

The Effectiveness of Side Right-in and Crossover Shuffle Training on Improving Agility in Futsal Athletes: A Speed, Agility, and Quickness (SAQ) Approach

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Received: 18 Agustus 2025; Accepted 8 September 2025; Published 29 September 2025

Ed:2025: 110-121

Abstract

This study aims to analyze the effect of two forms of agility ladder drills, namely Side Right-in and Crossover Shuffle, on improving the agility of male futsal athletes from the FIM Squad UNDIKMA. Agility is a crucial physical component in futsal, as it relates to the ability to change direction and respond quickly to game situations. The study employed a quasi-experimental two-group pretest–posttest design, involving 20 athletes. Divided into two training groups. Agility was measured using the Shuttle Run Test. The results showed that both types of training significantly improved agility ($p < 0.05$), but the Side Right-in group produced a greater average increase than the Crossover Shuffle. Comparisons between groups also showed significant differences, indicating the superiority of Side Right-in training in improving the ability to change direction. In conclusion, agility ladder drills are effective for use in the Speed, Agility, and Quickness (SAQ) program, and Side Right-in training is recommended as a more optimal form of training to improve the agility of futsal athletes. These findings can serve as a basis for trainers in designing more targeted and effective training programs.

Keywords: *Futsal, Agility, Side Right-in, Crossover Shuffle, Speed Agility Quickness.*

Abstrak

Penelitian ini bertujuan untuk menganalisis pengaruh dua bentuk latihan agility ladder drill, yaitu Side Right-in dan Crossover Shuffle, terhadap peningkatan kelincahan atlet futsal putra FIM Squad UNDIKMA. Kelincahan merupakan komponen fisik penting dalam futsal karena berkaitan dengan kemampuan perubahan arah dan respon cepat terhadap situasi permainan. Penelitian menggunakan desain kuasi-eksperimen two-group pretest–posttest dengan melibatkan 20 atlet yang dibagi menjadi dua kelompok latihan selama enam minggu. Pengukuran kelincahan dilakukan menggunakan Shuttle Run Test. Hasil penelitian menunjukkan bahwa kedua jenis latihan meningkatkan kelincahan secara signifikan ($p < 0,05$), namun kelompok Side Right-in menghasilkan peningkatan rata-rata lebih besar dibandingkan Crossover Shuffle. Perbandingan antar kelompok juga menunjukkan perbedaan signifikan yang mengindikasikan keunggulan latihan Side Right-in dalam peningkatan kemampuan perubahan arah. Kesimpulannya, agility ladder drills efektif digunakan dalam program Speed, Agility, and Quickness (SAQ), dan latihan Side Right-in direkomendasikan sebagai bentuk latihan yang lebih optimal untuk meningkatkan kelincahan atlet futsal. Temuan ini dapat menjadi dasar bagi pelatih dalam merancang program latihan yang lebih terarah dan efisien.

Kata Kunci: *Futsal, Kelincahan, Side Right-in, Crossover Shuffle, Speed Agility Quickness.*

INTRODUCTION

Futsal is a team sport that requires players to perform various fast, complex, and repetitive movements within a limited space. Futsal requires players to accelerate, change direction, and respond to visual and tactical stimuli from opponents in a very short time. In this context, agility is the primary physical component that determines a player's performance effectiveness. Agility is generally understood as the body's ability to move quickly and change direction without losing balance or control of body position. However, from a modern sports science perspective, this definition has evolved into a comprehensive body movement ability that involves changing speed or

direction in response to external stimuli, combining perceptual-cognitive processes with motor actions. (Cassidy et al., 2023; Young et al., 2021, 2022).

In futsal, change of direction (COD) and reactive agility are crucial, particularly in one-on-one situations and transitions from attack to defense. Recent research shows that good COD skills are positively correlated with dribbling effectiveness and the ability to maintain possession (Redo & Jariono, 2023). Futsal athletes with high agility can quickly change direction to avoid opponents while maintaining speed and ball control in tight spaces. Biomechanically, COD performance depends on adequate deceleration, change of direction, and re-acceleration, supported by leg muscle strength, joint flexibility, and neuromuscular coordination (GÖRAL et al., 2023; Loturco et al., 2020; Spyrou et al., 2020). Therefore, training that targets the development of agility through increasing strength, speed, balance, and visual reaction is essential in the context of developing futsal athletes.

Although the importance of agility in futsal is widely recognized, various studies show that most athletes, particularly at the university or amateur level, still struggle to optimize this ability. For example, the men's futsal athletes from the FIM Squad UNDIKMA still exhibit difficulty in passing opponents, losing the ball in one-on-one duels, and a limited ability to change direction quickly, indicating low specific agility abilities. This may be due to a lack of variety and intensity in training that focuses on aspects of rapid movement coordination, balance, and visual reaction.

One common approach that has been widely used to improve agility is speed, agility, and quickness (SAQ) training, a form of training that focuses on improving reaction speed, coordination, and multidirectional acceleration abilities. SAQ training has been shown to improve dynamic balance, reaction time, and movement efficiency in athletes in team sports such as soccer, futsal, and basketball (Anwer et al., 2021; P & Josheeta, 2023; Trecroci, Invernizzi, et al., 2022). This approach not only improves physical aspects but also cognitive-ceptual aspects, such as the ability to make quick decisions in the game context (Mota et al., 2021). Dengan demikian, latihan SAQ, termasuk variasi berbasis agility ladder drill, menjadi salah satu solusi yang dapat diandalkan untuk meningkatkan kelincahan dalam konteks permainan futsal.

Agility ladder drills are a form of SAQ training that targets increased footwork speed, coordination, and the ability to change direction quickly. Various studies have demonstrated that ladder drills are effective in enhancing movement efficiency and agility in multiple sports, including futsal (Ilham et al., 2024), badminton (Rasyid et al., 2023), volleyball (Pramono et al., 2023), and soccer (Padrón-Cabo et al., 2020). This exercise combines biomechanical and neuromuscular elements, where repetitive movements in specific patterns train lower limb muscle synchronization, improve balance, and refine multidirectional movement coordination patterns.

Ladder drill variations, such as the side right-in and crossover shuffle, are specifically designed to train lateral coordination, pelvic stability, and leg response to rapid changes in direction. The side-right-in focus is on a two-point lateral movement pattern that demands precise gait and balance control. At the same time, the crossover shuffle involves a crossover movement that stimulates hip strength and flexibility during changes of direction (Sanrijaya et al., 2023). Experimental studies have demonstrated that both variations can significantly enhance agility and speed, with distinct adaptation mechanisms depending on the specific movement pattern employed (Sanrijaya et al., 2023). When combined in a structured training program, these variations have been shown to optimize movement efficiency and responsiveness to game stimuli. Furthermore, recent literature suggests that the effectiveness of ladder drills can be enhanced by combining them with other methods, such as core stability and plyometric training, which strengthen the trunk-supporting muscles and increase explosive leg muscle power (Ilham et al., 2024; Pramono et al., 2023). In the context of futsal training, this integrated approach can help athletes maintain body control during rapid deceleration and acceleration in confined spaces.

Although numerous studies have supported the effectiveness of ladder drills in improving agility, several empirical gaps remain that require further investigation, particularly in the context of

futsal. First, the transfer of ladder drill results to real-world game performance has not been consistent. Several studies in youth soccer players have shown that improvements in agility in the laboratory do not always translate directly to match performance (Padrón-Cabo et al., 2020, 2021). Second, there remains heterogeneity in training protocols, including variations in drill types (zigzag, in-out, side-right, crossover), training frequency, and program duration, which makes it challenging to determine the most effective training standards (Sanrijaya et al., 2023).

Furthermore, the number of high-quality studies specifically examining ladder drill training in futsal athletes is still very limited (Ilham et al., 2025). Most studies have been conducted on young or amateur athletes, which does not accurately describe the training effects in adult futsal players who engage in high-intensity play. Factors such as body mass index (BMI), playing experience, and training progression were also not fully controlled, which could influence the results of agility improvement (Hikmah et al., 2023). Furthermore, most studies rely solely on field tests such as the zigzag run test or the Illinois Agility Test, without measuring performance transfer to reaction time or endurance in real-life match situations (Wijayanti et al., 2021). Although various previous studies have reported the effectiveness of ladder drills, the literature still reveals several gaps, including inconsistent transfer of training to game performance, heterogeneity in training protocols, and a lack of studies specifically examining the effect of ladder drill variations on university futsal athletes (Ilham et al., 2025). Additionally, direct comparisons between the side right-in and crossover shuffle are rare, so the relative effectiveness of the two exercises has not been clearly defined.

The novelty of this study lies in the application of a combination of side-right-in and crossover shuffle exercises in the context of university futsal athletes, to identify the most effective exercises for improving agility, particularly change of direction ability. These findings are expected to provide a scientific basis for coaches to design more targeted SAQ programs that meet the demands of futsal performance, which are currently underexplored in the national literature. This study not only measures agility improvements through a quantitative approach (using a pretest-posttest design) but also evaluates the relative effectiveness of each type of exercise in improving reaction time and change of direction ability.

The study's scope included the 2022 FIM Squad UNDIKMA men's futsal athletes, who underwent a six-week training period with a training frequency of three times per week. The primary instrument used to measure agility was the zigzag run test, which has been recognized for its validity in assessing change-of-direction ability. This research is also expected to contribute to filling the gap in the literature regarding the application of ladder drill-based SAQ training in the context of futsal in Indonesia, as well as enrich scientific understanding of the mechanisms of agility adaptation in high-intensity team sports.

METHOD

Research Materials and Subjects

This study used a quasi-experimental approach with a two-group pretest–posttest design, a standard design in agility training studies when complete randomization is challenging to implement at the individual level (Dimas & Budi, 2025; Fikri et al., 2021). This design allowed researchers to compare two interventions, the Side Right-in and Crossover Shuffle, on improving agility in futsal athletes. Each group received a different treatment, but with the same training duration, intensity, and frequency of exercise. Similar designs are also widely used in agility training research in soccer (Pandey et al., 2025), basketball (Anwar et al., 2020), and volleyball (Chuang et al., 2022).

The study subjects were 20 male futsal athletes from the 2022 FIM Squad UNDIKMA, a homogeneous population based on age (18–23 years), fitness level, and playing experience. All participants were deemed healthy following an initial examination and participated in all scheduled training sessions, held three times per week for six weeks. The sampling technique employed was a population study, utilizing the entire population as a sample, given the limited number of team

members and the high representativeness of the university futsal athlete population.

Sample Preparation

Before the training, all participants received a technical briefing on the objectives, training format, and measurement procedures. A 10-minute warm-up phase included a combination of dynamic stretching and light jogging to prevent muscle injury during the training. Each participant underwent a Zig Zag Run pretest to obtain baseline agility data. The pretest results were used to determine the group distribution, ensuring that both groups had relatively equal average abilities before the treatment.

The training program was implemented over 6 weeks, with a frequency of three times per week, following the Speed, Agility, and Quickness (SAQ) training model, which emphasizes improving coordination, reaction time, and movement efficiency (Anwer et al., 2021; Trecroci, Cavaggioni, et al., 2022). Training intensity started at 30% in the first week and gradually increased to 80% in the sixth week, in accordance with the principle of progressive overload (Ilham et al., 2024). Each training session lasted 60 minutes, consisting of: a 10-minute warm-up (dynamic stretching and light footwork), 40 minutes of main training (Side Right-in or Crossover Shuffle depending on the group), and a 10-minute cool-down (static stretching and evaluation). Instructions were provided directly by certified trainers and researchers to maintain consistency of technique. During training, researchers recorded movement error rates and execution duration to ensure procedural accuracy.

Experimental Set-up

This study followed a two-group pretest–posttest design as recommended in modern experimental validity studies (Klaver et al., 2020; Pandey et al., 2025). This design is described as follows:

Table 1. Experimental Design

Group	Pretest	Treatment	Posttest
A (Side Right-in)	Initial agility test	Side Right-in exercise	Final agility test
B (Crossover Shuffle)	Initial agility test	Crossover Shuffle exercise	Final agility test

Both exercises use an agility ladder with different movement patterns. The Side Right-in exercises train two-point lateral movements, focusing on coordination, balance, and foot speed. Meanwhile, the Crossover Shuffle exercises crosswise and rotational movements to improve hip strength, flexibility, and directional control. Each session consists of three sets, with the number of repetitions gradually increasing each week:

- Weeks 1–2: 9–12 reps
- Weeks 3–4: 15–18 reps
- Weeks 5–6: 21–24 reps

Recovery time between sets was set at 60 seconds, in accordance with SAQ training recommendations for optimal anaerobic energy recovery (Mota et al., 2021). During training, the trainer ensured that the stride pattern complied with international ladder drill standards, as adapted from recent research (Sanrijaya et al., 2023). To ensure equitable treatment, all training sessions were conducted on the UNDIKMA indoor futsal court, with the same surface, stable environmental conditions, and a fixed schedule.

Instrument dan Parameter

The primary parameter measured in this study was agility, defined as the ability to change direction quickly without losing balance or body control (Cassidy et al., 2023). Measurements were conducted using a primary measuring instrument with high validity and reliability in the futsal context: the 4×10 m Shuttle Run, which aims to measure speed and endurance for rapid changes in direction (Fahlefi et al., 2021).

The testing procedure followed international standards (Zeljko et al., 2020), with reaction times recorded using a digital stopwatch with a precision of 0.01 seconds. Each participant

performed two attempts for each test, and the best score was used as the final score. The data collected included travel time (in seconds) and observations of movement quality to ensure the validity of the results. All tests were administered at the same time of day (4:00 PM–6:00 PM) to avoid the effects of temperature and fatigue.

Statistical Analysis

Data analysis was performed using parametric statistical tests, including normality (Shapiro–Wilk) and homogeneity (Levene's Test) to ensure the suitability of data assumptions. Pretest–posttest changes within each group were analyzed using a paired sample t-test. In contrast, comparisons between groups were performed using an independent t-test at a significance level of $\alpha = 0.05$. A p-value < 0.05 was used as an indicator of significant differences. This t-test was chosen because it is appropriate for a pretest–posttest design with two independent treatment groups (Buluş, 2021; Utomo et al., 2024). Furthermore, the effect size (Cohen's d) was calculated to determine the strength of the training effect. All analyses were performed using SPSS version 26.0 without any additional irrelevant procedures to ensure more focused and easily interpretable results.

RESULT AND DISCUSSION

The following presents the empirical results of an experimental study examining the effect of Side Right-in and Crossover Shuffle training on improving the agility of men's futsal athletes from the FIM Squad UNDIKMA. Data were collected through the ZigZag Run test, which was administered twice: before (pretest) and after (posttest) the six-week training intervention. Statistical analysis included descriptive data (mean, minimum, and maximum values), a paired t-test to examine the effect within groups, and an independent t-test to examine differences between groups.

Table 1 shows the descriptive statistics for both training groups, depicting the agility test scores (in seconds) at the initial and final measurements.

Tabel 1. Descriptive Statistics of Agility Pretest and Posttest Results

Exercise Type	Test Type	Minimum Score	Maximum Score	Average	Improvement
Side Right-in	Pretest	12,50 s	14,44 s	13,40 s	—
Side Right-in	Posttest	12,09 s	13,72 s	12,78 s	0,62 s
Crossover Shuffle	Pretest	12,34 s	14,19 s	13,28 s	—
Crossover Shuffle	Posttest	12,16 s	13,75 s	12,96 s	0,32 s

The data showed that both training methods resulted in consistent improvements in agility. The average travel time of participants in the Side Right-in group decreased by 0.62 seconds, while the Crossover Shuffle group decreased by 0.32 seconds. This indicates that both exercises effectively improve change of direction and speed, with more pronounced results in the Side Right-in exercise.

To determine the significance of the improvement in each group, a paired t-test was conducted on the pretest and posttest data.

Tabel 2. Paired t-Test Results for Each Group

Type of Exercise	t-count	t-table (df=9, $\alpha=0,05$)	Significance	Conclusion
Side Right-in	5,252	1,833	$p < 0,05$	Signifikan
Crossover Shuffle	4,878	1,833	$p < 0,05$	Signifikan

The analysis results showed that both training groups experienced a statistically significant increase in agility ($p < 0.05$). The t-value for the Side Right-in exercise was higher than the Crossover Shuffle, which means that the Side Right-in exercise had a greater effect on increasing agility. Side Right-in training consistently improves agility and coordination in various athletic populations. This has been proven to be effective in producing measurable improvements in agility and coordination, as shown by (Rachman et al., 2024), who reported a significant increase in agility

in a futsal team after the Side Right-in ladder training intervention. Research by (Sanrijaya et al., 2023) also confirmed that various variations of ladder drills, including the Side Right-in pattern, can enhance athlete speed and agility.

To compare the effectiveness of the two exercises, an independent t-test was performed between the Side Right-in and Crossover Shuffle groups.

Table 3. Independent t-test

Comparison	Differences in Average	t-count	t-table (df=18, $\alpha=0,05$)	Significance	Conclusion
Side Right-in vs Crossover Shuffle	0,30 s	2,017	1,729	$p < 0,05$	Significance

A significant difference ($t = 2.017 > 1.729$; $p < 0.05$) indicates that the Side Right-in exercise is more effective than the Crossover Shuffle in improving agility in futsal athletes. Side-right-in exercises have been shown to significantly improve agility and coordination in various sports. Similar results were found by (Padrón-Cabo et al., 2020; Putra et al., 2023), who demonstrated increased speed and coordination following ladder training. The resulting neuromuscular adaptations include improved balance and quick reactions (Chuang et al., 2022; Hikmah et al., 2023). Structured training progressions improve agility outcomes (Li, 2023; Plotkin et al., 2022). Meanwhile, the Crossover Shuffle exercise activates the adductor and abductor muscles, strengthens lateral stability, and improves multi-segment coordination. (Pinelli et al., 2025) demonstrated that repeated crossing patterns enhanced knee control and directional changes, while proprioceptive adaptation facilitated faster directional reactions (Sehgal et al., 2023). The effectiveness of this exercise has also been demonstrated in improving agility and speed in various sports (Dos'Santos et al., 2022; Wang et al., 2024).

The results of the study indicate that both the Side Right-in and Crossover Shuffle exercises significantly improved the agility of the FIM Squad UNDIKMA male futsal athletes. Empirically, these results support the hypothesis that variations in Speed, Agility, and Quickness (SAQ)-based training, utilizing agility ladder drills, can stimulate improvements in players' change of direction, dynamic balance, and reaction speed. The primary rationale for these improvements can be explained through the mechanisms of neuromuscular adaptation, intermuscular coordination, and proprioception, which are the foundation of movement efficiency in team sports such as futsal (Sidik et al., 2020; Sumpena & Sidik, 2020; Yuliawati, 2023).

Ladder drills, such as the Side Right-in and Crossover Shuffle, involve repetitive, rhythmic movements that require the simultaneous activation of lower limb muscles, including the gastrocnemius, quadriceps, hamstrings, and hip stabilizers. This rapid, repetitive activation trains the rate of force development (RFD) and improves neuromuscular efficiency, which directly impacts acceleration speed and change of direction (Rachman et al., 2024). In vivo studies have demonstrated that high-intensity coordination exercises, such as the agility ladder, enhance the speed of motor nerve signals and reduce muscle reaction time to external stimuli, leading to faster and more precise movements (Hanani et al., 2024). From a biomechanical perspective, the Side Right-in emphasizes lateral stability and balance control during two-point movements. At the same time, the Crossover Shuffle focuses on cross-movement coordination, strengthening pelvic and adductor-abductor muscle control. The combination of the two enhances eccentric control during deceleration and concentric propulsion during re-acceleration. This aligns with the principle of change of direction in futsal, which requires the ability to stop body momentum and change direction quickly without losing balance (Spyrou et al., 2020).

These findings are consistent with recent studies demonstrating the effectiveness of agility ladder-based training in improving agility in various sports. (Ilham et al., 2024) found that ladder-based SAQ training significantly improved the speed, coordination, and agility of futsal players, with more pronounced results in the group with lower BMI. These findings are further supported by

(Yuliawati, 2023), who showed that variations in ladder drills significantly improved reaction time and change-of-direction ability in soccer and futsal players. Research by (Rachman et al., 2024) specifically highlighted that Side Right-in training significantly improved futsal players' agility by enhancing lateral movement control and dynamic stability. This aligns with the results of this study, where Side Right-in training demonstrated a greater improvement effect than Crossover Shuffle. This study confirms that lateral movement patterns significantly contribute to agility in games characterized by horizontal movements, such as futsal.

Meanwhile, findings on the Crossover Shuffle exercise are also supported by research (Sanrijaya et al., 2023), which demonstrated that the crossover ladder drill pattern is efficacious in improving multidirectional abilities by stimulating simultaneous action between the neuromuscular system and pelvic control. Similar results were reported by (Hikmah et al., 2023) in martial arts athletes, where variations of the crossover ladder drill significantly improved lateral speed and body coordination. However, not all studies provide consistent results. (Padrón-Cabo et al., 2020, 2021) reported that ladder drill training in young soccer players did not always result in significant improvements in speed and agility performance when compared to small-sided games (SSG) training. This inconsistency may be explained by differences in experience level, training intensity, and supervision during implementation. Recent research confirms that the effectiveness of ladder drills is highly dependent on supervision, intensity progression, and integration with other exercises such as plyometrics or game-based training (Ilham et al., 2025; Pramono et al., 2023).

Furthermore, several studies have reported that the effect of ladder drills on in-game performance is not always significant unless perceptual and decision-making aspects are integrated (Morrall-Yepes et al., 2020). Therefore, for agility improvements to truly translate into futsal performance, ladder-based training needs to be integrated with reactive training that requires responding to visual and auditory stimuli, as implemented in the reactive agility training approach (Cassidy et al., 2023; Mota et al., 2021).

The findings of this study, which demonstrate the different effects of the Side Right-in and Crossover Shuffle, also add to the existing literature by providing evidence that varying movement patterns provide different adaptive stimuli to the neuromuscular system. The Side Right-in is superior in training change of direction (COD) and lateral stability, while the Crossover Shuffle tends to strengthen cross-body coordination and hip flexibility. Therefore, the selection of training variations should be tailored to the player's position or role on a futsal team. Theoretically, the results of this study align with the theories of neuromuscular adaptation and ecological dynamics in agility development. This approach emphasizes that agility relies not only on physical abilities such as strength and speed but also on the nervous system's ability to coordinate body movements in response to environmental stimuli (Cassidy et al., 2023). The Side Right-in and Crossover Shuffle training creates training conditions rich in perceptual-motor coupling, where athletes continuously adapt to changes in body position, direction of movement, and balance.

Neuromuscular adaptations resulting from ladder drills are characterized by increased efficiency of motor nerve signal transmission, enhanced agonist-antagonist muscle synchronization, and improved motor unit recruitment (Sidik et al., 2020). Exercises such as the Side Right-in, which involves rapid lateral movements with repeated changes of direction, result in increased postural stability through stimulation of proprioceptors in the ankle and hip joints (Hanani et al., 2024). This process strengthens the feedforward mechanism in the nervous system, allowing athletes to anticipate changes in direction with shorter reaction times. From a biomechanical perspective, ladder drills emphasize three key components in agility development: (1) deceleration ability, (2) change of direction ability (COD ability), and (3) re-acceleration ability (Loturco et al., 2020). These three aspects are interrelated in producing efficient agility performance. The Right Side-in exercise strengthens deceleration ability by increasing control of the stabilizer muscles, while the Crossover Shuffle improves re-acceleration ability by increasing eccentric strength and pelvic flexibility.

Furthermore, these findings reinforce the concept of the training transfer continuum proposed by (Ilham et al., 2025), where ladder drills serve as a bridge between the development of general physical abilities and game-specific skills. In the context of futsal, ladders serve as a transitional tool from basic coordination exercises to situational exercises that demand speed, flexibility, and quick decision-making. Therefore, ladder drills can be incorporated into the futsal training macrocycle as part of the preparatory phase, build phase, and peak phase, as recommended by (Campos et al., 2021). Theoretical support also comes from the biopsychological approach to sports performance, which emphasizes the involvement of cognitive processes in agility. SAQ exercises involving rapid movement patterns with complex coordination stimulate the primary motor area and the prefrontal cortex, which play a role in rapid decision-making (Mota et al., 2021). Therefore, agility adaptation in futsal is not only produced by physiological factors but also by increasing the integration of perception and action, in accordance with the principle of perception-action coupling in ecological dynamics theory (Cassidy et al., 2023).

Practically, the findings of this study provide important implications for coaches and sports practitioners in designing futsal training programs. First, the Side Right-in exercise should be prioritized during the basic agility development phase because it has a greater impact on COD (coordination of movement) and lateral balance. Second, the Crossover Shuffle exercise can be used during the development phase to improve pelvic flexibility and multi-segment coordination. Third, integrating both exercises can, in turn, increase the complexity of motor adaptations while expanding performance transfer to real-game situations. In the long term, the effectiveness of ladder drills can be enhanced by combining them with plyometric training and small-sided games (SSGs), which add cognitive and situational load to the training (Apriantono et al., 2023). This integrated approach supports improvements in agility that are not only physiologically measurable but also contextually relevant to the dynamics of futsal matches.

CONCLUSION

Based on the research results and discussions conducted, it can be concluded that both the Side Right-in and Crossover Shuffle exercises have a significant influence on improving the agility of male futsal athletes from the FIM Squad UNDIKMA. Both forms of training, which are included in the agility ladder drills category, have been proven to be able to improve the ability to change direction, dynamic balance, motor coordination, and reaction speed, which are essential components in futsal performance. The Side Right-in exercise showed a higher improvement compared to the Crossover Shuffle, particularly in terms of lateral direction change and body stability. This indicates that the two-point lateral movement pattern in the Side Right-in exercise is more effective in stimulating the neuromuscular system and strengthening balance control during the deceleration and re-acceleration phases. Meanwhile, the Crossover Shuffle exercise continues to make a significant contribution to improving cross coordination, hip flexibility, and postural control in multi-directional movements. Practically, the results of this study confirm that variations of ladder exercises can be adapted in the Speed, Agility, and Quickness (SAQ) program to improve the agility performance of futsal players. Coaches are advised to combine these two types of training in a structured manner, with the principles of progression and proper supervision, to maximize the results of adaptation. With the right training program, improving agility will directly contribute to players' ability to cope with fast-paced, dynamic, and stressful game situations, as well as strengthening the team's overall competitive performance.

REFERENCE

- Anwar, R. J., Muliyadi, & Sutono, E. (2020). Influence of Ladder Drill Exercises and Shuttle Run Toward Agility Level Among Basketball Players in Bosowa International School Makassar. *Journal of Physics Conference Series*, 1529(3), 032039. <https://doi.org/10.1088/1742-6596/1529/3/032039>

- Anwer, U., Nuhmani, S., Sharma, S., Bari, Mohd. A., Kachanathu, S. J., & Abualait, T. (2021). Efficacy of Speed, Agility and Quickness Training with and Without Equipment on Athletic Performance Parameters – A Randomized Control Trial. *International Journal of Human Movement and Sports Sciences*, 9(2), 194–202. <https://doi.org/10.13189/saj.2021.090205>
- Apriantono, T., Juniarsyah, A. D., Adnyana, I. K., Hasan, M. F., & Resmana, D. (2023). The Effect of Speed Training on the Physical Performance of Adolescent Futsal Players. *Jurnal Sportif Jurnal Penelitian Pembelajaran*, 9(1), 172–184. https://doi.org/10.29407/js_unpgri.v9i1.19047
- Buluş, M. (2021). Sample Size Determination and Optimal Design of Randomized/Non-Equivalent Pretest-Posttest Control-Group Designs. *Adiyaman Üniversitesi Eğitim Bilimleri Dergisi*, 11(1), 48–69. <https://doi.org/10.17984/adyuebd.941434>
- Campos, F. D. S., Borszcz, F. K., Flores, L. J. F., Barazetti, L. K., Teixeira, A. S., Hartmann Nunes, R. F., & Guglielmo, L. G. A. (2021). HIIT Models in Addition to Training Load and Heart Rate Variability Are Related with Physiological and Performance Adaptations After 10-Weeks of Training in Young Futsal Players. *Frontiers in Psychology*, 12. Scopus. <https://doi.org/10.3389/fpsyg.2021.636153>
- Cassidy, J., Young, W., Gorman, A. D., & Kelly, V. G. (2023). Merging Athletic Development with Skill Acquisition: Developing Agility Using an Ecological Dynamics Approach. *Strength and Conditioning*, 46(2), 202–213. <https://doi.org/10.1519/ssc.0000000000000791>
- Chuang, C.-H., Hung, M.-H., Chang, C.-Y., Wang, Y.-Y., & Lin, K.-C. (2022). Effects of Agility Training on Skill-Related Physical Capabilities in Young Volleyball Players. *Applied Sciences*, 12(4), 1904. <https://doi.org/10.3390/app12041904>
- Dimas, D., & Budi, B. (2025). Pengaruh Latihan Cone Drill Untuk Meningkatkan Kelincahan Siswa Sekolah Dasar Kelas 5 Melalui Permainan Olahraga Tradisional Hadang Di SDN Banjaran 03. *Mupeno*, 2(4), 77–92. <https://doi.org/10.61132/mupeno.v2i4.518>
- Dos'Santos, T., McBurnie, A., Thomas, C., Jones, P. A., & Harper, D. (2022). Attacking Agility Actions: Match Play Contextual Applications with Coaching and Technique Guidelines. *Strength and Conditioning*, 44(5), 102–118. <https://doi.org/10.1519/ssc.0000000000000697>
- Fahlefi, P. M. I., Multazam, A., Rahmanto, S., & Rahim, A. F. (2021). Perbandingan Shuttle Run Exercise Dan Ladder Drill Exercise Terhadap Kelincahan Pada Pemain Futsal. *Physiotherapy & Health Science (Physiohs)*, 2(2), 62–68. <https://doi.org/10.22219/physiohs.v2i2.15195>
- Fikri, M. D., Wiriawan, O., & Widodo, A. (2021). Pengaruh Pelatihan Ladder Drill Dengan Metode Ascending Dan Descending Terhadap Peningkatan Kecepatan Dan Kelincahan. *Journal of Sport Science and Fitness*, 7(1), 1–8. <https://doi.org/10.15294/jssf.v7i1.43707>
- GÖRAL, K., Hadi, G., & KAPLAN, T. (2023). Investigation of Futsal Players' Answers to Different Agility Tests According to Their Positions. *Spor Ve Performans Araştırmaları Dergisi*, 14(1), 115–126. <https://doi.org/10.17155/omuspd.1179192>
- Hanani, M. R., I Dewa Ayu Inten Dwi Primayanti, & Lesmana, S. I. (2024). The Effect Proprioceptive Training on Ladder Drill Training Variation on Dynamic Balance of Futsal Players. *International Journal of Public Health Excellence (Ijphe)*, 4(1), 197–203. <https://doi.org/10.55299/ijphe.v4i1.1054>
- Hikmah, N., Tomoliyus, T., Wedi, S., Wijayanti, N. P. N., Prayoga, H. D., & Prabowo, T. A. (2023). Is Ladder Drill Training Effective for Increasing Agility for Karate Athletes in the Amp;#39 & ;Kumite' Category (14-16 Years)? *International Journal of Physical Education Sports and Health*, 10(6), 15–20. <https://doi.org/10.22271/kheljournal.2023.v10.i6a.3127>
- I Dewa Made Aryananda Wijaya Kusuma, Phanpheng, Y., Bulqini, A., & Prianto, D. A. (2023). The Effect of 6 Weeks of Combination of Three Cone Exercise Using Ball and High-Intensity Interval Training on the Agility and Dribbling Ability of Student Futsal Athletes.

- Teoriâ Ta Metodika Fizičnogo Vihovannâ*, 23(5), 686–691. <https://doi.org/10.17309/tmfv.2023.5.05>
- Ilham, I., Putra, R. A., Agus, A., Bafirman, B., Arsil, A., Bahtra, R., Kurniawan, R., Ndayisenga, J., & Sibomana, A. (2024). The Effect of Combination of Cone Drill (Zigzag) With Core Stability, Combination of Ladder Drill (Snake Jump) With Core Stability, and Speed on Agility of Futsal Players: A Factorial Experimental Design. *Retos*, 58, 1–11. <https://doi.org/10.47197/retos.v58.105462>
- Ilham, I., Putra, R. A., Orhan, B. E., Prasetyo, T. F., Effendi, R., Kurniawan, R., & Geantă, V. A. (2025). The Effects of Ladder Drill and Plyometric Training on Agility in Futsal Players Considering Body Mass Index. *Teoriâ Ta Metodika Fizičnogo Vihovannâ*, 25(4), 886–895. <https://doi.org/10.17309/tmfv.2025.4.17>
- Klaver, M., Bildt, A. d., Bruinsma, E., Kuijper, G. d., Hoekstra, P. J., & Barbara J. van den Hoofdakker. (2020). First Steps Toward Positive Behavior Support in the Netherlands: A Pilot Study Exploring the Effectiveness of a Training for Staff. *Journal of Policy and Practice in Intellectual Disabilities*, 17(3), 188–194. <https://doi.org/10.1111/jppi.12334>
- Li, R. (2023). Study on the Opening of School Sports Facilities Under the National Fitness Programme. *The Educational Review Usa*, 7(1), 39–44. <https://doi.org/10.26855/er.2023.01.010>
- Loturco, I., Pereira, L. A., Reis, V. P., Abad, C. C. C., Freitas, T. T., Paulo Henrique Silva Marques de Azevedo, & Nimphius, S. (2020). Change of Direction Performance in Elite Players from Different Team Sports. *The Journal of Strength and Conditioning Research*, 36(3), 862–866. <https://doi.org/10.1519/jsc.0000000000003502>
- Morral-Yepes, M., Moras, G., Bishop, C., & Gonzalo-Skok, Ó. (2020). Assessing the Reliability and Validity of Agility Testing in Team Sports: A Systematic Review. *The Journal of Strength and Conditioning Research*, 36(7), 2035–2049. <https://doi.org/10.1519/jsc.0000000000003753>
- Mota, T., Afonso, J., Sá, M., & Clemente, F. M. (2021). An Agility Training Continuum for Team Sports: From Cones and Ladders to Small-Sided Games. *Strength and Conditioning*, 44(1), 46–56. <https://doi.org/10.1519/ssc.0000000000000653>
- Muhammad Labib Siena Ar Rasyid, Wiriawan, O., Siantoro, G., Kusuma, D. A., & Rusdiawan, A. (2023). Combination of Plyometric and Ladder Drill: Its Impact on Improving Speed, Agility, and Leg Muscle Power in Badminton. *Jurnal Sportif Jurnal Penelitian Pembelajaran*, 9(2), 290–309. https://doi.org/10.29407/js_unpgri.v9i2.20468
- P, W. P., & Josheeta, S. (2023). Effect of Plyometric Exercises Versus Speed Agility Quickness Training on Agility, Speed, Power, Dynamic Balance and Reaction Time in Amateur Badminton Players. *International Journal of Physiotherapy and Research*, 11(3), 4524–4530. <https://doi.org/10.16965/ijpr.2023.124>
- Padrón-Cabo, A., Lorenzo-Martínez, M., Pérez-Ferreirós, A., Costa, P. B., & Rey, E. (2021). Effects of Plyometric Training with Agility Ladder on Physical Fitness in Youth Soccer Players. *International Journal of Sports Medicine*, 42(10), 896–904. <https://doi.org/10.1055/a-1308-3316>
- Padrón-Cabo, A., Rey, E., Kalén, A., & Costa, P. B. (2020). Effects of Training with an Agility Ladder on Sprint, Agility, and Dribbling Performance in Youth Soccer Players. *Journal of Human Kinetics*, 73(1), 219–228. <https://doi.org/10.2478/hukin-2019-0146>
- Pandey, P., Rathore, P., Narvariya, P., & Pal, I. S. (2025). Effectiveness of Targeted Football Drills on Agility, Explosive Strength, and Coordinative Abilities. A Comparative Study. *Fiz Pol*, 25(4), 42–46. <https://doi.org/10.56984/8zga431f4of>
- Pinelli, S., Zinno, R., Senesi, G., Massini, M. S., Pinelli, E., & Bragonzoni, L. (2025). Enhancing Soccer Athletes' Performance: A Kinematic Analysis of Agility Training. *Journal of Mechanics in Medicine and Biology*. <https://doi.org/10.1142/s0219519425400536>

- Plotkin, D. L., Coleman, M., Every, D. W. V., Maldonado, J., Oberlin, D., Israel, M., Feather, J., Alto, A., Vigotsky, A. D., & Schöenfeld, B. J. (2022). Progressive Overload Without Progressing Load? The Effects of Load or Repetition Progression on Muscular Adaptations. *Peerj*, 10, e14142. <https://doi.org/10.7717/peerj.14142>
- Pramono, H., Rahayu, T., & Yudhistira, D. (2023). The Effect of Plyometrics Exercise Through Agility Ladder Drill on Improving Physical Abilities of 13–15-Year-Old Volleyball Players. *Teoriâ Ta Metodika Fizičnogo Vihovannâ*, 23(2), 199–206. <https://doi.org/10.17309/tmfv.2023.2.07>
- Putra, J. G., Aryanti, S., & Victorian, A. R. (2023). Ladder Drill Training on the Agility of Beginner Badminton Athletes. *Kinestetik Jurnal Ilmiah Pendidikan Jasmani*, 7(4), 1046–1053. <https://doi.org/10.33369/jk.v7i4.30709>
- Rachman, A., Ramadhan, H. M., & Yannor, L. (2024). The Effect of Ladder Drill Side Right in Training on Increasing the Agility of the Futsal Team of SMKN 1 Kandangan. *Journal Coaching Education Sports*, 5(2), 297–308. <https://doi.org/10.31599/2v771d91>
- Redo, M. H., & Jariono, G. (2023). *Speed and Agility on Futsal Dribbling Ability: Correlation Study*. 634–641. https://doi.org/10.2991/978-2-38476-086-2_54
- Sanrijaya, N., Wiriawan, O., & Wibowo, S. (2023). Increased Speed and Agility Through Ladder Drill Variations. *Competitor Jurnal Pendidikan Kepelatihan Olahraga*, 15(2), 269. <https://doi.org/10.26858/cjpko.v15i2.47333>
- Sehgal, S., Chahal, A., Esht, V., Alshehri, M. M., Beg, R. A., Shaphe, M. A., Alajam, R. A., Kashoo, F. Z., Alghadir, A. H., & Khan, M. (2023). Unleashing Potential and Optimizing Adolescent Roller Skating Performance Through a Structured Exercise Program – A Randomized Controlled Trial. *BMC Sports Science Medicine and Rehabilitation*, 15(1). <https://doi.org/10.1186/s13102-023-00728-x>
- Sidik, D. Z., Sumpena, A., & Rosdiana, F. (2020). *The Impact of Training Methods with Resistance Band Ladder Drills Training Pattern to Increase Physiological Ability of Female Futsal Players*. <https://doi.org/10.2991/ahsr.k.200214.111>
- Spyrou, K., Freitas, T. T., Marin-Cascales, E., & Alcaráz, P. E. (2020). Physical and Physiological Match-Play Demands and Player Characteristics in Futsal: A Systematic Review. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.569897>
- Sumpena, A., & Sidik, D. Z. (2020). *The Impact of Exercise Methods and Genders on Improving the Physiological Capabilities of Futsal Players*. <https://doi.org/10.2991/ahsr.k.200214.054>
- Trecroci, A., Cavaggioni, L., Rossi, A., Moriondo, A., Merati, G., Nobari, H., Ardigò, L. P., & Formenti, D. (2022). Effects of Speed, Agility and Quickness Training Programme on Cognitive and Physical Performance in Preadolescent Soccer Players. *Plos One*, 17(12), e0277683. <https://doi.org/10.1371/journal.pone.0277683>
- Trecroci, A., Invernizzi, P. L., Monacis, D., & Colella, D. (2022). Physical Illiteracy and Obesity Barrier: How Physical Education Can Overpass Potential Adverse Effects? A Narrative Review. *Sustainability (Switzerland)*, 14(1). Scopus. <https://doi.org/10.3390/su14010419>
- Utomo, A. A. B., Nurhasan, N., Wiriawan, O., & Muhammad, H. N. (2024). The Effect of Mixed Method Training Circuit Training Ladder Drill on Agility and Speed Run. *Int. J. Emerg. Res. Rev.*, 2(1), 000063. <https://doi.org/10.56707/ijoerar.v2i1.63>
- Wang, X., Soh, K. G., Deng, N., Zhang, D., Cao, S., & Samsudin, S. (2024). Effects of functional training on muscle strength, jumping, and functional movement screen in wushu athletes: A systematic review. *Heliyon*, 10(2), e24087. <https://doi.org/10.1016/j.heliyon.2024.e24087>
- Wijayanti, N. P. N., Saputro, D. P., Af, O. F., & Febri, R. (2021). Ladder Drill Portable: Agility Tools for Sports. *Journal Sport Area*, 6(1), 123–135. [https://doi.org/10.25299/sportarea.2021.vol6\(2\).5912](https://doi.org/10.25299/sportarea.2021.vol6(2).5912)
- Young, W., Dos'Santos, T., Harper, D., Jefferys, I., & Talpey, S. (2022). Agility in Invasion Sports: Position Stand of the IUSCA. *International Journal of Strength and Conditioning*, 2(1).

<https://doi.org/10.47206/ijsc.v2i1.126>

- Young, W., Rayner, R., & Talpey, S. (2021). It's Time to Change Direction on Agility Research: A Call to Action. *Sports Medicine - Open*, 7(1). <https://doi.org/10.1186/s40798-021-00304-y>
- Yuliawati, W. V. (2023). Pengaruh Latihan Ladder Drill Terhadap Kelincahan Pemain Futsal UKM Putri STKIP Muhammadiyah Kuninga. *Jpess*, 5(2), 10–14. <https://doi.org/10.33222/jpess.v5i2.2342>
- Zeljko, I., Gilić, B., & Sekulić, D. (2020). Validity, Reliability and Correlates of Futsal-Specific Pre-Planned and Non-Planned Agility Testing Protocols. *Kinesiologia Slovenica*, 26(2), 25–34. <https://doi.org/10.52165/kinsi.26.2.25-34>