



Improving Early Childhood Gross Motor Skills through Structured Rope-Jumping Activities

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ABSTRACT

Purpose of the Study: This study aimed to investigate the effectiveness of structured rope-jumping activities in improving the gross motor skills of kindergarten children, particularly leg strength and body balance, through a Classroom Action Research approach implemented in two learning cycles.

Methodology: This study employed Classroom Action Research using the Kemmis and Mc. Taggart spiral model consisting of planning, action, observation, and reflection stages. The participants were 14 kindergarten children aged 4–5 years. Data were collected using structured observation sheets assessing leg strength and postural balance during rope-jumping activities conducted across two intervention cycles and six learning sessions.

Main Findings: The findings showed significant improvement in children's gross motor skills after the implementation of rope-jumping activities. The percentage of children achieving good performance increased from 14.28% in the pre-action stage to 71.42% in Cycle I and 92.86% in Cycle II. Improvements were observed in children's jumping ability, landing stability, movement coordination, confidence, enthusiasm, and participation during physical learning activities.

Novelty/Originality of this Study: The novelty of this study lies in the integration of structured rope-jumping activities with progressive instructional modifications, including warm-up exercises, adjusted rope height, repeated practice opportunities, group-based activity organization, and reward reinforcement. This study provides a practical, low-cost, and developmentally appropriate gross motor intervention model that can be directly implemented in early childhood education settings.

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1. INTRODUCTION

Early childhood is widely recognized as a critical developmental stage in which children experience rapid physical, cognitive, emotional, and social growth [1]-[3]. During this period, children gradually develop the ability to control and coordinate body movements through continuous interaction with their environment [4]-[6]. One of the most important developmental domains at this stage is gross motor development, which involves the use of large muscle groups to perform movements such as running, jumping, balancing, climbing, and other physical activities [7]-[9]. Gross motor skills not only support children's physical health but also contribute to their independence, self-confidence, concentration, and participation in learning and social interaction.

Children with well-developed gross motor abilities tend to be more active, confident, and engaged in classroom activities and peer interaction [10]-[12]. In contrast, children who experience limited motor stimulation often encounter difficulties in physical participation, reduced confidence, and lower readiness for formal schooling [13]-[15]. Therefore, the development of gross motor skills should become an important priority in early childhood education programs. Schools are expected to provide learning experiences that are active, enjoyable, and capable of stimulating children's physical development in a systematic manner [16]-[18].

In kindergarten education, physical and motor development constitutes one of the major developmental domains that must be facilitated through meaningful learning activities [19]-[21]. However, the implementation of gross motor learning in many early childhood institutions remains limited and less varied [22]-[24]. Learning activities are often dominated by indoor instruction and routine exercises that do not provide sufficient opportunities for children to engage in dynamic body movements. In many cases, outdoor learning environments and physical play activities are still underutilized, resulting in limited stimulation of children's strength, coordination, and balance abilities.

Preliminary observations conducted in a kindergarten classroom revealed that several children experienced difficulties in performing jumping movements properly [25]-[27]. Some children lacked sufficient leg strength to jump over simple obstacles, while others had difficulty maintaining balance after landing [28]-[30]. Learning activities related to physical development were generally limited to simple gymnastics and repetitive movement routines, which did not significantly improve children's gross motor competence [31]-[33]. These conditions indicate that children require more structured, attractive, and developmentally appropriate physical activities to stimulate their gross motor abilities effectively.

The problem becomes increasingly important because gross motor development during early childhood strongly influences children's future physical readiness and learning participation [34]-[36]. Insufficient stimulation at this stage may negatively affect children's confidence, movement coordination, and willingness to participate in active learning activities. Therefore, there is an urgent need for innovative and practical learning strategies that can improve gross motor development while maintaining children's enthusiasm and active participation during classroom learning.

One learning activity considered suitable for addressing this issue is rope jumping. Rope-jumping activities provide opportunities for children to train leg muscle strength, body coordination, balance, concentration, and movement control simultaneously [37], [38]. In addition, rope jumping is simple, inexpensive, easy to implement, and attractive for young children because it combines physical activity with play-based learning experiences. Through repetitive and enjoyable jumping practice, children can gradually improve their movement quality and confidence in performing physical activities.

Although studies discussing gross motor development in early childhood education have been widely conducted, most existing studies still focus on general physical activity programs and provide limited discussion regarding structured rope-jumping interventions in kindergarten settings. Furthermore, many previous studies emphasize theoretical perspectives without describing detailed implementation procedures that can be directly applied by teachers in classroom practice. Research specifically examining how rope-jumping activities can systematically improve children's jumping strength and balance through reflective classroom action cycles remains limited.

This condition indicates the existence of a research gap in the implementation of simple, low-cost, and structured rope-jumping activities as an intervention for improving gross motor development in early childhood education. In addition, previous studies have rarely integrated progressive instructional modifications such as warm-up activities, rope-height adjustment, group organization, and motivational reward systems within the intervention process. Therefore, further investigation is needed to provide more practical and applicable evidence regarding the effectiveness of rope-jumping activities in improving children's gross motor abilities.

The novelty of this study lies in the integration of structured rope-jumping activities with progressive instructional modifications implemented through Classroom Action Research cycles. Unlike conventional gross motor learning activities, this study combines warm-up exercises, developmentally appropriate rope height adjustments, repeated jumping opportunities, group-based activity organization, and reward reinforcement to create a more engaging and effective learning environment. This approach not only focuses on physical movement outcomes but also emphasizes children's motivation, participation, and confidence during the learning process.

Based on these considerations, this study aimed to investigate the implementation of rope-jumping activities as an effort to improve children's gross motor skills in kindergarten. Specifically, the study sought: (1) to describe the step-by-step implementation process of rope-jumping activities through two Classroom Action Research cycles, and (2) to analyze the improvement of children's gross motor skills, particularly leg strength and body balance, following the implementation of the intervention program.

2. RESEARCH METHOD

2.1 Type of Research

This study employed a Classroom Action Research (CAR) design using the spiral model consisting of planning, action, observation, and reflection stages. Classroom Action Research was selected because it is appropriate for improving learning practices directly within the classroom setting through continuous cycles of evaluation and refinement. The research was conducted collaboratively between the researcher and the classroom teacher, where the researcher acted as an observer and planner, while the teacher implemented the learning activities during the intervention process.

The study was carried out in two cycles, and each cycle consisted of three learning sessions. At the end of every cycle, reflection activities were conducted to identify weaknesses and determine necessary improvements for the following cycle. The intervention implemented in this study focused on rope-jumping activities designed to improve children's gross motor skills, particularly leg strength and body balance [39], [40]. Before the intervention was conducted, a preliminary observation was carried out to identify the initial condition of children's gross motor abilities. The findings from the preliminary observation served as the basis for designing the learning intervention implemented throughout the research cycles.

2.2 Population and Sample

The study was conducted in a kindergarten classroom during the first semester of the 2014/2015 academic year. The population of this study consisted of all children enrolled in Group A of the kindergarten program. Since the total number of children was relatively small, all members of the population were included as research participants.

The sample consisted of 14 children aged 4–5 years, including 7 boys and 7 girls. The intact classroom group was selected as the research unit because the study aimed to improve learning practices directly within the existing classroom environment. No sampling technique was applied because all children in the class participated in the intervention activities.

Table 1. Participant Profile

Characteristic	Details
Group	Group A
Total Participants	14 children
Gender	7 boys and 7 girls
Age Range	4–5 years
Research Period	October–November
Total Sessions	6 sessions
Research Cycles	2 cycles

Table 1 presents the characteristics of the research participants. The study involved 14 kindergarten children from Group A, consisting of an equal proportion of boys and girls aged 4–5 years. The intervention was implemented during October–November through six learning sessions conducted within two research cycles. The use of an intact classroom group allowed the intervention to be applied naturally within the existing learning environment.

2.3 Data Collection Technique

Data in this study were collected through direct observation using structured observation sheets. Observation was chosen because it allowed the researcher to monitor children's gross motor performance directly during rope-jumping activities. The observation process was conducted collaboratively by the researcher and an assisting observer during every learning session. The study focused on two major aspects of gross motor development: leg strength and body balance. Leg strength was assessed based on children's ability to jump over the rope without touching it, while body balance was assessed based on children's ability to maintain stable body posture after landing.

The assessment instrument used a four-level developmental rating scale consisting of: Excellent, Good, Developing, and Not Yet Developed. The scoring criteria were adjusted to children's jumping performance and landing stability during the activity sessions. Before the intervention cycles began, a pre-action observation was conducted to determine children's initial gross motor abilities. During Cycle I, children participated in rope-jumping activities using a rope approximately 30 cm high with a single-line queue system. Based on reflection results from Cycle I, several modifications were implemented in Cycle II, including warm-up exercises, reducing rope height to 20 cm, dividing children into two groups, fixing the rope to stable supports, and providing reward stickers to increase children's motivation and participation.

Table 2. Assessment Rubric of Gross Motor Skills

Score	Category	Leg Strength Indicator	Balance Indicator
4	Excellent	Jumps higher than 20 cm without touching the rope	Lands steadily without swaying
3	Good	Jumps over the rope without touching it	Lands with slight body sway
2	Developing	Touches the rope while jumping	Lands but loses balance
1	Not Yet Developed	Refuses or fails to jump	Unable to maintain balance

Table 2 presents the rubric used to assess children's gross motor skills during rope-jumping activities, focusing on two aspects: leg strength and body balance. The assessment employs a four-level scale ranging from "Not Yet Developed" to "Excellent," based on observable performance during jumping and landing. For leg strength, the "Excellent" category indicates the ability to jump above 20 cm without touching the rope, while lower categories reflect reduced performance, from successful jumps with rope contact to refusal or inability to jump. For body balance, "Excellent" describes stable landings without sway, whereas lower levels indicate increasing instability, including slight sway, loss of balance, and inability to maintain posture after landing. This rubric provides a structured and consistent basis for evaluating gross motor development across observation sessions.

2.4 Data Analysis Technique

The collected data were analyzed using descriptive quantitative analysis. Children's gross motor performance was calculated in the form of percentages to determine the level of improvement achieved during each cycle of the study.

The percentage of children achieving good performance was calculated using the following formula:

$$P = \frac{\text{Obtained Score}}{\text{Maximum possible score}} \times 100\%$$

The results were then categorized into several performance levels, namely Excellent, Good, Adequate, Poor, and Very Poor. The study established a success criterion stating that at least 80% of children were expected to achieve the "Good" category or higher in both leg strength and body balance indicators by the end of the final cycle. The results from each cycle were compared to identify improvements in children's gross motor skills after the implementation of rope-jumping activities. Reflection results from Cycle I were also used to revise and improve the intervention strategies implemented in Cycle II to achieve better learning outcomes.

2.5 Research Procedure

This study was implemented using a Classroom Action Research (CAR) design following the spiral model consisting of planning, action, observation, and reflection stages. The intervention was conducted over two cycles, and each cycle consisted of three learning sessions.

In the pre-cycle stage, an initial observation was carried out to identify children's baseline gross motor abilities, particularly in leg strength and body balance. The findings from this stage were used to design the rope-jumping learning intervention.

In Cycle I, the planning stage involved preparing rope-jumping activities with a rope height of approximately 30 cm and a single-line queue system. During the action stage, children participated in structured rope-jumping exercises under teacher guidance. The observation stage was conducted simultaneously by the researcher and an assisting observer to record children's gross motor performance using structured observation sheets. In the reflection stage, the results of Cycle I were analyzed to identify several limitations, including low motivation, uneven participation, and difficulties in maintaining body balance after landing.

Based on the reflection results, several improvements were implemented in Cycle II. These included a reduction of rope height to approximately 20 cm, the addition of warm-up activities before exercise, division of children into two smaller groups to increase participation opportunities, securing the rope to stable supports to ensure safety and consistency, and the use of reward stickers to increase motivation and engagement. Cycle II followed the same CAR stages of planning, action, observation, and reflection, with adjustments aimed at improving learning outcomes.

At the end of each cycle, reflection results were used to evaluate the effectiveness of the intervention and to determine whether the success criteria had been achieved, specifically that at least 80% of children reached the "Good" category or higher in gross motor performance. The iterative cycle design allowed continuous refinement of the rope-jumping activities to optimize children's leg strength and body balance development.

3. RESULTS AND DISCUSSION

The implementation of rope-jumping activities in this study demonstrated significant improvements in the gross motor skills of kindergarten children, particularly in the areas of leg strength and body balance. The

intervention was conducted through two cycles consisting of six learning sessions, beginning with a preliminary observation stage to identify children's initial motor abilities. The findings from the pre-action stage indicated that the majority of children still experienced difficulties in performing coordinated jumping movements and maintaining stable body posture after landing.

During the preliminary observation, children were asked to perform simple jumping activities over floor markings and ropes placed at a certain height. The observation revealed that many children lacked the physical readiness and coordination necessary to execute proper jumping techniques. Several children showed hesitation before jumping, indicating low confidence and fear of failure. Some children attempted to jump using incorrect body movements, while others failed to generate sufficient leg strength to lift their bodies effectively over the obstacle. Difficulties in balance were also clearly observed during the landing phase, where several children lost stability immediately after touching the ground.

The initial observation results showed that only 2 out of 14 children, or 14.28%, achieved the expected level of performance categorized as "good." Meanwhile, 6 children (42.86%) were categorized as developing, and another 6 children (42.86%) were still categorized as not yet developed. These results demonstrated that children's gross motor abilities were still below the expected developmental standard and required immediate improvement through more effective and engaging learning strategies.

Table 3. Pre-Action Results

Category	Number of Children	Percentage
Excellent	0	0%
Good	2	14.28%
Developing	6	42.86%
Not Yet Developed	6	42.86%

The low level of gross motor performance observed during the pre-action stage was influenced by several factors. First, children were rarely involved in structured physical activities that specifically trained jumping skills, muscle strength, and body balance. Most classroom activities focused primarily on indoor learning with limited opportunities for active movement. Second, gross motor learning activities implemented previously tended to be repetitive and less varied, reducing children's interest and motivation to participate actively. Third, some children lacked confidence when asked to perform physical movements that required coordination and balance, especially in front of their peers.

To overcome these problems, rope-jumping activities were introduced as an intervention in Cycle I. The implementation of Cycle I consisted of three learning sessions conducted during the morning learning period when children's physical energy and concentration were still optimal. In this cycle, children were asked to jump over an elastic rope positioned approximately 30 cm above the ground. The teacher first demonstrated the correct jumping technique, including body preparation, take-off movement, and landing posture. After the demonstration, children took turns jumping individually while standing in a single queue.

During the first session of Cycle I, several children still appeared hesitant and unsure about the activity. Some children touched the rope while jumping because they were unable to generate sufficient force during take-off. Others lost balance after landing because they could not control body posture properly. Nevertheless, children gradually became more interested and enthusiastic as the activity continued. They began observing their peers' movements and attempted to imitate successful jumping techniques demonstrated by the teacher and classmates.

In the second and third sessions of Cycle I, improvements in children's participation and movement quality became increasingly visible. More children attempted to jump confidently, and several children who initially refused to participate eventually joined the activity after receiving encouragement from the teacher. Children also showed better coordination between leg movement and body balance compared to the initial observation stage.

The cumulative results of Cycle I showed meaningful improvement in children's gross motor abilities. One child (7.14%) achieved the excellent category, while 9 children (64.28%) reached the good category. The remaining 4 children (28.57%) were categorized as developing, and no child remained in the not yet developed category. Overall, 10 out of 14 children, or 71.42%, successfully achieved the expected performance criteria.

Table 4. Comparison of Pre-Action and Cycle I Results

Category	Pre-Action (%)	Cycle I (%)
Excellent	0%	7.14%
Good	14.28%	64.28%
Developing	42.86%	28.57%
Not Yet Developed	42.86%	0%
Good and Above	14.28%	71.42%

The results of Cycle I indicated that rope-jumping activities had begun to produce positive effects on children's gross motor development. Children demonstrated stronger leg movements, improved coordination, and

better landing stability. Repeated practice opportunities allowed children to gradually adapt to the jumping movements and develop greater physical confidence. In addition, the playful nature of the activity increased children's motivation and participation during the learning process.

Although substantial improvement was achieved during Cycle I, the overall success percentage of 71.42% had not yet reached the predetermined success criterion of 80%. Reflection conducted after Cycle I identified several factors that limited the effectiveness of the intervention. The rope height of 30 cm was still too difficult for several children with weaker physical abilities. The single-queue arrangement also limited children's opportunities to practice because each child received only one jumping attempt in each session. Furthermore, some children became distracted while waiting for their turns, resulting in decreased concentration and classroom management challenges.

Another important finding from the reflection stage was the absence of warm-up activities before the jumping sessions. Several children appeared physically stiff at the beginning of the activity, which affected movement flexibility and coordination. In addition, children who lacked confidence required stronger motivational support to encourage active participation throughout the learning process.

Based on these findings, several improvements were implemented in Cycle II. First, warm-up exercises were introduced before the jumping activity to prepare children's muscles and improve body flexibility. The warm-up consisted of simple stretching, leg movements, and light physical exercises suitable for young children. Second, the rope height was lowered from 30 cm to 20 cm to provide a more achievable challenge level for children aged 4–5 years. Third, children were divided into two groups so that each child could receive more opportunities to practice jumping within a single session. Fourth, the rope was attached to stable chair supports to reduce movement and distractions during the activity. Finally, star-sticker rewards were introduced to increase children's motivation and enthusiasm.

The implementation of Cycle II produced significantly better learning outcomes compared to Cycle I. Children appeared more enthusiastic and confident during the activities. The warm-up exercises helped children become physically prepared and reduced movement stiffness. The lower rope height enabled more children to complete successful jumps, while the two-group arrangement increased practice frequency and minimized waiting time. The reward system also created a more enjoyable and motivating learning atmosphere, encouraging children to participate actively and confidently.

As the sessions progressed, children demonstrated considerable improvement in jumping techniques and landing stability. Many children who initially struggled to clear the rope successfully performed higher and more controlled jumps. Their body balance also improved noticeably, as most children were able to land steadily without falling or using their hands for support. Children became more independent and enthusiastic, often asking to repeat the activity even after the session had ended.

At the end of Cycle II, 7 children (50.00%) achieved the excellent category, while 6 children (42.86%) reached the good category. Only 1 child (7.14%) remained in the developing category, and no child was categorized as not yet developed. Overall, 13 out of 14 children, or 92.86%, successfully achieved the expected level of gross motor performance.

Table 5. Comparison of Pre-Action, Cycle I, and Cycle II

Category	Pre-Action (%)	Cycle I (%)	Cycle II (%)
Excellent	0%	7.14%	50.00%
Good	14.28%	64.28%	42.86%
Developing	42.86%	28.57%	7.14%
Not Yet Developed	42.86%	0%	0%
Good and Above	14.28%	71.42%	92.86%

The progression of results from the pre-action stage to Cycle II clearly demonstrated that rope-jumping activities were highly effective in improving children's gross motor development. The intervention successfully increased leg muscle strength, movement coordination, body balance, and children's confidence in performing physical activities. The improvement process also showed that consistent practice and supportive learning environments play essential roles in helping children develop motor skills effectively.

The findings further indicated that instructional modifications significantly influenced the success of the intervention. The combination of warm-up activities, reduced rope height, increased practice opportunities, and motivational reinforcement created a learning environment that supported children's physical and psychological readiness. These improvements not only enhanced children's motor performance but also increased their enthusiasm, participation, and enjoyment during learning activities.

The study also demonstrated that simple and low-cost physical activities can provide meaningful developmental benefits when implemented systematically and consistently. Rope-jumping activities required minimal equipment and preparation, making them practical for kindergarten settings with limited facilities. Despite their simplicity, these activities effectively stimulated active movement, concentration, coordination, and confidence among young children.

Another important finding was the role of positive reinforcement in improving children's participation. The use of star-sticker rewards encouraged children to participate more actively and reduced fear of failure during the activity. Children became more motivated to practice repeatedly because they received appreciation and encouragement from teachers. This positive learning atmosphere contributed significantly to the improvement of children's confidence and willingness to engage in physical activities.

Overall, the results of this study confirmed that structured rope-jumping activities are an effective strategy for improving gross motor skills in early childhood education. Through systematic implementation, repeated practice, supportive instructional modifications, and positive reinforcement, children's gross motor performance improved substantially within a relatively short intervention period.

Despite the growing body of literature on gross motor development in early childhood, most existing studies have primarily focused on general physical activity programs or conventional locomotor exercises without structured progression or iterative instructional refinement. In addition, limited research has examined the effectiveness of rope-jumping activities implemented through a cyclical Classroom Action Research design that allows continuous reflection and modification of teaching strategies. Evidence regarding the use of simple, low-cost, and play-based interventions to systematically improve both leg strength and body balance in kindergarten settings also remains limited, particularly in resource-constrained early childhood education environments.

The findings of this study have several important implications. From a pedagogical perspective, structured rope-jumping activities can be effectively integrated into early childhood physical education programs to enhance gross motor development through systematic repetition, demonstration, and progressive task difficulty. From a practical standpoint, this intervention demonstrates that teachers can implement meaningful motor skill development activities using simple and inexpensive materials, making it highly applicable in schools with limited facilities. In addition, motivational reinforcement strategies such as sticker rewards and group-based participation play an important role in increasing children's engagement, confidence, and sustained participation in physical activity.

However, this study also has several limitations. The relatively small sample size consisting of 14 children limits the generalizability of the findings to broader populations. The study was conducted in a single kindergarten setting, which may not fully represent diverse early childhood educational contexts. Furthermore, the intervention was implemented over a relatively short period without long-term follow-up, making it difficult to determine whether the observed improvements in gross motor skills are maintained over time. Lastly, although structured observation rubrics were used, the assessment still contains a degree of subjectivity inherent in observational evaluation methods.

4. CONCLUSION

This study concludes that structured rope-jumping activities are effective in improving kindergarten children's gross motor skills, particularly leg strength and body balance. The Classroom Action Research implemented in two cycles showed a substantial increase in the proportion of children achieving the "good" category, from 14.28% in the pre-action stage to 71.42% in Cycle I and 92.86% in Cycle II. The improvement was supported by instructional modifications, including warm-up activities, appropriate rope-height adjustment, increased practice opportunities, group organization, and reward reinforcement, which collectively enhanced children's participation, confidence, coordination, and movement stability. Overall, rope-jumping activities represent a simple, low-cost, and effective strategy for supporting gross motor development in early childhood education settings.

Based on these findings, it is recommended that early childhood teachers integrate structured rope-jumping activities into regular gross motor learning to optimize children's physical development. Future studies are also encouraged to involve larger samples, longer intervention periods, additional motor skill indicators, and comparative or experimental designs to further validate and expand the effectiveness of this intervention.

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AUTHOR CONTRIBUTIONS

Conceptualization, P.I.S. and A.R.; Methodology, P.I.S. and A.R.; Validation, A.R.; Formal Analysis, P.I.S.; Investigation, P.I.S.; Resources, P.I.S. and A.R.; Data Curation, P.I.S.; Writing – Original Draft Preparation, P.I.S.; Writing – Review & Editing, A.R.; Visualization, P.I.S.; Supervision, A.R.; Project Administration, P.I.S.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

Not applicable.

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