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The influence of a coordination training model that uses various manipulative movements on futsal kick accuracy

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Abstract*:* Achieving precise kick accuracy and coordinated movements in futsal was essential for competitive success. This study aimed to evaluate the differences between various futsal training approaches that incorporated distinct coordination exercises involving manipulative movements, specifically assessing their impact on kick accuracy. A quasi-experimental design with a control group was employed, focusing on shooting skills within the futsal context. The population consisted of 70 members from the Universitas Muhammadiyah Kalimantan Timur (UMKT) futsal team, from which 40 players were purposively selected based on their participation duration of over six months and their tier status within the university's core teams. Participants were divided into two groups: one received static coordination training (control group), and the other underwent dynamic coordination training (experimental group), each comprising 20 players. The intervention spanned 18 sessions, including pre- and post-tests. Data were collected through a modified shooting kick test at the futsal goal, utilizing a point distribution system. Analysis revealed significant differences in kick performance between the two training methods, with dynamic coordination training yielding superior results (t-count = 3.010 > t-table = 2.024). These findings indicated that dynamic coordination exercises were more effective than static ones in enhancing futsal kick accuracy. Future research should have considered expanding the population and sample size to include amateur players, introducing additional variables and diverse training methodologies, extending training duration and frequency, conducting long-term evaluations, measuring shooting technique quality, and employing quantitative research methods. By addressing these suggestions, subsequent studies could contribute more comprehensively to the understanding of effective training strategies in futsal.

Keywords: coordination, accuracy, shooting, futsal

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INTRODUCTION

Futsal is a type of defensive and attacking sport that tends to be like football because it is designed to be smaller in terms of both facilities and infrastructure as well as the number of players. The size of the field, which is smaller than a football field, also requires a smaller number of players, namely five people, including a goalkeeper. Futsal has several playing techniques, such as shooting, passing the ball, and so on. Speed of movement and the creation of space are attributes that help define the sport, and awareness is a key attribute of elite futsal players (Oliveira et al., 2024). These techniques require special attention to produce significant improvements. Apart from technique, the athlete's physical condition is also important, which will support the athlete's performance and abilities (Katanic et al., 2023). The anthropometry and body proportions of each futsal team are, of course, different. This shows that each

athlete on a team has different characteristics. This characteristic is, of course, not only about psychology but also about physicality, which requires coaches to be able to maintain a consistent rhythm during training and matches (Ribeiro et al., 2024). With consistency and a good training program, an athlete's appearance will change. Paying attention to several aspects of physical performance will be better. Focusing on neuromuscular performance will have an impact on many things, such as reducing jumping ability but not reducing other movement abilities (Spyrou et al., 2023). Monitoring and improving the physical aspects of athletes includes reducing the number and risk of injuries (Rebelo et al., 2024). packaged using a training program specifically designed to provide intensive training and training experience to achieve the desired results. Apart from the techniques that must be carried out by human resources, encouragement must also be given to coaches and athletes who excel in the sport of futsal.

In developing athletes, several efforts and treatments need to be given. To optimize training programs and improve performance in elite futsal competitions, it is important to understand the dynamics of player movement (Ribeiro et al., 2024). Trainers do this by building and providing physical training programs. Complex exercises can improve physical condition, especially strength and endurance (Zhai & Qin, 2024). To provide a comprehensive competition and training experience, coaches must manage the time and duration of training or play in a more balanced manner. It should also encourage athletes to choose the right physical condition. Athletes with high playing time will disrupt neuromuscular performance recovery compared to athletes with low playing time (Spyrou et al., 2024). In the coaching strategy, the coach should also pay attention to each player's position, the attacking part, which must be given attention to provide great attacks and produce lots of goals. The importance of the offensive part and the number of goals in the game system, and how an increase in the number of goals can affect it (Villarejo García et al., 2024). In addition, the training model appropriate to the type of sport and athlete must be considered, as futsal will have a greater external load than football in a small table game (Kose et al., 2023).

Although some techniques in futsal and soccer are almost the same, there are some changes that make them different. Smaller fields and fewer players are the main differences. In addition, the infrastructure and facilities are adjusted to support a faster and more intense game. With a smaller field, players must have better technical skills and be able to make quick decisions in tight conditions. To improve the overall ability of futsal players, the development of training models and test rules that are carried out periodically is very important. These tests help coaches evaluate the progress of players and adjust their training programs to meet the needs of each player. The Yong Futsal Specific Test Battery is often recommended as a tool to measure the performance of futsal players accurately (Iqbal Doewes, 2023). Shooting ability testing is very important in futsal, in addition to general performance evaluation. An alternative method to evaluate the shooting ability of futsal players is the Massay Futsal shooting test (Naser & Ali, 2016). This test is useful for measuring the accuracy and power of shots and identifying player talents in real-game situations. The results of this test can help coaches create better training programs to improve players' shooting abilities. It is very important to collect futsal skill data to identify player talents and as a reference in efforts to develop futsal playing skills. This data can provide insight into elements that need improvement and where players have great potential. Coaches can create more targeted and successful training programs to improve players' overall abilities with accurate data (Ramadhan et al., 2021). The ability to kick the ball, including shooting towards the opponent's goal, is very important in futsal skills. This ability requires additional physical strength, as well as good technical skills and accuracy in doing so. Players must be able to kick the ball in various situations and use various techniques. To improve player performance on the field, training that focuses on improving kicking and shooting skills will be very beneficial.

Kicking ability depends on psychomotor factors (strength, speed, endurance, flexibility, coordination, and accuracy), psychological factors (cognitive, conative, social), incentive structure, teaching and training methods, various external factors (playground, referees, equipment, public, etc.), and error factors (Dejan & Igor, 2013). Based on this statement, one way to improve accuracy skills is to carry out coordination exercises. Coordination is the process of muscle cooperation that produces structured, oriented movements with the aim of developing the movements necessary for the application of technical skills (Irawadi, 2011). Coordination is basically the ability to combine several movements into one harmonious and harmonious movement pattern (Widodo, 2021). Coordination is an athlete's ability to sequence movements into a complete and harmonious movement (Hanief, 2015). Coordination is an element of overall fitness. The term "coordination" refers to the coordination of movements (Sors

et al., 2018). Almost all sports and competitions that require participation require coordination (Faruq, 2006). The extent to which a person's movement coordination is reflected in their ability to move smoothly, accurately, quickly, and efficiently (Ridlo, 2019). Kicking ability is related to kick accuracy (Ozaki et al., 2010). Accurate kicks will provide optimal results in futsal games. Kick accuracy in futsal is a key that cannot be ignored because it is part of the effort to achieve futsal results or achievements. An athlete's physical condition is an important part of efforts to achieve accuracy in kicks, so in meeting the goal of kick accuracy, it is deemed necessary to be able to train in the physical conditions related to futsal kicks (Palucci Vieira et al., 2019). One thing related to this is the athlete's coordination, which is an important part that must be improved because, without coordination, it is impossible for the kick to be on target. This condition is part of an effort to perfect or optimize the results of a process undertaken while carrying out the futsal training program tasks. Of course, when training, there are variations in practice to provide an effect that is not boring. In this case, the coordination training method is part of the physical components or other movements which are combined into one of the things that is done or optimized in an effort to achieve the target in futsal training.

Several relevant studies related to accuracy and coordination that support this research are as follows: This coordination test is successful in differentiating coordination in soccer players and can integrate field test batteries during the entire soccer season because it is easy and cheap to administer by coaches (Tessitore et al., 2011). Moving target passing drills are more effective in improving passing accuracy than fixed target passing drills, and players with high eye-foot coordination have greater accuracy than players with low eye-foot coordination (Thomas et al., 2021); interaction of the influence of silent eye training methods, anxiety, and eye-foot coordination on the accuracy of a player's kick against the goal. This research can improve the design of training programs to increase the accuracy of kicks on goals (Alficandra et al., 2021). Many studies have investigated the futsal kicking technique, but few have experimentally tested the effects of specific coordination training with various manipulative movements. These studies have typically focused on routine training without considering the variety of movements that may improve futsal kicking accuracy. Previous studies have only looked at professional players or high-level teams, so the results are not relevant to amateur or student players. Based on relevant theory and research, this research focuses on variations in kick coordination and accuracy. The aim of this research is to determine the differences between training methods using variations in static and dynamic coordination in producing accurate futsal kicks. This research is also directed at improving the kick accuracy abilities of students from the UMKT Futsal student activity unit and as a recommendation for coaches.

METHODS

This study employed a quasi-experimental design to investigate the effects of shooting skill treatment in futsal. The research examined the impact of different coordination exercises on kick accuracy while controlling for other variables that might influence the outcome. The study utilized a counter-balanced design, dividing the same individuals into two experimental groups to perform different coordination exercises simultaneously with an alternating time sequence.

The research focused on two types of exercises: variations of static ankle coordination and variations of dynamic ankle coordination. The study sample consisted of 40 students who participated in extracurricular futsal activities. These 40 participants were divided into two equal groups of 20, with each group receiving a different treatment. One group underwent static ankle coordination exercises, while the other group performed dynamic ankle coordination exercises. The treatment was conducted over 18 sessions, including pre-test and post-test evaluations.

The data collection process began with a pre-test where all participants performed a shooting kick towards a modified goal with predetermined scoring zones based on difficulty levels (Narlan et al., 2017). The test was designed to measure kicking skills, accuracy, and speed. Each participant executed 10 kicks from three different points, all at 12 meters from the goal. This included 4 kicks from the centre point, 3 kicks from the right point, and 3 kicks from the left point. The scoring system was designed such that if the ball hit the rope dividing the score boxes (see Figure 1), the higher score was awarded. Kicks that missed the target or went outside the goal were given a score of zero. After the treatment period, a post-test following the same procedure was conducted to assess improvements. This methodology allowed for a comprehensive evaluation of the participants' shooting skills and the

effectiveness of the two different coordination exercise regimens. The statistical analysis for this study utilized the paired sample T-test to examine the differences between kick accuracy scores in the pre-test and post-test. This statistical method was chosen because it is particularly suitable for comparing two sets of measurements taken from the same individuals before and after a treatment or intervention.

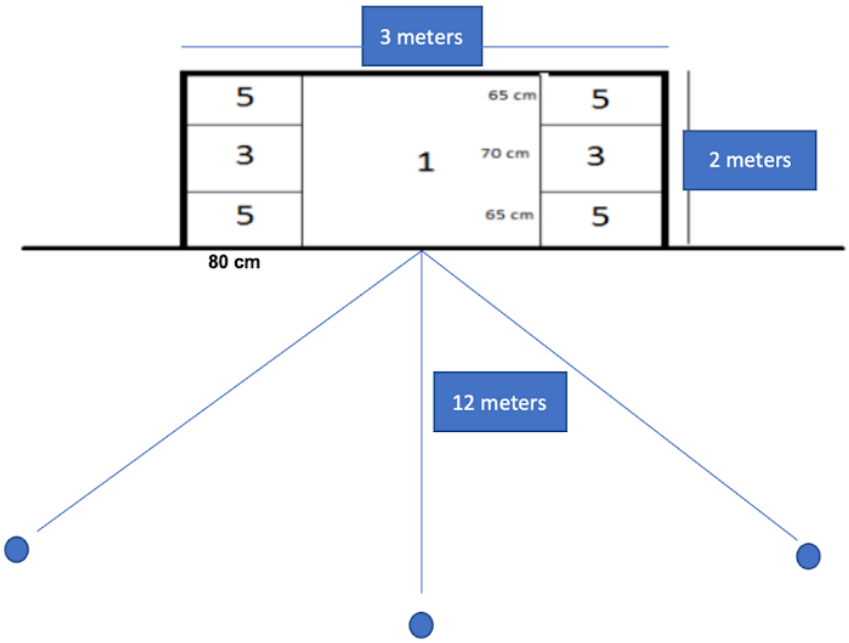

Figure 1. Futsal shooting test (Narlan et al., 2017)

RESULTS AND DISCUSSION

The statistical analysis for this study employed the independent samples test to examine the differences in shooting accuracy between the two treatment groups. The independent samples test, also known as the independent t-test, was used to assess whether there was a statistically significant difference between the mean scores of the static ankle coordination group and the dynamic ankle coordination group. The test assumes that the dependent variable (shooting accuracy) is measured on an interval or ratio scale, which aligns with the scoring system used in this research. It also assumes that the data is normally distributed and that there is homogeneity of variances between the two groups. In conducting the analysis, the post-treatment shooting accuracy scores of the static ankle coordination group were compared with those of the dynamic ankle coordination group. The test calculates a t-statistic and a corresponding p-value, which indicate the magnitude of the difference between the groups and the probability of obtaining such results by chance, respectively. The results of the independent samples test are presented in Table 1, which includes the mean scores for each group, the t-value, degrees of freedom, and the p-value. These statistics provide insights into whether the difference in shooting accuracy between the two coordination exercise regimens is statistically significant, thus addressing the research question regarding the relative effectiveness of static versus dynamic ankle coordination exercises on futsal shooting accuracy.

Table1. Independent Samples Test Result

F	Sig	t	df	Sig. (2-tailed)
2.433	.127	3.010	38	.005

The results of the analysis in Table 1 regarding the independent samples t-test show that there is a significant difference between static coordination and dynamic coordination. The results of data analysis show that t-count is greater than t-table, namely 3.010 > 2.024 and sig (2-tailed) = 0.005 < 0.05.

So, it can be concluded that there is a significant difference between the results of shooting kicks with static coordination and the results of shooting kicks with dynamic coordination. The results of descriptive statistics for each variable show that the average/mean shows a difference. These results can be seen in Table 2.

Table 2. Descriptive Statistics Results

Exercise Type	Mean	N	Std. Deviation	Std. Error Mean
Static Coordination	7,90	20	1,518	.340
Dynamic Coordination	9,40	20	1,731	.387

Table 2 shows the average or mean results for each variable. From the results in Table 2, the average futsal training method with static coordination variations is 7.90 with a standard deviation of 1.518, or a percentage of 46%, and the average futsal training method with dynamic coordination variations is 9.40 with a standard deviation of 1.731 or a percentage of 54%. The shooting kick is one of the important factors in the game/sport of futsal, considering that the size of the field is not too big, which allows athletes to kick the ball hard towards the goal, so accuracy in kicking the ball is very necessary to master. To train kick accuracy, you can do static coordination exercises and dynamic coordination exercises (González-Fernández et al., 2021; Manolopoulos et al., 2006) as carried out in this research. The results of data analysis in this study show that there is a significant difference between static coordination and dynamic coordination in determining the accuracy of shooting kicks in futsal. Static coordination is better than dynamic coordination in determining kick accuracy because static coordination when shooting, has better ball control than dynamic coordination (Tessitore et al., 2011). The condition of the ball being stationary when kicking with static coordination makes it easier for the player to hit the ball according to the position of the foot to direct the target according to the player's wishes (Manolopoulos et al., 2006). In contrast to previous research results, it was explained that athletes would be able to increase their dynamic sideways jumps during training twice a week (Bezerra-Santos et al., 2023). This relates to the use of kicks in real-game situations, where athletes run with the ball or receive a pass before kicking the ball into the goal. Playing futsal has a relationship with physical condition. In shooting, for example, coordination, strength, and power must always be trained and maintained. Dynamic coordination and agility training can improve the physical condition of athletes (Nawawi & Fatoni, 2023). In contrast to dynamic coordination, the ball to be kicked moves, so it is not easy to control. The point of support when kicking is important; the larger the area of support, the higher the level of balance; the higher the point of body weight from the place of support, the lower the level of balance.

On the other hand, if you look at these results, coordination can be used to improve kick accuracy, where kick accuracy in every futsal match is very influential in creating goals or points for the team. This is based on the results of matches where goals or points determine victory. Previous research on kick coordination and accuracy was conducted by Alficandra et al., (2021) on the effect of quiet eye exercises, anxiety levels, and eye-foot coordination on the accuracy of kicks against football players. It can be done by choosing a form of approach training method that is appropriate to the growth and development of the player's motor skills and following the stages in carrying out technical exercises at the cognitive stage, fixation stage, and automation is designed to help optimize player performance (Cakir et al., 2020; González-Fernández et al., 2021). Training in sports is an attempt to produce a different impact from previous results. Training methods in futsal have diversity and adapt to what techniques will be improved or techniques that will be trained. Improving futsal technical abilities requires measuring tools that can describe the results of the training program provided. Dribbling test instruments can be measured using several alternatives, either manually without the help of certain technology or even using technological assistance, as happened in the development of an Arduino microcontroller, which is useful for measuring futsal dribbling speed (Tauba & Bafirman, 2021).

The ability to control the ball when kicking is an important factor (Manolopoulos et al., 2006) because each coordination has different goals. Static coordination makes it easier for players to control so that balance and contact with the ball are better, in contrast to dynamic coordination, which requires a high level of balance so that the ball can be controlled and the ball impact is in accordance with the desired foot position and target direction (Cakir et al., 2020; González-Fernández et al., 2021; Mulyawan

et al., 2023). In addition, if you look at these results, it is necessary to practice static coordination exercises regularly to improve the quality of shooting kick accuracy (Mulyawan, 2020; Mulyawan et al., 2016). The better the accuracy of the kick, the more opportunities there are to score goals or points in a futsal match. A player practices kicking in an open field with the aim of kicking the ball towards a certain target (Manolopoulos et al., 2006). Players who concentrate on static coordination can control the ball better and improve the accuracy of their kicks. To improve skills and increase confidence, this exercise involves regular repetition (Bompa & Buzzichelli, 2019). The coach organizes team training, such as matches where each player must work together to create goal opportunities. Players with good static coordination can receive and pass the ball more precisely, allowing the team to maintain possession of the ball and create more opportunities to score goals (Lubis et al., 2019; Mulyawan et al., 2023). Practising kicks in different weather conditions, such as rain or wind, can also help players become better at kicking. Players' ability to control the ball can be improved by using additional equipment, such as cones or dummies, to simulate their opponents. In this drill, players must maintain coordination and control of the ball while avoiding obstacles (Tessitore et al., 2011). Ultimately, this will result in more accurate kicks in pressure situations. Reviewing training sessions using video analysis allows players to review their kicking technique and correct any errors. By viewing the footage, players can improve their static coordination, ensuring that each kick has the correct technique and accuracy.

A player's ability to master various techniques in futsal can be improved with several alternatives, including varying the training methods provided with several variations or using several combined methods. The training methods provided are, of course, adapted to several conditions and characteristics. The characteristics referred to in this case were obtained through previous research to get an idea of the level of ability that serves as a direction for the development and improvement of skills in the future (Insanistyo et al., 2023). Apart from being influenced by training methods, skills in futsal techniques are also influenced by several things, including muscle strength to support shooting abilities (Supriadi, 2022). Efforts to improve shooting abilities are specifically influenced by several things related to technical and physical training programs and viewed from the context of the athlete's physical fitness, anatomy and physiology(Puncreobutr & Promputh, 2016; Sekulic et al., 2021). Improving the quality of athletes through various forms of effort should be organized to be more optimal; giving treatment to a sports training program will have a good impact, not only limited to sports achievements, in educational sports, the impact of treatment in an effort to improve student performance can also be done, as is the case providing treatment using visual videos to provide increased motivation (Pratiwi & Ridwan, 2021). Apart from that, in an effort to achieve optimal performance results in sports training, it is recommended that players have good endurance. Players are expected to carry out endurance training in a well-structured manner and follow the guidelines provided (Rezki et al., 2020). Apart from paying attention to treatment in training programs and treatment in physical education, it is also necessary to consider the risk of sports injuries. Where these injuries can be minimized with measurable forms of activity, such as warming up before and cooling down after training (Muhibbi et al., 2023), it is also very important to implement treatment programs in sports in the discussion of this research, which is more specific to the sport of futsal, as well as minimize the risk of sports injuries. The following explains more about the discussion on the sport of futsal (Juniarsyah et al., 2020).

Futsal shooting accuracy through training methods combined with dynamic ankle-foot coordination produces better results than static. Training methods combined with dynamic coordination can be an alternative in an effort to improve athletes' futsal shooting abilities. Accuracy, in this case, is the fulcrum or measure of success of the training method used. Futsal players often have to shoot under pressure from opposing players. Training with dynamic coordination that involves variations in fast movements and kicking accuracy under pressure, such as with a timer or virtual opposing player, can help players become more prepared for such situations. In addition, real game simulations allow the use of dynamic coordination training techniques, which teach players to make quick decisions while maintaining shooting accuracy and game scenarios such as shooting after dribbling or after receiving a pass in a narrow area (Silveira et al., 2022). This will help players learn to adjust their kicks to changing circumstances. Players' dynamic coordination can be improved through movement exercises that combine running, changing direction, and kicking. Players can practice kicking after running zigzag through several cones. This will improve the accuracy of the kick and the accuracy of adjusting the body position before the kick. Training with teammates can improve dynamic coordination. Fast passing drills followed by shooting straight at the goal are examples of drills that not only improve individual skills

but also improve team synergy to create more accurate and effective shooting opportunities (Doğramacı et al., 2015). Often, futsal players have to shoot the ball from unexpected angles. Dynamic coordination drills with random passes from different angles help players improve their response to shooting quickly and accurately without changing their body position for too long. This drill can be done using a ball shooting machine or a training partner who provides random passes. A new training program focused on dynamic coordination was started by the futsal team. Each training session involved a variety of dynamic locomotor movements, such as running, dribbling, and shooting at the goal (Sáez De Villarreal et al., 2015). The players were challenged to master movements that combined speed and agility, which helped them improve their abilities in a real game environment. The coach directed the players to concentrate on dynamic shooting techniques during today's futsal training. The purpose of this training was to ensure that each player was able to shoot on target at high speed in situations similar to those in a match.

Dynamic coordination is a human ability to carry out movements combined with a level of coordination, so it has pretty great difficulties for those not used to it. Dynamic coordination training in futsal or kicking practice in futsal can provide a different experience and will provide support for factors increasing one's abilities. Coordination combined with learning methods provides quite a good impact (Cakir et al., 2020; Manolopoulos et al., 2006). It is also important to pay attention to this coordination in efforts to train coordination, which correlates with futsal shooting ability (Lhaksana, 2011). Coordination training can be influenced by learning methods and gender (Jurak et al., 2023). In this case, efforts to improve athletes' futsal shooting abilities have been implemented. From several previous studies presented previously, it can be found that there has been a lack of specific study that conveys or researches training methods related to shooting accuracy using approaches or treatments combined with dynamic eye-foot coordination, so this could be a novelty from this research with research results that point to the effectiveness of futsal shooting training methods using dynamic eye-foot coordination techniques. It can be used as a recommendation in the futsal training process to support optimal results towards training objectives to improve futsal shooting.

CONCLUSION

Based on the study's findings, it can be concluded that there is a significant influence between futsal shooting training methods using static and dynamic coordination variations on improving the futsal shooting results for amateur or collegiate players. Variations in shooting training using dynamic coordination are the right recommendations to be used as alternative training to improve futsal shooting abilities and results. Based on this finding, some suggestions for future research are expanded population and sample for amateur subjects only, added variables, more diverse training methods, longer training duration and frequency, long-term evaluation, measurement of shooting technique quality, and quantitative research. By considering these suggestions, future research can provide a more in-depth and comprehensive contribution.

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