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The Effect of Predictable and Unpredictable Training Methods On The Reaction Speed of Futsal Goalkeepers

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ABSTRACT

This study aims to analyze the effect of predictable and unpredictable training methods on the reaction speed of futsal goalkeepers. Reaction speed is an important ability for a goalkeeper in responding to fast and dynamic game situations. This study uses a quantitative method with a quasi-experimental design of the pretest-posttest control group design. The subject of the study consisted of 45 goalkeepers who were divided into three groups, namely the predictable training group, the unpredictable training group, and the control group. The measurement instrument used was the Hand Touch Reaction Test to measure reaction speed. The training program was carried out for 4 weeks with a total of 12 training sessions. The result showed that there was a significant effect between the predictable and unpredictable training methods on increasing the reaction speed of a futsal goalkeeper. The One-Way ANOVA test showed a significant difference between the three groups. Training with the unpredictable methods resulted in a higher increase in reaction speed compared to the predictable method and the conventional method. The results of the Bonferroni further test confirmed that there was a significant difference between the unpredictable and predictable groups ($p = 0.013$) and with the control group ($p < 0.001$). These findings suggest that training requiring adaptation to unpredictable situations is more effective in training futsal goalkeepers' quick response. This study makes an important contribution to the development of futsal goalkeeper training programs and recommends the integration of unpredictable training into training routines.

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INTRODUCTION

According to Wicaksono & Kusuma (2021), the goalkeeper has a very important role in futsal because the attack and defence start from the goalkeeper. The goalkeeper is a player who is trusted by the management and the main coach to guard the goal and face the opponent's attack (Hidayat et al., 2022). The goalkeeper is the last defence of a team to determine victory. Some teams believe that if the goalkeeper performs optimally and confidently in every match he participates in, the team will difficult to beat. The goalkeeper

also has a very big and difficult responsibility because the goalkeeper must catch the ball and drop the body with the correct technique. A player who wants to be a good goalkeeper is not easy; he must go through a long process. The goalkeeper needs to master various diving to save techniques, positioning, throttling, kicking, and ball-catching techniques.

Goalkeepers need to participate/contribute effectively to the implementation of the team game model and not just stay at the goalpost to defend or stop shots de Baranda et al., 2019). A goalkeeper must also have strength, speed, and agility in guarding their goal. In addition, the goalkeeper must have a strong mentality and a perfectly disciplined attitude. In a match, the goalkeeper will encounter collisions or physical contact with the opponent (Aurora & Hananto Puriana, 2022). Therefore, the goalkeeper needs to reduce the opponent's chances and have excellent skills. Without physical training and good mastery of basic techniques, playing skills will not develop. The become a reliable player, one must practice diligently. The athlete's way of playing is created by the extraordinary encouragement of the coach, management and all components present in the match (Lukman et al., 2024). The role of a coach in the development of goalkeeper abilities is very important. The coach's understanding of the goalkeeper's abilities is something that must be understood. Goalkeepers have different abilities from other positions, in terms of technical, tactical, physical and mental factors. In terms of goalkeeper abilities, the training approach is adjusted to the differences in physical and technical needs compared to other players (Mauladani et al., 2024). Therefore, training for goalkeepers is carried out separately, paying attention to specific aspects of the position, such as catching the ball.

The obstacle that exists for goalkeepers is the ability to react quickly to catch the ball, which is caused by the lack of variation in training methods. Training using tennis balls and agility reflex balls is still very rarely done (Nadzifah et al., 2024). A goalkeeper is expected to be able to develop training skills using tennis balls and agility reflex balls, especially in reaction time and focus when catching the ball, because this improves the quality of a goalkeeper in futsal (Wicaksono & Kusuma, 2021). The training can be beneficial for the training process; therefore, with training using tennis balls on the goalkeeper's reaction, it is hoped that it can train skills, especially in reaction speed and improve performance that can support the quality of a goalkeeper.

Training designed to improve reaction speed can be divided into two types, namely predictable training and unpredictable training. Predictable methods generally consist of training that has a clear pattern or scenario, so that athletes can prepare to respond quickly Fadi & Sutresna, (2019). On the other hand, unpredictable approaches include more active and unstable conditions, which require athletes to quickly adapt to various changes. Studies show that training that contains uncertainty factors, such as the use of tennis balls in goalkeeping training, can significantly improve reaction time (Aurora & Hananto Puriana, 2022).

In futsal, fast reactions are not only determined by physical training, but also involve mental and cognitive factors. A goalkeeper needs to be able to understand the flow of the game and predict the opponent's movements, which is an ability that can be improved through appropriate training. Previous research shows that combining physical exercise with developing cognitive skills can produce more optimal increases in reaction speed

(Cahyaningrum et al., 2018). Apart from that, training developed with appropriate variations can help goalkeepers become better prepared to face unexpected situations when playing on the field (Rahman, 2018).

Various studies have been conducted to evaluate the effectiveness of training methods in increasing reaction speed, especially in futsal goalkeepers and other sports athletes. One of them is a study by Wicaksono & Kusuma (2021), which examined the effect of training using tennis balls on the reaction speed and concentration of futsal goalkeepers at Surabaya State University. The result of the study showed a less significant increase with a significance value of 0,011(<0,05), and a difference in increase of 0,1. This indicates that training using tennis balls has an effect, although not dominantly. A similar study was conducted by (Herlambang et al., 2021), through the methods of bouncing tennis balls against the wall on futsal goalkeepers at STKIP Setia Budhi Rangkasbitung. The results showed an increase in the average score from 4,20 to 7,30, with a difference of 3,10 and a t-value of 11,1196. This proves that this method provides a significant increase in reaction speed. Meanwhile, (Hidayat et al., 2022) studied the effect of reaction training on goalkeeper performance at SSB Putra Bungbulang. The results of the statistical test showed a significance value of 0,000 (<0,05), and the n-Gain calculation was 71% which is included in the effective category. Reaction training has been shown to have a 50% effect on improving goalkeeper performance.

In the study of Aurora & Hananto Puriana (2022), training was modified using tennis balls to improve the reactions of futsal goalkeepers at Sekolah Futsal Pelangi Nusantara Pontianak. The results of the analysis with SPSS showed a sig. (2-tailed) valued <0,05, indicating that the training significantly improved the goalkeeper's reaction ability. Research conducted by (Febby Ardhia et al., 2022) focused more on badminton. They studied the effect of predictable training on foot speed. The average pretest score of 65,80 increased to 85 in the posttest. The N-Gain value of the experimental group, 56,85, was much higher than the control group, 31,78, with a significance value of 0,001 (<0,05). This shows that the unpredictable training method is more effective in increasing movement speed. The conclusion of the various studies states that the reaction training method, either through a tennis ball or rebound walls, has a positive effect on increasing reaction speed and athlete performance, especially for futsal goalkeepers.

In response to the above research, it is important to further research the various training methods applied to improve futsal goalkeeper performance. There are still a few studies that specifically compare the effectiveness of predictable and unpredictable training methods in improving reaction speed. This creates a knowledge gap that needs to be filled, considering that reaction speed is a crucial factor in determining a goalkeeper's success in facing an opponent's attack. Previous studies tend to focus on one type of training method or do not consider specific variables that affect the goalkeeper's reaction speed. Therefore, this study aims to fill this gap by comprehensively analyzing the effect of these training methods on the futsal goalkeeper's reaction speed, as well as providing new insights that can be applied in training practices.

This study has several objectives to be achieved. First, this study aims to determine the predictable method or unpredictable method that is more influential in increasing the reaction

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speed of futsal goalkeepers as measured by the Hand Touch Reaction Test. Then, this study also wants to find out to what extent this method contributes to the goalkeeper's skill in their reaction speed. Second, this study also aims to find out which factors influence the results of the two methods. This study is expected to provide valuable insight into the most effective training methods to improve futsal goalkeeper reaction speed. By understanding the factors that influence the results, coaches can design more targeted and effective training programs, thereby improving goalkeeper performance in matches.

METHODS

This study aims to determine the effect of predictable and unpredictable training methods on futsal goalkeepers' reaction speed. The research employs a quantitative approach with a quasi-experimental design, as it was conducted in a club setting where full randomization of participants was not possible. The design used is a pretest-posttest control group design with three treatment groups: a predictable training group, an unpredictable training group, and a control group that followed conventional goalkeeper training methods. The population of this study consisted of 45 goalkeepers from the Owl Futsal Club in Jatinangor, comprising 30 males and 15 females. All participants were included as samples using a total sampling technique, with each group consisting of 15 participants. To measure reaction speed, the study used the Hand Touch Reaction Test instrument, which is considered capable of objectively measuring visual-motor response time. The design allows the researcher to examine the causal relationship between the applied training methods and improvements in goalkeepers' reaction speed.

RESULTS AND DISCUSSION

Result

In this study, the instrument used was Hand Touch Reaction, which aims to assess the response of all samples in facing conditions that arise in the field. This study was conducted to identify the impact of predictable and unpredictable training methods on the reaction speed of futsal goalkeepers. After undergoing initial and final tests, here are the results.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. deviation
Pretest Pre	15	0,44	0,50	0,4742	0,01814
Pretest Unpre	15	0,44	0,50	0,4727	0,01831
Pretest Kontrol	15	0,44	0,50	0,4747	0,01727
Posttest Pre	15	0,41	0,48	0,4460	0,01882
Posttest Un	15	0,40	0,46	0,4260	0,01844
Posttest Kontrol	15	0,43	0,43	0,4653	0,12727

This study involved 45 futsal goalkeepers who were evenly divided into three treatment groups: predictable, unpredictable and control. The pretest results showed that the three groups had relatively similar initial reaction speed levels. The average

pretest values ranged from 0,4747 to 0,4747 seconds, with a small standard deviation (<0,02), indicating the homogeneity of the participants' initial abilities. After undergoing the training session, the posttest results showed a decrease in the average reaction time in the predictable and unpredictable groups, indicating an increase in reaction speed. The predictable group recorded an average of 0,4460 seconds, while the unpredictable group recorded the lowest average, at 0,4260 seconds. In contrast, the control group showed relatively small changes with a posttest average of 0,4653 seconds. The variation in scores (standard deviation) in the posttest phase increased slightly in the treatment group compared to the pretest phase, reflecting an individual response to the training. However, in general, the unpredictable group showed the most significant improvement in reaction speed, followed by the predictable group, while the control group experienced a less significant increase. These results indicate that training with an unpredictable approach has a greater effect on improving the reaction speed of futsal goalkeepers compared to a predictable approach or no treatment.

Table 2.

Test of Normality

Class	Statistic	df	Sig.
Predictable	0,980	15	0,971
Unpredictable	0,945	15	0,448
Control	0,945	15	0,443

The Shapiro-Wilk Test results produced a statistical value of 0,980 with df 15 and a significance of 0,971. A very high significance value (p>0,05) confirms that the predictable group data is normally distributed. While the Shapiro-Wilk statistical value in the unpredictable group is 0,945 with df and a significance of 0,448. These results also show that the unpredictable group is normally distributed because (p>0,05). Then in the control group has a statistical value of 0,945 with df 15 and a significance of 0,443. This data is also normally distributed (p>0,05).

Table 3.

Test of Homogeneity of Variance

	Levene Statistic	df1	df2	Sig.
Based on the Mean	0,084	2	42	0,919
Based on the Median	0,144	2	42	0,866
Based on Median and with adjusted df	0,144	2	41,808	0,866
Based on the trimmed mean	0,100	2	42	0,905

Based on the results of the Test of Homogeneity of Variance (Levene's Test), all significance values show results above 0,05, namely based on Mean 0,919, based on Median 0,866, based on Median and with adjusted df 0,866, and based on trimmed mean 0,905. These results indicate that the assumption of homogeneity of variance is met, so there is no significant difference in variance between groups in the reaction speed variable, and the data is worthy of being continued to a One-Way ANOVA analysis.

Table 4.
Test of One-Way Anova

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0,012	2	0,006	17,540	<,001
Within Groups	0,014	42	0,000		
Total	0,025	44			

Based on the results of the ANOVA analysis on the reaction speed variable, an F value of 17,540 was obtained with a significance level of <0,001 (p<0,05), which indicates that there is a significant difference in reaction speed between treatment groups.

Table 5.
Test Post Hoc

Class	(j) class	Mean Difference (I-J)	Std. Error	Sig.	Lowed Bound	Upper Bound
Predictable	Unpredictable	0,02000*	0,00664	0,013	0,0034	0,0366
	Control	-0,01933*	0,00664	0,017	-0,0359	-0,028
Unpredictable	Predictable	-0,2000*	0,00664	0,013	-0,0366	-0,0034
	Control	-0,03033*	0,00664	<0,001	-0,0559	-0,0228
Control	Predictable	0,01933*	0,00664	0,017	0,0028	0,359
	Unpredictable	0,03933	0,00664	<0.001	0,0228	0,559

The results of Bonferrini's further test showed significant differences between the predictable and unpredictable groups (p=0.013), unpredictable and control (p<0,001), and control and unpredictable (p<0,001). Meanwhile, there was no significant difference between the predicted and control groups (p=0,017>0,05). These results indicate that the type of stimulus affects the speed of the subject's reaction, with the unpredictable group showing a significantly different reaction speed compared to the other groups.

Table 6.
Homogeneous Subsets

Group	N	1	2	3
Unpredictable	15	42,60		
Predictable	15		44,60	
Kontrol	15			46,53
Sig.		1,000	1,000	1,000

Tukey HSD follow-up test was conducted to determine the significant mean differences between treatment groups after the ANOVA results showed statistically significant differences. In the study, there were three groups compared, namely the unpredictable, predictable and control groups. The homogeneous subsets table shows that unpredictable groups have an average value of 42,60. The predictable group has an average value of 44,60. The control group has the highest average value, 46,53. Each group is in a different subset, which means that there is a significant difference between each group at the significance level of a = 0,05. This indicates that the training method used has a different effect on the reaction speed of a futsal goalkeeper. Thus, it can be concluded that the predictable and unpredictable training methods each have different effects on increasing reaction speed compared to the control group, and are even different from each other.

Discussion

This study aims to improve the reaction speed of futsal goalkeepers during the match through the implementation of a designed training program. The program implemented is predictable and unpredictable training, with a total of 12 meetings carried out in a time span of 3 times in 1 weeks, with variations in material in each meeting. Each player is expected to follow each training session with discipline to maximise the desired results. By repeating the practice of a skill, the ability being trained will develop and become more mature (Mauladani et al., 2024). Reflex speed is very important for futsal goalkeepers, because futsal is played on a smaller field, with a fast tempo of play, the ball moves faster, and often comes at close range, requiring the goalkeeper to have sharp reflexes in dealing with the opponent's attack. In addition, the high frequency of attacks on a small field requires the goalkeeper to always be ready to respond to shots in a short time.

Looking at the understanding of the purpose of reaction speed itself, it can be concluded that reaction is a basic technique that is very important or even mandatory, to be mastered by futsal goalkeepers. Therefore, researchers want to try to examine whether there is a significant effect a reaction speed if given a predictable and unpredictable method training pattern. With a structured training pattern, goalkeepers are enthusiastic about doing training and will provide good benefits for goalkeepers in mastering the basic techniques given during training. According to research, predictable and unpredictable training patterns affect the goalkeeper's reaction speed because the training pattern is carried out continuously, so that the goalkeeper will get used to doing good and correct reactions or reflexes.

The speed of the goalkeeper's reflexes allows them to adapt to unexpected situations, such as the ball bouncing off walls, players, or the floor, thus securing the goal more effectively. Important physical characteristics for a futsal goalkeeper include agility and quick reactions, where the goalkeeper must be able to respond to shots that come suddenly and from close range (Vieira et al., 2017). Thus, these skills are very crucial to support the optimal performance of futsal goalkeepers in matches. Movement refers to the implementation of sport activities that have been planned and systematically arranged over a long period of time, aiming to improve motor skills, including physical, technical, tactical and mental aspects.

CONCLUSION

This study concludes that predictable and unpredictable training programs carried out in a structured and varied manner can improve the reaction speed of futsal goalkeepers during matches. This training has been proven effective in preparing goalkeepers to face attacks more quickly and accurately, thereby improving their performance on the field. The training program applied with the right portion and discipline has a positive impact on the goalkeeper's motor and psychological abilities, which are important for responding to fast and dynamic game situations. Therefore,

predictable and unpredictable training is highly recommended as a training method to improve the reaction speed of a futsal goalkeeper, both by coaches, teachers, and extracurricular coaches. The result of the study shows a significant increase in the reaction speed of futsal goalkeepers, as evidenced by a striking increase in the average pretest and posttest.

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