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Development of Gross Motor Game Models for Elementary Schools

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ABSTRACT

Gross motor development is a fundamental aspect of children's growth and plays an important role in supporting physical, cognitive, social, and emotional development. However, limitations in learning models and the lack of innovative physical education activities often reduce opportunities for elementary school students to optimally develop their gross motor skills. Therefore, this study aimed to develop a gross motor game model for elementary school students at SD Inpres 2 Birobuli that is feasible, attractive, and effective for use in Physical Education, Sports, and Health (PJOK) learning. This study employed a Research and Development (R&D) approach focusing on the development of a game-based learning module. The development process consisted of four stages: needs analysis, product design, expert validation, and product revision. Data were collected through observations, interviews, and expert validation questionnaires involving a material expert, a media expert, and a practitioner expert (PJOK teacher). The results revealed that the developed model was considered feasible and appropriate for implementation in elementary school learning. The validation scores reached 77.34% from the media expert, 87.50% from the material expert, and 98.04% from the practitioner expert. Furthermore, the combined validation results showed that all developed games were categorized as highly valid, with Game 1 obtaining 93.2%, Game 2 84.9%, Game 3 86.5%, and Game 4 85.4%. In conclusion, the developed gross motor game model is highly feasible and valid for supporting gross motor skill development among elementary school students. The model can serve as an innovative learning resource that helps teachers create more engaging, enjoyable, and effective physical education learning experiences.

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INTRODUCTION

Physical Education (PE) is a fundamental component of formal education that contributes significantly to the holistic development of students. Through systematically designed physical activities, PE aims to enhance students' organic functions, neuromuscular systems, perceptual abilities, cognitive development, social skills, and emotional maturity (Sari et al., 2024). In elementary schools, Physical Education, Sports, and Health (PJOK) plays an essential role in fostering healthy lifestyles while simultaneously

promoting motor development and character formation among children. Therefore, effective PE learning experiences are required to ensure that students achieve optimal growth and development outcomes. One of the most important aspects of child development addressed through PE is gross motor development. According to Hurlock's developmental theory, motor development refers to the progressive ability of individuals to control body movements through coordinated interactions among muscles, nerves, and the central nervous system (Ariani et al., 2022). Gross motor skills involve large muscle movements such as running, jumping, balancing, throwing, and catching, which serve as the foundation for more complex physical activities later in life. Adequate development of these skills is strongly associated with children's physical fitness, academic readiness, self-confidence, and social interaction (Robinson et al., 2018).

Motor learning in elementary schools, however, often faces various challenges. Although children naturally acquire gross motor skills through play, environmental limitations, insufficient learning stimuli, and inadequate instructional approaches may hinder optimal motor development (Asmuddin et al., 2022). Several studies have reported declining physical activity levels among children due to increased sedentary behavior and excessive use of digital technology, resulting in reduced opportunities for motor skill practice (Barnett et al., 2022; Carson et al., 2021). Consequently, schools are expected to provide structured and meaningful learning experiences that effectively stimulate motor development. Physical education is not merely a means of improving physical fitness but also serves as an educational tool capable of developing students' competencies and character (Mustaqim, 2024). Through appropriate learning activities, children can acquire discipline, cooperation, responsibility, and sportsmanship. Therefore, the learning process should be designed in ways that are engaging, enjoyable, and developmentally appropriate. In this regard, game-based learning has become one of the most recommended approaches because it naturally aligns with children's characteristics and learning preferences.

Recent studies have demonstrated that play-based learning approaches significantly contribute to the development of children's motor skills and overall learning engagement. Traditional games, in particular, have received considerable attention because they combine physical activity with social, cultural, and emotional values (Ramdani & Azizah, 2019). Traditional games provide opportunities for children to perform diverse movement patterns while simultaneously fostering cooperation, communication, and cultural appreciation. Research by Tuswan (2023) found that traditional game models effectively stimulated elementary students' motor development and were feasible for implementation in school settings. Similarly, Hidayatullah and Hasbi (2021) reported that modified traditional games significantly improved gross motor abilities and increased student participation in physical education classes. Other studies have consistently demonstrated that game-based learning positively influences students' motivation, enjoyment, and learning outcomes in PE contexts (Logan et al., 2018; Brian et al., 2020; Palmer et al., 2021).

The theoretical foundation supporting game-based motor learning can be traced to motor learning theory proposed by Fitts and Posner, which describes motor skill

acquisition through three stages: cognitive, associative, and autonomous stages (Andrian et al., 2020). During the cognitive stage, learners understand movement concepts and instructions. In the associative stage, movement execution becomes more refined through repeated practice. Finally, in the autonomous stage, movements can be performed efficiently with minimal conscious effort. Well-designed games provide repeated practice opportunities in enjoyable contexts, enabling students to progress through these stages more effectively.

Furthermore, contemporary educational theories emphasize the importance of active learning experiences. According to constructivist perspectives, students develop knowledge and skills more effectively when actively engaged in meaningful activities rather than passively receiving information (Casey & Goodyear, 2019). Game-based motor learning aligns closely with these principles because it encourages exploration, experimentation, problem-solving, and active participation. Consequently, integrating structured games into PE instruction has become a promising strategy for enhancing both motor competence and educational outcomes. Research has also highlighted the importance of developing fundamental movement skills during elementary school years. These skills serve as the building blocks for lifelong physical activity participation and sports involvement (Lubans et al., 2019). Children with higher motor competence tend to exhibit greater physical activity levels, improved physical fitness, and stronger self-perceptions compared to their peers with lower motor competence (Barnett et al., 2022). Therefore, educational interventions aimed at improving gross motor skills are increasingly recognized as essential components of quality PE programs.

Despite the growing body of literature supporting game-based motor learning, several limitations remain evident. First, most previous studies have focused primarily on evaluating the effectiveness of existing games rather than developing comprehensive and systematically structured gross motor game models tailored to specific school contexts. Many interventions are implemented without considering the unique characteristics of students, environmental conditions, and resource limitations present in different schools. Second, previous research often emphasizes general implementation outcomes without providing detailed developmental procedures, expert validation processes, and practical implementation guidelines that would facilitate broader adoption by teachers (Brian et al., 2020; Logan et al., 2018). Consequently, many PE teachers encounter difficulties in adapting available game models to their local educational contexts. Third, limited studies have specifically addressed the challenges faced by schools with restricted facilities and infrastructure. In many Indonesian elementary schools, including public schools in developing regions, inadequate sports equipment and limited learning spaces remain significant obstacles to effective PE instruction (Suharjana et al., 2021). Existing game models frequently require resources that are not readily available in these settings, reducing their practicality and sustainability. Fourth, although traditional and modified games have demonstrated effectiveness in enhancing motor skills, there remains a lack of validated gross motor game models that integrate developmental principles, motor learning theory, and

contextual school needs into a single instructional framework. This gap indicates the necessity of developing innovative learning models that are practical, feasible, and scientifically validated before implementation. Therefore, the present study addresses these limitations by focusing on the development of a structured gross motor game model specifically designed for elementary school students at SD Inpres 2 Birobuli. The model seeks to accommodate students' developmental characteristics while considering the realities of school facilities and instructional constraints.

Based on the identified gaps, this study aims to develop a gross motor game model for elementary school students at SD Inpres 2 Birobuli. Specifically, the research seeks to design, validate, and evaluate the feasibility of a game-based learning model capable of enhancing students' gross motor development while increasing engagement and enjoyment in physical education learning. The novelty of this study lies in several aspects. First, unlike previous studies that primarily focused on implementation, this research emphasizes the systematic development of a gross motor game model through a research and development approach. Second, the model integrates fundamental movement skill development, motor learning theory, and contextual adaptation into a unified instructional framework. Third, the developed games are specifically designed to accommodate schools with limited facilities and infrastructure, thereby increasing practicality and scalability. Fourth, the model undergoes expert validation and field testing to ensure both pedagogical feasibility and implementation effectiveness.

By integrating motor learning principles, traditional game modifications, and contextual educational needs, this study is expected to contribute both theoretically and practically to the field of physical education. The resulting model may serve as an innovative learning alternative that supports gross motor development, enhances student participation, and improves the quality of PE instruction in elementary schools.

In summary, gross motor development represents a critical aspect of children's growth that requires appropriate educational interventions. Although previous studies have confirmed the benefits of game-based learning approaches, limitations remain regarding the availability of structured, validated, and contextually adaptable gross motor game models. Addressing this issue, the present study proposes the development of a gross motor game model for elementary school students at SD Inpres 2 Birobuli. The study contributes novelty through the integration of motor learning theory, game modification strategies, contextual school adaptation, and expert validation procedures. Consequently, the developed model is expected to provide an effective, engaging, and practical solution for enhancing gross motor learning outcomes in elementary school physical education.

METHODS

This study employed a Research and Development (R&D) approach to develop a gross motor game model for elementary school students at SD Inpres 2 Birobuli. The selection of the R&D method was based on the need to produce an educational product that is systematically designed, validated, and evaluated to improve the quality of physical education learning. R&D is widely recognized as an effective method for

creating innovative educational products and testing their feasibility before implementation in real learning environments (Prasetyo & Sukarmin, 2017; Sugiyono, 2022). Furthermore, educational product development research has been shown to contribute significantly to improving learning effectiveness, student engagement, and instructional quality (Branch, 2019; Borg et al., 2019).

This research adopted the Borg and Gall development model, which originally consists of ten stages: (1) preliminary study, (2) research planning, (3) initial product development, (4) preliminary field testing, (5) revision of limited field test results, (6) wider field testing, (7) product revision, (8) feasibility testing, (9) final revision, and (10) dissemination of the final product (Borg et al., 2019). However, considering the scope and objectives of the present study, the development process was limited to four stages: (1) needs analysis, (2) product design, (3) expert validation, and (4) product revision. Such modification is consistent with previous educational development studies that focus primarily on product feasibility and validity during the initial development phase (Putra et al., 2021; Hidayatullah & Hasbi, 2021).

The final product of this study was a Gross Motor Game Model Guidebook designed as a teaching reference for physical education teachers and as a learning resource that promotes active, enjoyable, and meaningful motor learning experiences among elementary school students. The guidebook incorporates fundamental movement skills, game-based learning principles, and contextual adaptations suitable for schools with limited facilities (Logan et al., 2018; Barnett et al., 2022). The research subjects consisted of three expert validators: one physical education expert, one instructional media expert, and one experienced elementary school teacher. Their role was to evaluate the content validity, practicality, and instructional feasibility of the developed model. Expert validation is considered a crucial step in ensuring the quality and applicability of educational products (Akker et al., 2018; Nieveen, 2019).

Data analysis employed both quantitative and qualitative approaches. Quantitative data obtained from validation questionnaires were analyzed using descriptive percentage techniques to determine the validity level of the product. Meanwhile, qualitative data consisting of suggestions, comments, and recommendations from validators were analyzed descriptively and used as the basis for product revision (Creswell & Creswell, 2018; Fraenkel et al., 2019). The percentage score was calculated using the following formula:

$$P = \frac{\sum X}{\sum xi} \text{ x } 100\%$$

The interpretation criteria for product validity are presented in Table 1.

Table 1.
Product Validity Classification

No.	Percentage (%)	Classification	Interpretation
1	80%–100%	Valid	Suitable for use
2	60%–79%	Valid	Suitable for use with minor revisions
3	50%–59%	Less Valid	Not suitable for use
4	< 50%	Invalid	Not suitable for use

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RESULTS AND DISCUSSION

Result

The present study was limited to the product feasibility stage through expert validation. The validation process was conducted to determine the appropriateness and practicality of the developed gross motor game model before its implementation in physical education learning. Three validators participated in the assessment process, consisting of a material expert, a media expert, and a practitioner (elementary school teacher). Each validator evaluated the product using a structured validation instrument based on a rating scale.

Overall Expert Validation Results

The overall results of expert validation are presented in Table 2.

Table 2.
Recapitulation of Expert Validation Results

No.	Expert Assessment	Percentage (%)
1	Material Expert	87.50
2	Media Expert	77.77
3	Practitioner Expert	98.04
	Average	**87.77**

Table 2 shows that the developed gross motor game model obtained an average validation score of **87.77%**, indicating that the product falls within the **highly feasible** category. Among the validators, the practitioner expert provided the highest evaluation score (98.04%), followed by the material expert (87.50%) and the media expert (77.77%). These findings suggest that the developed model is considered suitable for use in elementary school physical education learning.

Material Expert Validation Results

The material expert evaluation focused on the suitability of game content, learning objectives, gross motor skill components, safety aspects, and instructional relevance.

Table 3.
Material Expert Validation Results

No.	Game Model	Obtained Score	Maximum Score	Percentage (%)	Category
1	Zetti Baal	56	64	87.50	Highly Feasible
2	Coco Relay	56	64	87.50	Highly Feasible
3	Rainbow Stone Track	56	64	87.50	Highly Feasible
4	Oper Boom	56	64	87.50	Highly Feasible
	Total	**224**	**256**	**87.50**	**Highly Feasible**

Based on the evaluation conducted by the material expert, Dr. Didik Purwanto, M.Pd., the four developed games obtained a total score of 224 out of a maximum score of 256. The resulting percentage score was 87.50%, indicating that all game models were categorized as highly feasible. The validator concluded that the developed games appropriately support gross motor skill development and are aligned with the learning objectives of elementary school physical education.

Media Expert Validation Results

The media expert assessed the visual design, instructional clarity, layout, usability, and attractiveness of the guidebook and game presentation.

Table 4.
Media Expert Validation Results

No.	Game Model	Obtained Score	Maximum Score	Percentage (%)	Category
1	Zetti Baal	62	64	96.87	Highly Feasible
2	Coco Relay	46	64	71.87	Feasible
3	Rainbow Stone Track	46	64	71.87	Feasible
4	Oper Boom	45	64	70.31	Feasible
	Total	**199**	**256**	**77.77**	**Highly Feasible**

The media expert, Dr. Andi Sultan Brilin Susandi E.W., S.Pd., M.Pd., AIFO-K, awarded a total score of 199 out of 256. The percentage score reached 77.77%, placing the product within the highly feasible category. Among the four games, *Zetti Baal* received the highest score (96.87%), indicating excellent visual presentation and instructional clarity.

Practitioner Expert Validation Results

The practitioner expert evaluated the practicality, implementation feasibility, student engagement potential, and compatibility with elementary school learning environments.

Table 5.
Practitioner Expert Validation Results

No.	Game Model	Obtained Score	Maximum Score	Percentage (%)	Category
1	Zetti Baal	63	64	98.43	Highly Feasible
2	Coco Relay	61	64	95.31	Highly Feasible
3	Rainbow Stone Track	64	64	100.00	Highly Feasible
4	Oper Boom	63	64	98.43	Highly Feasible
	Total	**251**	**256**	**98.04**	**Highly Feasible**

The practitioner expert, Asman Mualim, S.Pd., Gr., provided a total score of 251 out of 256. The resulting percentage score was 98.04%**,** indicating an exceptionally high level of feasibility. The game *Rainbow Stone Track* achieved a perfect score of 100%, demonstrating excellent practicality and suitability for elementary school physical education settings.

Combined Validation Results of the Four Game Models

The combined validation results from the three experts are presented in Table 6.

Table 6.
Combined Validation Results from Three Experts

No.	Game Model	Material Expert	Media Expert	Practitioner Expert	Total Score	Maximum Score	Percentage (%)	Category
1	Zetti Baal	56	62	62	180	192	93.7	Highly Valid
2	Coco Relay	56	46	61	163	192	84.9	Highly Valid
3	Rainbow Stone Track	56	46	64	166	192	86.5	Highly Valid
4	Oper Boom	56	45	63	164	192	85.4	Highly Valid

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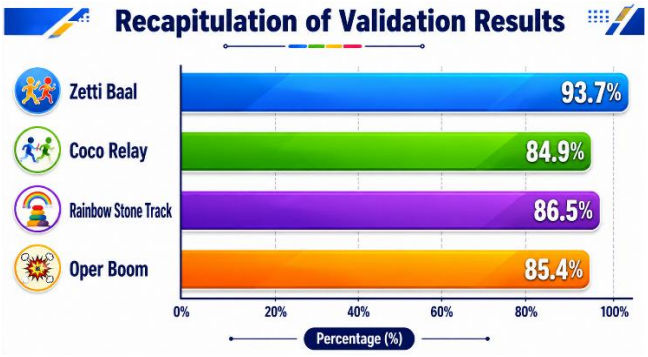

Figure 1.
Recapitulation of Validation Results

The results presented in Table 6 and Figure 1 indicate that all four developed game models achieved validation percentages above 80%, placing them within the **highly valid** category. *Zetti Baal* obtained the highest validation score (93.7%), followed by *Rainbow Stone Track* (86.5%), *Oper Boom* (85.4%), and *Coco Relay* (84.9%).
Overall, the validation findings demonstrate that the gross motor game model developed for students at SD Inpres 2 Birobuli possesses strong content validity, instructional feasibility, media quality, and practical applicability. Therefore, the developed model can be considered suitable for implementation in elementary school physical education learning. The high validation scores from all experts indicate that the games effectively support gross motor development while providing engaging and meaningful learning experiences for students.

Discussion

The findings of this study demonstrate that the developed gross motor game model for elementary school students at SD Inpres 2 Birobuli achieved a highly feasible and highly valid classification based on expert validation results. The overall average validation score reached 87.77%, indicating that the developed product meets pedagogical, practical, and instructional standards for implementation in Physical Education, Sports, and Health (PJOK) learning. These findings confirm that a systematically designed game-based motor learning model can serve as an effective learning medium to support gross motor development among elementary school students.

The material expert validation score of 87.50% indicates that the developed games successfully align with the principles of motor learning and fundamental movement skill development. Fundamental movement skills such as running, jumping, balancing, throwing, and coordination are considered essential foundations for children's physical literacy and lifelong participation in physical activity (Barnett et al., 2022; Logan et al., 2018). The four developed games—Zetti Baal, Coco Relay, Rainbow Stone Track, and Oper Boom—were specifically designed to stimulate these movement components through structured and enjoyable activities. This finding supports previous studies reporting that game-based motor learning provides meaningful movement experiences that improve

children's motor competence and physical engagement (Robinson et al., 2018; Lubans et al., 2019).

From a theoretical perspective, the positive validation results can be explained through the motor learning theory proposed by Fitts and Posner. According to this theory, skill acquisition occurs through cognitive, associative, and autonomous stages (Andrian et al., 2020). The developed game model provides repetitive movement opportunities in enjoyable learning situations, enabling students to understand movement concepts, refine movement execution, and gradually perform skills automatically. Previous studies have emphasized that repeated practice embedded within playful activities significantly accelerates motor skill mastery among children (Brian et al., 2020; Palmer et al., 2021).

The high practitioner validation score of 98.04% further demonstrates the practicality and applicability of the developed games within real school settings. This result suggests that teachers perceive the model as easy to implement, attractive to students, and compatible with elementary school learning conditions. The findings are consistent with research showing that practical and enjoyable learning models increase student participation and engagement during physical education classes (Casey & Goodyear, 2019; Hidayatullah & Hasbi, 2021). In elementary education, student engagement is a crucial determinant of learning effectiveness because children learn more effectively when they are actively involved in meaningful and enjoyable activities (Dyson et al., 2021).

The game Zetti Baal obtained the highest combined validation score (93.7%), indicating superior quality in terms of content, media design, and implementation practicality. This result may be attributed to the game's ability to integrate multiple gross motor components simultaneously, including agility, balance, coordination, and reaction speed. According to Gallahue et al. (2020), activities that involve multidimensional movement patterns tend to produce greater motor learning benefits because they stimulate various neuromuscular systems concurrently. Similar findings have been reported by Barnett et al. (2022), who noted that diversified movement experiences contribute significantly to children's motor competence development.

Meanwhile, Coco Relay, Rainbow Stone Track, and Oper Boom also achieved highly valid classifications with percentages of 84.9%, 86.5%, and 85.4%, respectively. Although these scores were slightly lower than Zetti Baal, they still indicate strong feasibility for educational implementation. The differences in validation scores may reflect variations in media presentation, instructional clarity, and game complexity. Nevertheless, all four games successfully met the established validity criteria, confirming that each model contributes positively to gross motor learning. These findings support previous research conducted by Tuswan (2023), which concluded that modified traditional games effectively stimulate children's motor development while maintaining high levels of learning enjoyment.

The media expert validation score of 77.77% highlights the importance of instructional media quality in supporting effective learning. Although categorized as

highly feasible, the score was lower than those of the material and practitioner experts, suggesting opportunities for improving visual presentation, design consistency, and instructional guidance. Educational media play a significant role in facilitating learning comprehension, especially among elementary school students who tend to respond positively to visually engaging materials (Branch, 2019; Akker et al., 2018). Therefore, revisions based on media expert recommendations may further enhance the usability and attractiveness of the developed guidebook.

Another important finding is that the developed model addresses challenges related to limited school facilities and infrastructure. Many elementary schools in Indonesia encounter constraints regarding sports equipment and learning spaces, which often hinder effective physical education implementation (Suharjana et al., 2021; Suryadi et al., 2022). The developed games were intentionally designed using simple, accessible, and low-cost materials, making them practical for schools with limited resources. This contextual adaptation represents one of the primary strengths and novelties of the present study.

The findings also support constructivist learning theory, which emphasizes active student participation in knowledge construction through direct experience (Casey & Goodyear, 2019). Through game-based activities, students are not merely recipients of instruction but active participants who explore movement patterns, solve movement challenges, and interact socially with peers. Such learning experiences contribute not only to motor development but also to cognitive, emotional, and social growth (Dyson et al., 2021; Kirk, 2020).

Furthermore, traditional and modified games contain cultural and social values that enrich the educational experience. Ramdani and Azizah (2019) argued that traditional games promote cooperation, communication, discipline, and social responsibility among children. Therefore, integrating modified games into physical education supports holistic child development, aligning with contemporary educational goals emphasizing character building alongside academic achievement (Sari et al., 2024; Mustaqim, 2024).

Overall, the validation results indicate that the developed gross motor game model possesses strong content validity, media feasibility, and practical applicability. The integration of motor learning principles, fundamental movement skills, contextual adaptation, and game-based learning approaches has resulted in an innovative educational product capable of supporting effective physical education instruction. Consequently, the developed model can serve as an alternative learning resource for teachers while simultaneously enhancing students' gross motor competence, motivation, and active participation in elementary school physical education learning.

CONCLUSION

This study aimed to develop a gross motor game model for elementary school students at SD Inpres 2 Birobuli and evaluate its feasibility through expert validation. The findings indicate that the developed model is highly feasible and appropriate for use as a

learning medium to support the development of gross motor skills in elementary school physical education. The validation results demonstrated that the product met the established feasibility criteria, with the media expert assigning a score of 77.34%, the learning/material expert 87.50%, and the practitioner expert (PJOK teacher) 98.04%. These results confirm that the developed model possesses strong content relevance, instructional practicality, and media quality.

Furthermore, the combined validation results from the three experts revealed that all four developed games were categorized as highly valid. Game 1 (Zetti Baal) achieved a validation score of 93.2%, Game 2 (Coco Relay) 84.9%, Game 3 (Rainbow Stone Track) 86.5%, and Game 4 (Oper Boom) 85.4%. These findings indicate that each game successfully fulfilled the criteria for educational implementation and can effectively stimulate students' gross motor development through structured and enjoyable activities.

Conceptually, this study contributes to the integration of motor learning principles and game-based learning approaches in elementary physical education. Practically, the developed model provides teachers with an innovative and accessible instructional resource that can create more engaging, enjoyable, and effective learning experiences. Therefore, the gross motor game model developed in this study has significant potential to enhance the quality of physical education learning and support holistic student development in elementary schools.

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