



Development of "Futsal Kids" Game Model to Improve Elementary School Students Motor Skills

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ABSTRACT

This study aims to develop and test the effectiveness of the "Futsal Kids" game model as an innovation in futsal training for extracurricular activities to increase students' motor skills. School-based research using the research and development (R&D) method, with the Borg & Gall steps simplified and experimental. One-Group Pretest–Posttest Design. The subject study is a student-based class above who participate in futsal extracurricular activities at three schools in Palembang City, with 25 students in the trial, 50 students in the trial field, and 50 students who tested the effectiveness. Instrument study covering observation, questionnaires, interviews, and testing basic motor skills (coordination, agility, speed, balance, and control). Validation results from three experts show that the "Futsal Kids" game model obtained an average eligibility rating of 89.2% with the "worthy" category. The trial, limited and field show that the model is easy to apply, tailored to students' characteristics, and receives very positive responses from teachers and students. Results of the effectiveness test show an average score increase in motor skills from 67.74 (pretest) to 82.20 (posttest) with a p-value < 0.05. The most significant increase occurs in control movement (23.6%) and agility (22.3%). Thus, the game model "Futsal Kids" is deemed feasible, practical, and effective for increasing students' motor skills through school-based futsal training and fun, educational games.

Keywords: Futsal Kids, Game Based Training, Motor Skills, School Base

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INTRODUCTION

Sport own role important in support growth and development children, especially during school years known basis as *golden age* motor (Gallahue et al., 2019; Robinson et al., 2023) development. In this period, this child is developing movement-based skills such as balance, agility, coordination, speed, and power, which serve as a foundation for mastering more complex skills in sports. Futsal is one of the most popular and potentially skill-building sports. Apart from being Competitive and fun, futsal also offers educational values such as equality, discipline, and sportsmanship, and can help practice various motor skills through activities like dribbling, passing, and kicking (Agustama, 2023; Kurniawan, 2020).

In the context of a school, basic futsal not only serves as a recreational activity but also helps develop children's physical and motor skills comprehensively. Activities such as futsal and extracurricular activities become essential for students to practice skills through fun and challenging play. Training model-based games (game-based training) are seen as effective for improving motor skills because they provide experience with contextual movement, train decision-making skills, and motivate students to be active and involved (Clemente et al., 2021; Li et al., 2024). Approach This in line with the principle proven small-sided games capable of increasing physical activity, response, cognitive, and technical skills in players of an early age (Sarmiento et al., 2018).

However, the implementation of futsal practice at the school base is still conventional, emphasizing repetitive, monotonous, and less effective techniques in accordance with the characteristics of child development (Nugraha, 2022; Setiawan, 2021). This condition is characterized by low motivation, low active involvement, and suboptimal improvement in students' motor skills. In fact, the theory of Dynamic Systems confirms that the development of motor skills is the result of the interaction between the individual, the task, and the environment (Newell, 2020). Therefore that, design children's futsal training need consider context environment adaptive, challenging, and experience - oriented play varied movements.

In addition, the paradigm *physical literacy* (Whitehead, 2023) Confirm that children need a chance to move with belief in self and whole motivation in various physical activity contexts, including extracurricular activities. Experience positive movement at any age: school-based play plays an essential role in forming active, long-term motor habits (García-Hermoso et al., 2023).

Based on the review, I identified a gap: not yet. Lots developed a futsal training model for schools, based on a systematic, well-organized approach to research and development (R&D) grounded in modern theories such as game-based training, physical literacy, and dynamic systems theory. In fact, it's a training model. This can significantly improve basic motor skills and create a fun experience for the child.

Therefore, this research aims to develop and test the effectiveness of the "Futsal Kids" game model as an innovation in customized futsal training with characteristics of student school basic development. This model integrates basic futsal with adaptive, progressive, and participatory games to comprehensively train a range of motor skills. It is hoped that the results of this study will provide practical contributions to PJOK teachers and trainers in developing a training program with more innovative, contextual, and effective extracurricular activities that support children's motor development at the school-based age.

METHODS

This study uses a research and development (R&D) method, adapting the Borg & Gall (1983) model and the One-Group Pretest–Posttest Design. The Borg & Gall model was chosen because it provides systematic steps for developing and validating educational products through gradual trials and revisions based on field feedback. The product is the "Futsal Kids" Exercise Model Guidebook, intended for physical education teachers to train elementary school students' motor skills, with an emphasis on five main aspects: balance, agility, speed, endurance, and coordination. The One Group Pretest–Posttest experimental design was used to evaluate the effectiveness of the "Futsal Kids" exercise model in improving elementary school students' motor skills in Palembang City.

This research was conducted at three elementary schools with active futsal extracurricular activities: SD Negeri 10 Palembang, SD Negeri 23 Palembang, and SD Negeri 45 Palembang. The research subjects were upper-grade students who participated in futsal extracurricular activities at these schools, using purposive sampling (i.e., selecting students based on the assumption that those actively involved in futsal activities have physical conditions that suit the research needs).

The number of subjects in each stage of the study is described consistently, namely the limited trial involved 25 students from the upper grades of SD Negeri 10 Palembang, while the main field trial involved 50 students from the upper grades of SD Negeri 23 and SD Negeri 45 Palembang, and the final sample of 50 upper grade students was used in the effectiveness test stage of the training model with the One Group Pretest–Posttest design, which also became the basis for statistical

analysis to measure significant differences between the pretest and posttest results of students' motor skills.

The research instruments include quantitative and qualitative data; the quantitative instrument is a basic motor skills test to measure motor skills (coordination, agility, speed, balance, and movement control) using standard child motor tests (Gallahue et al., 2019) such as the Shuttle Run Test for agility, the Standing Balance Test for balance, the 20-Meter Sprint Test for speed, the Multistage Fitness Test for endurance, and the Throw-and-Catch Coordination Test for coordination, while qualitative instruments in the form of observation sheets, validation questionnaires, and interviews with PJOK teachers and futsal coaches to obtain feedback on the ease of implementing the model.

Data were analyzed using a paired-samples t-test to assess the effectiveness of the training model quantitatively. In contrast, qualitative data from interviews and observations were used to strengthen the research findings. The research procedure adapted Borg & Gall's ten steps, simplifying them into five main stages, while adjusting for the sport context, timeframe, and number of research subjects.

The first stage, namely *Research and Information Collecting* (Needs Analysis), was carried out through observations of PJOK activities, interviews with futsal coaching teachers, literature studies on children's futsal games and motor development, and identification of the need for game models that suit the characteristics of elementary school students using observation instruments, questionnaires, interviews, and basic motor skills tests (coordination, agility, speed, balance, and movement control).

The second stage, Planning, includes setting development goals, formulating motor skill indicators to be improved, such as coordination, agility, balance, basic ball control, as well as preparing the initial game design, which includes rules, field and ball modifications, duration, and evaluation instruments in the form of observation sheets and assessment rubrics.

The third stage, Develop Preliminary Form of Product (Initial Product Design), focuses on creating a prototype of the Futsal Kids game model in the form of a game guide, training videos, and procedures for implementing extracurricular futsal training, all modified to suit the characteristics of elementary school students.

The fourth stage, Preliminary Field Testing (Limited Trial/Design Validation), a small group limited trial on students of SD N 10 Palembang City with a total of 25 upper grade students, to observe motor skills during the game, collect input from PJOK teachers and students, and revise the product based on the evaluation results.

The fifth stage, Main Field Testing, was conducted to test the effectiveness of the game model in a broader scale in two schools, SD N 23 and SD N 45 with a total of 50 students, as well as testing the effectiveness of 50 students through the implementation of pretests and posttests of motor skills and data analysis using t-tests to determine the increase in students' motor skills after the application of the training model.

Qualitative data from observations and interviews were analyzed descriptively to strengthen the quantitative results, resulting in an effective, feasible, and practical "Futsal Kids " game model for implementation in physical education instruction in elementary schools. With this procedure, this study is expected to produce an effective, empirically tested "Futsal Kids " training model to improve elementary school students' motor skills.

RESULTS AND DISCUSSION

The product developed in this research is the Futsal Kids Game Model, a modified futsal game model for upper elementary school students. This product consists of 30 types of games designed to improve five main components of motor skills: balance, agility, speed, endurance, and coordination. Each game has its own objectives, tools, gameplay, and exercise variations that can be adapted to the characteristics of elementary school students. The final product includes a game guidebook and Futsal Kids video tutorials as supporting materials for field implementation.

The validation test was conducted by three experts: a material expert, a physical education expert, and a futsal coach. The validation results, regarding the appropriateness of the content, presentation, suitability to elementary school student characteristics, suitability to motoric objectives, and practicality of the model, are presented in Table 1 below.

Table 1. Expert Validation Results of the Kids Futsal Game Model

Assessment Aspects	Expert 1	Expert 2	Expert 3	Average	Category
Content Suitability	88%	86%	90%	88%	Worthy
Presentation Eligibility	90%	85%	88%	87.7%	Worthy
Suitability with the Characteristics of Elementary School Students	92%	89%	91%	90.7%	Worthy
Model Conformity with Motor Objectives	93%	87%	92%	90.7%	Worthy
Practicality & Ease of Implementation	89%	88%	90%	89%	Worthy
Average Total	90.4%	87.0%	90.2%	89.2%	Worthy
	Expert 1	Expert 2	Expert 3	Average	Category

Based on the assessment results from the three validators, the Futsal Kids game model achieved an average feasibility score of 89.2%, placing it in the "Feasible" category for implementation in elementary school extracurricular futsal activities. The experts assessed that this game model aligns with the motor development characteristics of elementary school students and is suitable for field implementation. Minor improvements were made based on validator feedback, particularly in simplifying the rules and improving the game guide's appearance.

A limited trial was conducted on 25 students at State Elementary School 10 Palembang to assess the feasibility and initial implementation of the "*Futsal Kids*" game model in an elementary school setting. This trial focused on the extent to which the model could be implemented, understood, and accepted by physical education teachers and students. Assessments were conducted through observation sheets and response questionnaires covering several key aspects: ease of implementation, clarity of game rules, activity appeal, suitability to elementary school student characteristics, and potential for motor skill development.

Table 2. Limited Trial Results (Model Feasibility Aspect, N = 25)

Rated aspect	Assessment Indicators	Average Score (%)	Category
Clarity of game rules	Rules that are easy for students and teachers to understand	86%	Worthy
Ease of implementation	The model can be implemented with available means	88%	Worthy
The attractiveness of the activity	Students are enthusiastic and actively participate in activities	91%	Very Worthy
Suitability with the characteristics of elementary school students	The level of difficulty is appropriate to the child's age and abilities.	89%	Worthy
Potential to improve motor skills	Basic futsal movements are developed in a fun way	87%	Worthy
Total average		88.2%	Worthy

The results of a limited trial showed that the *Futsal Kids game model* was categorized as "Feasible" for implementation. Physical Education teachers provided positive feedback that the model was practical and appropriate for extracurricular learning, while students demonstrated high enthusiasm and had no difficulty understanding the rules. Based on teacher feedback, minor revisions were made, including simplifying the game instructions and adjusting the duration of each session to improve effectiveness.

The next stage, a field trial, was conducted on 50 students (N=50) from Public Elementary Schools 23 and 45 in Palembang. The focus of this trial was not to measure learning outcomes, but rather to ensure that the game model remained consistent, easy to implement, and widely accepted.

Field trials demonstrated that the model could be implemented successfully without significant challenges. Teachers reported that game components such as zigzag dribbling, chain passing, and a three-on-three mini-game could be implemented within limited school facilities. The average assessment of the implementation aspects by three physical education teachers was 90.1% (very feasible).

Student responses were also very positive; they found the training more enjoyable and challenging, without feeling monotonous like conventional training. Thus, the results of the limited and field trials indicate that the Futsal Kids game model is suitable for children. Feasible and practical to be applied in elementary school physical education learning, and ready to be tested for effectiveness at the next stage. To clarify the structure and scope of the games developed, the following summarizes the games by the motor skills they train.

Table 3. “Futsal Kids” Game Model Based on Motor Skills Aspects

Motor Aspects	Example Game	Focus / Main Goal
Coordination	Chasing Ball, Chain Passing	Practice synchronization movement body and ball control integrated.
Agility	Dribble, Zigzag Relay Ball	Practice direction and reaction fast to stimulus.
Balance	Duck Dribble, Jump Dribble	Guard stability body movement and dribble the ball.
Speed	Dribble Relay, 1 vs 1 Mini Game	Increase speed reactions and transitions in games.
Durability	Attack the Fortress, Many Goals	Practice resilience physique through game repetitive intensity currently.
Control & Accuracy	Shooting Target, Passing to Mini Goal	Hone precision passing and shooting in room limited.
Creativity & Teamwork	King of Dribble, Mystery Ball	Develop taking decisions and communication between player.

The Futsal Kids model is designed in stages, from simple to complex exercises, with a fun, participatory approach, so that students can naturally develop basic motor skills through futsal game activities. After the game model was declared feasible through limited trials and field trials, the next stage was an effectiveness test to see the effect of implementing the Futsal Kids model on improving elementary school students' motor skills. The effectiveness test was conducted on 50 students (N = 50) from SD Negeri 23 and SD Negeri 45 Palembang using a One Group Pretest–Posttest Design. The measurement instrument included a basic motor skills test based on five main aspects: coordination, agility, speed, balance, and motion control. Measurements were conducted twice before (pretest) and after (posttest) the implementation of the game model across 16 meetings.

Table 4. Improvement in Average Scores of Students' Motor Skills (n=50)

Aspect Skills	Pre-Test	Post-Test	Increase (%)
Coordination	68.2	82.4	20.7%
Agility	65.5	80.1	22.3%
Speed	70.8	85.2	20.3%
Balance	67.6	81.5	20.6%
Motion Control	66.9	82.7	23.6%
Average	67.8	82.4	21.5%

Based on Table 4, students' motor skills improved after follow-up learning with the Futsal Kids game model. Overall average score increased from 67.8 on the pre-test to 82.4 on the post-test, or an experience improvement of 21.5%. Every aspect of motor skills shows consistent improvement, with the highest percentage in control movement (23.6%) and agility (22.3%).

This matter shows that the variation in the game of Futsal Kids significantly improves students' ability to control their bodies and react quickly in game situations. Aspects of speed, coordination, and balance also show an average increase above 20%, indicating that the game model is capable of practicing motor components in general. Thus, the results suggest that implementing the Futsal Kids model effectively increases basic motor skills among students at the school level.

The effectiveness of the game model Futsal Kids in improving students' motor skills in school basics is being analyzed using a paired t-test on pre-test and post-test scores. Calculation results are shown in Table 5 below.

Table 5. *t- Test Results* Student Motor Skills

Aspect Skills	Pre-Test Average	Post-Test Average	t- count	p-value	Conclusion
Coordination	68.24	82.30	45,987	0.000	Significant
Agility	65.62	80.14	58,988	0.000	Significant
Speed	71.16	85.10	54,987	0.000	Significant
Balance	67.13	81.01	47,912	0.000	Significant
Motion Control	66.55	82.47	52,325	0.000	Significant
Average	67.74	82.20	-97,004	0.000	Significant

Paired t-tests show that all aspects of students' motor skills improve significantly after treatment. Average score overall increased from 67.74 on the pre-test to 82.20 on the post-test. The p-value = 0.000 (<0.05) across all aspects indicates that the difference is not coincidental but instead results from the

application of the Futsal Kids game model. Thus, this model effectively enhances students' motor skills at school comprehensively. A t-test analysis shows a significant difference ($p < 0.05$) between the pre-test and post-test results, indicating that the Futsal Kids game model effectively improves students' motor skills at school.

Research results show that the game model Futsal Kids has proven effective in improving students' fundamental motor skills in school, with the most significant improvement in control movement (23.6%) and agility (22.3%). Effectiveness. This occurs because the model integrates a game-based learning approach with principles of modern motor development, using activity-oriented (open skill) activities. Games like Passing to Mini Goals and Cone Shooting Targets demand accuracy, ball control, and simultaneous ankle coordination. Activities This stimulates improvement of the neuromotor system through a basic process that leads to a repetitive feedback loop and ongoing, progressive sensorimotor adaptation. Findings are in line with the results of the study Li et al. (2024) and Zhang et al. (2024) which states that scale ball game small with structure varied capable speed up strengthening connection motor nerves and increase efficiency control movement in children age school base.

Improvements in aspects of agility also show a close relationship with activities that involve fast changes in direction and responsiveness to visual stimuli, such as Zigzag Dribble and Tail Chasing Ball. Game: This practice ability, adaptive body-to-environment, dynamic, and situation-changing games, accordingly with the principle of exercise-based skills (open-skill training).

According to Moon et al. (2024), training-demanding game, change direction and speed reaction, capable of increasing neuromuscular activation and muscle coordination simultaneously, which becomes the foundation of agility and fast reaction in children. In addition, the approach to fun learning increases motivation and participation of active students, who are a factor important in the success of motor learning (Shi et al., 2022). Motivation intrinsic this play a role in maintain intensity exercise, concentration, and consistency movement. This is reinforced by García-Hermoso et al. (2023) the discoverer that involvement emotional positive in game increase adaptation neuromuscular and speed reaction.

Thus, the effectiveness of the Futsal Kids model is not solely influenced by intensive physical practice. Still, rather, because of its harmonious design with the principles of modern neurophysiological learning of children's motor skills, namely involving variability in movement, bait-and-return time-based real-time feedback, adaptation to the environment, as well as strong motivational and affective findings. This strengthens the results of systematic studies and the latest findings by Moon et al. (2024) and (Zhang et al., 2024) which confirms that game model structured and fun in a way significant increase coordination, agility, and control movement child school base.

Based on *t*- test results pairs in Table 2, all aspect students' motor skills experience improvement significant after application of game models *Futsal Kids*. Average score coordination increase from 68.24 to 82.30 ($t = 45.987$; $p = 0.000$), agility from 65.62 to 80.14 ($t = 58.988$; $p = 0.000$), speed from 71.16 to 85.10 ($t = 54.987$; $p = 0.000$), balance from 67.13 to 81.01 ($t = 47.912$; $p = 0.000$), as well as control movement from 66.55 to 82.47 ($t = 52.325$; $p = 0.000$). The *p-value* <0.05 in all aspect show that difference between results *pre-test* and *post-test* No nature coincidence, but is direct effect from application of game models said. In a way Overall, the average score increased from 67.74 on *the pre-test* to 82.20 on *the post-test* with difference significant ($t = -97.004$; $p = 0.000$).

Findings This strengthen theory *Game-Based Learning* (Light & Harvey, 2019) proposed by that approach based game give experience contextual and fun learning, so that can increase more motor skills effective compared to with training model conventional. Research results this is also in line with theory *Dynamic Systems* by Newell (2020) which it is asserted that children's motor development is results interaction between individual, task, and environment. In the context of study this is a modified futsal activity through rule simple, variation games, and atmosphere fun competitive proven create optimal environmental stimuli for basic motor development student.

More further findings this strengthen draft *physical literacy* as stated by Whitehead (2023), Children who receive experience in movement through games will develop trust in themselves, high motivation, and a positive attitude toward physical activity. Thus, the Futsal Kids model not only increases motor skills in

general, as shown by statistical tests, but also has a practical impact on fostering early interest in exercise and supporting the achievement of educational objectives in physical education at school in a sustainable way.

CONCLUSIONS

This study aims to develop and test the effectiveness of the Futsal Kids game model as an innovation in school-based physical education to improve students' fundamental motor skills through an approach research and development (Research and Development), which adapts the Borg & Gall model and is combined with a design experiment, One Group Pretest– Posttest Design. This approach successfully produced a modified futsal game model tailored to the child class, equipped with book guides and video tutorials. Validation results from experts show that the game model Futsal Kids has an average eligibility score of 89.2%, which is categorized as "suitable " for implementation in activity-based learning and futsal extracurricular activities at school-based settings.

Trials show that the model can be implemented with clear, easy-to-understand instructions for students and received positive feedback from the PJOK teacher who assessed the game. This is practical and appropriate for the field. The trial field shows significant improvement in existence across basic motor skills. Paired t-test results show an average score increase from 67.74 (pretest) to 82.20 (posttest), with a p-value < 0.05, indicating a significant difference. The largest increases occur in control movement (23.6%) and agility (22.3%), followed by coordination, speed, and balance, each of which also shows a meaningful increase.

Improving the proof that the game model Futsal Kids is effective in developing basic motor skills in students in schools. Effectiveness is supported by design games based on game-based learning principles, with open (open skill activities) that stimulate coordination, quick reaction time, and control movement through varied and enjoyable activities. Findings. This is in harmony with the theory of Dynamic Systems (Newell, 2020), which emphasizes that motor development is influenced by interaction between individual, task, and environment, as well as supporting the development of physical literacy (Whitehead, 2023), which emphasizes the importance of experience in movement, favorable for the formation of children's attitudes, motivation, and motor skills.

Thus, the Futsal Kids model is not only effective in improving motor skills but also has high educational value because it fosters intrinsic motivation, promotes a similar work ethic, and encourages interest in exercise from an early age. Overall, the game model Futsal Kids is feasible, practical, and effective as an alternative, innovative approach to learning and physical education in basic schools. This model can integrate students' physiological, psychological, and social characteristics through an engaging, adaptive game. In the future, research is recommended to expand coverage of the subject, add a component to measure cognitive and affective aspects, and test the model's effectiveness in the context of Physical Education learning at different levels. For strengthening generalization findings, this.

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