

Enhancing Motor Skills, Cooperation, and Discipline in Elementary Students Through a Kids' Athletics-Based Learning Approach

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ABSTRACT:

Background. Motor skills, cooperation, and discipline are fundamental developmental components in elementary school students and play a crucial role in supporting both physical and social learning outcomes. However, the increasing influence of digital technology has reduced students' engagement in physical activities, highlighting the need for innovative and engaging physical education models. This study aimed to develop and evaluate a kids' athletics-based learning model to enhance motor skills, cooperation, and discipline among elementary school students.

Materials and Methods. This study employed a Research and Development (R&D) design using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation stages. The developed learning model was validated by six expert lecturers with doctoral and professorial qualifications. The effectiveness test involved 48 upper-grade elementary school students aged 11–12 years. Data were analyzed using Aiken's V to assess content validity, Intraclass Correlation Coefficient (ICC) for reliability, and paired sample t-tests to evaluate the effectiveness of the model.

Results. The results revealed that the kids' athletics-based learning model significantly improved students' motor skills, cooperation, and discipline ($p < 0.05$). Furthermore, the model demonstrated strong content validity and high reliability, indicating that it is both appropriate and consistent for implementation in physical education settings.

Conclusions. The kids' athletics-based learning model is effective in enhancing motor skills, cooperation, and discipline among elementary school students and is suitable for practical application in physical education. This model also contributes to fostering positive character development and increasing student engagement in physical activity. Future studies are recommended to further refine and expand this model to strengthen its applicability and alignment with evolving educational curricula.

Keywords: Kids' Athletics, Physical Education Model, Motor Skills, Cooperation, Discipline..

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1. Introduction

Character formation is strongly influenced by educational processes. Within the national education system, character education is integrated across various subjects, including Physical Education (Purnomo et al., 2025). This approach aims to guide students in developing well-rounded character through multiple dimensions, including emotional, intellectual, physical, sensory, and spiritual aspects (Ma & Liu, 2026). Research indicates that participation in physical education tends to strengthen students' sense of belonging and connectedness rather than feelings of social isolation. Physical education not only emphasizes physical health and fitness but also promotes aesthetic appreciation and character development. Moreover, it provides meaningful opportunities for learners to enhance interpersonal skills and expand their social interactions. (Carl et al., 2026)

Over time, sports activities have become an integral component of physical education learning. Positive experiences in play, games, and physical activity during early stages of development are essential, as they establish the foundation of knowledge, skills, attitudes, and motivation required for lifelong participation in sport and active lifestyles (Sinha, 2024). Learning activities in physical education are often delivered through various Kids' Athletics-based approaches. These may include cooperative, competitive, territorial, and modified games designed to facilitate comprehensive understanding of sports (Cocca et al., 2020). Through such activities, students are encouraged to practice specific elements of a sport while adhering to established rules and structures. In this context, physical education also serves as a medium for fostering cooperation, promoting mutual understanding among peers, and developing the ability to interact and evaluate performance within a social environment (Martín-Rodríguez et al., 2024). Several studies further highlight that engagement in physical activity can enhance individuals' sense of belonging, community attachment, and group membership (Ho et al., 2026).

In addition, learning in physical education plays a significant role in improving children's motor development (Lorås, 2020). The instruction of motor skills at the primary school level is particularly important, as this stage represents a critical period for motor growth. Well-developed motor abilities provide a fundamental foundation that supports children's participation in learning activities, play, and social interaction, while also contributing to the development of self-confidence (Dapp et al., 2021; Suhartini & Wara Kushartanti, 2022). Furthermore, motor competence is closely associated with children's cognitive development, which may subsequently influence their future academic performance (Loprinzi et al., 2015). Children who possess well-developed motor skills generally demonstrate greater confidence and comfort when engaging in various learning and physical activities.

Beyond the development of motor competence, fostering students' cooperative abilities is equally essential to enable them to address complex tasks collaboratively. Within the context of learning objectives, both the physical education instructional process and cooperative interaction play a crucial role. Cooperative activities encourage students to engage in meaningful social interactions with their peers during learning sessions (Aguilar-Farias et al., 2024). Through collaborative engagement, students become more motivated to communicate, share ideas, and work collectively in completing learning tasks. The value of cooperation is fundamental not only in Physical Education but also in everyday life, as students with varying levels of ability are expected to collaborate so that the learning experience becomes beneficial for all participants (Sumarauw et al., 2025). Collaborative learning environments enable students to develop mutual respect, provide support to one another, and build trust within their groups. Therefore, cultivating cooperative attitudes is essential considering the significance of student collaboration in physical education contexts.

Participation in school learning activities also requires students to adhere to the rules and regulations established by their educational

institutions. Every student is expected to demonstrate behaviour that aligns with these established standards. Students' willingness to comply with and respect school regulations is commonly referred to as student discipline (Zhang et al., 2024). Schools serve as environments where learners shape their identity; consequently, teachers must function as role models who consistently support the development of students' disciplinary behaviour (Sun & Chen, 2024). Discipline is widely recognized as a fundamental factor contributing to success, as individuals who maintain disciplined behaviour tend to experience greater benefits through consistent actions (Munir et al., 2024). Consequently, discipline has a substantial influence on students' academic achievement and learning outcomes.

Based on these perspectives, it can be inferred that the effective development of motor skills and character traits among elementary school students requires the implementation of well-designed Physical Education learning processes. Teachers are expected to stimulate active student participation in learning activities, one effective approach being the application of game-based learning models. Games remain a highly relevant method for supporting children's development. Through play, children naturally experience enjoyment, which contributes to the development of their organic, neuromuscular, social, and emotional systems (Adi et al., 2022). A game-oriented instructional approach is considered highly appropriate because enjoyable learning experiences reduce boredom and enable students to achieve optimal learning outcomes (Adipat et al., 2021; Varghese et al., 2022).

The development of innovative learning models also represents an effort to address the limitations of Physical Education facilities and infrastructure commonly found in schools. When teachers design and implement creative learning models, they can create a more engaging and dynamic learning environment. Such an environment allows students to explore a wide range of movements freely according to their individual abilities, thereby increasing opportunities for

active participation. Research conducted by (Varghese et al., 2022) examined the effectiveness of game-based learning strategies in enhancing students' perceptions of learning, engagement, and teamwork. Their findings indicate that game-based learning significantly promotes intrinsic motivation, enjoyment, and emotional involvement in the learning process. Moreover, game-based approaches utilize elements of intrinsic motivation to encourage students to practice and develop targeted skills. Similarly, Jääskä et al (2022) highlight that play plays a crucial role in supporting children's social, emotional, linguistic, and intellectual development.

In light of these considerations, the present study aims to develop a game-based Physical Education learning model designed to effectively enhance motor skills, cooperation, and discipline among elementary school students. Through this research, it is expected that students will be able to comprehend and accept learning materials more easily. Furthermore, the learning process is anticipated to encourage students to become more confident and motivated to improve their competencies and abilities.

2. Methodology

2.1. Study Participants

The validation process of the game-based learning model involved six expert lecturers holding professorial and doctoral qualifications. Their role was to evaluate the feasibility and appropriateness of the developed learning model. The effectiveness testing was conducted with 48 upper-grade elementary school students aged 11–12 years from two different elementary schools. This research received ethical approval from the Research Ethics Committee of Airlangga University (Approval No. 012/EC/KEPK/UNAIR/I/2026) and was carried out in accordance with the principles outlined in the Declaration of Helsinki for studies involving human participants. Prior to participation, parents were required to complete a screening questionnaire to identify any medical

conditions that could potentially influence their children's involvement in the study.

2.2. Study Organization

This study employed the ADDIE development framework (Analysis, Design, Development, Implementation, and Evaluation) to create a game-based learning model aimed at enhancing motor skills, cooperation, and discipline among upper elementary school students. The learning model underwent validation by six expert lecturers holding professorial and doctoral qualifications. After confirming the model's feasibility, an effectiveness assessment was conducted to evaluate its impact.

The research instruments included tests for motor abilities, cooperation, and discipline. Gross motor skills were measured through four assessments:

- Speed: 30-meter sprint,
- Agility: 4 × 10-meter shuttle run,
- Coordination: ball-throwing and catching 1 meter from a wall,
- Balance: stork stand test.

Cooperation and discipline were evaluated using a Likert-scale questionnaire:

- Strongly Agree (4),
- Agree (3),
- Disagree (2),
- Strongly Disagree (1).

Cooperation was assessed through indicators such as responsibility (2 items), reflecting joint task completion and shared accountability; contribution to others (2 items), measuring how team members share effort and ideas; and optimizing individual abilities (2 items), emphasizing the full utilization of each member's skills to support team cohesion. Discipline indicators included responsibility (2 items), generosity (2 items), honesty (2 items), and courage to uphold truth (2 items).

The effectiveness test was conducted over eight sessions (2 × 45 minutes), preceded by a pretest

to evaluate students' motor skills, *cooperation, and discipline levels*.

2.3. Statistical Analysis

The study employed Aiken's validity index and Intraclass Correlation Coefficients for statistical validation. To assess the product's effectiveness, paired-sample t-tests were conducted. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 25.

3. Results

3.1. Validity, Reliability and Statistics Descriptive

A key goal of the expert evaluation of a kids' athletics-based learning model designed to enhance motor skills, cooperation, and discipline in elementary school students was to assess its validity through Aiken's V coefficient. The outcomes of this expert assessment are summarized in Table 1.

Table 1. Aiken's V validity results

Item	Aiken's V	Description
1	0.878	Valid
2	0.822	Valid
3	0.933	Valid
4	0.878	Valid
5	0.933	Valid
6	0.878	Valid

Based on the validity classification, a coefficient within the range of 0.80 to 1.00 is considered to reflect very high validity. The findings indicate that the kids' athletics-based learning model demonstrates excellent Aiken's validity and effectively enhances motor skills, cooperation, and discipline among elementary school students. Additionally, reliability was assessed using the Intraclass Correlation Coefficient (ICC) to evaluate inter-rater agreement. This analysis was conducted to determine the extent of consensus among experts regarding the effectiveness of the game-based learning model in fostering motor skills, cooperation, and discipline. The results of the ICC assessment are presented in Table 2.

Table 2. Reliability outcomes based on Intraclass Correlation Coefficients (ICC)

Reliability Metric	ICC Value	95% Confidence Interval		F Test with True Value 0			
		Lower	Upper	F Statistic	df ₁	df ₂	p-value
Single Rating Reliability	0.779	0.477	0.945	21.000	5	25	<0.000
Mean Rating Reliability	0.941	0.841	0.981	21.000	5	25	<0.000

Based on Table 2, the average inter-rater agreement (rxx) was 0.779. According to (Nelson & Edwards, 2015) reliability classification, k values of <0.40 indicate poor agreement, 0.40–0.75 indicate good agreement, and >0.75 indicate excellent agreement. These findings suggest a very high level of consensus among the experts, with each maintaining strong internal consistency. The final product comprises five simple game-based learning models, designed for ease of implementation by Physical Education teachers while providing an engaging and safe learning experience for students. The models aim to enhance motor skills, cooperation, and discipline. They are intended for upper-grade

elementary school students and are accompanied by comprehensive teacher guidelines, including preparatory activities (warm-up), core activities consisting of five distinct games with defined objectives, detailed gameplay instructions, required facilities, safety protocols, and a cool-down phase.

An effectiveness assessment was subsequently carried out to examine whether the kids' athletics-based learning model contributed to improvements in elementary school students' motor skills, cooperation, and discipline (see Table 3).

Table 3. Descriptive Statistics of Pretest and Posttest Scores

Variable	N	Minimum	Maximum	Mean	SD
Motor Ability	Pretest 48	143.02	238.54	197.24	20.35
	Posttest 48	144.33	240.40	200.68	20.39
Cooperation	Pretest 48	8.00	16.00	12.12	2.20
	Posttest 48	11.00	19.00	15.06	2.06
Discipline	Pretest 48	15.00	22.00	19.16	1.50
	Posttest 48	19.00	23.00	21.41	1.10

Referring to Table 3, the results indicate a consistent improvement across motor ability, cooperation, and discipline from pretest to posttest. The mean score for motor ability increased from its baseline value to 200.68 at the posttest stage. Likewise, cooperation scores showed a notable rise, progressing from 12.12 in the pretest to 15.06 in the posttest, reflecting enhanced collaborative behavior. In addition, discipline scores improved from 19.16 to 21.41 following the intervention.

3.2. Normality Test

The assessment of data normality was conducted using the Shapiro–Wilk method, and the corresponding results are presented in Table 4.

Table 4. Results of the Normality Test

Variable	Statistic	Df.	Sig.
Motor Ability	Pretest 0.959	48	0.109
	Posttest 0.965	48	0.197
Cooperation	Pretest 0.925	48	0.105
	Posttest 0.932	48	0.110

Variable	Statistic	Df.	Sig.
Discipline	Pretest	0.908	48 0.101
	Posttest	0.888	48 0.109

The results of the normality test presented in Table 4 indicate that the motor ability, cooperation, and discipline data are normally distributed.

3.3. Homogeneity Test

The homogeneity test was conducted to determine the consistency of variance within the sample, specifically to assess whether the sample variances derived from the population exhibit similar characteristics. The outcomes of the homogeneity analysis conducted in this study are displayed in Table 5.

Table 5. Results of the homogeneity assessment

Variable	df ₁	df ₂	Sig.
Motor Ability Pretest	1	90	0.902

Table 6. Paired Samples Test Analysis

Variable	t	Sig.(2-tailed)	Difference
Motor Ability	12.506	0.000	2.42
Cooperation	9.707	0.000	2.82
Discipline	8.220	0.000	2.24

Based on the results presented in Table 6, the pretest–posttest comparisons for motor skills, cooperation, and discipline demonstrate statistically significant t-values (motor skills = 12.506; cooperation = 9.707; discipline = 8.220) with corresponding p-values of 0.000, which are below the significance level of 0.05. These findings indicate that the proposed kids' athletics-based learning model significantly enhances elementary school students' motor skills, cooperative behavior, and discipline. The magnitude of improvement observed in these variables was 2.42 for motor skills, 2.82 for cooperation, and 2.24 for discipline.

Variable	df ₁	df ₂	Sig.
Cooperation	Pretest	1	90 0.321
	Posttest		
Discipline	Pretest	1	90 0.066
	Posttest		

As shown in Table 5, the homogeneity test results reveal that the pretest–posttest data for motor skills produced a p-value of 0.902 (> 0.05), cooperation yielded a p-value of 0.321 (> 0.05), and discipline resulted in a p-value of 0.066 (> 0.05). Since all p-values exceed the significance threshold of 0.05, the data can be considered homogeneous.

3.4. Hypothesis Testing

The hypotheses proposed in this study were examined using a paired-sample t-test ($df = n - 1$). The outcome of the analysis conducted is displayed in Table 6.

4. Discussion

Investigations examining the influence of Kids' Athletics-based learning approaches on student development typically address three principal domains.

1) Impact on motor skill development. Empirical findings indicate that kids' athletics-based instructional models are effective in enhancing students' motor competencies. The integration of such models within Physical Education settings is associated with observable improvements in learners' motor performance. This is particularly relevant for elementary school students, who are inherently active and derive

substantial benefits from the development of fundamental motor skills. Engagement in structured physical activities and play stimulates muscular involvement, thereby facilitating the refinement of motor abilities. Increased participation in movement-based tasks contributes to progressive skill acquisition, with these experiences being retained for subsequent application. In sum, students' motor proficiency evolves as a result of accumulating varied and meaningful movement experiences.

2) Influence of Kids' Athletics-Based Learning Models on Cooperation. The application of game-based learning models positively enhances students' cooperative abilities. Observations indicate that learners demonstrate increased responsibility and effective teamwork when collaborating to achieve game-related objectives. Cooperation, as a social construct, inherently involves group interactions, mutual support, and shared accountability. Within the game context, students also develop respect for opposing teams. Central to this process is positive interdependence, which underscores the significance of attaining a common goal through collective effort. This collaborative dynamic reinforces the understanding that individual success is contingent upon effective group cooperation.

3) Impact of Kids' Athletics-Based Learning Models on Cooperation and Discipline. The adoption of Kids' athletics-based learning models significantly enhances students' discipline and cooperative abilities. This is reflected in students taking on increased responsibility within group activities, demonstrating constructive behavior, and upholding integrity. Discipline is crucial, particularly for individuals aiming to achieve targeted objectives. Broadly, it encompasses the organizational skills that enable learners to adapt effectively to their surroundings and manage external demands efficiently.

The designed Kids' athletics model functions as an active physical activity that engages muscle groups, thereby enhancing muscular performance. Active muscle engagement contributes to improved cerebral blood flow. Motor actions occur only when muscles are

integrated with the skeletal system and receive neural stimulation. Fun and enjoyable Kids' athletics learn generates positive emotions in children, motivating them to repeat these activities, often without conscious awareness that they are exercising (Petros et al., 2016). Consequently, Kids' athletics acts as an effective medium for child stimulation, fostering cognitive, emotional, social, and physical development (Abhaydev et al., 2020; Sortwell et al., 2024).

(Huang & Choosakul, 2025) conducted a study to implement a gesture-based interactive Kids' Athletics learning model aimed at enhancing participants' learning outcomes and motor abilities, particularly coordination and agility. Using a quasi-experimental design with 70 preschool children (mean age 9.5 years), their findings indicated that children exposed to the gesture-based approach exhibited superior learning performance and motor skills compared to those engaging in the conventional Kids' Athletics activities. Statistical analysis confirmed a significant difference between the two methods. These results support the hypothesis that Kids' Athletics-based learning can effectively enhance children's motor development. Nevertheless, notable differences exist with the present study: our participants were aged 11–12 years, the intervention occurred during Physical Education sessions spanning eight meetings (2×45 minutes), whereas Huang and Choosakul did not specify the frequency of their treatment sessions.

Jakubík & Broďáni (2023) investigated the impact of goal-oriented play activities on motor skill development in early childhood. Their study involved 50 children aged 7–8 years who participated in a series of training sessions divided into five posts. Each post required children to run, walk on a balance beam, move a stick, throw and catch a ball, and stack blocks. Training was conducted three times per week over a 12-week period, with measurements including a 25-meter run, balance beam walking, maximum ball throw, locomotor movements, can stacking, and ball bouncing. The results indicated significant improvements across various motor skill domains.

In contrast, our study involved participants aged 11–12 years and was implemented during Physical Education classes over eight sessions (2×45 minutes). The motor skill components measured were also different, and our research extended beyond motor development. Our findings demonstrate that a game-based learning model effectively enhances not only motor skills but also cooperation and discipline among upper-grade elementary students. Therefore, this study highlights both motor development and character building, while contributing to progressive and innovative educational practices within a broader age and learning context.

Engaging children in enjoyable physical activities facilitates the development of coordination, strength, and self-confidence (Çalik et al., 2018; Nugraha et al., 2022). Moreover, research indicates that participation in Athletics can significantly enhance motor skill proficiency in children (Mijalković et al., 2026). Due to the inherently social nature of Physical Education and sport, these contexts are considered effective for fostering personal and social competencies, including responsibility, cooperation, and other prosocial behaviors (Li & Shao, 2022). A key reason for their suitability is that the skills acquired in these settings are transferable to other areas of life (Abhaydev et al., 2020). For instance, when guided by appropriate pedagogical approaches (Conesa et al., 2022), children can develop problem-solving abilities, communication skills, and teamwork, which are applicable in everyday contexts, such as at home or in future professional environments (Sortwell et al., 2024). While previous literature emphasizes the general importance of physical activity and education, our study contributes by presenting empirical findings and examining their practical implications.

Implementing a Kids' Athletics-based approach is considered an effective model for physical education, as it makes learning enjoyable and reduces student boredom, thereby promoting optimal learning outcomes. Physical education not only supports the development of children's psychomotor skills but also contributes to

psychological growth by fostering personal and social responsibility, as well as appropriate social behavior (Nugraha et al., 2022). The Kids' Athletics-based learning model actively engages all students in the physical education process. Battaglia et al. (2024) highlight the necessity of ensuring that any chosen physical education model achieves the intended learning objectives. Using standardized worksheets can guide teachers on how to conduct Kids' Athletics-based lessons while maintaining high fidelity (Jakubík & Broďáni, 2025). Essential features such as positive interdependence, face-to-face interaction, individual accountability, interpersonal and small-group skills, group processing, heterogeneous teams, goal setting, and the teacher's role as facilitator should be maintained throughout the unit.

During learning, students perform various movements, including running, jumping, crawling, pushing, and lifting. These activities engage major muscle groups, including those of the legs, arms, heart, and lungs, which are closely linked to circulation and respiration (Huang & Choosakul, 2025). Warm-up activities incorporating competitive games have been shown to effectively motivate students, creating an environment conducive to sports and physical activity (Adi et al., 2022). The Kids' Athletics-based approach is appropriate for promoting cooperative learning, as it allows children to interact with peers, experience enjoyment, and support the development of neuromuscular, social, and emotional systems (Abhaydev et al., 2020). Previous studies have highlighted the general benefits of games on physical activity, motivation, and collaborative skills, without providing detailed empirical evidence.

Our research demonstrates that the Kids' Athletics-based learning model effectively enhances motor skills, cooperation, and discipline among upper-grade students, while also showing strong validity and reliability. Adipat et al (2021) note that sports, when appropriately adapted, can contribute to both physical and mental development. By applying structured criteria, teachers can design and implement more

meaningful and authentic learning experiences. Sports games are widely recognized as an effective educational strategy within health and physical education (Dapp et al., 2021). Group activities and games promote both explicit and implicit development of skills such as running, throwing, catching, dodging, balance, teamwork, speed, and agility. They also enhance personal and communication skills, including self-awareness, empathy, emotional regulation, coordination, and interpersonal communication (Sinha, 2024). Planning activities that emphasize communication can further encourage students to be more expressive and socially confident.

The selection of kids' athletics in physical education is purposeful, considering the learning objectives, student characteristics, and the integration of activities within the broader curriculum. Kids' Athletics-based activities provide enjoyment, which is crucial for fostering interest and sustaining engagement in physical education. This aligns with the widely recognized association of games with fun and pleasure, which supports the development of students' motor skills, discipline, and cooperative abilities.

5. Conclusion

The study's findings indicate that the Kids' Athletics-based learning model significantly enhances motor skills ($p < 0.05$), cooperation ($p < 0.05$), and discipline ($p < 0.05$) among upper-grade elementary students. The developed learning model has been validated and proven reliable, demonstrating its high effectiveness for use by Physical Education teachers. By integrating this Kids' Athletics-based approach, the model is expected to positively influence students' character development, aligning with the appeal of contemporary games and technological trends. The outcomes of this research offer meaningful contributions to the advancement of innovative and progressive educational practices. Moreover, the study provides insights into how game-centered physical education strategies can foster students' motor proficiency, teamwork, and self-discipline. Future research should focus on further development and diversification of Kids'

Athletics-based models to continue enhancing motor skills, cooperation, and discipline, thereby supporting effective Physical Education instruction in line with the current curriculum.

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Conflict of interest

The author affirms that there are no conflicts of interest.

AI Declaration.

The authors declare that artificial intelligence (AI) tools were utilized solely to support language refinement and editorial improvements in this manuscript. All conceptualization, data analysis, interpretation of results, and critical intellectual contributions were conducted entirely by the authors. The use of AI did not influence the study design, data integrity, or scientific conclusions. The authors take full responsibility for the content and confirm adherence to ethical publishing standards.

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