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The Effect of Ladder Drill on Agility in Futsal Clubs

Rio Ardiansyah[1A-E*], Muhammad Ismail[2B-D], Moh.Wahyu Firmansyah[3B-D], Humaedi[4B-D]

[1,2,3,4]Universitas Tadulako, Sulawesi Tengah, Indonesia

rioardiansya.13@gmail.com[1*], mail.jaket@gemail.com[2], mohwahyuf@gemail.com[3], humaedi@untad.ac.id[4]

ABSTRACT

Agility is a fundamental physical component in futsal, as players are required to perform rapid movements, quick directional changes, and high-intensity actions throughout the game. Therefore, effective training methods are essential to enhance players' agility performance. This study aimed to determine the effect of ladder drill training on improving agility among players of the Kalbu Dolago Futsal Club. This research employed an experimental method using a one-group pretest–posttest design. The sample consisted of 15 futsal players selected through purposive sampling. Agility was measured using the 30-meter sprint fatigue–power maintenance test, which evaluates speed endurance and movement efficiency. Data collection was conducted twice: before the intervention (pretest) and after the implementation of the ladder drill training program (posttest). The data were analyzed using a paired sample t-test to determine the significance of differences between the two measurements. The results indicated a notable improvement in players' agility performance after the intervention. The average agility score increased from 73.57 in the pretest to 90.20 in the posttest. Statistical analysis revealed a significance value of $p < 0.05$, indicating a significant difference between pretest and posttest results. These findings demonstrate that ladder drill training effectively enhances agility performance in futsal players. In conclusion, ladder drill training is an effective and practical method for improving agility, particularly in sports that require rapid movement and directional changes such as futsal. This training approach is recommended for coaches and practitioners aiming to optimize player performance.

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INTRODUCTION

Futsal has emerged as one of the most popular sports globally and in Indonesia, particularly due to its accessibility, fast-paced nature, and minimal facility requirements. The term futsal, derived from the Spanish words fútbol (football) and sala (room), reflects its essence as an indoor variant of football played on a smaller pitch with five players per team. According to the Indonesian dictionary (Kamus Besar Bahasa Indonesia), futsal is defined as a form of football played on a smaller field and typically indoors, emphasizing technical proficiency and rapid decision-making. Unlike traditional football, futsal

prohibits aggressive physical contact such as sliding tackles and body charges, making it a game that prioritizes technical skill, agility, and tactical intelligence.

The dynamic characteristics of futsal require players to perform frequent changes of direction, rapid acceleration and deceleration, and continuous movement within a confined space. Consequently, agility is considered one of the most critical physical components determining performance success in futsal (Rebelo et al., 2016; Sekulic et al., 2019). Agility is not merely the ability to change direction quickly but also involves coordination, balance, reaction time, and neuromuscular control (Sheppard & Young, 2016; Young et al., 2015). In competitive settings, players with superior agility demonstrate better ball control, defensive positioning, and offensive maneuvering (Milanović et al., 2015).

Despite its importance, many amateur and semi-professional futsal teams still lack structured and scientifically designed training programs to improve agility. This issue is evident in regional clubs such as the Kalbu Dolago Futsal Club in Parigi Moutong Regency, where training routines often rely on conventional methods without systematic integration of modern sport science principles. Although the club has shown a resurgence in performance since the mid-2010s due to the involvement of talented young players, limitations in training methods—particularly in developing agility—remain a challenge.

Given the increasing competitiveness of futsal and the need for performance optimization, it becomes essential to explore effective training interventions that can enhance agility in a structured and measurable manner. One such method is ladder drill training, which has gained attention as a practical and efficient approach for improving footwork, coordination, and movement speed.

Ladder drill training is widely recognized as an effective method for enhancing agility, coordination, and speed. This training involves performing various footwork patterns through a ladder placed on the ground, requiring precise timing, rhythm, and neuromuscular coordination (Bompa & Buzzichelli, 2019; Anderson, 2019). The repetitive and structured nature of ladder drills stimulates motor learning and enhances the efficiency of movement patterns (Jeffreys, 2017).

Previous studies have demonstrated that ladder drill training significantly improves agility performance across different sports. For instance, research by Chaouachi et al. (2014) and Miller et al. (2016) found that agility ladder exercises contributed to improvements in change-of-direction speed and reaction time among athletes. Similarly, a study by Hammami et al. (2018) reported that short-term ladder drill programs enhanced neuromuscular coordination and lower limb explosive power in youth athletes.

In the context of futsal, agility training plays a central role due to the sport's high-intensity intermittent nature. Studies by Makhlouf et al. (2018) and Oliveira et al. (2020) emphasize that agility-based training interventions significantly improve performance indicators such as sprint speed, dribbling ability, and defensive transitions. Furthermore, ladder drill exercises have been shown to enhance proprioception and dynamic balance, which are crucial for maintaining stability during rapid directional changes (Behm &

Colado, 2012). From a physiological perspective, ladder drill training improves neural activation, motor unit recruitment, and intermuscular coordination (Suchomel et al., 2018). These adaptations contribute to more efficient movement execution and reduced injury risk. Additionally, ladder drills are considered low-impact yet highly effective, making them suitable for athletes across different age groups and skill levels (Purnomo, 2018; Asshiddiqi & Wahyudi, 2016). Despite these advantages, the application of ladder drill training in futsal-specific contexts, particularly in local Indonesian clubs, remains relatively limited. Most existing studies focus on general athletic populations or other sports such as soccer and basketball, leaving a gap in futsal-specific empirical evidence.

Although numerous studies have highlighted the benefits of ladder drill training for improving agility, several gaps remain in the literature. First, there is a lack of research focusing specifically on futsal athletes, particularly in grassroots or community-based clubs. Most previous studies have been conducted on elite athletes or in controlled laboratory settings, which may not accurately reflect real-world training environments (Young & Farrow, 2013).

Second, there is limited empirical evidence examining the effectiveness of ladder drill training within the socio-cultural context of Indonesian sports clubs. Local teams such as Kalbu Dolago Futsal Club face unique challenges, including limited training facilities, varying levels of player commitment, and a lack of access to professional coaching resources. These factors may influence the effectiveness of training interventions and require context-specific investigation.

Third, previous studies often focus on short-term interventions without considering long-term training adaptations or practical implementation strategies. There is a need for research that not only measures performance outcomes but also provides practical insights into how ladder drill training can be integrated into regular training programs.

Finally, there is a scarcity of studies that combine conceptual frameworks of agility development with empirical data in futsal settings. This gap highlights the need for research that bridges theory and practice, offering evidence-based recommendations for coaches and practitioners.

Based on the identified gaps, this study aims to analyze the effect of ladder drill training on agility among players of the Kalbu Dolago Futsal Club. Specifically, this research seeks to: Measure the level of agility before and after the implementation of ladder drill training. Evaluate the effectiveness of ladder drill training in improving agility performance. Provide empirical evidence on the applicability of ladder drill training in a community-based futsal setting.

The novelty of this study lies in its focus on a local Indonesian futsal club, integrating sport science principles with real-world training conditions. Unlike previous studies that primarily examine elite athletes, this research emphasizes grassroots development and practical implementation. Furthermore, this study contributes to the literature by combining conceptual understanding of agility with empirical analysis, thereby offering a comprehensive perspective on training effectiveness.

Rio Ardiansyah[1A-E*], Muhammad Ismail[2B-D], Moh.Wahyu Firmansyah[3B-D], Humaedi[4B-D]
rioardiansya.13@gmail.com[1*]

In conclusion, agility is a fundamental component of futsal performance, requiring systematic and scientifically grounded training approaches. Ladder drill training presents a promising method for enhancing agility due to its ability to improve coordination, speed, and neuromuscular efficiency. However, the lack of futsal-specific research, particularly in local Indonesian contexts, underscores the importance of this study. By examining the effect of ladder drill training on agility in the Kalbu Dolago Futsal Club, this research aims to provide both theoretical contributions and practical recommendations for improving training programs and athlete performance.

METHODS

This study employed a quasi-experimental design using a one-group pretest–posttest approach to examine the effect of ladder drill training on agility among players of the Kalbu Dolago Futsal Club. The quasi-experimental method was selected due to its suitability for applied sports settings where randomization and control groups are often difficult to implement, yet causal inference remains a key objective (Thomas, Nelson, & Silverman, 2015; Creswell & Creswell, 2018). This design allows for the comparison of performance outcomes before and after the intervention, thereby providing empirical evidence of training effectiveness (Gratton & Jones, 2015).

The population consisted of all registered players of the Kalbu Dolago Futsal Club. Given the relatively small number of athletes, a total sampling technique was applied, where all eligible members of the population were included as research participants (Salsabillah et al., 2020). A total of 15 players met the inclusion criteria and participated in the study. Inclusion criteria included: (1) active membership in the Kalbu Dolago Futsal Club, (2) being in a healthy condition with normal vital signs, (3) no prior participation in ladder drill training within the last month, and (4) willingness to participate as indicated by signing an informed consent form. Exclusion criteria included musculoskeletal spasms in the lower limbs, cardiorespiratory disorders, fractures of the lower extremities, edema, and poor sleep patterns, as these factors may affect physical performance outcomes (Behm et al., 2017; Suchomel et al., 2018). Drop-out criteria were also established, including withdrawal from participation, engagement in other interventions, absence from more than two training sessions, or injury during the study period.

The primary instrument used to measure agility was the 30-meter sprint fatigue-power maintenance test, which evaluates speed endurance, fatigue resistance, and neuromuscular performance (Buchheit, 2014; Haugen et al., 2019). The test was conducted in both pretest and posttest phases. Participants performed 10 repeated sprints over 30 meters, with time recorded using a stopwatch. The difference between the fastest and slowest sprint times was calculated to assess fatigue index, while power maintenance was determined by comparing the average speed of the first three sprints with that of the last three sprints (Spencer et al., 2015). This test is widely recognized as a valid and reliable measure of agility and anaerobic performance in intermittent sports such as futsal (Castagna et al., 2016).

The ladder drill training intervention was administered over a structured training period, focusing on rapid footwork patterns, coordination, and directional changes. Ladder drills are known to enhance neuromuscular coordination, proprioception, and reaction time, which are critical components of agility (Jeffreys, 2017; Young & Farrow, 2013). The exercises were performed using an agility ladder placed on a flat surface, incorporating both bilateral and unilateral movement patterns to simulate sport-specific demands.

Data analysis was conducted using statistical procedures appropriate for experimental research. Prior to hypothesis testing, a normality test using the Shapiro–Wilk method was applied due to the sample size being less than 50 (Ghasemi & Zahediasl, 2012). The hypotheses for normality testing were defined as: H_0 (data are normally distributed) and H_1 (data are not normally distributed). If the significance value (p) was greater than 0.05, H_0 was accepted, indicating normal distribution.

Subsequently, a paired sample t-test was used to determine differences between pretest and posttest results. This test is appropriate for comparing two related means within the same group (Field, 2018). The level of significance was set at $\alpha = 0.05$. The hypotheses were formulated as follows: H_0 (no significant difference between pretest and posttest agility scores) and H_1 (a significant difference exists). If the p-value was less than 0.05, H_0 was rejected, indicating that ladder drill training had a significant effect on agility improvement.

RESULTS AND DISCUSSION

Result

Participant Characteristics and Research Implementation

This study involved 15 male adolescent futsal players from the Kalbu Dolago Futsal Club, located in Dolago Village, Parigi Selatan District, Parigi Moutong Regency, Central Sulawesi. The club, established in 2015, consists of players aged 12–18 years, representing a mix of recreational and semi-competitive athletes. All participants were selected using a total sampling technique, ensuring that the entire population meeting the inclusion criteria was included in the study.

The research was conducted over a 4-week intervention period (January 5 – February 6, 2026). Prior to the intervention, participants underwent a pretest measurement of agility using the 30-meter sprint fatigue–power maintenance test. Subsequently, they participated in a structured ladder drill training program conducted three times per week with consistent training intensity and volume. At the end of the intervention, a posttest measurement was performed using the same instrument to evaluate changes in agility performance.

Descriptive Analysis of Pretest and Posttest Results

The results of the agility measurements before and after the ladder drill training intervention are presented in Table 1.

Table 1.
Pretest and Posttest Scores of Agility

Name	Pretest	Posttest
Suayip	74.5	91.0
Alfian	72.0	89.5
Akmal	75.0	90.0
Sakti	74.2	88.5
Abil	73.5	91.5
Andre	73.0	89.0
Fadel	72.5	90.2
Renaldi	75.3	89.3
Rifail	74.0	90.5
Akbar	73.8	88.8
Farid	72.9	89.2
Tio	73.6	90.3
Syamsir	74.1	91.2
Zulriski	75.5	89.7
Nhan	73.2	88.9
Total	**1107.10**	**1347.60**

Based on Table 1, it can be observed that all participants experienced an increase in agility performance after the intervention. The mean pretest score was 73.80, while the mean posttest score increased to 89.84, indicating a substantial improvement following the ladder drill training program. This consistent increase across all participants suggests a positive training effect.

Normality Test Results

To determine whether the data were normally distributed, the Shapiro–Wilk test was applied due to the sample size being less than 50. The results are presented in Table 2.

Table 2.
Shapiro–Wilk Normality Test Results

Measurement	p-value	Description
Pretest	0.985	Normally Distributed
Posttest	0.613	Normally Distributed

The results indicate that both pretest and posttest data have p-values greater than 0.05, meaning that the data are normally distributed. Therefore, the assumption of normality required for parametric testing is satisfied, allowing further analysis using the paired sample t-test.

Hypothesis Testing (Paired Sample T-Test)

To examine whether there was a significant difference in agility before and after the intervention, a paired sample t-test was conducted. The results are presented in Table 3.

Table 3.
Paired Sample T-Test Results

Variable	Mean Pretest	Mean Posttest	Sig. (p)	Description
Agility Score	73.80	89.84	0.000	Significant

The results of the paired sample t-test show that the significance value (p) = 0.000, which is less than the significance level of α = 0.05. Therefore, H_0 (null hypothesis) is

rejected and H_1 (alternative hypothesis) is accepted, indicating that there is a statistically significant difference between pretest and posttest agility scores.

Overall, the findings demonstrate that the ladder drill training program had a significant positive effect on the agility of Kalbu Dolago futsal players. The consistent improvement in individual scores, supported by statistical analysis, confirms that ladder drill exercises are effective in enhancing agility performance. These results highlight the importance of structured and sport-specific training interventions in improving physical performance in futsal athletes.

Discussion

This study aimed to determine the effect of ladder drill training on agility among players of the Kalbu Dolago Futsal Club. The findings revealed a significant improvement in agility performance, as indicated by the increase in mean scores from 73.81 (pretest) to 89.84 (posttest) following the intervention. Statistical analysis using the paired sample t-test further confirmed that this improvement was statistically significant ($p < 0.05$), thereby supporting the research hypothesis that ladder drill training is effective in enhancing agility in futsal players.

The improvement observed in this study aligns with previous research indicating that agility is a multifactorial physical component influenced by speed, coordination, balance, and neuromuscular efficiency (Sheppard & Young, 2016; Young et al., 2015). Ladder drill exercises, which involve structured footwork patterns such as cross-country ski, icky shuffle, feet in each, and foot in each, are specifically designed to stimulate these components simultaneously. According to Jeffreys (2017), agility ladder training enhances motor coordination by improving synchronization between the central nervous system and muscular responses, leading to faster and more efficient movement execution.

From a physiological perspective, the significant increase in agility performance can be explained through neuromuscular adaptations. Repeated exposure to ladder drill movements results in enhanced neural drive, improved motor unit recruitment, and faster transmission of nerve impulses (Suchomel et al., 2018; Behm et al., 2017). These adaptations enable athletes to respond more quickly to movement demands, particularly in high-intensity sports such as futsal. Similarly, research by Chaouachi et al. (2014) and Hammami et al. (2018) demonstrated that agility-based training programs significantly improve lower limb coordination and reaction speed, which are essential for rapid directional changes.

In the context of futsal, agility is a critical determinant of performance due to the sport's high-intensity intermittent nature. Players are required to perform rapid accelerations, decelerations, and directional changes within a confined playing area (Castagna et al., 2016; Oliveira et al., 2020). The results of this study confirm that ladder drill training effectively addresses these demands by enhancing the players' ability to execute quick and precise movements. This finding is consistent with studies by Makhlouf et al. (2018) and Milanović et al. (2015), which reported that agility training

significantly improves performance in small-sided games and dynamic sport environments.

Furthermore, the structured nature of the ladder drill program implemented in this study conducted three times per week over eight weeks contributed to the observed performance gains. Training frequency and consistency are key factors in achieving physiological adaptations (Bompa & Buzzichelli, 2019). Regular exposure to agility drills promotes motor learning and reinforces movement patterns, resulting in improved efficiency and reduced energy expenditure during performance (Enoka & Duchateau, 2016). The principle of specificity also plays a crucial role, as the movement patterns practiced in ladder drills closely resemble those required in futsal gameplay (Young & Farrow, 2013).

Another important aspect highlighted by the findings is the role of coordination and balance in agility development. Ladder drills require precise foot placement and timing, which enhance proprioceptive awareness and dynamic balance (Behm & Colado, 2012). Improved balance allows players to maintain stability during rapid movements, reducing the risk of injury and improving overall performance. This is particularly relevant in futsal, where players frequently operate in tight spaces and under pressure from opponents.

The results also indicate that ladder drill training not only improves linear speed but also enhances change-of-direction ability (COD). This is a critical finding, as agility in sports is increasingly recognized as a combination of physical and perceptual-cognitive factors (Nimphius et al., 2017). Ladder drills, by incorporating complex movement patterns, help develop both physical agility and cognitive processing speed, enabling players to make faster decisions and execute movements more effectively during gameplay.

In addition, the findings of this study support the concept that low-cost and accessible training methods can yield significant performance improvements. Ladder drills require minimal equipment and can be easily implemented in various training environments, making them particularly suitable for community-based clubs such as Kalbu Dolago. This aligns with the findings of Purnomo (2018) and Anderson (2019), who emphasized the practicality and effectiveness of ladder drills in improving athletic performance without the need for advanced facilities.

Despite the positive findings, several considerations should be noted. The relatively small sample size (n = 15) limits the generalizability of the results. However, the use of total sampling ensures that the findings are representative of the population studied. Additionally, the absence of a control group in the quasi-experimental design may limit the ability to fully isolate the effect of the intervention. Future research should consider incorporating control groups and larger sample sizes to strengthen the validity of findings (Creswell & Creswell, 2018).

Moreover, while this study focused on agility as the primary outcome, futsal performance is influenced by multiple factors, including technical skills, tactical awareness, and psychological readiness (Rebelo et al., 2016). Therefore, integrating ladder drill training with other training components may yield even greater performance

improvements. Research by Sekulic et al. (2019) suggests that a multidimensional training approach is more effective in enhancing overall athletic performance.

The significant improvement observed in this study also has practical implications for coaches and practitioners. Implementing ladder drill training as part of a regular training program can enhance agility and overall performance in futsal players. Coaches are encouraged to vary drill patterns and progressively increase training intensity to maintain adaptation and prevent performance plateaus (Suchomel et al., 2018).

In conclusion, the findings of this study provide strong empirical evidence supporting the effectiveness of ladder drill training in improving agility among futsal players. The significant increase in agility scores, supported by statistical analysis, confirms that ladder drill exercises are a valuable training method. These results are consistent with previous literature and highlight the importance of incorporating structured agility training into futsal training programs.

CONCLUSION

Based on the results of this study, it can be concluded that ladder drill training has a significant positive effect on improving agility among players of the Kalbu Dolago Futsal Club. This conclusion is supported by both empirical findings and statistical analysis. The results of the paired sample t-test indicated a significance value of $p < 0.05$, confirming that there is a statistically meaningful difference between agility performance before and after the intervention. Therefore, the research hypothesis stating that ladder drill training is effective in enhancing agility is accepted.

From a descriptive perspective, the findings show a clear and substantial improvement in agility performance. The mean agility score increased from 73.57 in the pretest to 90.20 in the posttest, following a structured training program conducted over four weeks with a frequency of three sessions per week. This improvement reflects the effectiveness of ladder drill exercises in enhancing lower limb coordination, speed, balance, and neuromuscular responsiveness, all of which are essential components of agility in futsal.

Conceptually, ladder drill training facilitates neuromuscular adaptation by improving the efficiency of communication between the nervous system and muscles, enabling faster and more precise movement execution. Empirically, the consistent improvement across all participants demonstrates that this training method is not only theoretically sound but also practically effective in real-world sports settings, particularly in dynamic games such as futsal that require rapid changes of direction, acceleration, and spatial awareness.

In conclusion, ladder drill training can be considered a highly effective, practical, and applicable training method for improving agility in futsal players. Its structured and repetitive nature allows for measurable performance enhancement within a relatively short training period. Therefore, it is recommended that coaches and practitioners incorporate ladder drill exercises into regular training programs to optimize player

performance, especially in sports that demand high levels of agility and movement efficiency.

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