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Developing a Tic TAC Toe Exercise Model to Enhance Agility, Speed, and Accuracy in Basic Basketball Skills among Male Students at SMP Kasih Kemuliaan

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ABSTRACT: SMP Kasih Kemuliaan offers a co-curricular basketball club that attracts active student participation. However, the limited variety in exercise models has led to student boredom and a subsequent decline in basketball performance. This study aims to develop a novel exercise model, named Tic Tac Toe, designed to enhance agility, speed, and accuracy in basketball skills among male students. The research adopts the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model for development. The proposed exercise model was validated by three experts. A small-scale trial involving six students was conducted, followed by a larger trial with eighteen students. The study employed validity and reliability tests, utilizing instruments to measure agility, speed, and accuracy. A hypothesis was tested using a paired t-test model to evaluate the efficacy of the exercise model. The analysis indicates that the Tic Tac Toe exercise model effectively enhances agility, speed, and accuracy in basic basketball movements. Expert evaluations demonstrated that the model is practical, with over 70% of experts rating it as usable. The Tic Tac Toe exercise model is a viable tool for improving students' agility, speed, and accuracy in basic basketball skills.

KEYWORDS: Tic Tac Toe, Speed, Agility, Accuracy, Basketball

I. INTRODUCTION

The Indonesian youth play a crucial role in national development, especially considering how they will be a generation whose upbringing is decorated with technology (Parlina, & Hudaya, 2024). To this end, sports play a crucial role in enhancing the quality of human resources in Indonesia by fostering character and personality development, discipline, and sportsmanship, as well as improving performance that can evoke national pride (Pranata, Hita, Ariestika, & Suwanto, 2023). Among the various sports activities, basketball has gained significant popularity, particularly among students.

Basketball is a sport that demands high skill levels and mental acuity. Fundamental movements such as dribbling, passing, shooting, and court movements are essential for players to master. These skills not only contribute to the popularity of basketball but also have a significant impact on the physical and mental development of players. The sport requires physical strength, agility, speed, and accuracy to execute these basic movements effectively. Increasing competition in sports necessitates that coaches and training program developers continually seek innovative methods and techniques to enhance athletes' skills and performance (Abraham & Collins, 2011).

Basketball is characterized by high-intensity activities, such as running, stopping, and changing directions based on the game situation. Mastering basic technical skills is crucial for every player, alongside tactical abilities, to ensure optimal performance. The effectiveness of training programs is often evaluated through descriptive studies that assess the players' basic skills and their application during games.

Basic basketball movements, such as dribbling, passing, lay-ups, shooting, and court movements, form the foundation for more complex skills in the game. Proficiency in these basic movements is necessary for both individual success and overall team performance. Therefore, special attention is given to developing individual skills during athlete training. Key technical skills that coaches should emphasize include shooting, lay-ups, passing, and dribbling (Tachtatzis, 2024).

In addition to technical proficiency, players must possess optimal physical condition components, such as agility, speed, and accuracy. These physical attributes are critical for achieving high performance in sports. Regular physical training stimulates all body systems, maintaining overall health and fitness (Zavalishina, Karpov, Rysakova, Rodionova, Pryanikova, & Shulgin, 2021).

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Physical condition encompasses various components, including strength, speed, flexibility, agility, accuracy, coordination, balance, power, and endurance. Effective training programs must be well-designed and tailored to the specific needs of the sport.

Among these physical components, agility, speed, and accuracy are particularly crucial for basketball players. These attributes are interrelated and essential for executing fundamental movements such as dribbling past opponents, making quick movements, and accurately performing lay-ups. Likewise, defensive skills in basketball require quick reactions, agility to maneuver around screens, and accurate blocking or stealing.

Given the importance of agility, speed, and accuracy, it is beneficial to develop these skills from an early age, especially during the peak motor development stage in junior high school students aged 12-14 years. These students are characterized by frequent daily physical activities and have a higher capacity for motor skill development. Training programs that incorporate these physical components are particularly suitable for junior high school basketball teams (Ziv, & Lidor, 2009).

Based on observations and interviews with coaches, SMP Kasih Kemuliaan has an active basketball extracurricular program, with students regularly participating in training and inter-school competitions. However, the lack of variety in exercise models and limited coaching knowledge has resulted in a monotonous training atmosphere and weak physical components, particularly in agility, speed, and accuracy. This study aims to address this issue by developing a modified exercise model called Tic Tac Toe to enhance these physical attributes.

Gamified learning has been growing more popular as of late, both inside and outside the classroom (Hudaya & Salsabila, 2024). Some gamified models even incorporate modern technology with classroom activities (Hudaya, 2019) and some others can be done asynchronously (Rohayani, Malihah, & Hudaya, 2020). In particular, still in line with the above about gamified learning, the Tic Tac Toe exercise is a simple game involving strategy and quick decision-making. The concept can be adapted to basketball training to improve agility, speed, and accuracy in basic movements. Previous research by Arizal (2013) compared the effects of Tic Tac Toe drills with Four Corners drills on agility in soccer players, but this study focuses on the physical aspects of agility alone. Therefore, this research seeks to develop the Tic Tac Toe exercise model further to enhance agility, speed, and accuracy in basketball.

The proposed Tic Tac Toe exercise model involves participants navigating through pre-set posts in a zig-zag pattern, sprinting to place cones in designated boxes, performing lay-ups, and returning to the starting point to high-five their teammates. This exercise aims to improve coordination, speed, and accuracy by combining strategic movement with physical exertion.

Based on the above rationale, this study aims to investigate and develop training methods that combine the Tic Tac Toe game with physical exercises to enhance agility, speed, and accuracy in basic basketball movements among male students at SMP Kasih Kemuliaan.

II. METHODS

A. Development Model

This study employs the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model, widely recognized in instructional design for its systematic and interactive approach to developing effective educational programs (Nindiawati et al., 2021). The ADDIE model is designed to guide the creation of efficient and effective instructional designs, with each phase informing the next. The model comprises five main phases:

1. **Analysis:** Identifying the training needs and objectives, analyzing the characteristics of the trainees, reviewing relevant literature, observing training sessions, and conducting interviews with coaches and sports experts to gather insights and recommendations.
2. **Design:** Planning the training materials, instructional methods, and media to be used. This phase is informed by literature reviews and best practices from previous studies relevant to the research topic.
3. **Development:** Creating the training materials and media, followed by testing the developed training model. Limited trials are conducted to assess the feasibility and effectiveness of the Tic Tac Toe exercise model.
4. **Implementation:** Executing the training program using the developed Tic Tac Toe model, administering pre-tests and post-tests to evaluate improvements in agility, speed, and accuracy, and observing participants to assess the model's effectiveness and efficiency.
5. **Evaluation:** Assessing the training outcomes by analyzing data from pre-tests and post-tests, and gathering feedback from participants to measure satisfaction and provide insights for further refinement.

B. Product Testing Design

Product testing ensures the quality, relevance, and effectiveness of the developed training model. The testing process includes: (Aini, 2022)

1. **Expert Validation:** Feedback from experts in the field is sought to validate the design and ensure it meets established standards and criteria. This involves obtaining critiques and suggestions from sports experts and basketball coaches.
2. **Small-Scale Trial:** A trial with a small group of six participants is conducted to observe reactions and gather initial feedback.
3. **Large-Scale Trial:** The trial is expanded to eighteen participants to obtain more representative feedback and data on the model's effectiveness.
4. **Feasibility Testing:** Evaluating the suitability and applicability of the training model in real-world settings.
5. **Effectiveness Testing:** Measuring the training model's effectiveness by comparing pre-test and post-test results using paired t-tests to identify significant improvements in agility, speed, and accuracy.

C. Data Collection and Analysis Techniques

Data collection and analysis are critical components of the research process, involving:

1. **Agility Tests:** Utilizing the Lionis agility test, which requires a flat surface area, cones, and a stopwatch to measure participants' agility.

Table 1. Lionis test norms. Source: Mackenzie (2005)

Sex	Very good	Above average	Average	Under average	Low
M	< 15.2	15.2–16.1	16.2–18.1	18.2–18.3	> 18.3
F	< 17.0	17.0-17.9	18.0-21.7	21.8-23.0	> 23.0

2. **Speed Tests:** Conducting 30-meter sprint tests to evaluate participants' speed.

Table 2. 30m sprint norms. Source: Sepdanius (2019, in Armadhani, & Siantoro, 2022).

Category	Male	Female
Very Good	≤ 5.5s	≤ 5.8s
Good	5.6s – 6.1s	5.9s – 6.6s
Average	6.2s – 6.9s	6.7s – 7.8s
Low	7.0s – 8.6s	7.9s – 9.2s
Very Low	≥ 8.7s	≥ 9.3s

3. **Accuracy Tests:** Assessing participants' accuracy through lay-up drills in basketball.

Table 3. Accuracy test norms. Source: Author

No	Norm	Interval
1	Very Good	9–10
2	Good	7–8
3	Average	5–6
4	Low	3–4
5	Very Low	1–2

2.4. Data Analysis

Data analysis involves quantitative techniques to assess the training model's impact:

1. **Preliminary Study:** Utilizing surveys and questionnaires to gather initial data and validate the training model.
2. **Validation and Feasibility Testing:** Employing Likert scales to measure relevance and using Gregory's analysis technique for validation.
3. **Effectiveness Testing:** Analyzing pre-test and post-test data using paired t-tests with IBM SPSS Statistics to determine significant improvements. Hypothesis testing is conducted to compare the results before and after the training intervention.

III. RESULTS

A. Initial product development

This study aims to develop a Tic Tac Toe exercise model to enhance agility, speed, and accuracy in basic basketball movements among male students at SMP Kasih Kemuliaan. The researcher expects the developed product to function as a training model and serve as an alternative reference for coaches and athletes, providing a varied training routine. The goal is for the product to be user-friendly for both coaches and athletes during practice sessions.

The researcher conducted observations at SMP Kasih Kemuliaan. In addition to observations, interviews were conducted with coaches and athletes regarding the current training processes. The results of these observations indicated the following issues:

1. Lack of variation in training to improve agility, speed, and accuracy in basketball.
2. Coaches do not have guidelines or developed variations of exercises to enhance agility, speed, and accuracy.
3. Athletes appeared less enthusiastic and bored during practice due to the lack of varied training routines.

B. Expert Validation

The Tic Tac Toe training model was validated by three experts: Dr. (C) Aba Sandi Prayoga, S.Pd., M.Or., AIFO., Dr. Erick Burhaein, M.Pd., AIFO., and Rahmad Iqbal, S.Pd., M.Pd. Their feedback led to the following revisions:

a. **First Phase Validation by Content Expert** – Dr. (C) Aba Sandi Prayoga, an expert in sports education, evaluated the initial product. The first validation yielded a content feasibility score of 57.14%, categorizing it as "Fairly Feasible."
b. **First Phase Validation by Media Expert** – Dr. Erick Burhaein, an expert in coaching media and sports, evaluated the media aspect. The first validation yielded a media feasibility score of 51.42%, categorizing it as "Fairly Feasible."
c. **Second Phase Validation by Content Expert** – In the second phase, Dr. (C) Aba Sandi Prayoga reevaluated the content, resulting in a score of 77.14%, categorizing it as "Feasible."
d. **Second Phase Validation by Media Expert** – Dr. Erick Burhaein reevaluated the media aspect in the second phase, resulting in a score of 82.85%, categorizing it as "Feasible."
e. **Game Expert Validation** – Rahmad Iqbal, an expert in sports games, evaluated the model, resulting in scores of 77.14% for content feasibility and 82.85% for media feasibility, categorizing both as "Feasible."

Based on expert feedback, the Tic Tac Toe training model was revised accordingly. The model is now deemed highly feasible for both small and large-scale trials.

C. Product Revisions

Revisions were made based on expert feedback to improve the quality of the training model. Suggestions included creating multiple sets of the Tic Tac Toe equipment for group practice and adjusting the size of the cones used in the game.

D. Product Testing Results

a. **Small-Scale Trial** The small-scale trial was conducted at SMP Kasih Kemuliaan with 2 coaches and 6 athletes. The athletes practiced the Tic Tac Toe training model for approximately 15 minutes and then provided feedback. The results are as follows:

Table 4. Small-scale trial results. Source: Author

Aspect	S	Max S	%	Category
Physical	170	210	80.92%	Feasible
Usage	140	180	77.77%	Feasible
Average			79.34%	Feasible

The small-scale trial indicated that the Tic Tac Toe training model is feasible for improving agility, speed, and accuracy in basketball.

b. Hypothesis Testing

i. *Normality Test*: The normality test using Kolmogorov-Smirnov showed that all pre-test and post-test data were normally distributed (Sig > 0.05).

Table 5. Normality test results. Source: Author

Test	Pretest Sig.	Posttest Sig.	Normality
Lionis Agility Test	0.200	0.200	Normal
30m Sprint Test	0.198	0.200	Normal
Lay-Up Test	0.200	0.200	Normal

ii. *Homogeneity Test*: The homogeneity test indicated that pre-test and post-test data were homogeneous (Sig > 0.05).

Table 6. Homogenity test results. Source: Author

Test	F Value	Sig.	Homogeneity
Lionis Agility Test	202.405	0.031	Homogeneous
30m Sprint Test	-	-	Homogeneous
Lay-Up Test	-	-	Homogeneous

iii. *Hypothesis Testing*: Paired t-tests were conducted to evaluate the effectiveness of the Tic Tac Toe training model. The results showed significant improvements ($p < 0.05$) in agility, speed, and accuracy.

Table 7. Hypothesis testing results. Source: Author

Test	t-Value	Sig.
Lionis Agility Test	3.184	0.002
30m Sprint Test	3.177	0.000
Lay-Up Test	8.000	0.000

c. Large-Scale Trial: After revising the model based on small-scale trial feedback, a large-scale trial was conducted with 2 coaches and 18 athletes. The results are as follows:

Table 8. Large-scale trial results. Source: Author

Aspect	S	Max S	%	Category
Physical	450	630	71.42%	Feasible
Usage	425	540	78.70%	Feasible
Average			75.06%	Feasible

The large-scale trial further confirmed the feasibility and effectiveness of the Tic Tac Toe training model.

Based on these findings, the Tic Tac Toe training model is ready for implementation to enhance agility, speed, and accuracy in basketball among male students at SMP Kasih Kemuliaan.

IV. DISCUSSION

Based on the results, it can be concluded that the developed Tic Tac Toe training model is suitable for enhancing agility, speed, and accuracy in basic basketball movements. The model was validated with a content expert rating of 77.14% and a media expert rating of 82.85%, both falling within the “Feasible” category.

The Tic Tac Toe exercise contributes significantly to improving agility, speed, and accuracy in basketball. Although it appears simple, the game involves critical aspects such as quick thinking, rapid reactions, and strategic planning. When applied to basketball training, Tic Tac Toe provides an effective platform for developing both motor and cognitive skills required for the sport.

The game requires players to move swiftly between cells, make quick decisions, and adjust their strategies as the game progresses. In basketball, agility is crucial for evading opponents, creating shooting opportunities, and executing various movements during a game. By sharpening agility through Tic Tac Toe exercises, players can enhance their ability to maneuver on the court, overcome obstacles, and maintain control over their movements.

This training also plays a vital role in increasing the speed of basketball players. In Tic Tac Toe, players must make rapid decisions to anticipate opponents’ moves and build effective strategies. This engages both the brain and the body simultaneously, allowing players to develop both mental and physical speed. Continuous engagement in this game enables basketball players to experience significant improvements in reaction speed, giving them an edge in understanding and responding to the fast-paced dynamics of basketball games.

Accuracy in basic basketball movements can also be improved through Tic Tac Toe training. Players need to carefully choose the cell locations to achieve their objectives, requiring good control over their movements and a deep understanding of the impact of each step on the game’s outcome. In basketball, accuracy in dribbling, passing, and shooting are key skills that demand high precision. By consistently practicing and honing these skills through Tic Tac Toe exercises, players can optimize their basic movements’ accuracy and improve ball control on the court.

Besides enhancing agility, speed, and accuracy, Tic Tac Toe training also improves players’ ability to read and understand opponents’ strategies. Players must predict their opponents’ moves and dynamically adjust their strategies, enhancing their ability

to "read" the game. This skill is invaluable in basketball, where a quick understanding of the game situation can be crucial for success. By improving game-reading abilities through Tic Tac Toe training, players can make smarter decisions on the court and quickly adapt their strategies to match the game's dynamics.

Overall, the Tic Tac Toe training model has a significant positive impact on enhancing basketball players' agility, speed, accuracy, and game-reading abilities. Through a structured and consistent approach to this training, players can integrate the skills acquired into their basketball performance, leading to improved overall game proficiency.

V. CONCLUSION

The development and implementation of the Tic Tac Toe training model have proven to be effective in significantly enhancing the agility, speed, and accuracy of male basketball players at SMP Kasih Kemuliaan. Through expert validation and extensive testing, the model has demonstrated its feasibility and efficacy as a valuable training tool. By integrating critical cognitive and motor skills, the Tic Tac Toe exercise not only addresses the physical demands of basketball but also enhances players' strategic thinking and game-reading abilities. This innovative approach offers a structured, engaging, and impactful method for improving fundamental basketball skills, contributing to the overall advancement of athletic training programs.

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