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Development of Forehand and Beckhand Spin Training Equipment in Table Tennis

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Abstract

This study aims to produce a mechanical training tool for table tennis forehand and backhand spin techniques that are valid, practical, and effective for Junior High School Extracurricular athletes consisting of SMPN throughout Teluk Kermat District. The research method used is Research and Development (R&D) by adopting the Brog and Gall model development procedure (Research and Information Collecting, Planning, Develop Preliminary Form of Product, Preliminary Field Testing, Main Product Revision, Main Field Testing, Operational Product Revision, Operational Field Testing, Final Product Revision, Dissemination and Implementation). The research sample consisted of 30 adolescent athletes aged 12-15 years selected using a purposive sampling technique. Data collection instruments included a feasibility assessment questionnaire for experts and a skill test instrument using the Target Grid Assessment technique to measure athletes' motor performance before and after the intervention. The results of the research from the expert validation team showed a feasibility percentage of 88% and from the trainer practitioners at 91%, both of which were included in the very feasible criteria. The results of the effectiveness test showed an average N-gain score of 0.65, which confirms that the level of effectiveness of the training model is in the moderate or effective category, with an increase in the distribution of scores from the initial average (pre-test) of 63 to 86 in the final evaluation (post-test). The conclusion of this study is that the integration of mechanical training tools designed through the structure is proven to be very valid and effective in improving the quality and accuracy of spin technique stability in young athletes. This study aims to produce a mechanical training tool for table tennis forehand and backhand spin techniques that are valid, practical, and effective for Junior High School Extracurricular athletes (SMP) consisting of SMPN throughout Teluk Kermat District.

The research method used is Research and Development (R&D) by adopting the Brog and Gall model development procedure (Research and Information Collecting, Planning, Develop Preliminary Form of Product, Preliminary Field Testing, Main Product Revision, Main Field Testing, Operational Product Revision, Operational Field Testing, Final Product Revision, Dissemination and Implementation). The research sample consisted of 30 adolescent athletes aged 12-15 years selected using a purposive sampling technique. Data collection instruments included a feasibility assessment questionnaire for experts and a skills test instrument using the Target Grid Assessment technique to measure athletes' motor performance before and after the intervention. The research results from the expert validation team showed a feasibility percentage of 88% and from the trainer practitioners of 91%, both included in the very feasible criteria. The effectiveness test results showed an average N-gain score of 0.65, which confirms that the level of effectiveness of the training model is in the moderate or effective category, with an increase in the distribution of scores from an initial average (pre-test) of 63 to 86 in the final evaluation (post-test). The conclusion of this study is that the integration of mechanical training tools designed through the structure is proven to be very valid and effective in improving the quality and accuracy of spin technique stability in young athletes.

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Keywords: *Training Tool, Forehand Spin, Backhand Spin, Table Tennis.*

INTRODUCTION

In today's table tennis, ball speed and spin are the most important factors in winning. Players can no longer simply hit the ball straight or defend. Athletes are required to master spin shots, whether using the right hand in front (forehand) or backhand. Athletes with strong spin can easily control the ball's trajectory, confuse their opponents, and deliver devastating attacks. Swinging the bat to produce effective spin is not easy, as it requires strong instincts, precise hand-eye coordination, and sensitivity as the rubber rubs against the ball's surface.

For athletes just starting out or still in their teens, mastering the basics of spin consistently is often a major challenge. Ideally, they should be able to swing the bat at the same angle repeatedly to achieve perfect spin on the ball. However, the reality on the field is different. Typical drills used by coaches, such as throwing multiple balls manually (multiball), are ineffective for beginners. The balls thrown by coaches often change direction and vary in speed. This makes it difficult for young athletes to find the right contact point on the ball, resulting in frequent misses or even balls going off the table.

Seeing this problem, several table tennis coaches in Indonesia have suggested that clubs begin using mechanical aids to help athletes' muscles more quickly accustom themselves to the correct movements. According to Pratama and Saputra (2021), practicing with a stationary mechanical aid can accelerate athletes' understanding of the correct bat angle, as they are less likely to chase a moving ball. Wibowo and Kurniawan (2023) echoed this sentiment, writing that a stable spin shot can only be achieved if the athlete's hand becomes accustomed to applying a slight friction to the top of the ball. This hand reflex requires repeated practice on a fixed device before athletes can compete with a live ball on the court. Furthermore, Gunawan et al. (2024) added that variations in independent training using such aids have been shown to be effective in increasing athletes' stroke endurance and preventing boredom compared to simply doing the same routine.

Therefore, researchers created an innovation in the form of a new mechanical training tool for forehand and backhand spin. The advantage of this

tool is that it has an elastic rotating ball shaft and is equipped with a rubber bat friction resistance regulator. So, when athletes rub the ball on this tool, they can immediately feel whether the friction is correct or not. This tool can also be raised and lowered according to the athlete's height or the desired ball simulation type. The tool and training program were designed using the Brog and Gall model system so that the results are completely safe for teenagers, easy to use, and suitable for their training needs. This research is expected to produce a training aid that is valid, easy to use on the field, and effective in improving the spin ability of table tennis athletes.

METHOD

This research uses the Research and Development (R&D) method. The main goal is to create a physical product in the form of a mechanical aid to train spin in table tennis. The process of creating this tool follows the Brog and Gall model, which consists teen simple stages: The development procedure adopted the brog and gall model, which consists of teen systematic stages: Research and Information Collecting, Develop Preliminary Form of Product, Preliminary Field Testing, Main Product Revision, Main Field Testing, Operational Product Revision, Operational Field Testing, Final Product Revision, Dissemination and Implementation.

This research was conducted at the “Extracurricular Activities At State Junior High Schools Table 6 Teluk Keramat” Junior High School Extracurricular athletes consisting of SMPN throughout Teluk Kermat District” with a total of 38 teenage athletes in the club. From this total population, researchers selected a sample of 30 teenage athletes using a purposive sampling technique. The requirements for the athletes selected for the sample were that they were between 12 and 15 years old, attended practice regularly (at least 85% attendance), and were fluent in basic drive strokes. The research design for this sample group used a one-group pretest-posttest design.

In the initial stage of the research (Analysis), researchers monitored athletes' swing weaknesses through video recordings and then discussed with club coaches the limitations of the self-training equipment. In the Design stage,

researchers drew a blueprint for the equipment, specifying materials such as steel springs and strong rotating bearings. In the Development stage, the finished equipment was submitted to sports lecturers and senior table tennis coaches for feasibility checks. In the Implementation stage, the equipment was first tested on a small group of 10 athletes, followed by a large group test on 30 sample athletes over 16 training sessions.

The data collection technique in this study used the Circular Target Distribution Accuracy Performance Test system (Target Grid Assessment). The method, the tennis table in the opponent's area was installed with a circular target marker line with a score of 1 to 5. Each athlete was asked to perform 20 spin strokes using this new tool, then the researcher calculated how many total scores they managed to collect from the circular targets on the table (the highest score if all strokes were on target was 100). For data on the feasibility of the tool, the researcher distributed an assessment questionnaire to a team of experts. All data on the increase in technical ability from the initial test and the final test were then calculated using the Normalized Gain (N-Gain Score) statistical formula to see the percentage of effectiveness.

RESULTS AND DISCUSSION

The research data for this table tennis spin training tool is presented in simple, easy-to-read numerical form. Experts evaluated this training tool with excellent scores. Sports experts gave it a rating of 88% (Very Appropriate), and field table tennis coaches gave it a rating of 91% (Very Appropriate). To see how athletes' hitting abilities developed before and after using this tool, the distribution of scores can be seen in the histogram graph in Figure below :

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Figure 1. Frequency Distribution of Table Tennis Spin Skill Scores Before and After Implementation of Spin Training Aids

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

For example, in Equation 1, it is known that G is the N-gain score index to determine the level of effectiveness of product implementation, while represents the overall average value achieved by the sample in the final evaluation (post-test), Spra represents the average value of the athlete's initial ability in the pre-action phase (pre-test), and Smaks is the highest ideal score indicator with a value of one hundred in this table tennis movement assessment instrument.

The 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 table tennis spin technique skills. Based on the histogram graph, the distribution of scores in the pre-intervention phase (pre-test) is concentrated in the low range of values, ranging from 50 to 75 with an overall average score of 63. This situation indicates that the initial ability of the the “Extracurricular Activities At State Junior High Schools Tennis Table Junior High School Extracurricular athletes consisting of SMPN throughout Teluk Kermat District athletes in spinning is still dominated by problems with low hand movement stability and inaccuracy in contact with the bat rubber on the ball. Their hands are not used to loving the bat

properly, so the ball does not spin but is only pushed normally and falls randomly outside the target circle of the opponent's table.

Significant changes were evident after the brog and gall-based training model was intensively implemented during the training 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 of values, namely between 75 and 100 with a rounded average score of 86. Based on the results of the comparison of these data and after being entered into the calculation of Equation 1, the N-gain score index value was obtained at 0.65. The results of this test empirically conclude that the effectiveness of the developed training tool model is in the Moderate or Effective category in triggering extraordinary physical coordination growth in the research subjects. This increase proves that the habituation of structured motion trajectories successfully trains the muscle memory of the athletes' hands optimally.

Why can this mechanical device dramatically improve an athlete's hitting? This is because it simplifies focus during training. While a typical workout can be disrupted by athletes having to think about their footwork while chasing a bouncing ball, this new device eliminates that problem. The ball's position on a stationary spring-loaded axle allows athletes to calmly practice their hand swing repeatedly at the same bat angle. When the bat's rubber strikes the ball correctly, the ball in the device rotates smoothly without disrupting the balance of the support bar. This disciplined and repetitive practice is what consistently builds muscle memory in their wrists (wrist snap).

Furthermore, the adjustable resistance of this device allows the athlete's forearm muscles to respond to the thickness and fineness of the rubber on the ball. They no longer hit the ball haphazardly, but develop a mature feel for when to swing hard to produce sharp spin. The results of this study strongly align with modern coaching theory, which states that the key to successful spin shots lies in the athlete's visual and spatial abilities in positioning the bat's angle relative to the incoming ball (Wibowo & Kurniawan, 2023). Based on computer data processing, the developed manual and parallel mechanical device have proven to be safe,

comfortable for children to use, practical, and have important uses for long-term club training programs.

CONCLUSION

This development research has successfully produced an innovative product in the form of a mechanical training aid for forehand and backhand spin in table tennis which is constructed through five systematic stages of the Braog and Gall model. The assessment results from the validator team stated 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 table tennis coaching on the field. This feasibility is based on the accuracy of the measured axis settings which are able to reduce the weaknesses of conventional manual ball throwing (multiball) training programs which tend to be monotonous and difficult for beginner athletes.

This training tool has also been proven to have a significant impact on improving athletes' motor performance, especially in the aspects of swing stability, rotation speed, and target accuracy. A significant increase in motor scores between the pre-action (average 63) and post-action phases (average 86) and supported by an N-gain score index of 0.65 (effective category) confirms that the data collection model using the target circle on the table (Target Grid Assessment) is very suitable for recording the development of athletes' motor skills. Therefore, the use of this dynamic pivot mechanical training tool is highly recommended to be a mandatory training menu in table tennis clubs in order to produce young athletes who have mature hitting techniques, are tactically intelligent, and have quality.

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