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Examining the Effect of Fatherlessness on Students' Mathematical Mindset: The Mediating Role of Self-Esteem

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ABSTRACT

This study aims to examine the relationship between fatherlessness and mathematical mindset through self-esteem. The study used an ex post facto correlational research design involving 184 junior high school students. The instruments used were the fatherlessness scale, self-esteem scale, and mathematical mindset scale, all of which had been tested for validity and reliability. Data analysis was performed using Andrew F. Hayes' Process Model 4. The results showed that fatherlessness had a significant negative effect on self-esteem (β=-0.298, $p<0.01$). Self-esteem had a positive effect on mathematical mindset (β=0.384, $p<0.01$), and fatherlessness also had a direct negative effect on mathematical mindset (β=-0.167, $p<0.01$). In addition, there is an indirect mediating effect through self-esteem (β=-0.114, 95% CI [-0.184, -0.062]). The implications of the research results for guidance and counseling practices will be discussed.

Keywords: *Fatherlessness, Mathematical mindset, Self-esteem.*

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INTRODUCTION

Learning is a system that involves various important components (Kristianto et al., 2023). Learning has the objective of facilitating students to learn and develop their potential (Nofriyanti & Nurhafizah, 2019). This implies that students are an important part of the learning process itself, while teachers and schools are there to act as facilitators, mediators, and motivators in learning (Hewes et al., 2019).

As an important part of learning, learning facilitators, in this case teachers, need to understand the characteristics of students who will participate in learning activities at school. This is in line with Budiningsih's (Budiningsih, 2001)opinion that identifying student characteristics at the beginning of learning planning is an important part that must be considered. Furthermore, Dick et al. (Dick et al., 2015) have emphasized the importance of identifying student characteristics in learning planning as the third stage in the learning planning process.

Students who participate in learning activities at school certainly have varying backgrounds, ranging from their initial abilities, motivation to learn, independence in learning, to their learning environment (Seftiani et al., 2020). These factors certainly have a significant contribution in determining the achievement of students' learning objectives at school.

Research results have shown various psychological factors that influence student learning outcomes, particularly in mathematics (Bryant et al., 2016; Demedts et al., 2022; Huang et al., 2019; Ningsih et al., 2023; Pantoja et al., 2020). Ningsih et al. (Ningsih et al., 2023) have identified factors such as attitude, scaffolding, and motivation that contribute to students' working memory during mathematics learning.

Mathematical proficiency is influenced by students' own views of mathematics, known as mathematical mindset (Schindler & Lilienthal, 2020). The results show that when students are unable to complete mathematical tasks and feel that they lack the ability to do so, they feel that they cannot progress. In addition, students have the perception that they lack ability in mathematics. These perceptions indicate that students have a certain mindset towards mathematics. This mindset is referred to as mathematical mindset.

Mindset can be categorized into two types: fixed mathematical mindset and growth mathematical mindset. In the first mindset, fixed mathematical mindset, students believe that mathematical ability is an innate ability, so no matter how hard they study, if they feel they do not have innate ability, they will not be able to achieve the desired results. In contrast, students with a growth mathematical mindset tend to believe that mathematical ability can change and develop through practice and persistence in learning (Saefudin et al., 2023).

The growth mindset theory has become a topic of considerable interest to researchers in recent years. The growth mindset is a motivational theory proposed by Carol Dweck, which states that our beliefs about intelligence and the ability to change our mindset can impact how we face challenges, respond to challenges and criticism, and direct our (Wolcott et al., 2021). Growth mindset refers to the belief that a person's abilities can be developed through effort, while fixed mindset means viewing abilities as something that is fixed and cannot be changed (Yeager dan Dweck, 2012; Xu et al., 2022). According to Dweck's theory, these mindsets affect achievement motivation differently: Students with a fixed mindset tend to avoid challenges and negative feedback and give up easily, while students with a growth mindset embrace challenges, persevere in the face of setbacks, and learn from criticism (Dweck, 2016).

Seeing two very different concepts between growth mindset and fixed mindset, it is not an exaggeration for the author to state that growth mindset is very important and must be possessed by mathematics students. Many students are afraid of mathematics, and they associate struggling in learning mathematics with a lack of intelligence, and they believe that it is impossible to succeed (Boaler 2016). This kind of thing is a fixed mindset. As a result, students become less motivated and feel a loss of control over their own learning, which has significant consequences. They lose focus, stop asking questions, experience more stress, lack long-term goals, and develop a negative self-identity (Dweck, 2006).

Conversely, with a growth mindset, they believe that such things can be changed. They will see the obstacles they encounter as opportunities to learn (Dweck, 2006). With a growth mindset, students will be persistent and focused on long-term goals, step out of their comfort zone, not hesitate to ask questions, find learning strategies, and ultimately enjoy the learning process (Jaffe, 2020).

Self-esteem is a person's view, feelings, and thoughts about themselves. Self-esteem can be defined as how much a person values and likes themselves, regardless of their circumstances (Wang et al., 2020). Many studies have proven that high self-esteem helps individuals make friends, become more successful in school or work, and achieve high psychological well-being (Merino et al., 2024). It has also been reported that self-esteem is an effective solution to educational failures, including in mathematics education (Ulfah et al., 2024). Individuals with stronger self-esteem are known to have stronger learning motivation because they believe they have the potential to develop their academic and cognitive abilities (Dweck, 2006; Yeageretal.,2016).

Research indicates that growth mindset is related to self-esteem. Individuals with a growth mindset are reported to have higher self-esteem, which is a characteristic considered to facilitate academic and/or cognitive abilities (Anderson, Hildreth, & Howland, 2015; Blackwell et al., 2007; Dweck, 2006, 2008). Other research through regression analysis clarifies that self-esteem moderates the relationship between growth mindset and thinking ability. In other words, self-esteem reinforces the positive effect of growth mindset on thinking ability. Overall, this shows that a growth mindset is beneficial for the thinking ability of adolescents and young adults, and that self-esteem can enhance this positive effect (Wang et al., 2023).

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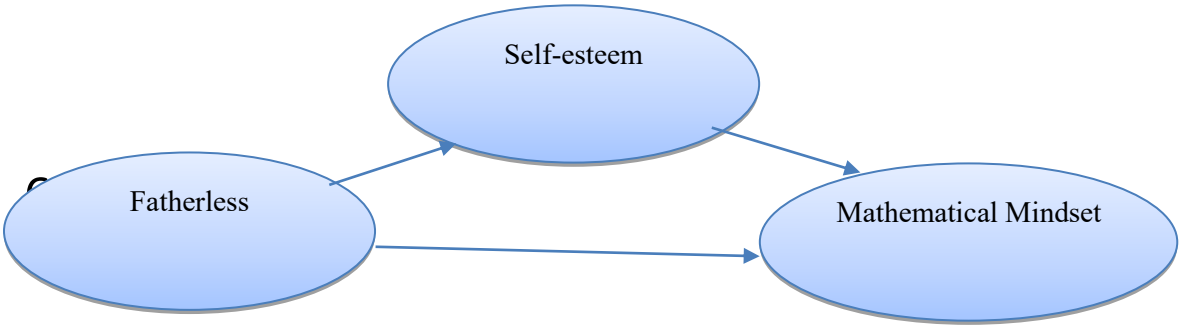
On the other hand, students' self-esteem is influenced by individual experiences both during childhood and adolescence. Many studies report that neglect has an impact on low self-esteem (Zhang et al., 2023). Furthermore, a meta-analysis study looking at the impact of child maltreatment on self-esteem from 1981 to 2021 reported that all forms of child maltreatment, including emotional abuse, neglect, physical abuse, sexual abuse, and physical neglect, have an impact on low self-esteem in individuals (Zhang et al., 2023). These results are effective and spread across a wide sample, both in terms of age and gender. In addition, it turns out that low self-esteem is an impact of the absence of the father's role in the child's development process until adolescence or even adulthood (Hidayah et al., 2023).

Fatherless is a term that describes a situation where the father is physically and emotionally absent in a child's upbringing. This situation can occur because the father does not take responsibility for his role as a father. Unlike in Western countries, where it is culturally acceptable to have children without being married, in Indonesia children are born to parents who are married, but the father does not fulfill his role as a father. Research shows that fatherlessness in life causes negative psychological development, such as lack of ambition, low self-esteem, inability to trust others, anger, and suicidal behavior (Hidayah et al., 2023; Sengkey et al., 2025). In addition, the absence of a father's role in parenting causes children to feel disappointed, hopeless, lazy, and unmotivated in the learning process, which leads to low academic achievement and indicates an impediment to the individual's growth mindset (Wae & Chandra, 2024).

Seeing this impact, this study will examine how self-esteem mediates the relationship between fatherlessness and growth mindset. Thus, the main objective of this study is to investigate the impact of psychological factors on the mathematical mindset of secondary school students. Furthermore, the specific objectives of this study can be written as follows.

a. Determine the extent of the influence of fatherlessness on the self-esteem of secondary school students.
b. Determine the extent of the influence of fatherlessness on the mathematical mindset of secondary school students.
c. Determine the extent of the influence of self-esteem on the mathematical mindset of secondary school students.
d. Determine the direct relationship between fatherlessness and mathematical mindset, and the indirect relationship through self-esteem.

Figure 1. Theoretical Framework of the Study



METHOD

Participants

This study is an ex post facto correlational study. The study population consists of all students in one junior high school in Metro City, totaling 392 students. The sample size was calculated using the Isaac and Michael formula (5%), resulting in a sample size of 184 students, consisting of 112 females and 72 males. The participating students were from grades VII (46%; 84 students), VIII (28%; 52 students), and IX (26%; 48 students) with ages ranging from 12 to 15 years. Most (73%) of the students lived in Islamic boarding schools, while the rest lived with their families at home. The average number of family members was 3.5, with 86% of fathers present and the rest working outside the city, divorced, or deceased.

Instruments

The variables of fatherlessness, self-esteem, and mathematical mindset were measured using questionnaires. Students were asked to fill out questionnaires in the form of Google Forms. The questionnaires for these three variables were adapted from instruments developed by previous researchers. The fatherless instrument consisted of emotional, social, academic, and self-development aspects in the form of nine questions with a scale of 5 (strongly disagree – strongly agree). All instruments consisted of positive statements. An example of a fatherless question item is: My father's absence makes me feel less confident in facing challenges. The self-esteem instrument consists of 10 statements with a 4-point scale (strongly disagree, disagree, agree, and strongly agree) with 4 negative statements and 6 positive statements. An example of a self-esteem question item is: Overall, I am satisfied with myself. Meanwhile, the mathematical mindset instrument consists of 19 questions using a 4-point Likert scale (strongly disagree – strongly agree). An example of a mathematical mindset question is: A person's mathematical ability can grow and develop through diligent study. To ensure that all instruments are completed, the form is designed so that respondents can proceed to the next section after completing the previous questions.

Procedure

The research team collaborated with high school mathematics teachers and Islamic boarding school administrators, assisted by volunteer guidance and counseling students. The research was conducted during the even semester of the 2024/2025 academic year. After obtaining approval from the school, the team distributed a Google Form link to the students. Meanwhile, students living in Islamic boarding schools were not allowed to use cell phones, so the researchers, assisted by the boarding school administrators, used several of the administrators' cell phones to help the students fill out the Google form link. Before filling out the instrument, the researchers asked for the students' consent regarding their willingness to participate in filling out the questionnaire so that the research data would be clear for ethical clearance.

Data Analysis

Data analysis in this study was conducted using SPSS software version 26, with the PROCESS Macro plugin by Andrew F. Hayes, specifically Model 4, which was used to test a simple mediation model. In this model, the independent variable (X) is fatherlessness, the mediator variable (M) is self-esteem, and the dependent variable (Y) is mathematical mindset. Model 4 was used to test whether there is an indirect effect of fatherlessness on mathematical mindset mediated by self-esteem.

RESULTS AND DISCUSSION

This study involved 184 junior high school students, consisting of 112 female students and 72 male students, aged between 13 and 15 years (mean age = 13.9 years). Based on descriptive analysis, the mean score (SD) on the fatherless variable was 26.82 (7.604). Approximately 65% of students were in the moderate to high category in terms of experiencing the loss of a father figure.

For the self-esteem variable, the mean score was 22.11 (5.018), with 58% of students in the moderate category, 32% in the low category, and 10% in the high category. Meanwhile, the

mathematical mindset variable had a relatively lower mean score of 29.86 (5.943). Most students (61%) were in the moderate category, but 30% were in the low category, and only 9% showed a well-developed mathematical mindset. The mean values, which were generally higher than the standard deviation for the three variables, indicate an even and representative distribution of data.

Table 1. Data Description

	N	M	SD
Fatherless	184	26.82	7.604
Self-esteem	184	22.11	5.018
Mathematical mindset	184	29.86	5.943

Mediation analysis using the PROCESS Macro Model 4 in SPSS shows that fatherlessness has a significant negative effect on self-esteem (β = -0.298, $p < 0.001$), indicating that the greater the experience of losing a father figure, the lower the students' self-esteem. In addition, self-esteem has a significant positive effect on mathematical mindset (β = 0.384, $p < 0.001$), which means that the higher the self-esteem, the higher the students' confidence in their mathematical thinking abilities.

Bootstrapping results (5000 replications, CI 95%) show that the indirect effect of fatherlessness on mathematical mindset through self-esteem is significant (β = -0.114, 95% CI [-0.184, -0.062]), so it can be concluded that self-esteem partially mediates the relationship between fatherlessness and mathematical mindset. The direct effect of fatherlessness on mathematical mindset remains significant (β = -0.167, p < 0.01) but decreases after the mediator is included in the model. Thus, these results show that the experience of losing a father figure has a negative impact on students' mathematical mindset, both directly and indirectly through a decrease in self-esteem as a psychological factor that mediates the relationship.

Table 2. Results of Regression Analysis Process Model 4

Prediktor	**β**	**p**	**R**	**R²**	**F**	**p**
Criteria: Self-Esteem (E)			.478	.228	109.123	.000
Fatherless (P)	-0.298	<.01				
Criteria: Mathematical Mindset (D)			.653	.427	136.657	.000
Self-Esteem (E)	0.384	<.01				
Fatherless (P)	-0.167	<.01				
Indirect Effects (E-P-D)	-0.114					

The results show that fatherlessness has a significant negative effect on self-esteem (β = -0.298, $p < 0.01$). This means that the greater the experience of losing a father figure, the lower the students' self-esteem. This finding is in line with a number of previous studies that show that the absence of a father figure affects the formation of children's self-concept and self-confidence. For example, studies by Hidayah et al. (2023) and Ellis (2025) found that children from fatherless families have a higher risk of experiencing self-esteem and emotional regulation disorders, especially during adolescence. Similarly, Sengkey et al. (2025) and Arvidsson, (2025) noted that fatherless children are more vulnerable to a decline in personal competence due to a lack of emotional support and identity validation from a father figure. What distinguishes this study is the context of early adolescence (junior high school) in the Indonesian education system, which has been relatively rarely studied specifically. In Indonesian culture, the father figure is not only seen as a provider of material needs but also as a symbol of authority, protection, and gender identity validation. Thus, the absence of a father can affect the psychological stability crucial for building self-esteem.

Despite the consistency of these findings with previous studies, an important contextual and analytical gap remains. Previous research has largely examined the impact of fatherlessness on self-esteem, emotional regulation, or academic attitudes in isolation, often

focusing on adolescents in broader or non-specific educational contexts (Hidayah et al., 2023; Sengkey et al., 2025; Ellis, 2025; Arvidsson, 2025). Similarly, studies on mathematical mindset have primarily emphasized individual cognitive and motivational factors without sufficiently considering family-related psychosocial conditions (Rayner & Riding, 2001; Mesler et al., 2021). By integrating these two strands of literature, this study addresses an important gap by demonstrating how fatherlessness affects students' mathematical mindset both directly and indirectly through self-esteem. Furthermore, by focusing on early adolescence within the Indonesian junior high school context, this research extends prior findings to a developmental stage and cultural setting that have received relatively limited empirical attention in existing studies.

In addition, unlike many prior studies that report bivariate associations between family background and academic outcomes, this study extends the literature by empirically testing a mediation model. The inclusion of self-esteem as a psychological mediator provides a more nuanced explanation of how fatherlessness translates into differences in mathematical mindset. This analytical approach highlights that the impact of father absence is not merely structural or demographic, but operates through students' internal psychological resources, which have been underexplored in earlier research.

Furthermore, the analysis shows that self-esteem has a significant positive effect on mathematical mindset ($\beta = 0.384$, $p < 0.01$). In other words, students with high self-esteem tend to have stronger confidence in their mathematical abilities. This finding reinforces previous studies, such as those conducted by Rayner & Riding, (2001) which confirm that self-belief and academic self-concept are strong predictors of achievement and attitudes toward mathematics. Mesler et al., (2021) also showed that students with a growth mindset toward mathematics generally have good self-esteem and do not easily give up when faced with difficulties. In the Indonesian context, where mathematics is often considered an "elite and difficult" subject, self-confidence is very important so that students do not shy away from challenges. This study enriches the literature by showing that self-esteem is not only an affective factor but also influences cognitive thinking patterns towards mathematics, even at the primary-secondary education level. This supports the importance of social-emotional interventions in improving students' mathematical competence.

Other findings show that fatherlessness has a direct negative effect on mathematical mindset ($\beta = -0.167$, $p < 0.01$), as well as an indirect effect through self-esteem ($\beta = -0.114$, 95% CI [-0.184, -0.062]). This means that the absence of a father figure not only affects students' emotional aspects (self-esteem) but also reduces their ability or willingness to develop a mathematical mindset.

Theoretically, these findings support the eco-psychological approach in education, which views family factors—especially father involvement—as influencing cognitive domains. Several studies (e.g., Wae & Chandra, 2024 and Mesler et al., 2021) have emphasized the importance of father involvement in building academic perseverance and positive attitudes toward learning, including mathematics.

The main difference between this study and previous studies is its emphasis on the role of psychological mediation (self-esteem) in explaining the impact of fatherlessness on cognitive aspects. Thus, this study bridges two dimensions that are often considered separate: psychosocial and academic cognitive.

The findings of this study have strong relevance in the field of Guidance and Counseling, particularly in the areas of developmental counseling and learning counseling. The results show that family social conditions, such as fatherlessness, have a significant psychological impact on students' self-esteem, which in turn affects their belief in their academic abilities, including their mathematical mindset. This confirms the importance of the role of guidance counselors in identifying students who have lost their father figure, either physically or emotionally, so that they can be provided with individual or group counseling services that can strengthen their self-esteem and encourage the development of a positive mindset towards learning, especially subjects that are considered difficult, such as mathematics.

In practical terms, these results imply the need for a holistic guidance approach that focuses not only on academic aspects but also on students' family backgrounds and emotional conditions. Basic guidance services can focus on improving self-esteem through reflective activities, self-affirmation, and emotional regulation training. In addition, responsive counseling services can be provided to students who show signs of father loss or low self-confidence in learning. This study also provides an empirical basis for guidance counselors to develop data-driven intervention programs and encourages collaboration between schools, parents, and counselors in building an environment that supports the balanced psychosocial and academic development of students.

This study contributes to the existing literature in several important ways. First, it empirically integrates psychosocial and academic-cognitive perspectives by demonstrating that self-esteem functions as a psychological mechanism linking fatherlessness to students' mathematical mindset, rather than treating emotional and academic outcomes as separate domains. Second, this study extends prior findings by focusing on early adolescence within the Indonesian junior high school context, a developmental stage and cultural setting that has been relatively underrepresented in previous research. Third, from a Guidance and Counseling perspective, this study provides empirical support for the incorporation of family-background-sensitive and self-esteem–based interventions into learning counseling services, particularly for students facing family-related vulnerabilities. By clarifying these contributions, this study moves beyond merely identifying risk factors and offers a more integrated explanatory framework with practical relevance for school-based counseling practices.

Limitations and future direction

This study involved junior high school students in Metro City. Of course, the sample size of this study is not yet representative enough to draw conclusions that represent the conditions of a country. This limitation encourages future studies to expand the sample size to include students from every province or across countries. Further research is needed to determine whether the results of the study will be the same. Another limitation is that the research data was collected using a closed questionnaire, so the results cannot explore in depth the forms of influence of fatherlessness, self-esteem, and mathematical mindset felt by students. This also opens up opportunities for further research to conduct an in-depth study of the profiles of fatherlessness, self-esteem, and mathematical mindset of students.

CONCLUSION

This study reveals that fatherless experiences have a negative impact on the mathematical mindset of junior high school students, both directly and indirectly through self-esteem as a mediator. The greater the experience of losing a father figure, the lower the students' self-esteem, which ultimately affects their confidence in their mathematical thinking abilities. These findings confirm that psychosocial factors, particularly family conditions and self-esteem, play an important role in shaping students' academic readiness and attitudes at school.

Theoretically, this study reinforces the model of the relationship between social, psychological, and cognitive aspects in adolescent development. Practically, these results highlight the urgency of the role of guidance and counseling teachers in providing services that are sensitive to students' family backgrounds and emotional conditions. Interventions aimed at improving self-esteem are not only psychologically beneficial, but also have a positive impact on academic aspects, including mathematics learning, which requires self-confidence and a growth mindset. This study is expected to form the basis for the development of more holistic guidance programs based on the real needs of students.

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