Jurnal SPORTIF: Jurnal Penelitian Pembelajaran
Vol. 10 No. 3, December 2024, pp. 503 - 520
https://doi.org/10.29407/js_unpgri.v10i3.23982

Game-based physical learning model to enhance gross motor skills in young students

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Received: 8 August 2024; Revised: 25 August 2024; Accepted: 24 December 2024; Available online: 30 December 2024.

Abstract

Limited diversity in learning approaches frequently results in suboptimal gross motor development among younger students. A play-based approach enhances motor development in a manner that is both more engaging and effective. Exploring a robust game-oriented pedagogical framework aimed at improving the gross motor abilities of elementary students. Utilizing game-based approaches in physical education enhances the engagement and efficacy of the learning experience, particularly in fostering motor development. This study employed a classroom action research methodology, focusing on students from elementary school Unggulan Putra Kaili Permata Bangsa in Palu City. The research utilized total sampling, encompassing a cohort of 25 students from the lower grades. This research instrument employs a performance rubric to analyze gross motor assessment in lower-grade children, a methodology that has been substantiated by experts in their respective fields. Analysis of data using the traditional completeness formula. The findings indicated that the initial percentage prior to the cycle stood at 4%; during cycle I, it escalated to 24%, and in cycle II, it reached an impressive 96%. The results indicated a progressive increase in each cycle, specifically demonstrating an improvement of 92% from the initial cycle to cycle II. The overall proficiency in gross motor skills among the students of Elementary school Unggulan Putra Kaili Permata Bangsa in Palu City is noteworthy. This research presents a novel, more comprehensive, contextualized, and purposeful approach to play-based physical learning aimed at tackling the challenges encountered by low-grade students in their gross motor development.

Keywords: Physical education, motor development, games, young students.

How to Cite: Purwanto, D., Rejeki, H. S., & Mentara, H. (2024). Game-based physical learning model to enhance gross motor skills in young students. *Jurnal SPORTIF : Jurnal Penelitian Pembelajaran*, *10*(3), 503–520. https://doi.org/10.29407/js_unpgri.v10i3.23982

Authors contribution: a – Preparing concepts; b – Formulating methods; c – Conducting research; d – Processing results; e – Interpretation and conclusions; f - Editing the final version.

INTRODUCTION

The game-based physical learning model is considered an effective approach as it combines game elements with specific physical education goals. Adi et al. (2022) highlight that game-based learning in physical

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education boosts student engagement and enjoyment, aligning with children's natural learning and development processes. This method not only enhances gross motor skills like running, jumping, and coordination but also promotes social skills through collaborative and playful activities (Suharjana, 2019). Despite its potential, the application of game-based models in primary education faces several challenges. Educators often encounter limitations such as time constraints, lack of resources, and insufficient guidance, which hinder the effective implementation of these strategies (Atiq et al., 2021). Observations in primary schools indicate that physical education focuses on repetitive and rigid activities, such as running in place and basic gymnastics, which lack diversity and interactive elements. As a result, these methods are often considered tedious, especially by younger students who prefer play-based learning over structured schedules. Consequently, physical education is often perceived as boring, leading to a decline in student engagement (Paramitha & Anggara, 2018).

Moreover, traditional teaching methods in physical education often prioritize repetitive exercises, limiting students' opportunities to explore free, spontaneous movements. This creates a passive learning environment where children follow teacher instructions without understanding the purpose of the activities, diminishing the effectiveness of gross motor development. Teachers face difficulties due to limited schedules and resources, which restrict their ability to develop varied, game-oriented activities. The focus remains on achieving basic competencies through repetitive tasks (Widyawan, 2021). In response to these challenges, a shift in physical education approaches is essential. A dynamic, game-based physical learning model offers a more engaging and enjoyable alternative, encouraging active participation and skill development. As Widyawan (2021) suggests, incorporating game elements can help alleviate the monotony of traditional physical exercises, providing stimulation that aligns with students' developmental needs. Play-based strategies engage large muscle groups and improve agility, coordination, and balance through

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dynamic activities. For instance, Classroom Action Research (PTK) frameworks can support educators in planning, implementing, and adjusting activities tailored to students' abilities, ensuring the effectiveness of this strategy (Irwandi Andi, 2024).

Research using pre-test and post-test methodologies consistently demonstrates the significant impact of game-based physical learning on the development of gross motor skills. This approach enhances physical abilities and fosters inclusion, allowing all students to participate actively and enjoyably. By addressing existing limitations, game-based learning has the potential to revolutionize physical education, making it more relevant, efficient, and aligned with the developmental needs of primary school students. Physical education plays a vital role in children's physical and psychomotor development. Students receiving physical education in primary schools are expected to improve their physical health and develop long-term healthy living habits. However, traditional physical education approaches often focus on monotonous and uninspiring activities for younger students (Lestari, 2021). These conventional methods typically fail to adequately support gross motor development, which is crucial for primary school-aged children. To improve basic motor skills like running, jumping, catching, and balance, children need more diverse and enjoyable physical activities (Jun 2019). These skills lay the foundation for more advanced motor abilities in the future.

The game-based physical learning model is gaining recognition for its effectiveness, as it integrates game elements with physical learning objectives. According to Adi et al. (2022), game-based learning in physical education is seen as more engaging and enjoyable for students. This approach allows children to learn while playing, which aligns with their natural learning and development processes. Game-based learning enhances both social and physical skills (Suharjana, 2019). However, despite their potential, play-based models are still underutilized in primary schools due to challenges such as insufficient time, resources, and practical guidance (Atiq et al., 2021). Thus, there is a need for more organized and

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accessible game-based physical learning models to support the gross motor development of primary school students.

Observations in various primary schools reveal that physical education is often limited to repetitive movements without interactive or fun activities. Teachers typically focus on structured physical exercises like running in place and basic gymnastics, which are considered monotonous, especially by younger students who prefer play. This leads to a perception of physical education as a boring routine, diminishing student interest. Moreover, in traditional physical education, many students are not actively engaged in sports activities due to a lack of mastery over the class structure (Paramitha & Anggara, 2018). Students need opportunities to explore free and spontaneous movements, but when instruction focuses solely on repetitive exercises, they follow teacher commands without understanding their purpose. As a result, their gross motor development is less effective.

Teachers often lack the time and resources to implement diverse physical activities, making incorporating game-based elements challenging. With limited schedules and insufficient facilities, educators find it difficult to create varied, game-oriented activities. Consequently, the focus remains on achieving basic competencies through repetition. These observations suggest that a shift is needed in physical education methodologies. To foster gross motor development in a fun and interactive setting, a more dynamic game-based model should be adopted (Widyawan, 2021). As proposed in this study, a game-based approach can help reduce the monotony of traditional physical activities, encouraging students to move and actively learn the physical skills required for their growth.

Game-based physical learning is a promising approach to enhance students' gross motor skills in a more engaging and effective way, particularly in the lower grades. This model increases students' motivation to engage in physical activities by offering a variety of enjoyable exercises. It also provides stimulation that meets their physical development needs. Gross motor skill development is a crucial aspect of a child's growth, involving the coordination of large muscle groups for activities like running,

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jumping, and maintaining balance. Research has shown that game-based learning is an effective way to improve these skills. For example, Sumiyati (2017) found that jump rope games significantly enhanced gross motor skills in children aged 3 to 4. Additionally, differentiated learning strategies have improved physical fitness in elementary school students (Nurkholishoh & Da'warul Choiro, 2022). The integration of character education in physical activities is also effective in promoting both gross motor skills and social-emotional development (Sofyan et al., 2022).

Furthermore, incorporating educational game tools, such as egrang bamboo, has been shown to improve balance and coordination (Jubaedah & Priyanti, 2022). Engaging in body exercises like gymnastics improves coordination and flexibility and strengthens major muscle groups (Ghaida Yunita Rahmani et al., 2024). These diverse methods contribute to the overall physical, cognitive, and social development of students. The issue of underdeveloped gross motor skills among elementary school students is a critical concern that requires immediate attention. Delays in gross motor development can hinder children's ability to perform everyday physical tasks and affect their cognitive and social development. Game-based learning (GBL) offers a promising solution, as it emphasizes "learning through play," which aligns with the developmental characteristics of primary school children. Activities like jumping rope, relay running, and ball games engage large muscle groups, improving coordination, strength, and balance (Irwandi Andi, 2024).

The Classroom Action Research (PTK) approach is an effective methodology for implementing Game-Based Learning (GBL) to improve gross motor skills. Through the PTK cycle—planning, implementation, observation, and reflection—educators can design games that cater to students' developmental needs, implement them, and assess their effectiveness over time. Each cycle provides an opportunity to refine educational activities and ensure that outcomes are maximized. In conclusion, the implementation of play-based learning strategies through the PTK approach addresses the challenges of delayed gross motor

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development while increasing student motivation to learn. Games create an engaging, fun environment, while the PTK methodology ensures activities are measurable and systematically assessed. By integrating these approaches, students' gross motor development can be optimized, supporting their physical and cognitive growth.

METHODS

This research uses Classroom Action Research (PTK) to improve children's gross motor skills through the Game-Based Learning (GBL) approach. Classroom Action Research is a research methodology conducted by educators who aim to improve the quality of learning in their classrooms through deliberate and methodical interventions. This study used observation, literature review, and assessment rubrics as data collection methods. The author carefully designed an evaluation rubric to evaluate students' gross motor skill development based on predetermined indications, including movement coordination, body balance, and significant muscle strength. Before use, the rubric underwent validity testing by professionals in physical education and learning media to ensure that this assessment tool is feasible, objective, and appropriate in evaluating students' gross motor skills.

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Table 1. Assessment rubric for improving gross motor

Motoric Aspects	Interpretation of Results			
	1 (Very Poor)	2 (Adequate)	3 (Good)	4 (Very Good)
Balance	Children often fall when doing things that require balance, such as standing on one foot.	Children can maintain balance, but they still need support.	Children often sway their balance but still maintain activity.	Children are very stable and maintain balance in various activities.
Movement Coordination	Children are often stiff or staggering, and they face difficulties coordinating their limb movements.	Children show basic movement coordination, but it could be more seamless.	Children who engage in directed activities have the ability to organize limb movements well.	Children have the ability to coordinate their movements smoothly and fluently in every activity they do.
Muscle Strength	The child has difficulty doing activities that require strength, such as pushing, pulling, or jumping.	Children can participate in simple physical activities, but they tire quickly when engaged in activities that require more exertion.	The child can do well with most activities that require strength.	The child performs gross motor activities very well and for a long time.
Agility	Children have difficulty moving quickly or changing direction, often being inhibited or delayed in responding.	Children have limited agility and need additional time to move or change direction.	Children have good agility in most activities and can move quickly and change direction.	Children are highly agile, responsive, and adaptable in situations that require a change of direction.
Precision of Movement	The child needs help performing the instructed movements correctly; they often miss or do not perform the intended movements.	Children can perform the movements shown but must do them correctly or miss them slightly.	Children have very precise movement skills.	The child shows very precise and consistent movements in all their activities.
Physical Endurance	Children get tired quickly and find it difficult to exercise in a short period of time.	The child can only exercise for a few minutes and needs to rest afterward.	Children have good endurance and can do most activities without long breaks.	Children have incredible physical endurance, so they can continue doing activities with little to no fatigue.

Children should be directly observed as they perform activities that require gross motor skills, such as running, jumping, crawling, and more. With these observations, you can assess the child's motor skills in real situations and ensure that the assessment accurately reflects their skills.

For each gross motor aspect (such as balance, coordination, strength, agility, and physical endurance), score 1-4 based on observation. Ensure that each score reflects the child's performance in the activity. Scores are given according to the child's skill level, with the following scores: Very Poor, Adequate, Good, and Excellent. For example, if a child is able to run and stop well but is a bit shaky when crawling, give the appropriate score for agility and balance. After providing a score for each aspect, record the assessment results of each element and then calculate the total score. Next, to get the total score, add up all the scores from each aspect. This total score indicates the child's general gross motor ability. To assess the child's

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gross motor development, use the total score according to the range of categories (e.g., Very Good, Good, Fair, and Very Poor). This way, you can tell which areas are already strong and which ones need improvement. For example, if the child has low scores in coordination and balance, exercises can be aimed at improving both. This rubric will help with an organized and objective assessment to support optimal gross motor development.

Table 2. Interpretation of assessment of gross motor improvement

No.	Value Interpretation	Conclusion
1	20 - 24	The child's gross motor skills are very good; no special intervention is required.
2	15 - 19	Gross motor skills are good, but some areas could be improved.
3	10 - 14	Gross motor skills are adequate but need additional practice for skill improvement.
4	6 - 9	Gross motor skills are severely lacking and require intensive intervention and practice.

This study used observation, literature review, and assessment rubrics as data collection methods. The author carefully designed an evaluation rubric to evaluate students' gross motor skill development based on predetermined indications, including movement coordination, body balance, and significant muscle strength. Before use, the rubric was validated by experts in physical education and learning media to ensure that this assessment tool is feasible, objective, and appropriate in evaluating students' gross motor skills.

The analysis stage began with the calculation of individual scores for each assessed indicator: movement synchronization, balance, large muscle strength, and agility. The results from each indicator were combined to calculate the students' total score, which was then averaged to assess the overall progress of gross motor skills in the class. After obtaining the total score, the data was further analyzed using the traditional completeness formula to determine the level of learning success. The calculation of classical completeness is based on the proportion of students who reach the predetermined Minimum Completion Criteria (KKM), which is 75% of the maximum score. If the percentage of classical completeness reaches ≥ 85%, then the learning is considered successful. Furthermore, to verify the data distribution, a normality test was conducted using the Kolmogorov-Smirnov method. The results of the normality test showed that the data

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followed a normal distribution ($p > 0.05$), making it possible to conduct a paired sample t-test to compare students' gross motor skills before and after the application of a game-based learning approach.

The t-test results showed a statistically significant change between the initial score and the score after the intervention, with a p-value <0.05. The implementation of game-based learning strategies was effective in improving students' gross motor skills. Classical completion was achieved, with the majority of students meeting the minimum completion criteria set. The results of the data analysis showed that the game-based learning approach positively impacted the development of gross motor skills, improving movement coordination, body balance, muscle strength, and student agility. This research provides strong empirical evidence that this method can be successfully applied in physical learning activities in elementary schools.

RESULTS

The research was conducted by using a game-based learning method (GBL) on students of elementary school Unggulan Putra Kaili Permata Bangsa in Palu City with a total sample of 25 students who were students of elementary school Unggulan Putra Kaili Permata Bangsa in Palu City. The game-based learning model (GBL) collected data to improve students' gross motor skills. Various games, such as rocking statues, paired ball throwing and catching, jump and pull, zig-zag obstacles, target shooting, chain rope jumping, and other games, were designed to help students improve their gross motor skills in a fun way. Before the cycle, 25 students from SD Unggulan Putra Kaili Permata Bangsa Palu City underwent a gross motor skills assessment. Subsequently, cycle planning and performance tests were conducted weekly.

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Table 3. Assessment of students' gross motor skills before the cycle

No.	Value Interpretation	Frequency	Percentage
1	20 - 24	0	0%
2	15 - 19	1	4%
3	10 - 14	22	88%
4	6 - 9	2	8%
Total		**25**	**100%**

From the results of the assessment carried out before the cycle, it was obtained that in this stage of the complete assessment of the value of 20-24, there were no students who got the value of the category, the value of 15-19, there was 1 student or 4% who got the value of the Gross Motor category good, but there were areas that could be improved, the value of 10-14 there were 22 students or 88% who got the value of the Gross Motor category sufficient, needing additional training to improve skills, the value of 6-9 there were 2 students or 8% who got the value of the Gross Motor category very poor; requires intervention and intensive training. Adjustment of the result analysis can be depicted in the form of a diagram as follows:

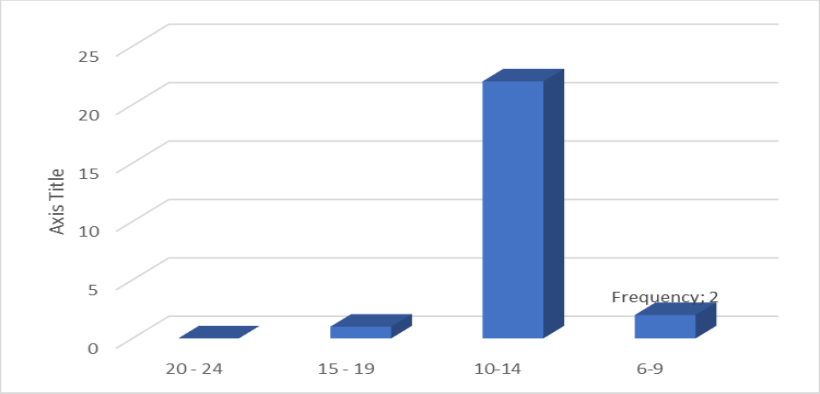

Figure 1. Assessment of students' gross motor skills before the cycle

From the above results, it can be concluded that at this stage, the value of the Gross Motor category is sufficient; additional training is needed to improve skills, more details can be seen in Table 3.

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Table 4. Assessment of students' gross motor skills cycle 1

No.	Value Interpretation	Frequency	Percentage
1	20 - 24	1	4%
2	15 - 19	4	16%
3	10 - 14	19	76%
4	6 - 9	1	4%%
	Total	**25**	**100%**

From the results of the assessment carried out in cycle 1, it was obtained that in this stage of complete assessment, the value of 20-24, there was no 1 student or 4% who scored in the excellent category, the child's gross motor skills were very good; did not require special intervention. For values 15-19, there are 4 students, or 16%, who get the value of the Gross Motor category is good, but there are areas that can be improved, values 10-14, there are 19 students or 76%, who get the value of the Gross Motor category is sufficient, need additional training to improve skills, values 6-9 there are 1 student or 4% who get the value of the Gross Motor category is very lacking; requires intervention and intensive training. Adjustment of the result analysis can be depicted in the form of a diagram as follows:

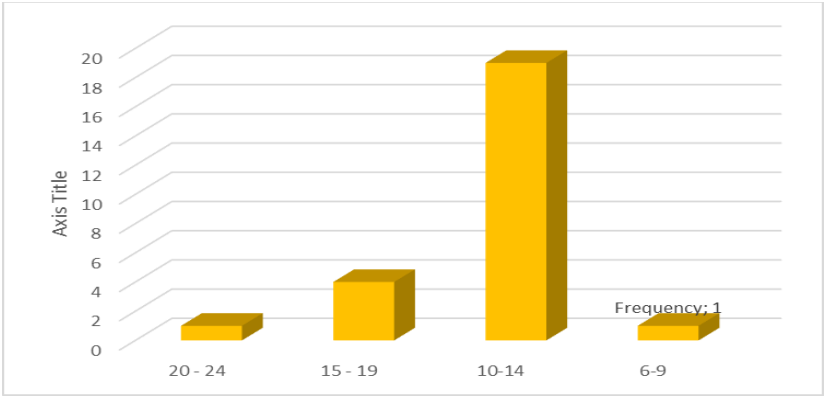

Figure 2. Assessment of students' gross motor skills cycle 1

From the above results, it can be concluded that at this stage, the value of the Gross Motor category is sufficient, so additional training is needed to improve skills; more details can be seen in Table 4.

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Table 5. Assessment of students' gross motor skills cycle 2

No.	Value Interpretation	Frequency	Percentage
1	20 - 24	7	28%
2	15 - 19	17	68%
3	10 - 14	1	4%
4	6 - 9	0	0%%
Total		**25**	**100%**

From the results of the assessment carried out in cycle 2, it was obtained that in this stage of complete assessment, the value of 20-24 was not. There were 7 students, or 28%, who scored in the excellent category; the child's gross motor skills were very good; did not require special intervention. In values 15-19, there are 17 students, or 68%, who get the value of the Gross Motor category is good, but there are areas that can be improved, In values 10-14, there is 1 student or 4%, who get the value of the Gross Motor category is sufficient, need additional training to improve skills, values 6-9 there are 0 students or 0% not in that category. Adjustment of the result analysis can be depicted in the form of a diagram as follows:

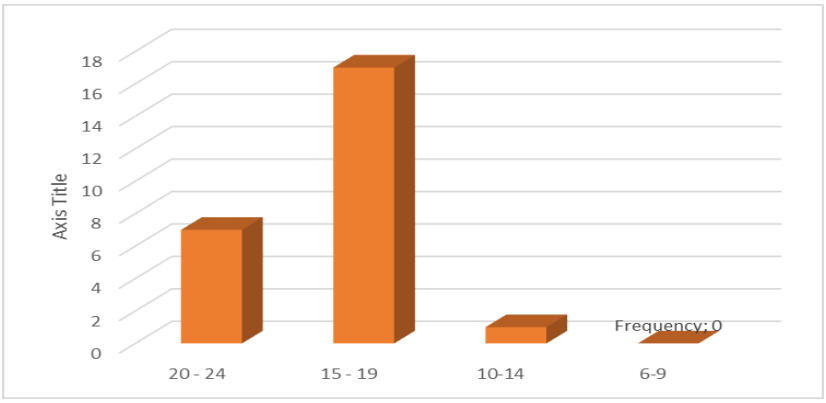

Figure 3. Assessment of students' gross motor skills cycle 2

From the above results, it can be concluded that at this stage, the value of the Gross Motor category is good, then Gross Motor is good, but there are areas that can be improved; more details can be seen in Table 5.

For more clarity regarding the game-based learning model (GBL) used to collect data to improve students' gross motor skills, it can be seen from the description of student learning outcomes in using game-based learning methods (GBL) from data before the cycle, cycle I and cycle II in table 6.

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Table 6. Assessment of student learning outcomes before cycle, cycle I and cycle II

Category	Before the cycle	Cycle 1	Cycle 2
Completed	4%	24%	96%
Not Completed	0,96	76%	4%
Total	10 - 14	19	76%

Based on the description of the research data, researchers conducted two test treatments to determine the improvement of students' gross motor skills. From the motor skills test based on the results of the assessment carried out in the pre-cycle activities, the maximum value obtained by 1 student, or 4% of students who were complete, and 24 students, or (96%) were not complete. From the assessment results carried out in cycle I, the value obtained was 6 students, or 24% of students who were complete, and 19 students, or 76%, were not complete. Meanwhile, in cycle II, 24 students, or 96% of students, were obtained, and 1 student, or 4%, needed to be completed. The overall percentage before the cycle was 4%; in cycle I, it was 24%, while in cycle II, it was 96%. From these results, there is an increase in each cycle, with a difference in improvement from before the cycle to cycle II of 92%. Overall, the gross motor skills of elementary school students Unggulan Putra Kaili Permata Bangsa in Palu City.

DISCUSSION

Improving students' gross motor skills can be effectively achieved through a Game-Based Learning (GBL) approach. This approach uses games as an engaging learning medium and encourages the natural enhancement of students' physical skills. Gross motor skills, including running, jumping, catching, and kicking, can be improved through activities structured to mimic games with defined objectives. GBL facilitates active student involvement in the learning process, encouraging the development of coordination, strength, and body balance through experiential learning. (Nurdiana, 2023; Prasetyo et al., 2022).

The Game-Based Learning (GBL) approach has been recognized as an excellent strategy to increase gross motor abilities, such as running, jumping, catching, and kicking, through engaging and interactive exercises. By integrating game aspects with physical learning objectives, GBL

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enhances experience learning, enabling students to acquire coordination, strength, and balance (Nurdiana, 2023; Prasetyo et al., 2022). This technique corresponds with children's natural learning tendencies since it integrates play components, like challenge, competition, and teamwork, which stimulate active movement and participation (Lestari, Citra Ayu, Rosinar Siregar, 2021). Traditional games like jump rope and cat-and-mouse have been demonstrated to improve hand-eye coordination, response speed, and dynamic balance, making them perfect instruments for motor skill development (Rechtik et al., 2019).

The efficacy of GBL is underpinned by educational theories such as Piaget's constructivist theory and Bandura's social learning theory, which emphasize the significance of experiential, exploratory activities and cooperative learning. Games offer students opportunities for practice and observation, facilitating teamwork and enhancing motor skills within a supportive and stimulating environment (Chen, 2017; Shepelenko et al., 2023). Rhythmic activities, such as gymnastics and dancing, synchronized with music, improving coordination, flexibility, and balance while augmenting children's motivation to engage (Ulfah & Putra, 2021). Outdoor activities, including climbing and traversing uneven terrain, enhance gross motor development by presenting varied physical challenges (Kojić et al., 2024).

Traditional and cultural games, such as cricket, tug-of-war, and gobak sodor, significantly enhance gross motor skills by involving children in dynamic activities like pulling, pushing, and jumping. These activities promote agility, strength, and coordination enjoyably and cooperatively (Nurkholishoh & Da'warul Choiro, 2022). Organized sports programs, like swimming, soccer, and martial arts, offer repetitious yet dynamic training that enhances balance, muscular strength, and focus (Kabisch et al., 2019). Sensorimotor activities, such as crawling or ball throwing, enhance body coordination by integrating sensory and motor tasks (Ayu et al., 2023).

Notwithstanding its advantages, the execution of GBL encounters obstacles, such as inadequate teacher training, insufficient resources, and time limitations within curricula (Atiq et al., 2021; Widyawan, 2021).

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Educators frequently possess insufficient skills to create secure and effective game-based activities, highlighting the necessity for professional development. Furthermore, educational institutions in remote or under-resourced regions may be deficient in the facilities required to execute such activities. Differentiated strategies are essential to accommodate variations in students' motor skills, ensuring that all participants benefit from game-based learning (GBL).

Future research should focus on enhancing the accuracy of assessment instruments to evaluate GBL's effect on gross motor skills, as current methodologies frequently overlook nuanced advancements. Establishing safety guidelines for GBL implementation to mitigate the risk of injury is essential. Moreover, incorporating cognitive and emotional skill enhancement into game-based learning can create a more comprehensive approach to student development. Ultimately, GBL facilitates not only physical improvements but also social, emotional, and cognitive growth, making it a comprehensive and sustainable method for enhancing students' gross motor skills.

CONCLUSION

The results of the above research indicate that the game-based learning method is a strategy that is considered to improve the learning process and help the development of student's gross motor skills, especially in the lower grades. Offering a variety of fun activities encourages children to exercise more and offers stimulation that fulfills their needs for physical growth. Students can improve gross motor skills, including balance, coordination, and agility, through play-based learning in an environment that encourages teamwork and movement exploration. In addition, this method fosters an inclusive classroom environment where children of varying physical abilities can easily engage. As a result, play-based physical education is a great way to enhance children's educational experience, give them a greater sense of purpose, and promote healthy physical growth. This review offers a fresh, more inclusive, contextualized, and intentional method

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of play-based physical learning, which can address the difficulties that low-grade students face in their gross motor development.

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