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Development of a Training Model to Improve the Shooting Ability of Beginner Petanque Athletes

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Abstract This research develops a specialized training model to enhance the shooting performance of beginner petanque players. Preliminary observations revealed that existing training models lacked focus and structure. The technical drills were conducted for a very short duration. Moreover, the lack of consistent coaching or supervision reduced the effectiveness of the training. To address these issues, the present study adopted a research and development (R&D) design to develop a more systematic and diverse model for shooting exercises. Model validation was achieved through consultations with experts in petanque and sports coaching. Data collection involved the use of questionnaires and evaluation forms. The samples were gathered from beginner petanque athletes at the YABNI Foundation in Padang City. They were selected using a total sampling method. Findings demonstrated that the newly designed model significantly improved training effectiveness, as reflected in an average respondent rating of 4.64 with a low standard deviation of 0.66. These figures indicate stable and consistent feedback. Additionally, both small-scale and large-scale trials produced highly positive outcomes, confirming that the model is suitable for practical implementation to enhance the shooting proficiency of beginner athletes. While the findings seem promising, several limitations should still be acknowledged. The limitations include the population level (limited to beginner athletes at the YABNI Foundation in Padang City), the short duration of the training model, and external variables such as weather conditions and individual motivation that were not fully controlled. In addition, the evaluation method remains subjective, relying on a questionnaire. Therefore, further research is recommended to involve a larger population over a longer research duration to assess its long-term effects. Implementing more objective evaluation methods, enriching mental training, and increasing supervision of trainers can also improve the effectiveness of this training model.

Keywords Training Model, Shooting Ability, Petanque, Beginner Athletes

1. Introduction

Petanque is a sport that emphasizes precision, strategy,

and technique and is increasingly popular in various countries, including Indonesia. This sport involves two main throwing techniques, namely pointing and shooting [1]. Pointing is a crucial ability as it requires a certain duration of eye stillness to aim the target [2]. Effective pointing requires a standing position to significantly improve accuracy [3]. In petanque, precision is more complex than just visual focus [4].

Researchers have developed training models to sharpen pointing skills that ultimately improve athlete performance [5]. They carefully consider several aspects when designing the training models, such as the functional-physiological areas of the body related to the targeted locomotor demands [6] and the integration of balanced fitness components [7]. Existing models primarily focus on increasing arm muscle strength to gain greater improvements in shooting accuracy than training that focuses solely on precision [8]. This suggests that a more targeted training approach focusing on physical-structural conditioning will yield greater improvements [9]. In addition to a targeted approach, proper training techniques are necessary for effective exercise [10]. Better performance is observed when athletes have balanced coordination and focus, which clearly demonstrates the mental demands [11].

Another key skill in petanque throwing is shooting, the ability to displace the setting ball of the opponent with precision and control [3]. Successful shooting requires proper ball grip, body alignment, and follow-through, emphasizing the need for proper technique [12], [13]. This skill is the most difficult to execute in the game. For novice players, this technique is difficult to master because it requires specific trained muscle groups. Therefore, training targeting this precision shooting has been increasing, such as placing shooting cues in the context of a cardio workout and interval training, and shooting specific distance targets for conditioning [14].

Distance shooting in a vertical position is a key exercise for petanque distance players [15]. Some of the dominant physical features that aid in shooting are height, arm length, hand strength, and body elasticity. These features, along with conditioning, account for 78.5% of the conditioning needed for shooting petanque [16]. Having conditioning will streamline a player's technique which results in better shooting [17]. In this training, the ability to focus and ‘hear’ the body movement is crucial for accuracy [18], [19]. Another crucial ability is to ‘see’ the shot and the body movement [20]. Some researchers argue that the Duo Tir has been proven to enhance shooting precision. This equipment is a cost-effective way to meet the training needs of petanque athletes [21].

This study aims to support beginner athletes by developing a training model to enhance shooting skills. The training model is designed to specifically develop the motor skills needed to enhance concentration and precision, thus improving their performance in competitive matches.

This research develops and evaluates a targeted training model for novice petanque players, particularly focusing on the shooting techniques. The comprehensive nature of the model is expected to serve as a training model paradigm, as it includes psychological components of precision sports and consistent performance evaluation. This study is significant because its findings may assist coaches and players in developing and refining a primary skill set essential to the sport. These skills can be improved to prepare the athletes for match competition. To achieve the objectives, this research is guided by the following research questions:

1. RQ1: What is the development of a training model to enhance shooting skills for beginner petanque players?
2. RQ2: What are the effective and efficient models of basic shooting techniques in petanque for beginner players?

2. Materials and Methods

2.1. Research Design

This specific investigation adopted a research and development (R&D) approach. In education, R&D refers to developing and improving innovative teaching methods and instructional materials to enhance the value and effectiveness of educational outcomes [22]. This approach encompasses a number of phases - analysis, design, development, implementation, and evaluation- each of which calls for the sustained and careful effort needed to create educational materials that are worthwhile and functional [23]. In this case, an attempt was made to develop, design, implement, and evaluate a training framework to improve the shooting techniques of novice petanque players.

2.2. Procedures

The development of the training model was structured using the following procedures:

a. The first stage began with doing need analysis through field observations, interviews with petanque coaches, and athletes’ questionnaires. This stage aims to identify problems and barriers that participants and coaches are facing during training. In addition, it identifies the essential components to include in the training model.
b. The stage was followed by the design stage. Based on the needs analysis’s results, a training model was created tailored to the athlete’s level, capacity, and situation. This model outlined the types of shooting techniques, training frequency, duration, and variations intended to enhance shooting accuracy, strength, and consistency.

c. The next stage was expert validation. The designed training model was then validated by several experts, including experienced petanque coaches and academics specialized in sports. The validation was carried out to ensure that the training model was developed in line with the principles of sports training and is relevant to the needs of beginner athletes.
d. After validating the model, a limited trial was conducted with a small group of beginner petanque athletes, consisting of 10-15 participants. This trial aimed to observe the initial response to the developed training model and identify areas that need improvement.
e. The next stage was the model revision. Based on the results of the limited trial and expert feedback, the training model was revised to improve its effectiveness. This revision included adjusting the training duration and intensity, and modifying the types of training that were considered less optimal.
f. After the revision, a large-scale trial was conducted with a larger number of participants (20-30 beginner petanque athletes). Data collection involved test exercises on shooting ability, conducted before and after the training sessions. Athlete performance was measured based on shooting accuracy, shooting power, and consistency in various match situations.
g. Following that, the stage continued with data analysis. The data from the large-scale trial were analyzed quantitatively using advanced statistical measures, including the paired t-tests, to assess differences in athletes' shooting skills between pre- and post-training model applications. In addition, a qualitative analysis was carried out using coach observations and interviews with athletes about their experiences during the training program.
h. The final stage was the conclusion and recommendation. At this stage, the effectiveness of the training model was evaluated. Along with that, recommendations on the use of this training model and its refinement for advanced athletes are presented to coaches and athletes.

This research method is expected to produce an effective and applicable training model to improve shooting ability among beginner petanque athletes. The preliminary version of the model comprised nine foundational concepts to improve accuracy. These exercises require athletes to execute shots using several targets and constraints, including 1) a single ball target, 2) a rope, 3) a standing tyre barrier, 4) a small goal, 5) a barrier in front of the target, 6) two balls, 7) a large goal, 8) car tyres, and 9) a target between barriers (see Figure 1).

(1) (2) (3)

(4) (5) (6)

(7) (8) (9)

Figure 1. Petanque shooting practice model

3. Result

Our initial observation revealed that many novice athletes have difficulty achieving shooting accuracy and consistency, especially under pressure. Therefore, this study responds to this need by designing a training model that focuses more on technical and mental aspects. Overall, the eight-week implementation of the training model managed to improve the athlete's shooting ability, particularly their accuracy, strength, and consistency. These findings were reinforced by statistical results that showed a significant difference in performance before and after the training. This difference indicates that the improvements were caused by the training developed for the athletes.

The process of developing this model involved several stages, starting from needs analysis to limited and large-scale trials. This section elaborates on the findings of each stage.

a. *Needs Analysis*. Data for this stage were collected through observation, interviews with experts, and questionnaires distributed to the participants. Results showed that beginner petanque athletes faced similar difficulties, especially those related to shooting accuracy and consistency under pressure. In addition, existing training tended to be less varied and less focused on developing specific shooting techniques. Therefore, there is a need for a more systematic, structured training model that can overcome these weaknesses.
b. *Initial Product*. The initial product draft was the initial plan for developing the model used in the study. The training model consisted of 9 training model concepts.

3.1. Product Trial Results

Product testing is the stage of testing a designed product on targeted subjects. The process involved several steps. Initially, a small-scale trial was undertaken to assess the product's viability for testing and practical application in real-life scenarios. A large-scale trial was then conducted to determine whether the product could be used effectively in a larger and more extensive environment. The

assessment categories were as follows:

Assessment Categories

5: Excellent
4: Good
3: Fair
2: Poor
1: Very Poor

3.1.1. Small-Scale Trial

In this stage, data were gathered using a questionnaire, with the results summarized in Table 1. Overall, the results demonstrated a high mean score (M=4.55) with a small standard deviation (SD=0.50). This small variation indicates high consensus among participants and indicates that the development of the shooting practice model in this study was very good.

Table 1. Results of Questionnaire Data in the Small-Scale Trial

NO	SAMPLE	1	2	3	4	5	6	7	8	9	10	TOTAL
1	R1	4	4	4	5	5	5	5	4	4	5	45
2	R2	5	5	5	5	4	4	5	5	4	4	46
3	R3	5	5	5	5	4	4	5	5	4	5	47
4	R4	4	4	4	4	5	5	4	5	5	4	44
5	R5	5	5	5	4	4	4	4	4	5	5	45
6	R6	5	5	5	5	5	5	4	4	5	5	48
7	R7	4	4	4	4	5	4	4	4	5	5	43
8	R8	5	5	5	4	5	4	4	4	5	5	46
Mean												4.55
Standard Deviation												0.50

Table 2. Large-Scale Trial Research Questionnaire Data

NO	SAMPLE	1	2	3	4	5	6	7	8	9	10	TOTAL
1	R1	4	4	4	4	4	5	4	4	5	5	43
2	R2	5	5	5	4	4	4	4	4	4	4	43
3	R3	5	5	5	5	5	5	5	4	4	5	48
4	R4	4	4	4	4	4	5	5	4	4	5	43
5	R5	5	5	5	5	5	5	5	5	5	5	50
6	R6	5	5	5	5	5	5	5	4	5	5	49
7	R7	4	4	5	5	5	5	4	4	5	5	46
8	R8	5	5	5	5	4	4	4	4	4	4	44
9	R9	5	5	5	5	5	5	5	4	5	5	49
10	R10	5	5	4	4	4	4	4	4	5	5	44
11	R11	5	5	5	5	4	4	4	4	5	5	46
12	R12	4	4	4	5	4	4	5	4	5	5	44
13	R13	5	5	5	5	5	4	4	4	5	5	47
14	R14	4	5	4	4	5	4	4	4	5	5	44
15	R15	5	5	5	5	5	5	5	5	5	5	50
16	R16	5	5	5	5	5	5	4	4	5	5	48
17	R17	5	5	5	5	4	4	4	4	5	4	45
18	R18	4	4	4	4	4	4	4	4	9	9	50
19	R19	5	5	5	5	5	5	4	4	5	4	47
20	R20	5	5	5	5	5	4	4	4	5	5	47
Mean												4.64
Standard Deviation												0.66

3.1.2. Large-Scale Trials

A large-scale trial was conducted afterward using another questionnaire. As provided in Table 2, the result yielded a higher mean score (M=4.64), with a small standard deviation (SD=0.66). This finding still shows little variation among the responses and suggests that the development of the training model was indeed commendable.

Therefore, based on both trials, the model development was assessed to be of very good quality. To determine the extent to which the model effectively improves the shooting skills of beginner petanque athletes, a t-test was administered.

3.2. Product Effectiveness Test Results

3.2.1. Descriptive Data Pretest and Posttest Results

As indicated in Table 3, the pretest mean scores for groups K1 and K2 were 10.00 and 12.07, respectively, which gives an average difference of 2.07 between the two groups. After intervention, the posttest mean scores rose to 11.67 for K1 and 15.60 for K2. These increases indicate a higher difference of 3.93 and show an improvement in the posttest results for each group. However, Group K2 experienced a greater improvement than Group K1.

3.2.2. Categorization of Pretest and Posttest Data

Based on Table 4, the highest frequency for group K1 was Fair, and the highest frequency for group K2 was Good. Figure 2 provides an illustration to better understand this categorization. Based on Figures 2 (a) and (b), a distinction can be made between Groups K1 and K2, with Group K1 having a mixture of Fair and Poor test results, and Group K2 having a predominance of Good results, with 13% of the members even attaining Excellent scores. These findings indicate that the pretest scores of Group K2 were higher than those of Group K1. To determine the extent to which Group K2 surpasses Group K1, the posttest scores for both classes are organized as follows.

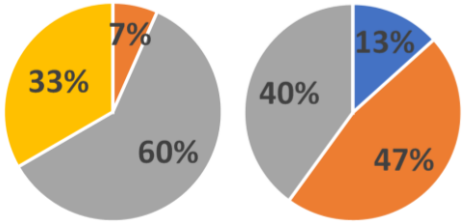
Based on Table 5, the highest frequencies for each class match those in the pretest results. Group K1 had the highest frequency in the Fair category, while the highest frequency in Group K2 was Good. To better understand the categorization of norms, these findings are visualized in Figure 3.

Table 3. Description of Pretest and Posttest Results

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
Pretest_K1	15	8	13	10.00	1.195
Posttest_K1	15	9	14	11.67	1.345
Pretest_K2	15	10	15	12.07	1.438
Posttest_K2	15	11	18	15.60	1.957
Valid N (listwise)	15				

Table 4. Pretest Result Norms for Control Group (K1) and Experimental Group (K2)

Category	Result	Group (K1)	Group (K2)
		Frequency	Frequency
Excellent	≥ 14 point	0	2
Good	12 point -13 point	1	7
Fair	10 point -11 point	9	6
Poor	8 point - 9 point	5	0
Very Poor	≤ 7 point	0	0

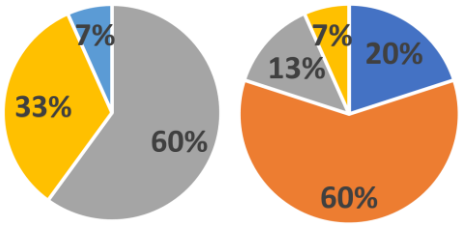


(a) (b)

Figure 2. (a) Pretest Diagram for Group K1 (b) Pretest Diagram for Group K2

Table 5. Posttest Result Norms for Control Group (K1) and Experimental Group (K2)

Category	Result	Group (K1)	Group (K2)
		Frequency	Frequency
Excellent	≥ 18 point	0	3
Good	15 point -17 point	0	9
Fair	12 point -14 point	9	2
Poor	10 point - 11 point	5	1
Very Poor	≤ 9 point	1	0



(a) (b)

Figure 3. (a) Posttest Diagram for Group K1 (b) Posttest Diagram for Group K2

Figure 3 (a) shows a decline in test results in Group K1, with 7% in the Very Poor category, although the Fair category still dominated at 60%. In contrast to Group K1, Group K2 performed better, with the percentage in the Good category increasing to 60% and the Very Good category to 20%. This shows that the developed model significantly improved test results.

3.3. Preliminary Test Results

3.3.1. Normality Test Results

Table 6 shows that the Shapiro-Wilk normality test p-values are greater than the 0.05 alpha level for the pretest and posttest scores in all groups. Thus, it can be inferred that the pretest and posttest data in both groups are normally distributed.

Table 6. Normality Test Results

	Tests of Normality		
	Shapiro-Wilk		
	Statistic	Df	Sig.
Pretest_K1	.901	15	.100
Posttest_K1	.953	15	.575
Pretest_K2	.942	15	.403
Posttest_K2	.923	15	.214

(Source: Processed Data, 2024**)**

3.3.2. Homogeneity Test Results

The results of the homogeneity test are presented in Tables 7 and 8. As shown in Table 7, the pretest significance value for both Groups K1 and K2 is 0.266. This value exceeds the 0.05 threshold, which indicates that the pretest data for both groups are homogeneous. Meanwhile, the homogeneity test result for the posttest yielded a significance value of 0.256, as presented in Table 8. This value also exceeds the 0.05 threshold. Based on these findings, it can be inferred that the posttest data from both groups also exhibit homogeneity.

3.3.3. T-Test Results

The T-test results are detailed in Tables 9 and 10. The paired sample t-test in Table 9 reveals significant differences between Group K1 and Group K2 at both pretest (p=0.001) and posttest (p=0.000). Further, the independent samples t-test results in Table 10 confirm the superiority of the experimental model. With a significance value of p = 0.000 (which is p< 0.05), reject H0 and accept Ha. This shows that there is a significant difference in effect between the two groups, indicating that the group that received treatment or the development model was more effective than the group that did not.

Table 7. Pretest Homogeneity Test Results

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
Pretest	Based on Mean	1.287	1	28	.266
	Based on Median	1.159	1	28	.291
	Based on Median and with adjusted df	1.159	1	27.969	.291
	Based on trimmed mean	1.089	1	28	.306

(Source: Processed Data, 2024**)**

Table 8. Posttest Homogeneity Test Results

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
Posttest	Based on Mean	1.345	1	28	.256
	Based on Median	1.280	1	28	.268
	Based on Median and with adjusted df	1.280	1	25.275	.269
	Based on trimmed mean	1.285	1	28	.267

(Source: Processed Data, 2024**)**

Table 9. Paired Sample T-Test Results

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Pretest_K1 – Pretest_K2	-2.067	2.017	.521	-3.183	-.950	-3.969	14	.001
Pair 2	Posttest_K1 –Posttest_K2	-3.933	2.865	.740	-5.520	-2.347	-5.317	14	.000

(Source: Processed Data, 2024**)**

Table 10. Results of the Independent T-Test

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
	Equal variances assumed	1.345	.256	-6.416	28	.000	-3.933	.613	-5.189	-2.677
Posttest	Equal variances not assumed			-6.416	24.817	.000	-3.933	.613	-5.196	-2.670

(Source: Processed Data, 2024**)**

4. Discussion

The findings of the present study show that the training model introduced has a positive effect on accuracy, strength, and consistency in shooting among beginner petanque players. Based on the needs analysis, it was found that many beginner athletes face challenges in maintaining shooting consistency and accuracy under pressure. Moreover, existing training tends to be less varied and does not focus on specific shooting techniques. Therefore, the development of a more structured and systematic training model is proven to be relevant and answers the needs of athletes.

During the trial phase, this model underwent both small-scale and large-scale testing, resulting in an average increase in the questionnaire score from 4.55 in the small-scale trial to 4.64 in the large-scale trial. The increase in the average value reflects that the designed training model can improve athletes' perceptions of more effective shooting training. Although the standard deviation shows little

difference among participants, the higher mean scores on the large scale indicate that this training model is well accepted and shows a trend of increasing positive perceptions.

The effectiveness testing results for the pretest and posttest assessments revealed an improvement in the experimental group (K2) compared to the control group (K1). This improvement was reinforced by the results in Table 8, where the mean posttest score in K2 (15.60) was higher than in K1 (11.67). This was a significant improvement after the training phase of the 8-week course. This improvement was substantiated statistically; paired t-test comparisons of pre- and posttest results in both groups indicated substantial improvements, with a significance level of less than 0.05. This shows that the training model used in the study effectively improved the shooting skills of the participants. The results of the independent-samples t-test on the posttest scores of the experimental and control groups also confirmed the improvements, as the obtained significance was 0.000, which far exceeds the 0.05 level. Based on this, it can be argued that the training model certainly improves shooting skills and performance more than those of beginner athletes who did not undergo the training model.

This training model meets the criteria for effectiveness by improving athletes' accuracy, strength, and consistency in shooting, and by providing a more systematic basis for coaches to train novice athletes to face the challenges of petanque. The program's effectiveness was confirmed through pretest and posttest evaluations, showing its impact on the performance of young athletes [24]. These findings emphasize the importance of a structured, focused training approach to improving athlete performance, especially for novices who need to master basic techniques and the game's mentality. Adapting the training environment to these differences can lead to better performance outcomes [25]. A systematic training progression builds a foundation of strength, endurance, and coordination, which are essential before introducing advanced techniques. This method helps reduce the likelihood of injury while ensuring that athletes are physically conditioned to meet the specific demands of their sport [26].

5. Conclusions

This research illustrates the remarkable effectiveness of the training model designed for novice petanque players' shooting skills. Implementing the training model for eight weeks demonstrated improvements in the athletes' attacking shots' accuracy, power, and consistency score. The experimental group demonstrated statistically significantly higher average posttest scores, thereby confirming the effectiveness of the training model. This performance improvement indicates that the training model designed has addressed and satisfactorily met the shooting technique demands of novice petanque players.

In addition, this training model can be a guide for coaches in providing more specific and effective training methods, especially for beginner athletes. In this case, this study provides practical contributions to the advancement of training in the sport of petanque, particularly by enhancing the shooting skills of novice players.

Nevertheless, the present study still has some limitations. First, the study only involved a limited sample of beginner athletes, so the results may be less generalizable to more experienced athletes. Second, the duration of the training was only eight weeks. A longer period may be needed to observe more sustainable performance developments. Third, this research did not consider external variables, such as field conditions and weather, which may also influence the shooting performance of the athletes.

Given the study's findings and limitations, several recommendations can be proposed. Future studies should include a larger, more varied participant group, encompassing athletes with different experience levels to enhance the generalizability and applicability of the results. It is also recommended to apply this training model over a longer period to assess its impact on long-term performance. In addition, future research can consider external variables that may affect the results and explore mental techniques that can better support athletes in dealing with competition pressure.

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