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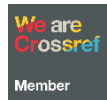
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Motor skills and parental support that affect physical education learning outcomes in elementary school students

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ABSTRACT

This study aims to analyze the influence of motor ability and parental support on Physical Education learning outcomes, mediated by the adversity quotient of fifth and sixth-grade students at SDN 007 Sagulung, Batam. A quantitative approach with path analysis was employed. The sample consisted of 103 students selected through specific sampling techniques. Data collection instruments included a motor ability test (straight-line walking, shuttle run, sprinting, push-ups, and jumping), questionnaires for parental support and adversity quotient, and academic reports for learning outcomes. Data were processed using SPSS 26 through descriptive and inferential analysis. The results indicate that: (1) motor ability significantly affects learning outcomes ($p < 0.05$); (2) parental support significantly affects learning outcomes ($p < 0.05$); (3) adversity quotient significantly affects learning outcomes ($p < 0.05$); (4) motor ability indirectly influences learning outcomes through adversity quotient by 12.85%; (5) parental support indirectly influences learning outcomes through adversity quotient by 9.59%; and (6) all variables simultaneously affect learning outcomes ($F_{count} 14.21 > F_{table} 3.14$). In conclusion, adversity quotient serves as a crucial mediating variable that strengthens the impact of physical and environmental factors on students' academic achievement in.



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Introduction

Physical Education, Sports, and Health plays a strategic role within the elementary school curriculum as it integrates cognitive, affective, and psychomotor domains in a holistic manner. Unlike purely academic subjects that tend to emphasize intellectual achievement, this subject fosters the development of physical competence, health awareness, and character values such as discipline, cooperation, and resilience. In this context, learning outcomes are not limited to academic scores but also reflect students' functional physical fitness and their ability to apply movement skills in real-life situations. Therefore, understanding the determinants of learning outcomes in Physical Education,

Sports, and Health requires a multidimensional perspective that connects physical, psychological, and social factors.

From a theoretical standpoint, learning outcomes in Physical Education, Sports, and Health are influenced by the interaction between internal and external factors (Hasmara, 2022; Indrawati et al., 2021). Internal factors include individual characteristics such as motor ability, while external factors involve environmental influences such as parental support. Previous studies consistently highlight that motor ability is a fundamental predictor of success in physical learning contexts (Asnaldi et al., 2018; Sari & Indahwati, 2016). Students with well-developed motor competence tend to demonstrate higher engagement, confidence, and effectiveness in performing physical tasks, which ultimately contributes to improved learning outcomes (Mustafa & Sugiharto, 2020).

Motor ability itself can be understood as a multidimensional construct involving physical fitness, coordination, and neuromuscular efficiency, which aligns with the concept of physical literacy (Durden-Myers & Bartle, 2023). Theoretically, motor ability serves as a foundational capacity that supports the acquisition of more complex movement skills (Hulteen et al., 2023; Klotzbier & Schott, 2025). Empirical evidence also shows that students with higher levels of motor competence are more likely to be physically active and cognitively engaged during learning processes, thus enhancing their academic performance (de Bruijn et al., 2019; Jafar et al., 2023; Zemková & Hamar, 2018). However, motor ability alone may not fully explain variations in learning outcomes, indicating the need to consider additional influencing factors.

In addition to internal factors, parental support plays a crucial role as an external determinant of student achievement. As the primary environment in a child's life, the family provides both material and non-material support, including access to sports facilities, nutritional support, motivation, and emotional encouragement (Mafulah et al., 2025; Salsabilah & Darmawan, 2025). From a socio-ecological perspective, parental involvement functions as a catalyst that strengthens students' commitment and participation in Physical Education, Sports, and Health activities. Children who receive consistent support from their parents tend to develop more positive attitudes toward physical activity and demonstrate higher persistence in learning tasks.

Despite the established importance of motor ability and parental support, previous research has often examined these variables independently, with limited attention to the psychological mechanisms that connect them to learning outcomes. One potential mediating factor is adversity quotient, which reflects an individual's resilience, perseverance, and capacity challenges in the learning process (Mayasari & Pagiling, 2020). In educational settings, adversity quotient is closely related to students' ability to cope with failure, maintain motivation, and persist in achieving learning goals (Sutanto, 2016). However, its role within the context of Physical Education, Sports, and Health remains underexplored.

Theoretically, adversity quotient can function as a psychological bridge that transforms physical competence and environmental support into meaningful academic achievement. Students with strong motor ability may develop higher self-efficacy, which enhances their resilience when facing complex physical tasks. Similarly, parental support can strengthen emotional stability and confidence, enabling students to remain engaged despite difficulties. This interaction suggests that learning outcomes are not solely determined by physical or environmental factors, but also by the student's internal capacity to respond to challenges.

The urgency of this study is supported by empirical findings from preliminary observations conducted at SDN 007 Sagulung, Batam City. The data reveal a significant gap between expected curriculum standards and actual student achievement. Only 37.86% of students were able to meet the Minimum Completion Criteria, while 62.14% required remedial intervention. This condition indicates that students face substantial challenges in achieving optimal learning outcomes, which may be influenced not only by motor limitations but also by insufficient parental support and low resilience in dealing with learning difficulties.

Based on these considerations, this study aims to analyze the influence of motor ability and parental support on learning outcomes in Physical Education, Sports, and Health, with adversity quotient as a mediating variable. This research is expected to contribute theoretically by enriching the

understanding of integrated physical and psychological factors in sports pedagogy, and practically by providing strategic insights for educators and parents in improving student achievement. By examining both direct and indirect relationships among variables, this study seeks to offer a more comprehensive explanation of the dynamics of learning outcomes at the elementary school level.

Method

This study employed a quantitative approach with an explanatory design using path analysis to examine both direct and indirect relationships among variables. The research was conducted in a cross-sectional framework, where data were collected at a single point in time to analyze causal patterns between motor ability (X1), parental support (X2), adversity quotient (Z) as a mediating variable, and learning outcomes in Physical Education, Sports, and Health (Y). The population consisted of all students at SDN 007 Sagulung, Batam City, during the 2024/2025 academic year. A purposive sampling technique was applied to select 103 students based on inclusion criteria, including active enrollment in grades V and VI, participation in Physical Education learning activities, and willingness to complete all research instruments (Asrulla et al., 2023).

Motor ability data were collected using the Nurhasan test instrument, which includes components such as balance (straight-line walking), agility (shuttle run), speed (sprint), upper body strength (push-ups), and power (jumping). This instrument has been reported to have high reliability (0.930) and validity (0.870) (Hardiyanto, 2024), and it was considered appropriate for elementary school students. The scores from each test component were standardized and combined into a composite motor ability score. Parental support and adversity quotient were measured using structured questionnaires based on a five-point Likert scale, covering dimensions such as emotional support, instrumental support, motivation, resilience, persistence, and problem-solving ability. Prior to data collection, both questionnaires were tested for validity and reliability using product-moment correlation and Cronbach's alpha to ensure internal consistency.

Learning outcomes data were obtained from secondary sources, namely students' official academic records provided by Physical Education teachers, which included cognitive, affective, and psychomotor assessments. To minimize subjectivity bias, the scores were taken from standardized school evaluations that follow the applicable curriculum guidelines (Sugiyono, 2019). In addition, the study considered basic demographic information such as grade level to ensure the consistency of data interpretation.

Before conducting hypothesis testing, several prerequisite tests were carried out to ensure the quality of the data. These included tests of normality using Kolmogorov-Smirnov, linearity, multicollinearity, and heteroscedasticity. All analyses were performed using SPSS version 26 with a significance level of 0.05. Path analysis was then conducted by constructing structural equations to estimate both direct and indirect effects among variables. The mediation effect of adversity quotient was further examined by comparing direct and indirect coefficients to determine whether the mediation was partial or full.

Ethical considerations were also addressed in this study. Permission to conduct the research was obtained from the school, and informed consent was secured from students and their parents prior to data collection. All data were treated confidentially and used solely for research purposes. Through this systematic procedure, the study aims to produce valid and reliable findings that accurately reflect the relationships among motor ability, parental support, adversity quotient, and learning outcomes in Physical Education, Sports, and Health.

Results and Discussions

The table below summarizes the results of the normality and linearity tests, which serve as essential statistical prerequisites before proceeding to hypothesis testing. In this study, the data distribution is considered normal if the Asymp. Sig. (2-tailed) value from the Kolmogorov-Smirnov test exceeds the 0.05 threshold. Similarly, the relationship between variables is deemed linear if the Sig. Deviation from

Linearity value is greater than 0.05, ensuring that the model meets the fundamental assumptions required for robust path analysis.

Table 1. Summary of normality test

Variable	Asymp. Sig. (2-tailed)	α (0.05)	Description
X1 toward Z	0.200	0.05	Normal
X2 toward Z	0.200	0.05	Normal
Y toward Z	0.200	0.05	Normal

Table 1 presents the results of the normality test using the Kolmogorov–Smirnov method. The findings indicate that all variables have an Asymp. Sig. (2-tailed) value of 0.200, which exceeds the significance level of 0.05. This confirms that the data are normally distributed. Therefore, the assumption of normality is fulfilled, allowing the data to be further analyzed using parametric statistical techniques, including path analysis.

Table 2. Summary of linearity test

Variable Relationship	Sig. Deviation from Linearity	α (0.05)	Description
X1 toward Y	0.519	0.05	Linear
X2 toward Y	0.451	0.05	Linear
X3 toward Y	0.726	0.05	Linear
X1 toward X2	0.364	0.05	Linear
X1 toward Z	0.662	0.05	Linear
X2 toward Z	0.437	0.05	Linear

Table 2 shows the results of the linearity test based on the Sig. Deviation from Linearity values. All variable relationships produce significance values greater than 0.05, indicating that the relationships between variables are linear. This means that the assumption of linearity is satisfied, ensuring that the variables can be appropriately analyzed within a path analysis framework. The linear relationships also support the validity of examining both direct and indirect effects among the variables.

Table 3. Direct Effects of Motor Ability, Parental Support, and Adversity Quotient on Learning Outcomes

Variable	Path Coefficient (β)	t-value	p-value	Decision
Motor Ability toward Learning Outcomes	0.321	2.45	0.016	Significant
Parental Support toward Learning Outcomes	0.287	2.31	0.023	Significant
Adversity Quotient toward Learning Outcomes	0.354	2.67	0.009	Significant

Table 1 shows the direct effects of motor ability, parental support, and adversity quotient on Physical Education learning outcomes. The findings indicate that all three variables have a statistically significant influence ($p < 0.05$). Among them, adversity quotient demonstrates the strongest effect ($\beta = 0.354$), suggesting that students' resilience plays a dominant role in determining their academic performance in PE. Motor ability and parental support also contribute positively, indicating that both physical competence and environmental support are essential factors in enhancing learning outcomes.

Table 4. Indirect Effects Through Adversity Quotient

Independent Variable	Mediator	Dependent Variable	Indirect Effect (%)	Interpretation
Motor Ability	Adversity Quotient	Learning Outcomes	12.85%	Moderate Mediation
Parental Support	Adversity Quotient	Learning Outcomes	9.59%	Moderate Mediation

Table 2 presents the indirect effects of motor ability and parental support on learning outcomes through adversity quotient. The results reveal that motor ability contributes an indirect effect of

12.85%, while parental support contributes 9.59%. These findings indicate that adversity quotient partially mediates the relationship between both independent variables and learning outcomes. This suggests that students with better motor skills and stronger parental support tend to develop higher resilience, which in turn enhances their academic achievement in Physical Education.

Table 5. Simultaneous Effect (F-Test) of All Variables on Learning Outcomes

Model Summary	F-count	F-table	p-value	Decision
Regression Model	14.21	3.14	0.000	Significant

Table 3 illustrates the simultaneous effect of motor ability, parental support, and adversity quotient on learning outcomes using the F-test. The calculated F-value (14.21) is significantly higher than the F-table value (3.14), with a p-value of 0.000 (< 0.05). This confirms that all independent variables collectively have a significant effect on students' learning outcomes. The model demonstrates strong explanatory power, reinforcing the importance of integrating physical ability, psychological resilience, and environmental support in improving academic performance in Physical Education.

The findings of this study confirm that motor ability has a significant direct effect on learning outcomes in Physical Education, Sports, and Health, as indicated by the statistical results obtained. The positive coefficient demonstrates that students with better motor competence tend to achieve higher academic performance. This finding strengthens the assumption that physical capacity is not only a supporting factor but a core determinant of success in physical education contexts. However, beyond statistical significance, it is important to interpret the magnitude of this influence in relation to other variables, indicating that motor ability contributes meaningfully but not exclusively to learning outcomes.

From a theoretical perspective, motor ability can be understood as a foundational capacity that underpins the execution of complex movement skills (Hulteen et al., 2023; Klotzbier & Schott, 2025). In this study, students who performed well in tasks such as balance, speed, and agility tests demonstrated more efficient neuromuscular coordination, which facilitated their ability to follow instructions and engage actively in learning activities. These findings are consistent with previous studies showing that motor competence is closely associated with physical literacy and overall academic engagement (Durden-Myers & Bartle, 2023; de Bruijn et al., 2019). Nevertheless, it should be noted that motor ability alone does not fully account for variations in learning outcomes, suggesting the presence of additional influencing factors.

In line with prior research, the results also indicate that parental support significantly affects learning outcomes. Students who receive encouragement, attention, and adequate facilities from their parents tend to show higher motivation and participation during Physical Education learning. This finding aligns with the view that the family environment plays a critical role in shaping students' attitudes toward physical activity (Mafulah et al., 2025; Salsabilah & Darmawan, 2025). However, the current study did not differentiate between types of parental support, which may limit the depth of interpretation regarding which forms of support are most influential.

The influence of parental support can also be explained through the Physical Activity Promotion Model, where parents act both as facilitators and role models (Coto et al., 2019). Students who observe active and supportive parental behavior are more likely to develop positive perceptions of Physical Education, Sports, and Health. In this context, parental involvement not only provides external motivation but also reinforces internal values related to discipline and persistence. Despite this, the study did not account for variations in socioeconomic background, which may moderate the level of support provided by parents.

Another important finding of this study is the significant role of adversity quotient as a predictor of learning outcomes. This result highlights that psychological resilience is as important as physical competence in determining student success. Students with higher adversity quotient tend to persist when facing difficulties, maintain motivation, and focus on skill mastery rather than avoiding failure. This is consistent with previous studies emphasizing the importance of resilience and perseverance in educational achievement (Juwita & Usodo, 2020; Sigit et al., 2019).

Theoretically, adversity quotient can be linked to the concept of mental toughness, which enables individuals to regulate pressure and transform challenges into opportunities for growth. In this study, students with strong adversity quotient were more capable of overcoming obstacles during learning activities, particularly when dealing with complex movement tasks. However, the measurement of adversity quotient in elementary school students may require further validation, considering their developmental stage and cognitive maturity.

A key contribution of this study lies in identifying the mediating role of adversity quotient in the relationship between motor ability, parental support, and learning outcomes. The results show that adversity quotient partially mediates these relationships, with indirect effects of 12.85% for motor ability and 9.59% for parental support. This indicates that both physical competence and environmental support can enhance learning outcomes through the development of resilience. However, the magnitude of these indirect effects suggests that mediation is moderate rather than dominant.

This mediation finding provides important insights into the mechanism of learning in Physical Education, Sports, and Health. Students with good motor ability are more likely to develop self-confidence, which in turn strengthens their resilience when facing challenges. Similarly, parental support contributes to emotional stability, enabling students to remain engaged in the learning process. These findings support the idea that learning outcomes are shaped by an interaction between physical, social, and psychological factors rather than a single determinant.

The simultaneous effect of all variables, as indicated by the significant F-test result, further confirms the multidimensional nature of learning outcomes. The combination of motor ability, parental support, and adversity quotient provides a more comprehensive explanation of student achievement. However, the absence of additional variables such as teaching quality, peer influence, and school environment suggests that the model may not fully capture the complexity of learning processes in Physical Education.

Despite its contributions, this study has several limitations that should be acknowledged. The research was conducted in a single school with a relatively limited sample size, which may restrict the generalizability of the findings. In addition, the use of self-report questionnaires for parental support and adversity quotient may introduce response bias. Future research is recommended to include a larger and more diverse sample, as well as to explore additional variables that may influence learning outcomes.

In terms of practical implications, the findings suggest that educators should adopt a more holistic approach in teaching Physical Education, Sports, and Health. Teachers are encouraged to design learning activities that not only develop motor skills but also foster students' resilience and motivation. At the same time, parents should be actively involved in supporting their children's physical activities. By strengthening the synergy between physical competence, psychological resilience, and environmental support, sustainable improvements in student learning outcomes can be achieved.

Conclusions

The study concluded that motor skills, parental support, and morale significantly influence physical education (PJOK) learning outcomes, both partially and simultaneously. Morale proved to be a crucial mediating variable that strengthens the contribution of physical and social environmental factors to student academic achievement. This confirms that successful physical education is a dynamic integration of physical literacy, psychosocial support, and student mental resilience. Physical education (PJOK) teachers are advised to integrate character-based learning models to foster morale, while schools need to strengthen partnerships with parents to align physical activity support at home. Future research is expected to expand the sample size and explore nutritional intake as a determinant of motor skills.

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