

## The influence of hurdle drill, ladder drill and agility training on women's football skills La influencia del ejercicio con vallas, el ejercicio con escaleras y el entrenamiento de agilidad en las habilidades del fútbol femenino

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**Abstract.** This study aims to test: (1) differences in the effect of hurdle drill training, ladder drill on football playing skills; (2) the difference in the effect of low agility and high agility on football playing skills; and (3) whether or not there is any interaction between hurdle drill training, ladder drill and agility to football playing skills. The design used in this study is an experimental method using a 2x2 factorial design. The research sample was taken by ordinal pairing from a population of 38 players aged 15-18 years. Instruments for measuring agility using the Illinois Agility Test. An instrument for measuring football playing skills using the David Lee Development Test. The results of the study are as follows: (1) There is an influence of the hurdle drill training method, ladder drill on football playing skills ( $p > 0.05$ ) because the significance value of  $p$  for the posttest is  $0.000 < 0.05$ . (2) There is a significant difference in the effect of low agility and high agility on football playing skills ( $p < 0.05$ ) because the significance value shows  $p$  of  $0.007 < 0.05$ . (3) There is an interaction between hurdle drill training methods, ladder drill and agility (high and low) to football playing skills ( $p > 0.05$ ) posttest results of  $0.001 < 0.05$  the results show that after treatment or training there is an interaction between method with football playing skills. Based on research conducted by researchers, agility has a significant influence on football playing skills, and there is an interaction between hurdle drill and ladder drill training methods and agility (high and low) on football playing skills. The application of the hurdle drill and ladder drill methods has an influence on football playing skills. The method of training hurdle drill and ladder drill in improving football playing skills has been proven.

**Key words:** hurdle drill, ladder drill, agility, basic skills of playing football.

**Resumen.** Este estudio tiene como objetivo probar: (1) las diferencias en el efecto del entrenamiento con obstáculos, ejercicios de escalera en las habilidades de juego de fútbol; (2) la diferencia en el efecto de baja agilidad y alta agilidad en las habilidades de juego de fútbol; y (3) si existe o no alguna interacción entre el entrenamiento con obstáculos, ejercicios con escaleras y agilidad con las habilidades para jugar al fútbol. El diseño utilizado en este estudio es un método experimental utilizando un diseño factorial 2x2. La muestra de investigación se tomó por emparejamiento ordinal de una población de 38 jugadores de 15 a 18 años. Instrumentos para medir la agilidad usando el Illinois Agility Test. Un instrumento para medir las habilidades de juego de fútbol utilizando la prueba de desarrollo de David Lee. Los resultados del estudio son los siguientes: (1) Hay una influencia del método de entrenamiento de obstáculos, ejercicio de escalera en las habilidades de juego de fútbol ( $p > 0.05$ ) porque el valor significativo de  $p$  para la prueba posterior es  $0.000 < 0.05$ . (2) Hay una diferencia significativa en el efecto de la agilidad baja y la agilidad alta en las habilidades para jugar al fútbol ( $p < 0,05$ ) porque el valor de significancia muestra una  $p$  de  $0,007 < 0,05$ . (3) Existe una interacción entre los métodos de entrenamiento de obstáculos, ejercicios de escalera y agilidad (alta y baja) con las habilidades para jugar al fútbol ( $p > 0,05$ ) resultados posteriores a la prueba de  $0,001 < 0,05$  los resultados muestran que después del tratamiento o entrenamiento existe una interacción entre método con habilidades de juego de fútbol. Según la investigación realizada por los investigadores, la agilidad tiene una influencia significativa en las habilidades para jugar al fútbol, y existe una interacción entre los métodos de entrenamiento de ejercicios con obstáculos y de escalera y la agilidad (alta y baja) en las habilidades para jugar al fútbol. La aplicación de los métodos de ejercicios con vallas y ejercicios con escaleras influye en las habilidades para jugar al fútbol. Se ha probado el método de entrenamiento de ejercicios con obstáculos y ejercicios con escaleras para mejorar las habilidades de juego de fútbol.

**Palabras clave:** ejercicios con vallas, ejercicios con escaleras, agilidad, habilidades básicas para jugar al fútbol.

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### Introduction

Sport is useful as a means of recreation, health and achievement. A sport that is much loved by people in Indonesia is football. Research conducted (Komarudin & Risqi, 2020) that football is much loved by people in Indonesia, as evidenced by football being used to find sweat, just play, seek achievements and make football a profession. This is in line with the opinion (Yudanto & Nurcahyo, 2020) which stated that the government's attention to the development of football is evidenced by the construction of various football stadiums and the various facilities in them. Football is a team sport that relies on technique, tactics, and mentality to get maximum achievements (Mardhika & Dimiyati, 2015). Football is a game that requires quality players (Gyambrah et al., 2013). A high level of physical

fitness provides a physiological basis for female football athletes to be able to cope with physical demands in a game and allow them to use technical and tactical abilities effectively (Martínez-Lagunas et al., 2014). Th Galih Pamungkase Football School (SSB) is the right tool to nurture and train novice football players to become skilled and outstanding football players. The public's interest in the game of football is not balanced with the achievements obtained by the Indonesian nation in the international football scene.

Athletes need hard work from start to finish, such as preparation during hard training, preparing for physical and body conditions, and mental preparation. This is in line with the opinion (Amiq, 2014) which states that, excellent physical condition is very supportive of a player's performance. Poor physical appearance will certainly have a

bad or negative impact on the appearance of his own technique and tactics. (Yudanto & Nurcahyo, 2020) stating a good football player must qualify as an individual as well as a member of the eleventh team. That is, a football player must have good agility, especially when performing dribbling techniques. Football requires good physical condition in playing and competing. There are four phases in football training, namely physical, technical, tactical and mental (Firmansyah et al., 2021). The optimal achievement that a team or athlete can achieve in sports is influenced by many factors, including the technical, physical, tactical, and mental skills of the players (Suherman & Nugroho, 2022).

The physical components involved in soccer are agility, speed, cardiovascular endurance, flexibility, speed, ankle coordination, balance, and power (Rebelo et al., 2014). One of the dominant components in soccer is agility and speed (França et al., 2022). Agility is needed by a football player in the face of certain situations and match conditions that require moving to control the ball as well as in defense to avoid collisions. This is emphasized (Widiastuti & Olahraga, 2015) that agility is the ability to change the direction or position of the body quickly which is done together with other movements. The principle of exercise is a process of change for the better, that is, to improve: the physical quality, functional abilities of the body's equipment, and the psychic qualities of the athlete (Sukadiyanto & Muluk, 2011). Agility training using a variety of portable equipment. This equipment includes agility ladders to train foot work quickly, cones and poles to mark turning points in running exercises. Plyometrics and speed are included as components of the recommended exercise (Nasution & Suharjana, 2015). Hurdle training is a form of plyometric training. According to (Sulaiman et al., 2018) states that the plyometric exercises in question are barrier hop, depth jump, multiple box-to-box jumps, stadium hop, single leg stride jump, skipping, tuck jump, and lateral obstacle jumps. This type of training can improve a player's speed, agility, balance, strength and flexibility. The same thing was expressed (Aalizadeh et al., 2015) stated that plyometric training is a training strategy designed to improve agility and strength performance, which allows the muscles to achieve maximum strength and speed increases in a short duration.

Research has shown that a plyometric training program with equipment can increase the vertical jump measured by the Abalakov Test, which better simulates playing conditions. The research offers to continue studies focusing on bursts of strength in this age group, taking into account the individual's sporting experience and physiological development; it is also important that the program's training includes other components (strength and speed, nutritional advice, and/or mental health) that can contribute to power bursts (Pena-Brito et al., 2023). According to (Bujak et al., 2014) states that the hurdle drill is one of the most demanding exercises in terms of motor and technical skills characterized by fast and powerful movements. The application of the hurdles technique is hurdles with a step pattern. The hurdler must have good

flexibility, quality of speed and strength, a high level of technical preparation and mental stability. In line with the above opinion (Pinthong et al., 2015) states that hurdle jump is a plyometric exercise whose intensity can be modified by adjusting the height of the goal, increasing the number of wickets, and varying the jump pattern. Plyometrics is an exercise that involves improving muscle performance (Bin Shamshuddin et al., 2020).

One form of exercise to increase speed and agility is agility hurdle drill. The agility hurdle drill training method is a varied and innovative form of power and coordination training that is modified using simple tools. Agility hurdle drill is a form of exercise method used to increase limb power that serves to increase stamina, coordination, agility, and speed (Ismoko & Putro, 2017).

As for the training method to increase speed, it is the Ladder Drill. Ladder drill is a form of jumping exercise using one or two feet by jumping over a rope in the form of a ladder placed on the floor or the ground. Following staircase training usually involves a set pattern through stairs that are placed flat or relatively flat on the floor. By moving the legs inside and outside the steps, the goal is to increase the speed (Somerset, 2014). According to (Saqrin, 2013) argues that ladder drill exercises using ladder tools or dexterity ladders focused on rapid movement and precise reactions can increase running speed. Speed and agility are interconnected in his particular soccer in dribbling ability (Andualem, G., Silassie, & Demena, 2016). Past researchers (Padrón-Cabo et al., 2020) It was also suggested that speed and agility contribute to dribbling in football.

Speed is the ability to perform similar movements successively in the shortest possible time (Widiastuti & Olahraga, 2015). Ladder drill training is an important part of many team sports practice. Athletes can move their feet quickly and precisely (Chandrakumar & Ramesh, 2015). As suggested by (F. S. Hadi et al., 2016) Ladder drill is the most frequently performed exercise in various worlds because this exercise can help players in various types and kinds of movements that can increase agility and speed with better coordination. In addition, this training can teach a player to take the right steps according to his agility (F. S. Hadi et al., 2016). Speed, coordination, flexibility and balance are the supporting factors of agility. Based on this, that speed is one of the factors supporting a person's agility. Speed and agility are one of the physical components that must be possessed by soccer athletes (Sermahaj, 2017).

Preliminary observation results show that the level of agility and speed of Putri Mataram Sleman players needs to be increased. This is in line with the opinion (Amiq, 2014) which states that excellent physical condition greatly supports the performance of a player. The reason researchers took the female subject is because women's football is a sport that is currently evolving. This fact was proven when researchers made initial observations, namely that as many as 17 Putri Mataram players took an agility test and a speed test. Meanwhile, from a series of tests to get results for the 50 meter running test, 13 players were said

to be lacking, 1 player was said to be sufficient, and 3 players were categorized as good. As for the shuttle run test, it is said that 13 players are still lacking, 1 player is said to be sufficient and 3 players are said to be good. Based on preliminary observations, it can be concluded that the agility and speed of Putri Mataram players needs to be improved, it is necessary to apply appropriate training methods to increase the agility and speed of Putri Mataram athletes. Based on this, this study aims to examine the effect of hurdle drill, ladder drill and agility exercises on women's soccer playing skills.

**Method**

**Subjects/ Participants**

The design used in this study is an experimental method using a 2x2 factorial design. This experimental study used two groups that received different treatment, namely the hurdle drill and ladder drill training methods which were grouped into high and low agility. The research was conducted on 21 November-31 December 2021. The research place was carried out at the Mataram Sleman Women's football club field located in Nogotirto Field, Gamping, Sleman, Yogyakarta Special Region. The population in this study was the Mataram Sleman Women's football players which amounted to 38 players. The inclusion criteria in this study are all players who are still active in Putri Mataram Sleman, while the exclusion criteria are players who are still active with vulnerable ages 15-18 years. The instrument for measuring agility uses the Illinois Agility Test with a validity of 0.87 while to measure football playing skills using the David Lee Development Test with a validity of 0.484 and a reliability of 0.942.

A population of 38 players was then tested for agility using the Illinois Agility Test. The goal is to find out the level of agility of the Mataram Sleman Princess players. After the agility data is collected, an analysis is then carried out to identify groups of players with high and low agility by using the overall test score of the agility possessed by the player by being ranked.

The results showed that after being ranked as many as 20 people from the highest to lowest agility of 38 players will be the research sample. Based on the ranking, 27% of the upper group and the lower 27% of the test results were determined (Miller, 2008). Thus the sample grouping was taken from players who had high agility as much as 27% and players who had low agility as much as 27% of the data that had been ranked. Based on this, 10 players who have high agility and 10 players who have low agility are obtained. Furthermore, an analysis was carried out using ordinal pairing techniques to identify the experimental group, and it was found that each of the 5 players who had high agility was treated with the hurdle drill and ladder drill training methods, the same was also done for the group of players who had low agility. Data analysis in this study used prerequisite tests, and hypothesis tests.

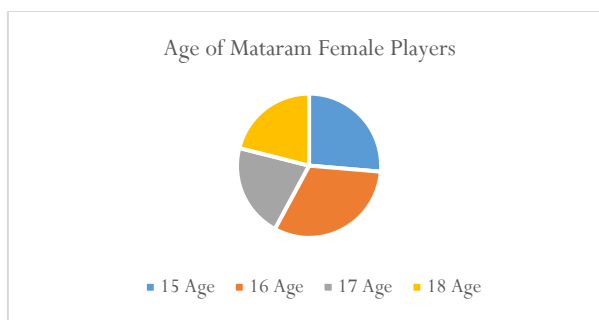


Figure 1. Data on the age of Mataram Female Players

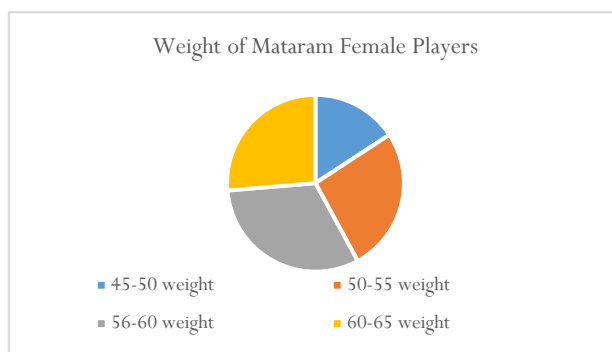


Figure 2. Data on the wight of Mataram Female Players

**Results**

The data from this study is in the form of pretest and posttest data which is an overview of each of the variables related to the study.

Table 1.

Research Data				
Method	Agility	Statistics	Pretest	Posttest
Hurdle Drill	Tall (A1B1)	Mean	41,61	44,23
		SD	1,789	1,234
	Low (A1B2)	Mean	42,62	43,91
		SD	2,319	1,521
Ladder Drill	Tall (A2B1)	Mean	41,05	40,53
		SD	0,967	0,549
	Low (A2B2)	Mean	41,68	44,57
		SD	1,344	0,912

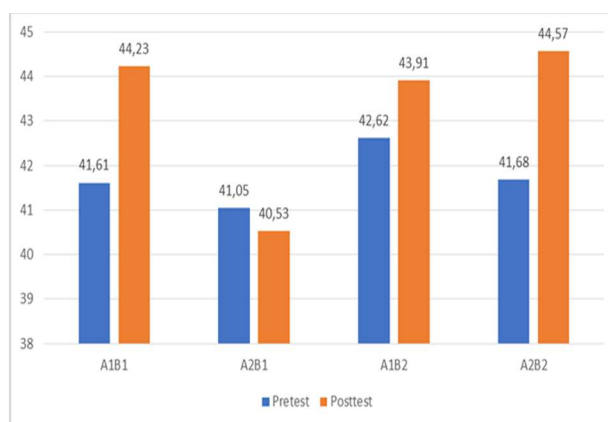


Figure 3. Pretest and Posttest Bar Charts Basic Football Playing Skills  
 Information:  
 A1B1: Group of players trained using the hurdle drill training method with high agility.  
 A2B1: A group of players trained using the ladder drill training method with high agility.  
 A1B2 The group of players trained using the low agility hurdle drill training method.  
 A2B2: Group of players trained using the ladder drill training method with low agility.

Table 2.  
Normality Test

Group	p	Significance	Information
Pretest	0,211	0,05	Normality
Posttest	0,628	0,05	Normality

The data obtained are tested for normality. Test its normality using the shapiro wilk method. The results of the data normality test conducted in each analysis group were carried out with the SPSS version 20.0 for windows software

Table 3.  
Homogeneity Test

Group	F	Significance	Information
Pretest	2,593	0,089	Homogen
Posttest	1,976	0,158	Homogen

The homogeneity test is carried out to test the equations of several samples, namely homogeneous or not. The homogeneity test is intended to test the similarity of variants between pretest and posttest. The homogeneity test in this study is the Levene Test. Based on statistical analysis of homogeneity tests that have been carried out using the Levene Test. In the pretest, the significance was obtained from  $0.089 > 0.05$  and in the posttest the significance was  $0.158 > 0.05$ . This means that the data group has homogeneous variants. Thus the population has a variable or homogeneous similarity. Record homogeneous data if the sig value.  $> 0.05$ .

Research hypothesis testing was carried out based on the results of data analysis and interpretation of two-way ANOVA analysis. The first hypothesis reads "There is a significant difference in the influence of hurdle drill and ladder drill training methods on football playing skills". The result of the pretest significance value was 0.146 and the posttest was 0.000. Because the significance value of p is  $0.146 > 0.05$  for the pretest which shows that it has no effect because it has not been given treatment or exercise. While the significance value of p is  $0.000 < 0.05$  for posttest, the results show that the training method affects football playing

## Discussion

The hurdle drill and ladder drill training methods will be able to improve the athlete's skills if done over a long period of time. Hariyanta et al., (2014) states that applying the basic principles of training systematically, repeatedly over a long period of time, will stress the muscles, so that the muscles will undergo physiological adaptation. Physiological adaptations that occur in the muscles of the limbs involving almost all muscles especially the muscles of the limb such as the muscles of the quadriceps, hamstring, gluteus, gastrocnemius, and hip abductors with the occurrence of hypertrophy. The occurrence of hypertrophy is caused by an increase in the number of myofibrils in each muscle fiber, an increase in capillary density in muscle fibers and an increase in the number of white muscle fibers or fast twitch, so that the leg muscles will become stronger which makes the speed increase (Anantawijaya et al., 2018). The research conducted by researchers was carried out for 18 meetings,

program with a significance level of 5% or 0.05. Based on the statistical analysis of the normality test that has been carried out using the shapiro wilk test, the pretest obtained a significance of  $0.211 > 0.05$  and the posttest obtained a significance of  $0.628 > 0.05$ . This means that the data is normally distributed. Data records are normally distributed if  $sig. > 0.0$

skills after treatment. This means  $H_0$  is rejected.

The second hypothesis reads "there is a significant difference in the influence of low agility and high agility levels on football playing skills". The result of the significance value of p for the pretest was 0.111 and for the posttest 0.007. Due to the p-significance value of  $0.111 > 0.05$  for the pretest the results showed insignificant due to the effect of agility on the basic skills of playing football before treatment or training. As for the posttest, it showed a p of  $0.007 < 0.05$  the results showed significant because after treatment or exercise. When significance (Sig.)  $< 0.05$  (Alpha) = significant. This shows that  $H_0$  was rejected.

The third hypothesis reads "there is an interaction between the hurdle drill and ladder drill training methods and agility (high and low) to football playing skills". The result of the significance value of p for the pretest was 0.387 and for the significance of p for the posttest was 0.001. Because the significance value of p for the pretest was  $0.387 > 0.05$ , the results showed that it had no significant effect because no treatment or exercise had been carried out. As for the posttest of  $0.001 < 0.05$ , the results showed that after treatment or exercise there was an interaction between the methods if the significance (Sig.)  $< 0.05$ . This shows that  $H_0$  was rejected. Based on this means the hypothesis that states "there is an interaction between the hurdle drill and ladder drill training methods and agility (high and low) to football playing skills", has been proven.

a study that can be said to be brief which aims to improve football playing skills, while the hurdle drill and ladder drill training methods to be able to improve the ability to play football take a long time (Anantawijaya et al., 2018).

Agility is related to nervous adaptation, the mechanism of nervous adaptation occurs as a result of exercise that causes an increase in the force of muscle contractions that is realized directly. Such an increase occurs due to increased activation of the main driving muscles, synergistic muscles contracting more precisely and increased inhibition of the antagonist muscles. The implication is that trained athletes can activate their muscles to the maximum under normal conditions that functionally their energy stores can be immediately used as a realized maximum effort (Astrawan et al, 2016). Muscle flexibility should be specially trained in football players from an early age (García-Pinillos et al., 2015).

Agility and speed are the main physical elements in carrying out dribbling techniques in passing opponents, be-

coming supporting elements in determining the right timing when passing, shooting, juggling, and heading (Dahlan et al., 2020). Regular physical training will lead to hypertrophy of muscle physiology, which is due to the number of myofibrils, the size of myofibrils, the density of capillary blood vessels, nerve tendons and ligaments, and the total number of contractiles, especially myosin contractile proteins, to increase significantly. Changes in muscle fibers do not all occur to the same degree, a greater increase occurs in white muscle fibers (fast twitch), so there is an increase in the speed of muscle contraction. The increased size of muscle fibers will eventually increase the speed of muscle contraction, thus causing an increase in agility (Womsiwor & Sandi, 2014). Agility is an important aspect of football (Raymundo et al., 2018). Muscle strength and agility to move in the field are important aspects of football (Almas et al., 2012). Agility is an important skill of football (Young et al., 2021).

Khalik, (2017) In his research revealed that agility helps players in performing football skills, that is, it helps to move turning, turning and changing direction without having to lose balance. In dribbling situations the player must take the initiative where the ball will be taken moving to whom the ball will be given. According to Doğanay et al., (2020) The use of core exercises in combination has been shown to be effective in increasing the speed and agility of football athletes Akhmad et al., (2018) In his research that agility is the ability to change the direction and position of the body quickly and precisely at the time it is moving without losing balance and awareness of its body position. So that in carrying out dribbling movements, it is necessary to be able to change direction quickly when moving at high speed. Agility is analyzed from the movement process involved in it, then agility supports the dribbling skills in football.

Based on research conducted by researchers related to the unproven interaction between hurdle drill and ladder drill training methods and agility (high and low) to football playing skills. The skill of playing football does not come casually, it requires a long process in the form of continuous training. The willingness to train tenaciously and compete with an unyielding spirit on the field requires an accompanying psychological aspect. The willingness to train and compete is obtained from the high motivation of each player. Achievements will not come alone but with careful planning and take a long time (R. Hadi, 2019).

The factors that cause the hurdle drill and ladder drill training methods to have no difference in influence on football playing skills at the time of carrying out the study are as follows: (1) Motivation is an important factor in carrying out the measurement test, when the teste in carrying out the test only at will, will have an impact on the research results. Indra & Marheni, (2020) An athlete who has high training motivation can maintain a better spirit and desire in participating in training, such as his desire to achieve maximum results in participating in training. (2) The condition of facilities and infrastructure, conditions and infrastructure are important factors in research, for example, facilities and infrastructure must support research.

Based on data analysis, high agility is better than low agility and greatly affects football playing skills. Added Kurniawan et al., (2016) that "Players who have agility will be able to quickly dribble football into the opponent's area and will also make it easier to score goals into the opponent's goal, besides that agility is also needed in the player's efforts to chase the ball". Based on research Irawan & Hariadi, (2019) revealed that agility and speed greatly affect the skills of playing football, especially in dribbling.

## Conclusion

In this study, it can be concluded that when a player has high agility, then the basic skills of playing soccer can be said to have better potential. Players who have high agility will perform various movements effectively and efficiently. Based on research conducted by researchers, agility has a significant influence on football playing skills, and there is an interaction between hurdle drill and ladder drill training methods and agility (high and low) on football playing skills. The application of the hurdle drill and ladder drill methods has an influence on football playing skills. The method of training hurdle drill and ladder drill in improving football playing skills has been proven. The skill of playing football does not come casually, it requires a long process in the form of continuous training. The willingness to train tenaciously and compete with an unyielding spirit on the field requires an accompanying psychological aspect. The willingness to train and compete is obtained from the high motivation of each player. Achievements will not come alone but with careful planning and take a long time. The application of the hurdle drill and ladder drill methods affects the skills of playing football. The hurdle drill and ladder drill training methods have been proven to improve soccer playing skills. The skill to play football does not just come, it requires a long process of continuous practice. The will to train diligently and compete with an unyielding spirit on the field requires a psychological aspect to accompany it. The willingness to practice and compete is obtained from the high motivation of each player. Achievements will not come alone but with careful planning and take a long time. Further research related to the hurdle drill and ladder drill training methods to improve women's soccer playing skills is urgently needed. Several modifications, innovations, and creativity in applying the method can be used as the main factors in developing training methods.

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Nothing to declare

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