelligence is positively associated with academic achievement. Di Giunta et al. (2021) emphasized that emotional competencies contribute to students' academic success by supporting adaptive learning behaviors. Likewise, Johnson et al. (2022) reported that emotional intelligence plays an important role in improving students' academic performance. Nevertheless, the relatively weak relationship observed in this study suggests that emotional intelligence alone cannot adequately explain differences in students' physics learning outcomes. Other factors, such as prior academic ability, learning motivation, instructional strategies, and family support, may also contribute substantially to students' academic achievement.

Relationship between Self-Efficacy and Physics Learning Outcomes

The findings also demonstrated a positive and statistically significant relationship between self-efficacy and physics learning outcomes (ñ = 0.203, $p < 0.001$). Although the correlation was weak, the results indicate that students with stronger beliefs in their academic abilities tended to achieve better physics learning outcomes.

This finding supports Bandura's (1997) Social Cognitive Theory, which states that self-efficacy influences individuals' motivation, persistence, effort, and resilience when facing challenging tasks. Students with higher self-efficacy are more likely to persist in solving physics problems, apply appropriate learning strategies, and remain confident despite experiencing learning difficulties. These characteristics contribute positively to students' academic performance.

The findings also align with previous studies showing that self-efficacy is positively associated with academic achievement. Johnson et al. (2022) found that students with stronger self-efficacy generally achieved better academic outcomes. Similarly, Lee and Larson (2023) reported that students with higher self-efficacy demonstrated better academic performance because they showed greater confidence and persistence during the learning process.

Relationship between Emotional Intelligence and Self-Efficacy

The present study identified a strong positive relationship between emotional intelligence and self-efficacy (ñ = 0.769, $p < 0.001$). This finding indicates that students who better understand and regulate their emotions also tend to have greater confidence in their ability to complete academic tasks successfully.

The strong association between these two psychological constructs suggests that emotional regulation and self-belief are closely interconnected. Students who can effectively manage emotional challenges may develop greater confidence when facing difficult learning situations. Likewise, students with higher self-efficacy are generally better able to maintain positive emotional responses while completing academic tasks.

This finding is consistent with previous research indicating that emotional intelligence and self-efficacy mutually reinforce one another in supporting students' academic development. Therefore, improving students' emotional competencies may simultaneously strengthen their confidence in learning, thereby creating more positive learning experiences.

Simultaneous Contribution of Emotional Intelligence and Self-Efficacy to Physics Learning Outcomes

The multiple linear regression analysis showed that emotional intelligence and self-efficacy jointly explained 5.28% of the variance in students' physics learning outcomes. The corresponding Cohen's f^2 of 0.056 indicated a small effect size. Although the regression model was statistically significant, the small effect size and coefficient of determination indicate that these two psychological variables had a relatively limited practical explanatory contribution.

Furthermore, the regression analysis showed that self-efficacy made a statistically significant unique contribution to physics learning outcomes. In contrast, emotional intelligence did not make a statistically significant contribution after both variables were analyzed simultaneously. This finding suggests that self-efficacy showed a stronger unique statistical contribution to physics learning outcomes than emotional intelligence within the regression model.

The relatively small coefficient of determination also indicates that other variables not examined in this study may play a larger role in explaining variation in students' physics learning outcomes. One possible factor is students' prior knowledge, as physics learning involves interconnected concepts in which understanding previous concepts provides a foundation for acquiring more complex knowledge. Students with stronger prior knowledge are generally better able to integrate new information, apply concepts, and solve physics problems effectively. In addition, learning motivation may contribute significantly to physics achievement because motivated students tend to demonstrate greater persistence, engagement, and effort when facing challenging learning tasks. Furthermore, instructional quality and teaching strategies may influence students' learning outcomes by determining how effectively abstract physics concepts are presented and understood. Therefore, future research should incorporate these cognitive, motivational, and instructional factors to provide a more comprehensive explanation of the determinants of physics learning outcomes.

Although Multiple Linear Regression (MLR) was employed to estimate the simultaneous contribution of emotional intelligence and self-efficacy, the findings should be interpreted with caution because the Shapiro–Wilk test indicated that the observed variables were not normally distributed. To address the potential impact of non-normality on statistical inference, the regression analysis was conducted using 5,000 bootstrap resamples with 95% confidence intervals. The absence of serious multicollinearity and heteroscedasticity further supported the regression model. Nevertheless, the model's relatively low explanatory power indicates that the findings should not be interpreted as definitive evidence of a strong predictive relationship. Future studies may further examine the consistency of these findings using other robust statistical approaches and alternative research designs.

This study has several limitations. First, the correlational research design does not permit causal inferences regarding the relationships among emotional intelligence, self-efficacy, and physics learning outcomes. Second, only two psychological variables were examined, whereas many other cognitive, instructional, and environmental factors may also influence students' physics learning outcomes. Therefore, interpret the findings in light of these limitations, and encourage future studies to examine additional variables to gain a more comprehensive understanding of the determinants of students' physics learning outcomes.

The findings of this study imply that efforts to support students' achievement in physics should not focus solely on cognitive development. Teachers may also consider fostering students' self-efficacy by providing constructive feedback, encouraging active participation, and creating supportive learning environments. In addition, strengthening students' emotional intelligence may support their ability to regulate emotions and adapt to academic challenges during the learning process.

CONCLUSION

This study investigated the relationships between emotional intelligence, self-efficacy, and physics learning outcomes among tenth-grade students in public senior high schools in Wajo Regency. The findings revealed that emotional intelligence had a positive and statistically significant relationship with physics learning outcomes, although the relationship was very weak. Similarly, self-efficacy was positively and significantly related to physics learning outcomes, but the relationship was weak. In addition, emotional intelligence and self-efficacy demonstrated a strong positive relationship.

The multiple linear regression analysis indicated that emotional intelligence and self-efficacy jointly explained 5.28% of the variance in students' physics learning outcomes. Although the regression model was statistically significant, the relatively small coefficient of determination and Cohen's f^2 effect size of 0.056 indicate that these two psychological variables had limited practical explanatory power. Among the two predictors, only self-efficacy showed a statistically significant contribution when both variables were analyzed simultaneously. These findings suggest that most of the variation in students' physics learning outcomes was associated with factors not examined in this study.

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