Game Development to Develop Basic Locomotor Movements of Lower Grade Students of Inti Tondo Elementary School

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ABSTRACT

This study aims to develop This study aims to develop a game model that can improve the basic locomotor movement abilities of lower-grade students at Inti Tondo State Elementary School (SDN). Basic locomotor movements such as walking, running, jumping, and hopping are fundamental skills that need to be developed early because they are the basis for subsequent physical activities. The research method used is research and development (R&D) with reference to the Borg & Gall model, which is modified into two stages, namely the preliminary stage and the development stage. The test subjects were students in grades I–III of SDN Inti Tondo. Data collection techniques used observation, questionnaires, and documentation that were validated by experts and tested through small and large-scale trials. The results of the study produced three game models, namely: (1) the S-M-S game (Fun, Enjoyable, Cool), (2) the Ninja Turtle game, and (3) the Cat's Tail game. Based on the results of expert validation, the developed game model was declared suitable for use with a reliability coefficient ranging from 0.812–0.875. These findings indicate that the development of game models has proven effective in improving the basic locomotor movement abilities of lower-grade students.

AUTHORS' CONTRIBUTION

A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

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INTRODUCTION

The development of fundamental movement skills in elementary school-aged children is a crucial foundation for the development of motor skills, readiness to participate in sports activities at a higher level, and the development of a lifelong active lifestyle. In the lower grades (grades I–III), children are in a golden age of motor development, where appropriate, varied, and enjoyable movement stimulation will significantly determine the quality of their future movement patterns (Gallagher, 2019; Komaini, 2017). Basic locomotor movements such as walking, running, jumping, hopping, and sliding are not only prerequisites for mastering sports skills but also play a role in cognitive, social, and emotional development as children learn to manage their bodies in space, cooperate, and obey rules (Barnett et al., 2016; Wati & Nurhayati, 2020). Therefore, physical education in elementary schools ideally goes beyond simply "moving children" but also consciously designs structured movement experiences to ensure the development of children's fundamental movement patterns in the right direction.

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In practice, physical education teachers in many elementary schools, including those in developing urban areas like Inti Tondo Elementary School, still face several challenges. First, fundamental movement material is often taught in the form of marching exercises or a series of movements that are repetitive and lack context for children. This pattern tends to quickly bore students, and not all children achieve movement goals optimally (Sari, 2019). Second, limited facilities and infrastructure—for example, narrow fields, limited play equipment, or large student numbers—encourage teachers to choose learning formats that are easy to control but less motorically challenging (Nur & Rahman, 2021). Third, some teachers have not fully utilized game-based learning as the primary medium for developing fundamental movement, despite the characteristics of lower-grade children being more responsive to playful, imaginative, and healthy competitive activities (Suharno, 2018; Hastuti, 2022).

Theoretically, games have advantages as a vehicle for developing fundamental movement because they incorporate elements of goals, rules, space, and social interaction into enjoyable activities. Purposeful games allow teachers to "insert" specific locomotor targets into the gameplay; for example, "hunter and the hare" to practice running and changing direction, "island hopping" to practice the long forward jump, or "message delivery" where children must balance running and walking while carrying objects (Casey & Hastie, 2016; Lubis, 2020). When games are tailored to the child's developmental level and the school environment, children move more (physical activity engagement increases), learn movement without feeling forced, and teachers find it easier to differentiate tasks based on student abilities (Pangrazi & Beighle, 2020).

However, at the elementary school level, the game materials used by teachers are often general and not explicitly aimed at developing a specific group of fundamental movements. Many traditional or free-play games are indeed enjoyable, but they do not always provide sufficient repetition of locomotor movements or a variety of tiered challenges (Hidayat, 2018). Furthermore, the curriculum demands the achievement of movement skills by the end of the phase, necessitating games that are more focused, documented, and replicable by other teachers. This is where the objective issues lie: there is a need to shift PE instruction at the lower grade level from simply "filling movement time" to "learning through play that consciously develops fundamental locomotor movements."

Research over the past decade confirms that good mastery of fundamental movements at an early age correlates with higher levels of physical activity, more robust motor competencies, and broader sports participation as children grow (Barnett et al., 2016; Robinson et al., 2015). Research in the Indonesian context also shows that some elementary school students are still in the moderate or even low category in mastering locomotor movements due to a lack of systematic training and a lack of varied learning media (Komaini, 2017; Sari, 2019). However, upon closer examination, most of these studies still stop at mapping the level of student motor skills or on testing general game models, not many specifically develop game packages based on local school needs—for example, field conditions, children's play culture, and number of students—such as those at Inti Tondo State Elementary School. This creates a research gap.

The novelty of this research lies in the development of a game package specifically targeting the basic locomotor skills of lower-grade students at Inti Tondo Public Elementary School through the integration of three pillars:
1. Modified traditional games (e.g., variations of hopscotch/rounders/gobak sodor) to stimulate motivation, cultural resonance, and repetition of locomotor patterns;
2. The TGfU framework ensures each game contains elements of simple tactical understanding (opening space, transitions, chases/rescues) that encourage movement decision-making;

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3. Game circuit design with load progression (duration/complexity/direction/rhythm) that guides the improvement of locomotor execution quality (running—jumping—hopping—changing direction—landing safely) along with an authentic assessment rubric integrated into the activity. Thus, this model is not only "fun to play" but also has measurable effects on specific locomotor indicators.

Furthermore, the game package is designed to be **low-equipment**, easy to replicate, and adaptable to school time and space constraints. Each game includes key locomotor objectives, technical indicators, rules/modifications, progressions, safety, and a performance assessment scheme so teachers can implement them immediately without excessive planning. This approach is expected to fill the gap between the demands of the FMS curriculum and the practical reality of heterogeneous lower grades.

This research aims to develop and validate a game package to improve basic locomotor movement in lower-grade students at Inti Tondo Elementary School. Specifically, the research will:

1. Design a prototype game package (traditional-TGfU-circuit) with a locomotor progression map and performance rubric per game;
2. Validate the content (content validity) through physical education experts and elementary school practitioners;
3. Test the feasibility and practicality of implementation in lower grades; and
4. Evaluate the initial effectiveness of locomotor indicators through rubric-based performance observations and/or age-appropriate FMS assessment instruments.

The rationale for this approach is supported by evidence that structured play interventions—whether through TGfU, traditional games, or circuits—improve movement competency and participation in elementary school students. The integration of these three is expected to provide a rich, meaningful, and effective learning experience to strengthen locomotor patterns. With clear technical indicators for each game and a practical assessment scheme, teachers can monitor student progress and gradually adjust challenges.

Furthermore, strengthening movement literacy from the lower grades is believed to impact long-term developmental pathways—from readiness to participate in team games in the upper grades, to active lifestyle preferences, to the foundation of fitness and health. Games contextualized within local culture have the potential to foster a sense of belonging, cooperation, and the joy of learning, which serve as intrinsic "drivers" for sustained physical engagement. Thus, the research outputs are not only relevant to Inti Tondo Public Elementary School but can also be exported to schools with similar facilities and student characteristics.

To conclude the introduction, this research positions games not simply as a medium for entertainment, but as a pedagogical platform for orchestrating the repetition of correct, safe, and enjoyable locomotor techniques. The developed game package bridges the gap between general intervention studies and the need for ready-to-use instructional design for lower grades. With a strong theoretical foundation and supporting empirical evidence, this research offers practical and scientific contributions to strengthening the FMS of Indonesian children in early elementary school.

METHODS

This research used a research and development (R&D) method based on the Borg & Gall model. This model was modified into two stages: 1. Preliminary Stage, including literature review, field observation, problem identification, and needs analysis. 2. Development Stage, including initial product design, expert validation, product revision,

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small-scale trials, revisions, large-scale trials, and final product refinement. The research subjects were students in grades I–III of SDN Inti Tondo. Data collection techniques included observation, questionnaires, and documentation. Data were analyzed using qualitative and quantitative descriptive analysis. Product validity was determined through expert assessment, while reliability was tested using the Crude Index of Agreement (CIA).

Development Procedure

The research procedure was based on the Borg & Gall model, modified into two stages:

1. Preliminary Stage
   A review of relevant literature and research on physical education learning and the characteristics of elementary school students, along with observations and field studies to identify problems that arise in the learning process.

2. Development Stage
   Initial product development based on the curriculum, student characteristics, and learning objectives, expert validation by two lecturers and one physical education teacher, small-scale trials on limited subjects, followed by product revision, large-scale trials on broader subjects, followed by product revision, and final product development in the form of a physical activity learning guidebook.

Trial Design

Product trials were conducted in two stages: small-scale and large-scale trials. Before the trials, the product was validated by experts and teachers, then revised to ensure its suitability for use in the field.

Research Subjects

The research subjects were students in grades I, II, and III of Inti Tondo Public Elementary School, who were the target groups for the game model implementation.

Data Collection Techniques and Instruments

Data collection techniques included:

Questionnaires to gather input from experts and teachers regarding product feasibility; Observations to directly observe the learning process and the implementation of the game model; and Documentation in the form of photographs and videos as supporting evidence for the research.

Data Analysis Techniques

Data analysis in this study used quantitative and qualitative descriptive analysis. Quantitative Descriptive Analysis was used to analyze observational data and expert assessments of the quality of the game model draft before the field trial. Validation was based on content validity, with experts rating the game model on a scale of 1-4. A game model was deemed suitable for testing if it met the assessment criteria. Furthermore, reliability testing was conducted using observational reliability, which is the level of agreement between observers or judges. Reliability was calculated using the Gross Conformity Index (CCI) using the following formula:

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CCI = n: N

Where:

CCI: Gross Conformity Index

n: Number of codes consistent across observers

N: Number of objects observed

(Arikunto, 1997:202)

Qualitative Descriptive Analysis was used to analyze input, suggestions, and revisions from experts and teachers regarding the game model, both during the small-scale and large-scale trials. This analysis was conducted by reviewing observational data and documentation to produce a more valid product that meets field needs.

The indicators of success of the development product are marked by students being more active and enthusiastic in learning, with at least 75% of students achieving the minimum completion criteria (KKM = 75).

RESULTS AND DISCUSSION

Result

This research produced three game models to improve students' basic locomotor skills: 1. The S-M-S (Fun, Exciting, Fun) game: a post-based game involving zigzag running, jumping, hopping, and sprinting. 2. The Ninja Turtles (Turtles): a game that trains balance and speed by carrying objects on your back without dropping them. 3. The Cat's Tail game: a competitive game that trains speed and agility by guarding and capturing an opponent's "tail." Expert validation results indicated that all three games were valid and suitable for use. The game's reliability coefficient ranged from 0.812 to 0.875, indicating reliability and consistency. Small- and large-scale trials demonstrated an improvement in students' basic locomotor skills after participating in the game.
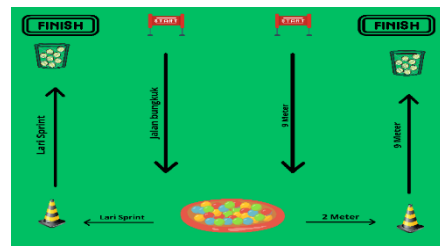
The S-M-S (Fun, Exciting, Fun) game involves sprinting, overcoming obstacles, and repeating the game in turns. Initial trials demonstrated that the game stimulated running and coordination skills. However, after expert validation, revisions were made to the field size, clarity of the rules, and adjustments to the number of students to make it more effective.
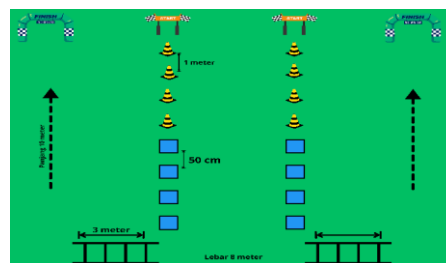
Image 1.

S-M-S (fun, exciting, fun) game

The Ninja Turtles game emphasizes agility and speed while carrying cardboard props on the back. Tests showed the game was engaging for students, but experts recommended improvements to the gameplay to avoid confusion and reduce the risk of injury. Revisions were made to the sequence of core activities, how to move, and the layout of the start and finish lines.

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Image 2.

Ninja Turtles Game

The Cat's Tail Game hones speed, agility, and defensive and offensive strategies by capturing an opponent's tail. Trials showed student enthusiasm, but the rules were still unclear. Revisions were made to the clarity of the rules, scoring techniques, and field dimensions to better suit school conditions.

Image 3.

Cat Tail Game

The trial showed that all three games can be implemented in physical education lessons. The children appeared enthusiastic and energetic, and demonstrated improved basic locomotor skills, particularly in running, jumping, and dodging. Validation by material experts and learning experts gave the games a good rating, although there were some comments regarding safety, appropriateness of field size, and clarity of game instructions.

Product Reliability Test

To achieve reliability by finding the crude suitability index (Crude Index Agement), with the following formula:

$$IKK = n : N$$

1. The S-M-S (Fun, Fun, and Awesome) Game
   It is known that:
   n: 13
   N: 16
   Answer :

    IKK = n: N
    IKK = 13 : 16 = 0,812
2. Ninja Turtles Game
   It is known that:
   n: 14
   N: 16
   Answer :

    IKK = n: N
    IKK = 14 : 16 = 0,875
3. Cat Tail Game
   It is known that:

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n: 14
N : 16
Answer :
    IKK = n : N
    IKK = 14 : 16 = 0,875

The results of the reliability test of game development to develop basic locomotor movements of lower-grade students at SDN Inti Tondo obtained coefficients for each game ranging from 0.812 to 0.875 as follows:

Table 1.
Reliability Results

Num.	Game Name	Correlation Coefficient
1	S-M-S (Fun, Fun, and Awesome) Game	0,812
2	Ninja Turtles Game	0,875
3	Cat Tail	0,875

Discussion

The research results demonstrate that the developed game model effectively improves basic locomotor skills in lower-grade students. This finding aligns with expert opinion that locomotor skills are essential as a foundation for other sports skills. The developed game not only improves physical aspects but also provides a fun learning experience for students. The game approach motivates students to be active, cooperate, and compete healthily. This has a positive impact on their cognitive, affective, and social development. Compared with monotonous conventional learning methods, this game model has proven more effective because it captures students' interest. This supports previous research that found that game-based learning models can significantly improve children's gross motor skills. Therefore, the developed game model can be an alternative for Physical Education (PJOK) learning in elementary schools that is innovative, engaging, and beneficial.

The students' enthusiasm and active involvement during the game support the theory that game-based learning is more easily accepted at elementary school age because it is fun and challenging. Revisions made based on expert input strengthened the product's quality. Changing the field size and simplifying the rules, for example, have been shown to make the game more accessible to students. This aligns with Sukintika's (2015) opinion that anal games should be simple, flexible, and appropriate to children's developmental characteristics. Furthermore, the ninja turtles and cat-and-mouse games emphasize speed and agility, which, according to Gallahue & Ozmun (2012), are important components in the development of fundamental motor skills. Meanwhile, the S-M-S game develops coordination and endurance.

The implementation of this game model also provides variation in physical education lessons, providing teachers with alternative methods to increase student interest and participation. However, this study has limitations: the trial was conducted on a small scale in one school. Therefore, further research is needed on a larger scale and in diverse school settings to ensure the product's broad effectiveness.

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CONCLUSION

This study produced three game models, namely S-M-S, Ninja Turtles, and Cat Tails, which are valid, practical, and effective in improving basic locomotor skills of lower-grade students at SDN Inti Tondo. Suggestions that can be given are that PJOK teachers can use these game models as learning variations, schools need to support with adequate facilities, and future researchers can develop these game models in a wider scope or different educational levels. The trial showed that all three games can be applied in physical education learning. Children looked enthusiastic, excited, and showed an increase in basic locomotor skills, especially in the aspects of running, jumping and dodging. Validation by material experts and learning experts gave a good score, although there was input on aspects of safety, appropriateness of field size, and clarity of game instructions.

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