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Full Length Research Paper

Effect of the station training program on shooting accuracy in futsal

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ABSTRACT

The objectives of this study were to develop and compare the effects of a station training program on shooting accuracy in futsal. The sample included 24 male students enrolled in the futsal course at Khuan Niang Wittaya School, selected through simple random sampling. A futsal shooting accuracy test was performed, and scores were ranked from highest to lowest. Participants were then divided into two groups of 12 students each and randomly assigned to the experimental group and the control group. The experimental group trained using the station training program developed by the researcher, while the control group trained using Khuan Niang Wittaya School's futsal skill training program. Both groups trained for 8 weeks, 3 days a week, with 30-minute sessions. A Futsal Shooting Moving Ball Test (FSMT) was used to measure shooting accuracy. Data were analyzed using mean and standard deviation. The Wilcoxon Matched Pairs Signed-Rank Test compared the mean shooting accuracy within each group before and after training. The Mann-Whitney U test was employed to compare the mean shooting accuracy between the control and experimental groups before and after the 8-week training period. The results showed that the station training program developed by the researcher was adequate and suitable. Additionally, both the experimental and control groups exhibited significantly higher mean shooting accuracy after training compared to before training at the .05 level of statistical significance. Furthermore, after 8 weeks of training, the experimental group demonstrated significantly higher mean shooting accuracy than the control group at the .05 level. These findings provide guidelines for enhancing shooting accuracy in futsal players and may benefit athletes, coaches, and individuals interested in futsal in the future.

Keywords: The station training program, shooting accuracy in futsal, futsal shooting moving ball test (FSMT).

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INTRODUCTION

The origin of futsal is unknown, but it is played on different continents. During winter, snow, cold, and windy conditions prevent outdoor sports from being played. This has led people to switch to indoor sports instead. This is how indoor football, also known as "futsal," began. Futsal originated from a five-a-side football game. It is closely related to football and shares many similarities. This matches Ketkaew (2002), who described futsal as a widely recognized sport, also called 5-a-side futsal. Therefore, the skills and techniques used in futsal are consistent. However, futsal still retains some similarities to football. However, futsal has a unique charm: everyone participates continuously in the game, and there is a high level of team coordination (Amornwanichsak, 2021). The number of goals scored determines who wins a match. The team with the most goals wins, making scoring a crucial factor in the outcome of each game. As Lepschy, Wäsche and Woll (2018) stated, the ultimate goal in football is victory. This means scoring more goals than the opponent, regardless of shooting technique.

Shooting well requires high-quality training and proper training principles to ensure practical shooting. Many

examples of shooting training programs can be used to develop skills. For instance, station training, which impacts shooting, is a specific type of practice. Shooting requires core muscle strength and endurance. This aligns with Krabuanrat's (2014) claim that station training enhances body movement and joint strength. Additionally, in competitions, players face a variety of shooting situations. Station training simulates these scenarios, allowing athletes or students to practice repeatedly and cyclically, helping their bodies become accustomed to different shooting styles. When opportunities arise in a match, this enables them to score goals efficiently.

Similarly, secondary schools in Khuan Niang District, including Khuan Niang Wittaya School and Pak Cha School, offer in-class futsal instruction as part of physical education and encourage students to participate in futsal competitions for the Songkhla Provincial Games. A team has been formed for several years, but has yet to win the Songkhla Provincial Championship. Furthermore, as a futsal coach and teacher in schools, the researcher has observed students' learning challenges in futsal courses and training. The researcher found that futsal shooting ability is weak, resulting in low shooting accuracy scores during competitions and skills tests. For this reason, the researcher is interested in developing a station training program to improve futsal shooting accuracy.

LITERATURE REVIEW

Futsal shooting

Santi and Rangubhet (2023) stated that the game of futsal is decided by goals scored. Therefore, it is not always certain that the best team will win if they fail to score. It is important to practice shooting in various styles, including close-range, long-range, one-touch, and two-touch, using different parts of the body, in accordance with the rules. This practice involves developing accurate, powerful, and fast shooting until you gain proficiency and can effectively use multiple shooting skills.

Accuracy training for futsal shooting

Pariyadamkon (2018) explained that force is the action of one object on another. The force tries to move the object in the direction of the force. It includes three aspects:

1. Magnitude: describes the amount of force exerted on an object.
2. Direction: refers to the direction in which the force is applied to the object.
3. Point of Application: refers to the location where the force is applied to the object.

The mass of a soccer ball affects its motion. To kick the ball, a force from the foot must be applied, causing it to accelerate. Therefore, a change in the ball's speed over time indicates that the force acting on it also changes, while the mass remains constant. This depends on the strength of the force, its direction, and the point of application—factors that are important for accurately kicking the ball. Highly skilled athletes undergo extensive training, during which their skills develop and improve, leading to high levels of expertise and competence. This progression occurs sequentially according to Bloom et al.'s (1956) skill learning process. Range skills refer to behaviors that demonstrate the ability to perform tasks with agility and expertise.

Futsal shooting test

The Futsal Shooting Test employs the Futsal Shooting Moving Ball Test (FSMT) (Doewes, Elumalai and Azmi, 2022). This test aims to evaluate shooting skills in futsal. It is performed on a futsal court with a net. A soccer ball is placed where the tester stands. When the tester's name is called, they kick the soccer ball. The ball bounces onto the soccer ball control board, rotates, and is shot toward the target area within the shooting zone. Test subjects will shoot with bare feet 10 times, alternating between each foot. The score for each shot is recorded. Evaluation is based on the accuracy of the shot in the target area. The score depends on the number of shots landed in the target area and is accumulated. Finally, the shooting results are compared to the evaluation criteria. The FSMT Futsal Shooting Test has an ICC value of 0.84, indicating high reliability.

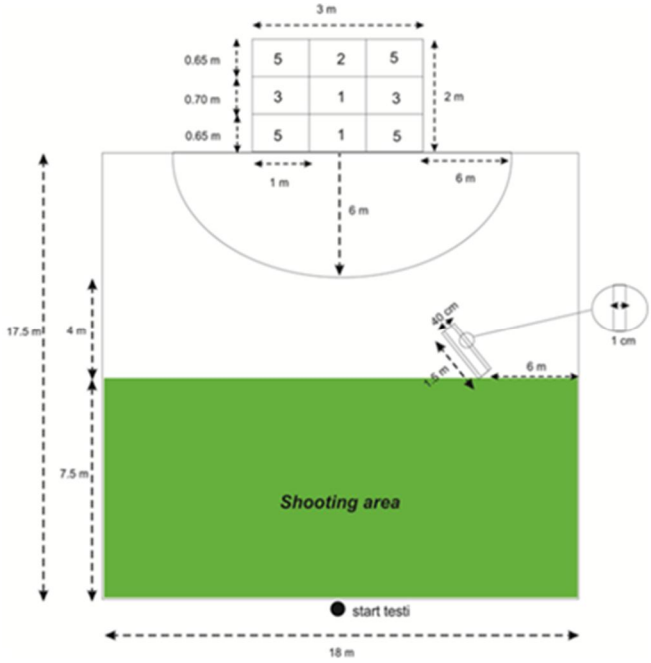

Figure 1. The Futsal Shooting Moving Ball Test (FSMT). Source: Doewes, Elumalai and Azmi (2022).

Station training program

Krabuanrat (2014) stated that station training is a type of exercise that can significantly improve physical and joint mobility, strength, and endurance. Generally, station training for beginners should include about 6-8 stations, with one complete circuit. The duration or number of repetitions for each set and station determines the intensity. Rest periods between stations are brief, ranging from 30 to 90 seconds, with a rest of 3-5 stations between rounds. Each session usually consists of 2-6 rounds, depending on the student's ability and experience level. Additionally, Trisaksit (2019) noted that station training involves developing both physical and mechanical fitness for health. It includes combining different movement activities. The activities are set up at various stations and rotated until all stations are completed.

Research objectives

1. To design a station training program that improves futsal shooting accuracy.
2. Compare the average futsal shooting accuracy before and after training within the experimental and control groups of students enrolled in the futsal course.
3. Compare the average futsal shooting accuracy after training between the experimental and control groups.

Research hypotheses

1. The average futsal shooting accuracy of students enrolled in the futsal course after training in the experimental and control groups was better than before training.

2. The average futsal shooting accuracy of students enrolled in the futsal course in the experimental group was better than the control group after training.

RESEARCH METHODOLOGY

Population

The population consisted of 50 male students enrolled in the futsal course from two secondary schools in Khuan Niang District, Songkhla Province: Khuan Niang Wittaya School and Pak Chaa School, all under 18 years old.

The sample consisted of 24 male students enrolled in the futsal course at Khuan Niang Wittaya School, all under 18 years old, selected through simple random sampling. Then, shooting accuracy was tested by ranking the scores from highest to lowest using a zigzag pattern. The participants were divided into two groups of 12 each and randomly assigned:

1) The experimental group participated in a station training program developed by the researcher. They trained for 8 weeks, three days a week (Monday, Wednesday, and Friday), with each session lasting 30 minutes. The training intensity increased as rest periods decreased every two weeks.
2) The control group participated in the Khuan Niang Wittaya School futsal skills training program. This group trained for 8 weeks, 3 days a week (Monday, Wednesday, and Friday), for 30 minutes each day. (Figure 2).

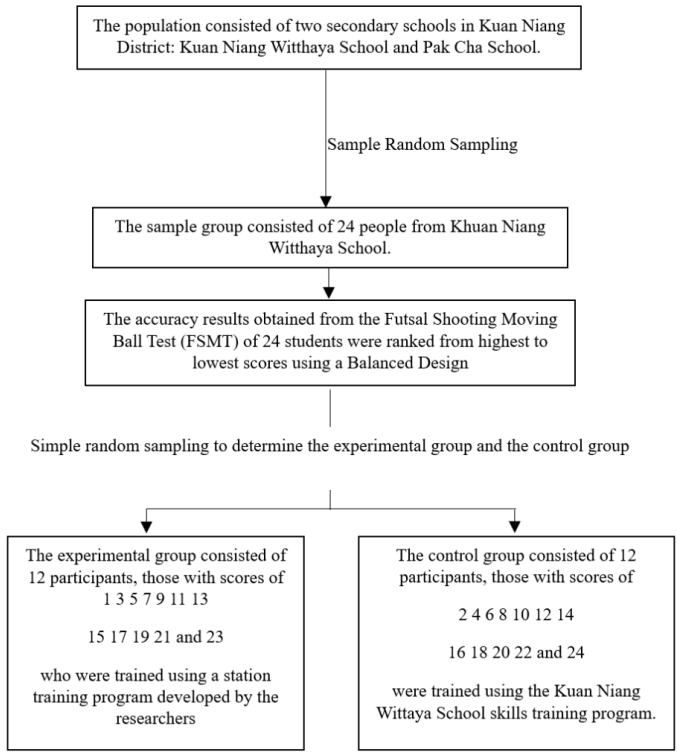

Figure 2. Random sampling.

Research instruments

1. The station training program.
2. The Futsal Skills Training Program at Khuan Niang Wittaya School
3. The Futsal Shooting Moving Ball Test (FSMT) (Doewes, Elumalai and Azmi, 2022)

Data collection methods

1. Request a letter from the Graduate School at Thaksin University, requesting permission to collect data from the sample group for the research to the Director of Khuan Niang Wittaya School. The test was conducted with 24 male students enrolled in the futsal course.

2. Schedule training sessions using the researcher-developed station training program. Training sessions were held three days a week: Mondays, Wednesdays, and Fridays. The experiment took place from June to August 2025.
3. Detailed information on the Futsal Shooting Moving Ball Test (FSMT) (Doewes, Elumalai and Azmi, 2022) was provided to the research assistants involved in the data collection.
4. Orientation was conducted to inform each group about the details of the researcher-developed station training program, and the group was trained using the Khuan Niang Wittaya School Futsal Skills Training Program.
5. The testing venue and equipment were ready. The equipment and tools were inspected and verified for quality and readiness.
6. The Futsal Shooting Moving Ball Test (FSMT) (Doewes, Elumalai and Azmi, 2022) was conducted among the subjects prior to the training session. The researcher provided detailed explanations and demonstrated the testing method in detail to ensure accurate results.
7. The study group was divided into two groups: an experimental group of 12 participants, who were trained using a station training program to assess the shooting accuracy of male students enrolled in the futsal course, and a control group of 12 participants, who were trained using the Khuan Niang Wittaya School futsal skills training program and conducted the training according to the specified program.

7.1. The experimental group will undergo training using a station training program developed by the researcher as follows:

Day	Step of training	Time (minutes)	Repetitions	Set	Break time
Mondays, Wednesdays, and Fridays.	1. Warm Up	5			
	2. Station Training Program				
	2.1. Station 1: Turn and Shoot	2	2		
	2.2. Station 2: Zigzag Dribble and Shoot	2	2		*
	2.3. Station 3: Squad Jump	1	1		
	2.4 Station 4: Pass the ball against the board and shoot	2	2	3	
	2.5. Station 5: Kick the ball inside and shoot	2	2		

	2.6. Station 6: Leg Lunge	1	1	
	3. Cool down	5		

* The intensity will increase by reducing the rest period every 2 weeks. In weeks 1 and 2, rest between stations will be 15 seconds; in weeks 3 and 4, it will be 10 seconds; in weeks 5 and 6, it will be 7 seconds; and in weeks 7 and 8, it will be 5 seconds.

7.2. The control group will be trained with the Futsal Skills Training Program at Khuan Niang Wittaya School as follows:

Day	Step of training	Time (minutes)	Repetitions	Set	Break time
Mondays, Wednesdays, and Fridays	1. Warm Up	5			
	2. The Futsal Skills Training Program at Khuan Niang Wittaya School				
	2.1 Continuous shooting	1	1	1	Rest for 2 minutes between stations.
	2.2 Run around the cones and shoot	1	1	1	
	2.3 Pass the ball and speed	4	6	1	
	2.4 Zigzag and dribble with speed	4	5	1	
	3. Cool down	5			

8. At the end of the 8-week training period, the shooting test was performed using the Futsal Shooting Moving Ball Test (FSMT) (Doewes, Elumalai and Azmi, 2022).
9. The data obtained from the test were analyzed statistically.

RESULTS

1. The program's suitability was assessed using a 5-point Likert scale, with scores averaged across all experts by dividing the total score by the number of experts. The scores ranged from 4.2 to 4.8. Therefore, the station training program developed by the researchers received an acceptable suitability score, consistent with Boone and Boone (2012), who stated that a suitability score of 3.41 or higher is considered highly appropriate and meets the objectives.

2. Results of the station training program: The mean futsal shooting accuracy before and after training within the experimental and control groups of male students enrolled in the futsal course over 8 weeks are shown in Tables 1 to 3.

Table 1. Shooting accuracy test results for the control group before and after the 8-week training program.

During training	n	The group was trained using the Khuan Niang Wittaya School futsal skills training program			
		$\bar{X}$	SD.	Z	*P*
Before training (C_1)	12	14.92	4.96	-3.068	0.002**
After training (C_2)	12	23.75	6.52		

** $P < .05$

Table 1 presents the results of the futsal shooting accuracy test for the control group trained with the futsal skills program at Khuan Niang Wittaya School before training. The average futsal shooting accuracy was 14.92, with a standard deviation of 4.96. After 8 weeks of training, the accuracy test showed a mean of 23.75 and a standard deviation of 6.52. The test statistic was -3.068, and the p-value for testing the hypothesis was 0.002. This indicates that the difference in futsal shooting accuracy between the control group before and after 8 weeks of training was statistically significant at the .05 level, with post-training results being better than pre-training results.

Table 2. Shooting accuracy results for the experimental group before and after the 8-week station training program.

During training	n	The group was trained using the station training program developed by the researcher			
		$\bar{X}$	SD.	Z	P
Before training (E_1)	12	15.75	4.85	-3.072	0.002**
After training (E_2)	12	31.08	6.25		

***P* < .05

Table 2 shows that the results of the futsal shooting accuracy test within the experimental group trained with the researcher-developed station training program had a mean of 15.75 and a standard deviation of 4.85 before training, and a mean of 31.08 and a standard deviation of 6.25 after 8 weeks of training. The test statistic for the hypothesis was -3.072, and the p-value used to determine the within-group difference was 0.002. Therefore, the futsal shooting accuracy in the experimental group before and after 8 weeks of training was significantly different at the .05 level, with post-training results being significantly better than pre-training.

Table 3. Comparison of baseline shooting accuracy between the experimental (station program) and control (Khuan Niang Wittaya program) groups.

During training	n	$\bar{X}$	SD.	Z	*P*
Control Group before training (C_1)	12	15.47	4.84	-.464	.643
Experimental Group before training (E_1)	12	14.91	4.96		

P > .05

Table 3 shows that the futsal shooting accuracy test results of the control group before training had a mean of 15.47 and a standard deviation of 4.84. The futsal shooting accuracy test results of the experimental group before training had a mean of 14.91 and a standard deviation of 4.96. The probability of testing the statistical hypothesis was -.464, and the statistical value used to determine the difference between the two groups was .643. Therefore, the futsal shooting accuracy before training did not differ significantly between the experimental and control groups at the .05 level.

3. Compare the mean futsal shooting accuracy after training between the experimental and control groups. The results are presented in Table 4.

Table 4. Comparison of post-training shooting accuracy between the experimental (station program) and control (Khuan Niang Wittaya program) groups.

During training	n	$\bar{X}$	SD.	Z	*P*
Control Group before training (C_2)	12	23.75	6.52	-2.486	.013**
Experimental Group before training (E_2)	12	31.08	6.25		

** *P* < .05

Table 4 presents the futsal shooting accuracy test results for the control group after training, with a mean of 23.75 and a standard deviation of 6.52. In contrast, the experimental group had a mean of 31.08 and a standard deviation of 6.25. The test statistic value was -2.486, and the p-value was .013. Therefore, the futsal shooting accuracy after training was significantly different between the experimental and control groups at the .05 level, with the experimental group performing better.

DISCUSSION

The impact of the station training program on futsal shooting accuracy was discussed according to the research objectives as follows:

1. The results of the station training program developed by the researcher show that the program was evaluated by five experts who examined the quality of the instrument to determine its suitability. This assessment used a 5-point Likert scale, with scores of 3.41 or higher indicating high appropriateness (Boone and Boone, 2012). After reviewing the instrument's quality, the experts also

assessed its overall suitability, with scores ranging from 4.2 to 4.8 across all evaluation items. Furthermore, the researcher made adjustments based on the experts' suggestions, such as recommending that training be combined with shooting at each base, aligning the direction with actual competition, and using real goals for shooting practice. Another expert advised that the shooting points for trainers should be challenging for the goalkeeper to defend, and suggested changing the posture at stations 3 and 6 to train the front thigh muscles used for shooting. The researcher also implemented the station training program to test and improve, addressing various issues and ensuring high quality. This approach may be because the researcher studied training principles, including the steps and methods for developing a pyramid weight training program, before proceeding. The program was based on the F.I.T.T. training principle, a widely accepted framework capable of improving physical fitness. This aligns with Fahey, Insel and Roth (2019), who stated that there are four main factors fundamental to exercising and sports. The F.I.T.T. principles are: 1. F – Frequency, which refers to how often you exercise within a specific period, such as 3-5 times per week. 2. I – Intensity, which indicates the level of effort during exercise. For training involving shot goals or station-based practice, it's important to specify the shooting situations encountered in competition at each station. If the goal is to improve futsal shooting accuracy, training should involve about 6 to 8 stations, with 2 to 6 rounds depending on the purpose, as suggested by Krabuanrat (2014). 3. T – Time, meaning the duration of each training session, which should be approximately 30 minutes. 4. T – Type, referring to the type of exercise selected to meet the training goal; for example, targeted shooting drills or station training that simulate actual game situations.

Furthermore, the suitability of the training program developed by the researcher was found to be at least 3.41 (highly appropriate). This aligns with Boone and Boone (2012), who determined that a suitability score of 3.41 or higher is considered highly appropriate, and the assessments can be reliably evaluated for quality, appropriateness, and purpose. The station training program was revised based on expert recommendations, including the implementation of time control through reminders and a timer, as athletes tend to take longer breaks than necessary. At the end of each round, athletes must pick up the futsal ball to start the next round, which wastes training time. Managing warm-ups and cool-downs is essential, so the researcher provided reminders and led the activities to reduce fatigue and injury, as many athletes neglect to follow the program. Additionally, trialing the station training program developed by the researchers will

improve its effectiveness, as problems and shortcomings have been identified and addressed, such as controlling rest times at each station. Providing practice equipment reduces equipment storage time, and controlling warm-up and cool-down periods ensures the program's effectiveness. This is consistent with Babbie (2020), who states that the trial process enhances the quality of the developed tools or research process by improving validity, reliability, content appropriateness, and reducing errors before actual implementation. This makes data collection more efficient and yields more accurate results.

2. The comparison of the average futsal shooting accuracy between the control group and the experimental group before and after training showed that, after 8 weeks of training, the male students enrolled in the futsal course in both groups had significantly better shooting accuracy than before training at the .05 level. In the group that trained using the station training program developed by the researcher, this improvement may be due to their training being based on principles designed to increase shooting accuracy. Specifically, training for shooting accuracy involves gradually increasing intensity or reducing rest periods to boost training effort, along with continuous repetition. Additionally, the researchers' program specified training three days a week for eight weeks, resulting in a significant improvement in shooting accuracy. This aligns with Krabuanrat (2018), who states that circuit training should aim to develop muscular strength and endurance. The intensity of the training should be gradually increased consistently, taking into consideration the appropriate phase of training. The duration at each station should not be excessively long, as it may lead to premature muscular fatigue before completing all stations. This finding is consistent with the results of Nakaphan and Tingsaphat (2015), who investigated the impact of a station training program on high school students' dribbling ability. They employed an experimental approach with futsal players and discovered that station training significantly enhanced the dribbling ability of the targeted muscles in high school students.

However, the study results for the control group trained with the Khuan Niang Wittaya School futsal skills training program, despite not following proper training principles, showed that after 8 weeks of regular training, their futsal shooting accuracy scores improved significantly. This may be because the Khuan Niang Wittaya School futsal skills training program uses a specific training format. Specific training is considered targeted training, focusing on shooting and offensive skills. This type of training is time-consuming, as it requires completing one exercise before moving to the next. Additionally, the program offers 8 weeks of continuous training, three days a week, which also improves futsal shooting accuracy. This supports the findings of Ericsson (2020), which stated that deliberate practice is purposeful, examined practice, focused on improvements in small parts of the whole. Deliberate practice targets the leading edge of current performance, where skills are not yet mastered and automated. It focuses on improving specific aspects of performance by breaking down skills into smaller parts and practicing those parts repeatedly. Between practicing these parts, experts

receive or seek feedback and reflect on their performance to identify mistakes and correct them. This recursive process structures and guides subsequent practice sessions. Ericsson's research indicated that practicing incorrectly does not lead to improvement and that, without deliberate focus, practice may result in stagnation.

3. The comparison of the average futsal shooting accuracy between the control group and the experimental group after 8 weeks of training showed that the experimental group in the station training program developed by the researcher had better futsal shooting accuracy than the control group in the futsal skills training program of Khuan Niang Wittaya School, with statistical significance at the. .05 level. This may be because the station training program developed by the researcher followed the correct principles, which helped improve futsal shooting accuracy. That is, the station- based training program developed by the researcher used the F. I. T. T. principle, which has four components: Component 1: F is Frequency; athletes train 3 days a week; Component 2: I is Intensity; intensity increases by decreasing rest time every 2 weeks; Component 3: T is Time; athletes train 30 minutes per session; and Component 4: T is Type; the training format uses station- based training, which can effectively improve futsal shooting accuracy. This aligns with Fahey, Insel and Roth (2019), who stated that physical fitness development should be guided by the F.I.T.T. principle when designing training programs for exercise. This is also supported by the research conducted by Nakaphan and Tingsaphat (2015), which studied the effect of station training on high school students' football dribbling ability. The study found that: 1) after 8 weeks, the experimental group showed significantly better ability to dribble a 50-meter straight line than before the experiment, at the .05 level; 2) after 8 weeks, they also showed significantly improved zig-zag dribbling ability at the. .05 level. Additionally, Al Mubarok and Sukoco (2019) studied the effectiveness of combined shooting and sprint training models on goal-scoring ability. The results indicated that the combined training improved shooting skills, with the shooting method proving significantly more effective than sprint training at the .05 level. In short, the station shooting method enables multiple training sessions, resulting in better outcomes than the traditional shooting method, which requires more time per session and reduces the number of sessions within the same period.

The research concluded that the station training program developed by the researchers had a statistically significant impact on futsal shooting accuracy in players, at a p-value of .05. This program examined training principles, appropriate training duration, training postures, and training frequency, resulting in improved shooting accuracy. However, there are caveats regarding station training: adequate stretching is necessary before and after training, as shooting primarily involves leg and core muscles. Therefore, warm-ups and stretching are crucial to reduce the potential for injuries. Strict adherence to the program is essential.

The station training program developed by the researcher was based on data collected from small schools with limited fields, minimal training equipment, and a small sample size. This means that managing the training area needs to be as efficient as possible. If implemented in larger schools with sufficient fields and training equipment, the number of stations can be increased to provide more variety, or the training duration can be extended to compare shooting accuracy.

Conclusion

The research results showed that the station training program created by the researchers significantly improved futsal shooting accuracy. This program was designed based on proper training principles. As a result, players' shooting accuracy increased, thanks to repeated, cycle-based training in a station format. Futsal players practicing in this format will become familiar with it. When they face shooting scenarios in actual competitions, they will be able to shoot confidently and accurately, which can lead to victory and success in futsal.

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