



The Relationship Between Self-Efficacy and Zinc Intake and Academic Achievement Among Junior High School Students

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Keywords:	Abstract
Self-efficacy; Zinc Intake; Academic Achievement; Junior High School Students.	Background: Academic achievement among junior high school students is influenced by various internal factors, particularly psychological factors such as self-efficacy and physiological factors such as adequate zinc intake, both of which play important roles in learning motivation and cognitive function. Objective: This study aimed to analyze the association between self-efficacy and zinc intake and academic achievement among junior high school students. Methods: This quantitative observational analytic study employed a case-control design and was conducted among eighth-grade students at SMP in PK Surakarta from October to December 2025. A total of 94 students were selected using purposive sampling. Self-efficacy was measured using the General Self-Efficacy Scale (GSES), zinc intake was assessed using a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), and academic achievement was determined based on Mid-Semester Summative Assessment scores. Data were analyzed using univariate analysis, bivariate analysis with the Chi-square test, and multivariate analysis using binary logistic regression. Results: Low self-efficacy was associated with poor academic achievement ($p = 0.032$; OR = 2.567; 95% CI: 1.075–6.131), while low zinc intake showed a stronger association with poor academic achievement ($p < 0.001$; OR = 9.103; 95% CI: 2.456–33.708). In multivariate analysis, both zinc intake and self-efficacy were significantly associated with academic achievement. Conclusion: Zinc intake and self-efficacy were associated with academic achievement among junior high school students.

INTRODUCTION

Academic achievement reflects students' success in internalizing knowledge, skills, and attitudes as outcomes of the formal education process after learning (Djamarah, 2017, cited in Yuniarty et al., 2023). Low academic achievement during adolescence may lead to various consequences, including reduced self-confidence, limited opportunities to continue to higher levels of education, and hindered optimal development of individual potential (Munira et al., 2024). Globally, the academic performance of Indonesian students remains unsatisfactory. The 2022 international education assessment reported that only about 18% of students achieved minimum proficiency in mathematics, 25% in reading literacy, and 34% in science. These figures are still far below those of developed countries, which reach more than 69% in mathematics, 74% in reading, and 76% in science (Organisation for Economic Co-operation and Development [OECD], 2023). This situation highlights the need for serious attention to various determinants of academic achievement, both internal and external factors, including psychological aspects and micronutrient status such as zinc intake (Gustina & Rahayu, 2020; Mustoip et al., 2023).

One of the psychological factors influencing learning success is self-efficacy, defined as an individual's belief in their ability to organize and execute actions required to achieve specific goals (Ningsih & Hayati, 2020). Research conducted among junior high school students in Brebes showed that approximately 41% of students had low self-efficacy (Azhar et al., 2022). Several previous studies have reported a relationship between self-efficacy and academic achievement (Talsma et al., 2019). A study among junior high school students in Banjarmasin found that students with higher self-efficacy tended to have better academic performance (Rachmayanie & Makaria, 2021). However, findings are not always consistent. Another study conducted in Bandung reported that self-efficacy was not significantly associated with academic achievement (Hasanah et al., 2021); therefore, the role of self-efficacy requires further investigation.

In addition to psychological factors, adequate zinc intake has also been reported to be associated with students' academic achievement (Anggraini et al., 2023). Zinc is an essential micronutrient that plays an important role in cognitive function and nervous system development. Previous research reported that approximately 94.7% of junior high school students had zinc intake below the recommended Nutritional Adequacy Rate (AKG) (Sudiarmanto & Sumarmi, 2020). A study among school-age children in Ghana showed a significant association between adequate zinc intake and academic achievement (Apprey et al., 2022). However, different findings were reported in a study conducted at a junior high school in Samarinda, which found no significant relationship between zinc intake and academic achievement (Anggraini et al., 2023).

Based on these inconsistent findings, further research is needed to comprehensively examine the relationship between self-efficacy, zinc intake, and academic achievement among junior high school students.

METHOD

Internal psychological and physiological factors played a crucial role in determining academic achievement. Based on this premise, this study employed a quantitative case-control design to identify differences in risk factors between students with suboptimal academic achievement (cases) and those with optimal achievement (controls).

Data were collected at SMP Muhammadiyah Al-Kautsar PK Surakarta from October to December 2025, involving grade VIII students for the 2025/2026 academic year. The sample was selected using purposive sampling based on predefined inclusion and exclusion criteria, resulting in a total of 94 respondents, evenly distributed into 47 case students and 47 control students.

The research procedure began with obtaining institutional permission and ethical clearance. This was followed by providing participants with information regarding the study objectives, benefits, and procedures, and obtaining informed consent. Primary data were collected using structured questionnaires, including the Minnesota Multiphasic Personality Inventory Lie Scale (MMPI-L), the General Self-Efficacy Scale (GSES), and the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Academic achievement data were obtained from Mid-Semester Summative Assessment (ASTS) score records.

Data analysis was conducted in several stages. Univariate analysis was performed to describe the characteristics of the study subjects. Bivariate analysis using the Chi-square test

was applied to examine the relationship between independent variables (self-efficacy and zinc intake) and academic achievement. Finally, multivariate analysis using binary logistic regression was conducted to assess the simultaneous effects of both variables and identify the most dominant contributing factors.

RESULTS AND DISCUSSION

The distribution of respondents' academic achievement showed an equal proportion between students with poor academic achievement and good academic achievement, as many as 47 students (50%) each. In the self-efficacy variable, most of the respondents were in the low self-efficacy category, namely 60 students (63.8%), while 34 students (36.2%) were in the normal self-efficacy category. In the zinc intake variable, the majority of respondents had low category zinc intake as many as 73 students (77.7%), while respondents with normal zinc intake amounted to 21 students (22.3%). Overall, the characteristics of the respondents showed that most students had a level of self-efficacy and zinc intake that was still in the low category.

Table 1. Respondent Characteristics

Variable	Frequency	Present (%)
1. Academic Achievement		
Not good	47	50
Good	47	50
2. Self-Efficacy		
Low	60	63,8
Normal	34	36,2
3. Zinc Intake		
Low	73	77,7
Normal	21	22,3

The results of the statistical test showed a significant correlation between the level of self-efficacy and student learning outcomes ($p=0.032$) and between zinc intake and student learning achievement ($p<0.001$).

Table 2. Chi-Square Test Results

Variable	Poor Academic Performance		Good Academic Achievement		Value <i>p</i>	OR	CI 95%	
	F (n)	(%)	F (n)	(%)			Lower	Upper
Self-Efficacy								
Low	35	58,3	25	41,7	0,032	2,567	1,075	6,131
Normal	12	35,3	22	64,7				
Zinc Intake								
Low	44	60	29	40	< 0.001	9,103	2,456	33,708
Normal	3	14,3	18	85,7				

Students with low self-efficacy had a 2.6 times greater risk of poor academic achievement than those with normal self-efficacy ($OR=2.567$; $CI\ 95\%: 1,075-6,131$). This is supported by distribution data where the proportion of poor achievement in the low self-efficacy group reached 58.3%, much higher than the normal self-efficacy group which was only 35.3%.

The risk of poor academic achievement increased sharply in students with low zinc intake, reaching 9.1 times compared to students with normal intake (OR=9.103; CI 95%: 2,456–33,708). This was confirmed through the Chi-Square test which yielded a significance value of $p < 0.001$. Descriptive data also supported this finding, where 60% of respondents in the low zinc intake group performed poorly, while the figure was much smaller in the normal intake group, which was only 14.3%.

Table 3. Logistic Regression Test Results

Variable	B	Value <i>p</i>	OR	CI 95%	
				Lower	Upper
Self-Efficacy	0,498	0,039	1,65	1,63	4,30
Zinc Intake	2,037	0,003	7,67	1,10	29,44

The results of the regression test showed that zinc intake and self-efficacy had a significant relationship with academic achievement.

The results of this study show that self-efficacy plays a role as a risk factor for academic achievement in bivariate analysis ($p = 0.032$). Self-efficacy reflects a student's confidence in his or her ability to manage the learning process, set academic goals, and set the strategies and efforts necessary to achieve success. In the context of education, students who have high self-efficacy are more likely to think that they are able to complete academic tasks effectively, while students with low self-efficacy are more prone to experiencing doubts, academic anxiety, and difficulty maintaining consistency in learning efforts. These conditions can affect learning behavior and contribute to the achievement of suboptimal academic achievement (Adi and Murti, 2025).

The level of self-efficacy of students is inseparable from environmental factors, such as the school's academic climate, teacher support, and learning experiences obtained during the educational process. The relatively conducive school environment in this study is suspected to contribute to the distribution of self-efficacy of students who tend to be in the category of quite high. Therefore, the use of the 70% percentile cut-off was carried out to identify groups of students with comparatively lower self-efficacy and increase the sensitivity of the classification of at-risk groups.

The findings in this study are in line with Anam (2025) who stated that self-efficacy plays a role in determining students' academic achievement. Students with low self-efficacy tend to have a negative perception of their abilities, making them more prone to experiencing doubt, academic anxiety, and procrastination behavior, which can ultimately reduce learning motivation and academic perseverance (Anam and Surawan, 2025). Similar findings were also reported in student studies in Kendari and Mataram which showed that low self-efficacy was associated with less than optimal learning engagement and lower learning outcomes (Indirwan et al., 2021; Putri et al., 2024).

In addition to the psychological aspect, this study found that zinc intake is a very significant risk factor for poor academic achievement ($p < 0.001$). The classification of zinc intake in this study refers to the 2019 Nutritional Adequacy Rate (AKG) for the age group of 13–15 years, namely 9 mg/day for adolescent girls and 11 mg/day for adolescent boys (Ministry of Health of the Republic of Indonesia, 2019). Zinc has an important role in a variety of

biological processes, including nervous system function, neurotransmitter activity, as well as learning and memory mechanisms. In adolescence, the need for zinc increases along with rapid physical growth and cognitive development (Patil et al., 2023). Lack of zinc intake has the potential to decrease the ability to concentrate, remember, and other cognitive functions that play a role in the learning process (Widiani et al., 2024).

The results of this study are consistent with studies on school-age children in India and Ghana that reported a relationship between adequate zinc intake, cognitive function, and academic achievement (Flora et al., 2021; Apprey et al., 2022). Biologically, zinc plays a role in the growth and differentiation of nerve cells, DNA and RNA synthesis, and regulation of neurotransmitter activity, so inadequate zinc status can increase the risk of impaired cognitive function and have an impact on suboptimal academic achievement (Indraswari et al., 2024).

In multivariate analysis, zinc intake and self-efficacy were both influential and showed a significant association with academic achievement. These findings suggest that the influence of self-efficacy on academic achievement can be influenced by students' biological conditions, especially the adequacy of zinc intake. This is in line with Bandura's (1997) theory which emphasizes that self-confidence needs to be supported by adequate biological and cognitive capacity in order to contribute optimally to academic achievement. Previous research has also shown that the influence of self-efficacy is an important psychological factor in learning outcomes (Maharani et al., 2025).

This study has limitations, including the use of the SQ-FFQ instrument which depends on the respondents' memory so that it has the potential to cause reporting bias. In addition, this study was only conducted in one school so the generalization of the results needs to be done carefully. Other confounding variables, such as family socioeconomic status, learning motivation, and intake of other micronutrients, have not been analyzed and can be considered for further research.

CONCLUSION

Based on the results of the research and discussion, it was concluded that self-efficacy and zinc intake were associated with academic achievement among junior high school students.

Low zinc intake showed a significant and consistent association with poor academic achievement in both bivariate and multivariate analyses. Thus, inadequate zinc intake was identified as the dominant risk factor for poor academic achievement in junior high school students. These findings indicate that adequate zinc intake is essential to support students' cognitive function and learning processes.

Overall, students' academic achievement is the result of an interaction between psychological and physiological factors. Efforts to improve academic achievement among junior high school students should be implemented comprehensively by strengthening psychological aspects and ensuring adequate nutritional intake, particularly zinc, to support optimal academic performance.

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