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The Effect of *Agility Ladder Drill* on The Speed and Agility of Arema Academy Students U-10 to U-13 Years Old

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Abstract

This study aims to evaluate the impact of agility ladder drill training on improving the agility and speed of Arema Academy students aged U-10 to U-13. Soccer requires high agility and speed, especially in young players. This study used an experimental method with a One Group Pretest-Posttest design. The sample consisted of 20 players selected through purposive sampling. The training was conducted over 16 sessions, three times per week. Speed was measured using a 30-meter run test, and agility was assessed using the Illinois Agility Test. Data analysis employed the Shapiro-Wilk normality test and the Paired Sample T-Test. The normality test results indicated that the data were normally distributed ($p > 0.05$). The results of the Paired Sample T-Test showed a significant increase in agility (mean difference = 1.76283; $p = 0.000$) and speed (mean difference = 0.60790; $p = 0.000$) after training. These findings are consistent with previous studies indicating that agility ladder drills improve directional change ability, reaction speed, and body coordination. Therefore, agility ladder drills are recommended in early-age soccer training programs to optimize physical performance.

Keywords: agiliti ladder drill, speed, agility.

INTRODUCTION

Sport is an essential part of human life, serving not only as a means of recreation but also as a means of supporting physical fitness. One of the most popular sports in Indonesia is football (Tiana et al., 2020). Football is not merely a recreational activity, but also a platform for achieving success, both at the national and international levels. The Indonesian government, through Law of the Republic of Indonesia Number 11 of 2022 concerning Sports, places great emphasis on sports development, including football. This law emphasizes the importance of developing talent from an early age through a structured coaching system, aimed at producing high-quality and high-achieving athletes.

Football, especially for young players, requires attention to physical development that supports technical skills. According to experts such as Gibson (2017), speed and agility are key elements in the game, where players with fast running and sharp changes of direction have an advantage in the match. Faqihuddin (2015) also highlighted the importance of basic skills such as agility and speed in the 10-13 age group, which serve as the main foundation for developing football skills. Therefore, training that focuses on

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improving agility and speed, especially at an early age, is crucial for producing quality football players (Rahman & Annas, 2023).

One method that has been proven effective in improving agility and speed is training using an agility ladder drill. This exercise involves an agility ladder that helps athletes improve footwork skills, body coordination, and reaction speed (Mulki et al., 2022). Several studies have shown that agility ladder drills can improve a player's agility and speed, which are very important in soccer, which requires fast movements and sudden changes of direction. According to Zemková & Hamar (2009), training with an agility ladder can improve aspects of an athlete's agility, where agility is essential for avoiding opponents and responding quickly and effectively to changing situations in the game. Meanwhile, according to (Sheppard & Young, 2006) agility ladder drills function to improve better foot coordination, reaction speed, and body control. The use of this simple tool can improve an athlete's movement efficiency, especially in sports like soccer, which require fast movements and sudden changes of direction. In research conducted by Arslan et al., (2017) found that training using agility ladder drills can improve speed and agility performance in young soccer players.

However, although there has been extensive research on agility ladder drills, no study has specifically examined the effects of this training on young players in Indonesia. Agility drills for young children serve as a foundation for mastering coordination and motor skills, while for adults, these exercises are merely supplementary to sharpen reaction and agility, and need to be combined with strength and conditioning to effectively improve physical performance (Thieschäfer & Büsch, 2022). Based on initial observations at Arema Academy, the implementation of agility ladder drills has been inconsistent, and many players have difficulty with rapid changes of direction and slowing down during sprints. Therefore, this study aims to analyze the effects of agility ladder drills on the agility and speed of Arema Academy players in the U-10 to U-13 age groups, to provide useful information for the development of early childhood soccer training in Indonesia.

METHOD

This study used an experimental method with a One Group Pretest-Posttest type with a quantitative approach . In this study, the design was applied to test the effect of agility ladder drill training on increasing the speed and agility of young players at the Arema academy U-10 to U-13.

This study was conducted by providing agility ladder drills for 16 sessions, three times per week. The study population was students at Arema Academy, with a purposive

sampling method, selecting 20 active players aged 10 to 13. The study was conducted from October to December at Arema Academy, Malang City. To measure speed, a 30-meter sprint test was used, measuring the player's travel time. For agility, the Illinois Agility Test was used, assessing the ability to move quickly and change direction effectively. This aligns with Sukardi's theory that short-distance sprint tests, such as the 30-meter dash, are valid tools for measuring athlete speed .

Data were collected through pretests and posttests that measured the players' speed and agility. The treatment consisted of agility ladder drills for 16 sessions, three times per week. The collected data were analyzed using a Paired Sample T-Test to test the mean difference between the pretest and posttest. This test was conducted at a 5% significance level. A normality test was then performed using the Shapiro-Wilk normality test processed with the latest version of SPSS to ensure data distribution. If the significance value is <0.05, the alternative hypothesis is accepted, indicating a significant effect of the agility ladder drill.

RESULTS AND DISCUSSION

Results

This section presents the results of measurements taken before and after training, including the participants' agility and speed. The data obtained were analyzed using a paired sample t-test to determine whether there was a significant difference between the pretest and posttest scores. However, before conducting the paired sample t-test, a normality test was performed to determine whether the data were normally distributed.

The following is a presentation of the data results from *the pretest* and *posttest* of speed and agility:

Table 1 Results of Descriptive Analysis of Speed

Category	Mean	Median	Elementary School	Minimum	Maximum
Pretest	5.88	5.9	0.198	5.5	6.2
Posttest	5.3	5.3	0.186	5	5.6
Difference	0.58	0.6	0.049	0.5	0.7

The descriptive analysis of speed data showed an increase in performance after participants underwent agility ladder drill training. The pretest mean of 5.88 seconds decreased to 5.3 seconds in the posttest, with medians of 5.9 and 5.3, respectively, and a mean difference of 0.58 seconds. This decrease in time indicates an increase in running speed among participants. The standard deviations for the pretest (0.198) and posttest (0.186) indicate that the data are relatively homogeneously distributed, while the standard

deviation of the difference of only 0.049 reinforces the conclusion that almost all participants experienced a consistent increase in speed. The range of values from the pretest (5.5–6.2 seconds) and posttest (5.0–5.6 seconds) also indicates that after training, participants' speeds became more even. Overall, these data indicate that agility ladder drill training has a positive effect on increasing the speed of Arema Academy students in the U-10 to U-13 age group.

Table 2 Results of Descriptive Analysis of Agility

Category	Mean	Median	Elementary School	Minimum	Maximum
Pretest	20.43	20.45	0.651	19.3	21.4
Posttest	18.75	18.75	0.597	17.8	19.7
Difference	1.68	1.7	0.166	1.4	2.2

Descriptive agility data showed clear improvements after the intervention: the average time decreased from 20.43 seconds (pretest) to 18.75 seconds (posttest), indicating that participants became more agile (less time = better performance). The median remained identical to the mean in each -phase (20.45 vs. 18.75), indicating a relatively symmetrical distribution. The standard deviation narrowed slightly (0.651 → 0.597), indicating that participants' performance not only improved but also became more uniform. The range of scores also narrowed from 19.3–21.4 seconds to 17.8–19.7 seconds. The mean difference of 1.68 seconds with an SD of 0.166 indicates consistent improvement across almost all participants. Practically, these results indicate that the agility ladder drill training contributed to the increase in the average agility posttest score.

Paired Sample T test

Table 3 Results of the *Paired Sample T-test*

Variable Pairs	Mean	t	df	Sig. (2-tailed)
Agility Pretest Posttest	1.76283	45,311	19	0.000
Pretest-Posttest Speed	0.60790	53,462	19	0.000

The results of the Paired Sample T-Test showed a statistically significant difference between the pretest and posttest scores for both variables, namely agility and speed. For the agility variable, the mean difference was 1.76283, with a t-value of 45.311, df = 19, and significance (p) = 0.000, indicating that the agility ladder drill significantly improved the participants' agility abilities. Similarly, for the speed variable, the mean difference was 0.60790, with a t-value of 53.462, df = 19, and significance (p) = 0.000. Since the significance values of both variables were much smaller than 0.05, it can be concluded that the agility ladder drill had a significant effect on improving the agility and speed of Arema

Academy students aged U-10 to U-13. These findings support the effectiveness of the exercise as part of a physical development program for young players.

Discussion

According to the results of the data analysis, this study showed a significant increase in the agility and speed aspects of athletes after participating in the agility ladder drill training program. In the agility variable, there was an average increase of 1.76283 ($p = 0.000$) while in the speed variable there was an average increase of 0.60790 ($p = 0.000$). A p value of less than 0.05 for both variables indicates that the difference between the conditions before and after training is statistically significant. This indicates that the agility ladder drill training has a positive impact on increasing the agility and speed of athletes in this study. The average increase in agility of 1.76283 after participating in the agility ladder drill program indicates that this training is effective in helping athletes improve their ability to move quickly and nimbly in various directions. Agility is an important skill in various sports, especially in sports that require rapid changes of direction and reactions to changing situations (Husna et al., 2024). This significant improvement indicates that the agility ladder drill program plays a role in improving motor coordination, balance, and the athlete's response speed to changing conditions on the field.

The results of this study are consistent with findings from Gabbett (2016) who stated that agility training is very effective in improving athletes' ability to change direction and increase agility, especially in sports like soccer that require quick reactions. These findings are also in line with research by Prasetyo & Handayani (2022) who concluded that agility training can improve the agility and speed of young athletes. In this case, agility ladder drills provide significant benefits for the development of physical skills in young athletes aged 10 to 13 years as examined in this study. In addition to agility, this study also found a significant increase in athletes' speed after participating in agility ladder drills. The average increase of 0.60790 ($p = 0.000$) indicates that agility ladder drills not only improve agility but also have a positive impact on athletes' running speed. Speed is a crucial element in sports, especially in sports that require fast sprints and timely reactions, such as soccer and athletics (Firmansyah & Rumini, 2022).

The speed improvements found in this study support the findings of previous research by Harrison & Duncan (2022) which showed that agility ladder training can help improve sprint speed and change-of-direction ability in young athletes. These results are also consistent with the findings in Bangsbo & Mohr (2017), which stated that agility ladder training can improve athletes' reaction speed and body control, allowing them to respond more quickly and increase their speed. The findings in this study are consistent with the

results of several previous studies that show that agility training has a significant effect on improving athletes' agility and speed. For example, Gabbett (2016) in his study stated that agility training has been proven effective in improving athletes' agility and change-of-direction ability, especially in sports that require quick reactions. Research by Prasetyo & Handayani (2022) also supports the results of this study, which concluded that agility training can improve agility and speed in young athletes.

Research by (Hendratno, 2020) which examined the effect of agility training on the agility of youth soccer athletes, also corroborates this study's findings, showing that agility training can significantly improve agility. Furthermore, research by Harrison & Duncan (2022) also found that agility ladder training significantly increased sprint speed and change of direction ability in young athletes, which aligns with the speed improvement results found in this study.

In addition to being supported by various previous research findings, the effectiveness of *agility ladder drills* in improving physical performance can also be explained by the physiological mechanisms underlying the training process. This exercise involves intensive neuromuscular activity that requires the central nervous system to coordinate muscle contractions quickly, precisely, and efficiently in a short period of time. This activity directly stimulates an increase in *the firing rate* (the rate of nerve impulses) and increased motor unit recruitment, which contributes to faster reflex responses and better control of body movements (Sheppard & Young, 2006). Furthermore, this exercise, with its rapid and varied movement patterns, also encourages neuromotor adaptations that strengthen the connection between the central and peripheral nervous systems, thereby improving proprioceptive capacity and spatial awareness (Sánchez-Gómez et al., 2021).

Thus, *agility ladder drills* not only train macro-physical abilities such as speed, acceleration, and agility, but also develop crucial coordinative and cognitive capacities, especially in children aged 10 to 13 years who are in a period of rapid motor development (Moran et al., 2018). These exercises as a whole form the foundation for optimal motor skills, which are crucial in the context of sports skills in early adolescence.

Furthermore, *agility ladder drills* play a crucial role in developing efficient and structured (T. J. Gabbett, 2010). This improved movement pattern development not only improves technical performance but also plays a role in reducing the risk of injury. Furthermore, a structured and familiar training environment contributes to increasing confidence in young athletes performing explosive movements such as sprints and rapid changes of direction, as they become accustomed to performing them in a measured context (Breslin et al., 2012). Integrating *agility ladder drills* into early childhood training

programs provides benefits not only in the short term but also helps create a long-term motor foundation that is crucial for an athlete's career development, as optimal movement patterns established early on have been shown to correlate with higher performance and lower injury rates later in life (Myer et al., 2011). This study focuses more on early age and measures two main variables, namely agility and speed, providing a clear and significant statistical picture, and supported by strong physiological and practical explanations as a basis for coaching young athletes.

CONCLUSION

Based on the research results, it can be concluded that *agility ladder drills* have a significant positive impact on increasing the speed and agility of Arema Academy students in the U-10 to U-13 age group. This is evident from the results of the 30-meter dash test and the Illinois Agility Test, which showed improved performance after 16 training sessions with a frequency of three times per week. The average increase in speed time reached 0.608 seconds, while in agility it was 1.766 seconds, reflecting improvements in reaction time, the ability to adapt to the direction of movement, and motor efficiency. These findings are in line with previous research that confirmed the effectiveness of *agility ladder drills* in improving important physical abilities in soccer, especially in young players. Therefore, this exercise is recommended to be implemented routinely with periodic evaluation so that the training program can be optimally adjusted according to the athlete's development.

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