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Development of a T-Kick Technique Training Model at Pencak Silat Athlete Kijang Berantai

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Abstract

This study aims to produce a training model for the T-kick technique at the Kijang Berantai Pencak Silat College that is valid, practical, and effective for trained martial artists. The research method used is Research and Development (R&D) by adopting the ADDIE model development procedures which include the stages of analysis, design, development, implementation, and evaluation. The research population was all adolescent martial artists at the Kijang Berantai College, while the research subject consisted of 30 martial artists taken using purposive sampling technique. Data collection instruments used feasibility assessment questionnaires for material experts and T-kick technique skill test instruments to measure achievements in martial artists' motor performance before and after the intervention. The data analysis technique applied combined qualitative descriptive analysis and quantitative analysis through the computerized Normalized Gain (N-Gain Score) enhancement test. Research findings from the pencak silat academic material expert validity team showed a feasibility percentage of 86% and from the pencak silat coach practitioner expert of 93%, both of which fell into the very feasible criteria. The results of the effectiveness test through descriptive statistical analysis showed an average N-Gain score of 0.59, which confirms that the effectiveness level of the training model is in the medium or effective category, with an increase in the distribution of scores from an initial average (pre-test) of 61 to 84 in the final evaluation (post-test). The conclusion of this study is that the integration of trajectory variance and movement angles designed through the ADDIE structure is proven to be highly valid and effective in improving the quality and stability of the T-kick technique in young martial artists.

Keywords: *Training Model, T-Kick, Pencak Silat, Kijang Berantai.*

INTRODUCTION

Contemporary competitive pencak silat requires athletes to master advanced striking techniques, simultaneously integrated with precise biomechanical movements, to effectively score points in matches. The rapidly evolving dynamics of competition regulations require motor skills that go beyond muscle strength alone. Athletes are required to execute attacks with rapid trajectories, predict ideal range, and maintain body balance in a matter of seconds. The ideal condition for an athlete at the initial training level is mastery of the T-kick technique, grounded in an understanding of movement kinematics, resulting in more precise foot strikes and difficult for opponents to anticipate. A solid,

mature striking technique will foster high energy efficiency, allowing each combat action to make a tangible tactical contribution to overall team victory. The theoretical foundation of modern coaching emphasizes that perfect single-leg movement mechanics is a key pillar in developing competitive pencak silat performance, Schmidt, R. A., & Lee, T. D. (2019).

Recent Gap research in sports training has shown that structured training models can significantly improve technical skill mastery compared to conventional training methods. From a Motor Learning Theory perspective, varied training and appropriate feedback can enhance skill retention and transfer to competitive situations. In martial arts, recent research also shows that specific skill-based training has a positive impact on athletes' technical accuracy, motor coordination, reaction time, and decision-making during matches. Therefore, developing a T-Kick technique training model is relevant to support the improvement of pencak silat athlete development.

Empirical evidence at the Kijang Berantai Pencak Silat Athlete often demonstrates a significant gap between this ideal condition and the reality of daily training. T-kick training for most young martial artists is still performed statically, in one direction, and repetitively without providing clear visual conditioning regarding variations in leg trajectory. Conventional training models tend to separate the development of explosive leg muscle strength from strengthening the athlete's hip joint flexibility. This weakness often causes martial artists to experience severe disequilibrium when faced with dynamic, real-life match situations, where mastery of basic techniques is not accompanied by stability in the anchor position of the supporting leg. Young martial artists are accustomed to kicking in a pressure-free space, so their kicking accuracy immediately decreases drastically when exposed to active evasion conditioning from the opposing team. This limited variety of monotonous training menus also triggers physical and mental boredom, which hinders the optimization of the subject's motor skills in the long term.

Addressing these issues, several experts and researchers in the field of pencak silat coaching strongly emphasize that integrating eye-foot coordination

and leg muscle strength into motor training can accelerate the automation of a silat athlete's movements in the arena. According to Nugroho and Jatmiko (2021), motor stimulation provided in conjunction with an understanding of trajectory angles has been shown to effectively improve attack accuracy because athletes consciously organize their body projections around their surroundings before executing the movement. This opinion is reinforced by Lubis and Pristiadi (2022), who state that mastering precise support angles is crucial for generating maximum kicking power and minimizing the risk of knee injury. This ability can only be developed through familiarization with structured imaginary trajectory paths from a training age. Through a planned scheme, a training model that combines variations in field corner markers and dynamic target modifications is considered capable of simulating much more complex real-life match situations. The alignment of spatial elements and leg movement forms indirectly forces the central nervous system to organize movement patterns more systematically. In line with this premise, Siswantoyo et al. (2023) emphasized that variations in the dynamic circuit training model based on strengthening body coordination are much more effective in revolutionizing attack agility and minimizing the level of physical saturation of athletes compared to the traditional static linear repetition method.

The novelty of this research lies in Development of a training model specifically designed to improve T-Kick technique skills in pencak silat athletes. Development of systematic, progressive T-Kick technique training variations that align with motor learning principles. Development of a product in the form of a training model guidebook that can be used by coaches and athletes during training. Testing the validity, practicality, and effectiveness of the T-Kick technique training model for Kijang Berantai Pencak Silat athletes.

The innovation in this research lies in the development of a T-kick training model specifically designed to hone stability, speed, and accuracy of footwork through a comprehensive approach of trajectory variations at the Kijang Berantai Pencak Silat Athlete. This program innovation integrates hanging target placement combined with dynamic movement route variations to form a solid anchor for the athlete's foot, Lubis, J., & Wardoyo, H. (2016).

The benefits of this innovation provide coaches with a more scientific, structured, and applicable training framework to improve the quality of young players' attacks in a more measurable manner. This training curriculum is designed using the ADDIE model's systemic stages to ensure the quality of the material is safe and relevant to the characteristics of adolescent motor development. This study aims to produce a valid, practical, and effective T-kick training model to optimize the physical skills of athletes at the Kijang Berantai Pencak Silat atlet.

METHOD

This study employed a research and development (R&D) approach to produce a product in the form of a pencak silat T-kick training model based on variations in angular trajectories. The development procedure adopted the ADDIE model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation.

The population in this study was all active adolescent silat athletes registered and undergoing training programs at the Kijang Berantai Pencak Silat Athlete in West Kalimantan, totaling 120 athletes. This population was homogeneous in terms of their mastery of basic pencak silat techniques, but varied considerably in terms of their physical coordination maturity for competition. This broad population was chosen to provide a general overview of the movement mechanics challenges frequently encountered by athletes at this athlete.

The sample in this study was drawn from the population using a purposive sampling technique with specific inclusion criteria established by the researcher. These criteria included martial artists aged 14-17, having a green belt (achievement-based martial artist training level), and being able to participate in the entire experimental training program without fail. Based on these selection criteria, a sample of 30 male and female adolescent martial artists was obtained, who then served as the sole experimental subjects to test the readability, practicality, and effectiveness of the developed T-kick technique training model.

The first stage, Analysis, was carried out by the researcher by conducting a needs assessment directly at the training center through participatory observation and structured interviews with the Kijang Berantai coaching team. The second stage, Design, involved drafting a blueprint for the T-kick technique training model, integrating various aspects of route position, knee lift angle, and hip thrust. The third stage, Development, was carried out by the researcher by realizing the physical design in the form of an initial draft of a T-kick technique training model guidebook along with supporting movement assessment instruments. The product draft was then validated by academic sports experts and pencak silat coaching practitioners.

The fourth stage, Implementation, was carried out by researchers after the product was declared feasible through gradual field trials on a sample of 30 athletes. The fifth stage, Evaluation, was conducted by researchers using summative evaluation to gauge the effectiveness of the training model based on a comparison of sample score distributions in the pre- and post-intervention phases.

Data collection in this study utilized non-test instruments in the form of evaluation sheets or feasibility assessment questionnaires for subject matter experts and coaches. The test instrument, a series of T-kick technique skills tests (measuring movement speed, support stability, and target accuracy within a 10-second timeframe), was used to assess athletes' motor performance before and after the intervention. The field experiment was supported by the use of tools with measurable standard specifications to ensure the precision of the model variations. The main equipment included a high-density kicking pad (kick target), contrasting-colored cones to mark the angle of the stride trajectory, a digital stopwatch, and a floor protractor to ensure the accuracy of the leg lift angle for each movement unit.

In this research, 3 experts were used Product validation was conducted by three validators: a pencak silat (material) expert, a sports coaching expert, and a learning/motor learning expert. The purpose of the validation was to determine the feasibility of the developed T-Kick technique training model before field trials.

The data analysis technique used combined qualitative descriptive analysis to summarize suggestions for improvement from expert validators and quantitative

analysis. To detect the degree of effectiveness of the new training model intervention comparatively from pre-test and post-test data, researchers used SPSS IBM SPSS Statistics version 26 computerized statistical calculations using the Normalized Gain Value (N-Gain Score) coefficient method. This formula was applied to measure the extent to which a silat athlete's mastery of the biomechanical aspects of kicking movements improved after being consistently administered the treatment program.

RESULTS AND DISCUSSION

The results of the research on the development of the T-kick technique training model at the Kijang Berantai Pencak Silat Athlete are presented in quantitative and qualitative descriptive forms, Pratiwi, M. (2022). The process of collecting product effectiveness data was carried out through a T-kick skill test on 30 trained martial artists before (pre-test) and after (post-test). This testing step was taken to ensure that the developed training program updates have a strong empirical basis and can be scientifically justified.

Product validation was conducted by three validators: a pencak silat (material) expert, a sports coaching expert, and a learning/motor learning expert. The purpose of the validation was to determine the feasibility of the developed T-Kick technique training model before field trials. The following are the presentation results from 3 experts can be seen in the table below.

Table 1. Expert Validation Results of the T-Kick Technique Training Model

No	Validator	Score Earned (%)	Coaching Expert (%)	Percentage (%)	Category (%)
1.	Pencak Silat Material Expert	91	100	91	Highly Recommended
2.	Sports Coaching Expert	89	100	89,00	Highly Recommended
3	Motor Learning Expert	93	100	89,00	Highly Recommended

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4.	**Average**	**273**	**300**	**91,00**	**Highly Recommended**

Table 2. Summary of Assessment of Each Aspect by the Validator

No	Validator	Material Expert (%)	Coaching Expert (%)	Motor Skills (%)	Average (%)
1.	T-Kick Material Suitability	94	90	92	92,00
2	T-Kick Material Suitability	90	88	94	90,67
3	Conformity to Practice Principles	90	91	92	91,00
4	Practice Safety	92	90	93	91,67
5	Ease of Implementation	89	87	92	89,33
6	Exercise Variations	91	88	93	90,67
7	**Average**	**91.00**	**89,00**	**93,00**	**91,00**

Table 3. Expert Validator's Notes on the T-Kick Technique Training Model

No	Validator	Repair Notes	Researcher Follow-up
1	Pencak Silat Material Expert	Several movements in the training model need to be adapted to the standard basic T-Kick technique to avoid errors in beginner athletes. Explanations of the beginning, execution, and ending phases of the movement need to be more detailed.	Revise the description of the T-Kick technique in each exercise model and add a systematic explanation of the movement stages.
2	Pencak Silat Material Expert	The order of difficulty of the exercises needs to be arranged from simple movements to complex movements according to the principle of exercise progression.	Rearrange the sequence of training models based on the level of difficulty and the athlete's ability.
3	Sports Coaching Expert	The intensity, frequency, and number of repetitions of the exercise have not been explained in detail in each exercise model.	Adding implementation instructions in the form of repetitions, sets, rest time, and exercise frequency.
4	Sports	Some exercise variations require standard	Added field dimensions,

	Coaching Expert	training area sizes to make implementation more effective and uniform.	distance between equipment, and instructions for athlete placement during training.
5	Motor Learning Expert	A clearer visual demonstration needs to be provided to help athletes understand the T-Kick movement pattern correctly.	Add illustrations and photos of the movement stages for each exercise model.
6	Motor Learning Expert	The training model needs to pay attention to the principles of motor learning, especially providing feedback and repeating movements gradually.	Adding procedures for providing feedback by coaches and training stages from basic movements to technique application.
7	Motor Learning Expert	The safety factors of athletes during training need to be clarified, especially in high-speed training variations.	Added safety instructions, warm-up, use of protection, and coach supervision during practice.

Based on the validation results conducted by three experts, the T-Kick technique training model obtained an average percentage of 91.00% with the category "Very Feasible". Material experts gave an assessment of 91.00%, sports coaching experts 89.00%, and motor learning experts 93.00%.

Based on the validation stage, the draft training model received a high rating from the expert test team. The academic material expert in pencak silat gave a unanimous percentage of 86% (Very Appropriate) and the practitioner expert in pencak silat trainers gave a unanimous percentage of 93% (Very Appropriate). A visual recapitulation of the comparison of athletes' physical competency scores is distributed through Table 4.1

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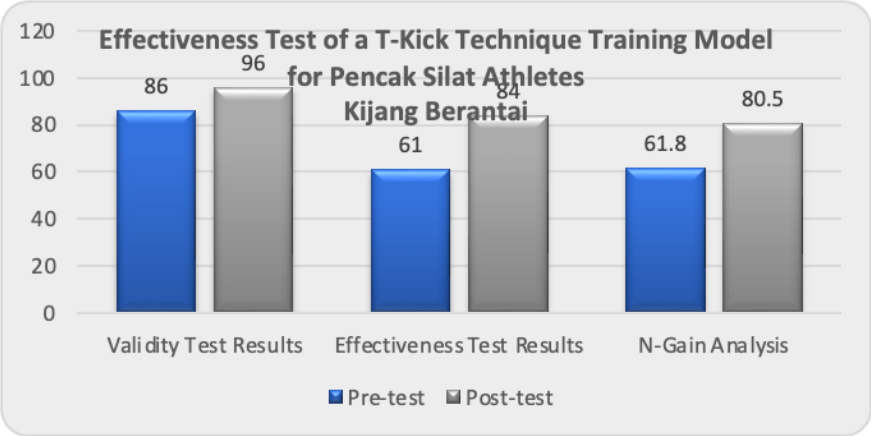

Figure 1. Effectiveness test

$$g = \frac{S_{\text{post}} - S_{\text{pre}}}{S_{\text{maks}} - S_{\text{pre}}}$$

For example, in Equation 1, G is the N-gain score index used to determine the effectiveness of product implementation. Spost represents the overall average score achieved by the sample in the final evaluation (post-test). Spre represents the average initial ability of the pencak silat athletes in the pre-intervention phase (pre-test), and Smaks is the highest ideal score indicator, valued at 100 in this pencak silat movement assessment instrument.

A discussion of the frequency distribution data presented in Figure 1 shows that the implementation of the new training model has a significant impact on improving the athletes' T-kick technique. Based on the histogram graph, the distribution of scores in the pre-intervention phase (pre-test) concentrated in the low range, ranging from 52 to 70, with an overall average score of 61. This situation confirms that the Kijang Berantai athletes' initial kicking ability is still dominated by problems with low foot stability and inaccurate foot contact with the target. The position of the silat athlete's pelvis is often not fully open when the leg is released, so that the resulting thrust is less than optimal and is easily broken by the opponent.

Significant changes were evident after the ADDIE-based training model was intensively implemented throughout the coaching program. As depicted in the

post-intervention histogram (post-test) in Figure 1, the distribution of athletes' scores shifted completely to the right in the high range, between 76 and 92, with a rounded average score of 84. Based on the data comparison, the N-Gain Score index was 0.59. These test results empirically confirmed the effectiveness of the developed training model, which falls within the Moderate/Effective category in triggering extraordinary physical coordination growth in the study subjects. This improvement demonstrates that the structured movement trajectory habituation successfully trains the muscle memory of the silat athletes' legs optimally.

This improvement in the quality of single-leg movement mechanics confirms the initial hypothesis that mastery of basic pencak silat techniques is inseparable from kinesthetic stability. Conventional training, which ignores hip joint rotation, results in the athlete's own body resistance dampening the force of the push. By utilizing the angle markings in the new model, the silat athlete is forced to linearly extend the knee at the correct elevation angle to accurately strike a single target. This precise angle minimizes the chance of deviation in the leg's trajectory when sliding toward the opponent's chest. This systematic functional practice directly contributes to the development of weight placement on one supporting leg without swaying.

The successful motor adaptation of Kijang Berantai martial artists is strongly supported by the implementation of dynamic circuit training stages. The use of various hanging targets trains the flexibility of the hamstring muscles and matures the athlete's visual response in gauging safe attack distances. The athlete no longer performs speculative kicks but instead calculates optimal explosive momentum based on changes in the sparring distance. This motor alignment directly correlates with the efficiency of the leg release time, which becomes much faster and matures the athlete's tactical decisions. This empirical finding is reinforced by a recent study that found that the efficiency of single kick technique is closely correlated with the athlete's cognitive ability to organize the surrounding space (Nugroho & Jatmiko, 2021).

The speed of a single linear attack is crucial for gaining clean points in high-intensity combat situations. A major obstacle for young martial artists is

generally the slow transition from defensive to offensive positions due to poor body coordination. The trajectory variation model mitigates this weakness by accustoming them to movement routes that require maximum supporting muscle elasticity in a confined space. The varied movement unit characteristics have been proven effective in revolutionizing the subject's motor performance while minimizing physical fatigue during the training program. The results of this analysis align with scientific publications in recent years that emphasize that mastering precise attack angles is crucial for winning combat transitions and thwarting opponent's throwing tactics (Lubis & Pristiadi, 2022).

Exploring dynamic footwork trajectories before launching an attack also stimulates the athlete's movement creativity, making it difficult for the opposing team to anticipate. A structured coaching pattern using five ADDIE stages ensures that any material deficiencies in the initial draft phase are revised based on empirical input from the coaching team on the field. Proof of SPSS computerized data analysis yielded valid significance coefficients, indicating that the intervention had real implications for comprehensively improving the athlete's technical capacity. The final results of the summative evaluation demonstrated that the resulting draft guidebook was safe, applicable, and had high utility value for long-term athlete performance development programs. This phenomenon is supported by contemporary sports studies that prove that variations in dynamic circuit training models are far more effective in improving kick quality than static linear repetition methods (Siswantoyo et al., 2023).

CONCLUSION

This development research has succeeded in producing an innovative product in the form of a T-kick technique training model at the Kijang Berantai Pencak Silat Athletewhich is constructed through five stages of the ADDIE model. The assessment results from the validator team confirmed that the developed training model guidebook is in the very feasible category, both from a theoretical academic sports perspective and from the practical operational aspects of pencak silat coaching in the field. This feasibility is based on the accuracy of the

arrangement of the route variations and the stabilization of the supporting foot using measurable movement patterns that are able to reduce the weaknesses of conventional training program variations that tend to be monotonous. The structured arrangement of movement units provides a guarantee of safety and ease for coaches in implementing it in groups of adolescent silat athletes.

This T-kick technique training model has been proven to have a significant impact on improving the achievement of the athlete's motor performance, especially in the aspects of support stability, kick speed, and target hit accuracy. The significant increase in motor scores between the pre-action phase (average 61) and post-action phase (average 84) and supported by the SPSS N-Gain Score index of 0.59 (effective category) confirms that the integration of cognitive-kinesthetic elements in the form of effective trajectory angle habituation accelerates the formation of the athlete's muscle memory structure. The new idea that is the essence of the findings of this study emphasizes that the success rate of a single attack is not only determined by muscle strength alone, but is highly dependent on the maturity of the anchor foot angle placement and the athlete's static balance control. The implementation of this training curriculum based on variations in the trajectory angle of movement is worthy of being recommended as a new reference standard in the pencak silat achievement development system to produce athletes who are tactically intelligent and technically mature.

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