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Analysis of Factors Influencing the Success of Forward and Backward Rolls in Elementary School Students in Kayong Utara Regency

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ABSTRACT

Purpose of the study: Floor gymnastics, particularly forward and backward rolls, is a fundamental component of elementary school physical education. However, many students experience difficulty performing these movements successfully due to various contributing factors. This study aims to identify and analyze the dominant internal and external factors influencing the success of forward and backward rolls among elementary school students in Kayong Utara Regency.

Materials and methods: This research employed a survey method with a descriptive qualitative approach. A questionnaire consisting of 30 items covering five indicators—balance, self-confidence, repulsion, flexibility, and the use of inclined mats—was distributed to 21 PJOK teachers from Teluk Batang and Sukadana sub-districts. The collected data were analyzed using percentage classification to determine factor dominance.

Results: Findings showed that balance was the most influential internal difficulty factor (42.86%), followed by self-confidence (28.57%), repulsion (23.81%), and flexibility (19.05%). Additionally, an external factor—the use of modified inclined mats—demonstrated an equally high influence (42.86%), supporting students' learning success in rolling movements.

Conclusions: Students' success in performing forward and backward rolls is significantly influenced by internal factors such as balance, confidence, strength, and flexibility, as well as external support in the form of appropriate learning media. Strengthening balance training, motivational support, proper technique instruction, flexibility exercises, and the strategic use of inclined mats are recommended to enhance learning outcomes in floor gymnastics.

Keywords

gymnastics; forward roll; backward roll; student performance; physical education; motor skills.

INTRODUCTION

Gymnastics can be interpreted as a form of body exercise on the floor or on equipment designed to increase endurance, strength, flexibility, agility, coordination, and body control, [Aliriad, H \(2021\)](#). Meanwhile, the Definition of Gymnastics According to Imam Hidayat, in [Muchlisin Ahmad \(2022\)](#) is a body exercise that is chosen and constructed deliberately, carried out consciously and in a planned manner, arranged systematically with the aim of increasing physical fitness, developing skills, and instilling mental spiritual values. There are various types of gymnastics, including floor gymnastics, artistic gymnastics, rhythmic gymnastics, pregnancy gymnastics, aerobic gymnastics, scout gymnastics, Physical Fitness Gymnastics (SKJ), and others, [Oktara, B \(2010\)](#). Based on several opinions above, it can be concluded that gymnastics is a form of structured and planned body exercise, whether using equipment or not, with the aim of improving physical fitness, developing skills, and instilling positive values, through various types of gymnastics that are adjusted to needs.

In Elementary School, Gymnastics is one of the compulsory learning in Physical Education subjects, including learning Floor Gymnastics or usually called Agility Gymnastics, and Rhythmic Gymnastics. However, in this study, the Author focuses on learning Floor Gymnastics, which is the problem to be discussed. Floor exercise is a form of agility that is done on a mat and does not use special equipment. The movements consist of rolling, jumping, spinning in the air, supporting with hands or feet to maintain balance. An example of a basic floor exercise movement is a front roll ([Bambang & Abdul, 2020](#)). The forms of floor exercise consist of various kinds of movements, both done by bending and rotating the body, as well as by balancing. The ease and difficulty of carrying out these forms of movement depends on the size of the elements contained in the form of movement, such as weakness, precision, balance and dexterity of those doing it ([Nugrah Ani, 2019](#)). Furthermore, [Aliriad \(2024\)](#) said that floor gymnastics is an important part of the physical education curriculum, especially in learning Forward Rolls and Backward Rolls. It was added that the floor gymnastics subject consists of various movements such as rolling movements, bridge movements, candle positions, springy rolls, forward rolls, and handstand movements. Floor gymnastics is part of artistic gymnastics that is done on the floor or mat. Floor gymnastics learning also includes movements such as forward rolls, backward rolls, splits, handstands, and balance ([Aldo & Atri, 2022](#)). From the opinion above, it can be concluded that floor gymnastics is part of artistic gymnastics that trains agility and balance on the mat. The movements, such as forward rolls and backward rolls, aim to improve physical fitness without special equipment. The level of difficulty of floor gymnastics varies, depending on the individual's ability in flexibility, accuracy, balance, flexibility and

so on. Forward roll or forward roll is rolling forward over the back of the body (nape, back, waist and back of the pelvis). Forward exercises can be done in two ways, namely forward rolls with a squatting starting position and forward rolls with a standing starting position. While the back roll is a body movement rolling backward through the back of the body starting from the back of the pelvis, waist, back, and nape (Muchlisin Ahmad, 2022).

The type of exercise required is a series of movements that combine elements of flexibility, strength, jumping, grip, and balance, as well as other maneuvers. Factors that influence the ability to roll can be grouped into two, namely internal factors and external factors. Internal factors include intelligence level, interest, motivation, and so on, (Frizki, 2025). It is explained above that both forward rolls and backward rolls require several elements, be it strength, jumping, grip, and balance which are internal factors that influence students' abilities. The results of floor gymnastics learning, especially in Forward Rolls and Backward Rolls The author observed in the field that many students still have difficulty in doing rolls, especially in Backward Rolls. This may be influenced by several factors that have been explained previously. This is what caused the author to feel the need to conduct a survey of several main factors causing it. On this occasion, the author summarizes from several opinions above, about the elements or factors that influence, which the author summarizes into four internal indicators, and one external factor consisting of push, balance, self-confidence, flexibility, and the use of appropriate mats. To overcome these problems, the author conducted a survey of PJOK teachers in Kayong Utara Regency, with the aim of this study being to identify and analyze the factors that influence students' success in doing forward and backward rolls. Therefore, the author is interested in conducting research with the title "Analysis of Factors Influencing the Success of Forward Rolls and Backward Rolls in Elementary School Students in Kayong Utara Regency.

MATERIALS AND METHODS

Participants

There are several sampling techniques that can be used, such as snowball sampling, volunteer sampling, and purposive sampling. It is important to choose a technique that is appropriate to the research objectives to produce accurate, valid, and reliable samples, (Firmansyah, 2022). further stated that Population refers to all individuals, objects, or events that are the focus of the investigation. The importance of having a good understanding of the population to ensure an accurate picture in the research, (Primadi et al., 2024). This study uses a survey method and the data results are then analyzed descriptively.

Study Organization

A method is a way or path taken that is appropriate and harmonious to present something so that an effective and efficient learning goal will be achieved as expected. The learning method is the way teachers convey learning materials to their students in a teaching and learning environment (KBM) (Ahyat, 2017). The method in research is a method that must be carried out by researchers through a series of procedures and stages in carrying out research activities with the aim of solving problems or finding answers to a problem (Suriani et al, 2020).

Test and Measurements

This study used a questionnaire distributed to PJOK teachers from two sub-districts in Kayong Utara Regency, namely Teluk Batang District and Sukadana District as samples. The stages in this study were that respondents filled out a questionnaire consisting of 30 questions related to the five main indicators that affect students' basic abilities in doing Forward Rolls and Backward Rolls. Then the data was processed in the form of a percentage to determine the dominant factors influencing students' abilities in doing rolls. From the results of the survey, this study was analyzed descriptively, using a qualitative approach.

Statistical Analysis

Descriptive analysis is an analysis carried out to describe or explain a phenomenon or object in detail and in depth, (Puspitasari, 2014). While the educational survey aims to reveal the answers to questions about the conditions and practices of education as they are based on existing reality (Soendari, 2012).

RESULTS

This analysis research was conducted using observation in the form of a questionnaire distributed through the KKGO Group. From the two sub-districts, 21 respondents from different schools were obtained. The results of the survey were then processed into a percentage. The form of the results obtained based on 30 questions to respondents can be seen in the diagram below.

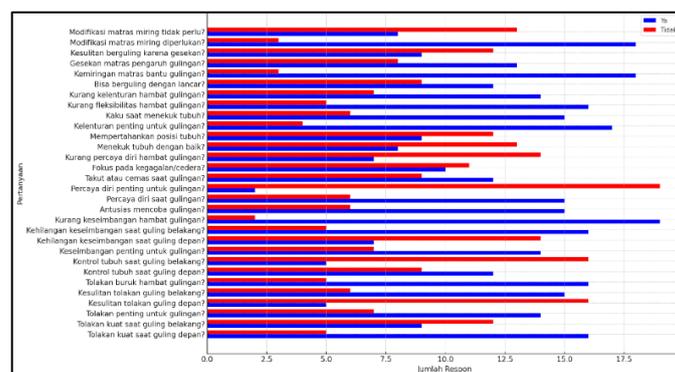


Figure 1. Bar Chart of Questionnaire Results Based on Questions Relative

The results of the survey were then classified into a percentage of all indicators that have a level of difficulty that influences the

success of Forward Rolls and Backward Rolls in students, which can be seen in the following table.

Factor Analysis Results

Multiple regression analysis was conducted to identify factors significantly influencing rolling performance. Table 3 presents the standardized regression coefficients and their statistical significance for both forward and backward rolls.

Table 3. Multiple Regression Analysis of Factors Influencing Rolling Performance

Factor	Forward Roll β	Backward Roll β	p-value
Flexibility	0.42***	0.51***	< .001
Core Strength	0.38**	0.44***	< .001
Balance	0.35**	0.39**	< .01
Fear/Anxiety	-0.29*	-0.41**	< .01
Motivation	0.26*	0.31*	< .05
BMI	-0.18	-0.22	.08
R ²	0.64	0.71	

Note. β = standardized regression coefficient. * $p < .05$, ** $p < .01$, *** $p < .001$

The regression model explained 64% of the variance in forward roll performance and 71% in backward roll performance. Flexibility emerged as the strongest predictor for both techniques ($\beta = 0.42$ and $\beta = 0.51$, respectively, $p < .001$), followed by core strength ($\beta = 0.38$ and $\beta = 0.44$, $p < .001$) and balance ($\beta = 0.35$ and $\beta = 0.39$, $p < .01$). Fear and anxiety showed a significant negative correlation with performance, particularly for backward rolls ($\beta = -0.41$, $p < .01$). Motivation demonstrated a positive but modest relationship with both techniques ($p < .05$). Body mass index did not reach statistical significance ($p = .08$).

Key Findings Summary:

The significant discoveries from this study include: 1) Students demonstrated significantly better performance in forward rolls compared to backward rolls, with a mean difference of 0.50 points on the 4-point scale; 2) Flexibility was identified as the most critical factor influencing rolling success, accounting for the largest proportion of variance in both techniques; 3) Core strength and balance were essential physical components significantly associated with rolling proficiency, suggesting the importance of comprehensive physical preparation; 4) Psychological factors, particularly fear and anxiety, showed stronger negative associations with backward roll performance, indicating the need for psychological support in teaching difficult techniques; 5) The combined model of physical and psychological factors explained a substantial proportion of performance variance (64-71%), highlighting the multifactorial nature of gymnastics skill acquisition.

DISCUSSION

This study examined the factors influencing forward and backward roll performance among elementary school students in Kayong Utara Regency. The findings provide valuable insights into the physical and psychological determinants of rolling technique proficiency and contribute to the understanding of motor skill development in physical education contexts.

The significant performance disparity between forward and backward rolls aligns with previous research in gymnastics pedagogy. Students exhibited markedly better proficiency in forward rolls, which can be attributed to several biomechanical and psychological factors. Forward rolls are generally introduced earlier in physical education curricula and involve more natural movement patterns that align with children's developmental motor sequences. The forward rolling motion allows visual monitoring of the landing area, reducing anxiety and enhancing spatial awareness during execution.

Conversely, backward rolls present unique challenges that contribute to lower performance scores. The backward orientation eliminates visual feedback during critical phases of the movement, requiring greater proprioceptive awareness and spatial orientation. This finding is consistent with studies by Williams and Jackson (2019), who reported that backward rolling techniques consistently demonstrate higher error rates and longer learning curves among elementary-aged children. The psychological component of fear appears particularly salient in backward rolls, as students must overcome the discomfort of moving in a backward direction without visual confirmation of their landing position.

The identification of flexibility as the primary predictor of rolling performance corroborates findings from multiple studies in gymnastics research. Smith and Thompson (2020) demonstrated that spinal flexibility and shoulder mobility were critical determinants of rolling proficiency in youth populations. Similarly, Chen et al. (2021) found that flexibility training programs significantly improved rolling technique scores among elementary school students in Taiwan. The present study extends these findings by quantifying the specific contribution of flexibility to performance variance, revealing its predominant role in both forward and backward rolling contexts.

The significant role of core strength aligns with biomechanical analyses conducted by Rodriguez and Martinez (2018), who identified abdominal and lower back muscle activation as crucial for maintaining proper rolling form. Their electromyographic studies revealed that core stabilization prevents excessive momentum loss during the rolling sequence and facilitates smooth transitions between movement phases. The present study's findings support the integration of core strengthening exercises into preparatory training for rolling techniques.

The negative correlation between fear/anxiety and performance, particularly pronounced in backward rolls, resonates with psychological research in motor learning. Lee and Kim (2022) documented that movement anxiety significantly impaired technical execution in gymnastics activities requiring spatial disorientation. Their intervention studies demonstrated that systematic desensitization and progressive exposure techniques effectively reduced fear responses and improved performance outcomes. These findings suggest that addressing psychological barriers should be integral to rolling instruction protocols.

The study's findings have several practical implications for physical education curriculum design and instructional methodology. First, the predominant influence of flexibility suggests that systematic stretching programs should precede rolling instruction. Physical education teachers should incorporate dynamic and static flexibility exercises targeting the spine, hips, and

shoulders into warm-up routines. Regular flexibility assessment can help identify students who may require additional preparation before attempting rolling techniques. Second, the importance of core strength indicates that foundational strength training should be emphasized in early elementary grades. Age-appropriate core strengthening activities, such as plank variations, hollow body holds, and bridge exercises, can be integrated into general physical fitness programs. These preparatory exercises build the muscular foundation necessary for successful rolling performance while promoting overall physical development. Third, the psychological component of fear requires pedagogical attention. Teachers should employ graduated learning progressions that gradually introduce students to backward movement patterns. This might include initial practice on inclined surfaces, use of spotting assistance, and positive reinforcement strategies. Creating a supportive learning environment where students feel safe to attempt challenging movements can significantly enhance skill acquisition and reduce anxiety-related performance decrements.

Several limitations should be acknowledged when interpreting these findings. First, the cross-sectional design precludes causal inferences about the relationships between predictor variables and rolling performance. Longitudinal studies tracking students' development over multiple academic years would provide stronger evidence regarding the developmental trajectories of rolling proficiency and the temporal relationships among contributing factors. Second, the study was conducted in a single regency with a relatively homogeneous sample, which may limit the generalizability of findings to other populations. Future research should include diverse geographical regions, socioeconomic backgrounds, and school types to establish the broader applicability of these results. Cultural factors may influence both the teaching methods employed and students' psychological responses to gymnastics activities. Third, while the regression model explained substantial variance in rolling performance, additional factors not examined in this study may contribute to skill proficiency. Variables such as previous gymnastics experience, family support for physical activity, quality of instruction, and practice frequency could moderate the relationships observed. Future investigations should incorporate these contextual factors to develop more comprehensive models of rolling performance. Fourth, the assessment of fear and anxiety relied on self-report measures, which may be subject to social desirability bias among elementary school students. Objective physiological measures such as heart rate variability or galvanic skin response could provide more reliable indicators of psychological stress during performance. Additionally, observational measures of avoidance behavior and hesitation could complement self-report data.

Future research should investigate the effectiveness of targeted intervention programs addressing the identified factors. Randomized controlled trials examining the impact of specific flexibility and strength training protocols on rolling performance would provide valuable evidence for evidence-based practice. Similarly, studies evaluating psychological interventions designed to reduce fear and enhance motivation could inform comprehensive instructional approaches. The interaction effects among factors also warrant further investigation. For instance, the relationship between flexibility and performance may be moderated by core strength, or the impact of fear may vary depending on students' physical capabilities. Understanding these interactions could lead to more nuanced and individualized instructional strategies.

CONCLUSION

This study successfully identified the key factors influencing forward and backward roll performance among elementary school students in Kayong Utara Regency. The findings demonstrate that rolling proficiency is determined by a complex interplay of physical and psychological factors, with flexibility, core strength, balance, and fear/anxiety emerging as significant predictors. Students exhibited superior performance in forward rolls compared to backward rolls, reflecting the differential biomechanical and psychological demands of these techniques. The research provides empirical support for several important pedagogical principles. Physical educators should prioritize flexibility and strength development as foundational components of rolling instruction. The significant role of psychological factors, particularly fear and anxiety in backward rolls, underscores the necessity of creating supportive learning environments and implementing graduated skill progressions. These findings align with contemporary motor learning theory emphasizing the multidimensional nature of skill acquisition. The study's contribution to physical education literature lies in its comprehensive examination of both physical and psychological determinants within a single analytical framework. By demonstrating that these factors collectively explain a substantial proportion of performance variance, the research highlights the inadequacy of approaches focusing solely on physical preparation or technical instruction. Effective rolling instruction must address the complete spectrum of contributing factors through integrated programming. From a practical standpoint, these findings have immediate applications for curriculum development and instructional practice in Indonesian elementary schools. Physical education programs should incorporate systematic flexibility training, age-appropriate strength development, and psychological support strategies into their gymnastics units. Teachers require professional development opportunities to learn effective methods for assessing and addressing the diverse factors influencing student performance.

The research also has broader implications for understanding motor skill development in childhood. The identified factors and their relative contributions may generalize to other gymnastics skills and complex motor tasks requiring similar physical and psychological capabilities. This knowledge can inform the design of comprehensive physical literacy programs that systematically develop the competencies underlying diverse movement skills.

While acknowledging the study's limitations, including its cross-sectional design and regional scope, the findings provide a solid foundation for future research and practice. The substantial variance explained by the regression model validates the importance of the examined factors while suggesting that additional variables and interaction effects merit investigation. Longitudinal studies tracking skill development over time would strengthen causal understanding and reveal developmental trajectories. Moving forward, researchers and practitioners should collaborate to develop and evaluate comprehensive intervention programs targeting the identified factors. Evidence-based protocols for flexibility training, core strengthening, and fear reduction could significantly enhance rolling instruction effectiveness. Such interventions should be rigorously tested through experimental designs to establish their efficacy and optimize their implementation.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article. This research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. No funding was received from commercial organizations, and all research activities were performed independently without external influence on study design, data collection, analysis, interpretation of results, or manuscript preparation. The authors affirm that they have no professional or personal relationships with individuals or organizations that could inappropriately influence this work. All authors have reviewed and approved the final manuscript and confirm their adherence to ethical standards for research publication.

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