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Effects of a four-week ladder drill training program on dribbling performance in u-14 youth soccer players: a quasi-experimental study

Putra Jawara, Alex Aldha Yudi*), Ardo Okilanda, Afrizal Afrizal
Universitas Negeri Padang

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ABSTRACT

Dribbling is a fundamental technical skill that strongly influences both individual and team performance in youth football. Ladder-based coordination training has been proposed as an effective method to improve footwork, coordination, and neuromuscular qualities associated with dribbling ability. This study aimed to determine the effect of a four-week ladder drill training program on the dribbling performance of youth players at SSB Elang Perkasa Padang, Indonesia. A quasi-experimental study with a one-group pretest–posttest design was conducted involving 16 male U-14 players selected through total sampling. Dribbling performance was assessed using the slalom dribbling test before and after a four-week intervention consisting of 16 ladder drill sessions (four sessions per week, 40–60 minutes each). Data were analyzed using the Liliefors normality test and paired-samples t-test ($\alpha = 0.05$), with Cohen's dz, percentage improvement, and 95% confidence intervals reported. Both datasets were normally distributed. Mean dribbling time significantly improved from 14.67 ± 1.65 s to 14.36 ± 1.62 s, $t(15) = 6.48$, $p < 0.001$, 95% CI [0.21, 0.42], representing a 2.13% improvement. The effect size was large (Cohen's dz = 1.62). Although the absolute improvement was relatively small, the statistically significant change and large standardized effect indicate that short-term ladder drill training can effectively enhance dribbling performance. Therefore, ladder drills are recommended as an efficient and practical complementary training method for grassroots football development.

Corresponding Author:

Alex Aldha Yudi,
Universitas Negeri Padang,
Email: alexaldha@fik.unp.ac.id

Introduction

Soccer continues to be the world's favorite team sport played by many, and global expansion has only made talent competition a fiercer affair among players who are getting younger all the time (Krolo et al., 2020). The faster-paced nature of games nowadays has also increased emphasis on duels at an individual level. Decisive moments in matches have increasingly depended on the technical skills performed in the tightest circumstances, which is why dribbling under pressure now has a larger strategic value. Being capable of a tight hold on the ball in difficult areas is constantly shown to be connected with having chances to score and causing a disorganizing opponent (McBurnie et al., 2021). Therefore, modern ideas of preparing soccer players not only show technical skills as something they can achieve alone but see technical expertise as a result of the player's inherent physical and neuromuscular qualities, specifically agile movement, good coordination, and a fast direction change

(COD) capability (Chauchai et al., 2012). This idea is further reinforced by the finding that dribbling skill itself grows alongside these physical qualities from the teenage years (Huijgen et al., 2010) as well as by implementing standardized dribbling-agility tests for assessing this interrelationship progressively (Bekris et al., 2018).

Dribbling is often considered the pinnacle of technical skill and match-decision making in soccer, and in order to be able to do it successfully, a player has to balance a wide range of abilities controlling the ball by footwork while at the same time changing direction quickly and doing so with great speed while the player must also resist and deal with physical and perceptual challenges from an opponent (Krolo et al., 2020; Chaalali et al., 2016). Dribbling requires the athlete to have a certain footwork control at a fairly fast pace. To enhance these skills in youth, a variety of drills that focus only on one aspect of movement coordination or movement and do not at the same time demand very high skill of the player will have a big impact on their development (Karahan, 2020). This aligns with the long-term athletic development (LTAD) model as it puts movement and coordination training as the building block for sport performances to come (Lloyd et al., 2015).

Agility training refers generally to the capability of quickly altering direction, speed, or movement from a stimulant. This training method consistently transfers knowledge of the technique of sports through the improvement of the players' skills, especially in the case of soccer performance, which mainly includes sprint power, change of direction (COD) proficiency, and performing the skills accurately when there is time pressure (Chaouachi et al., 2014; Rikken et al., 2024). Moreover, this tendency is also supported by the work of Sun et al. (2025) who conducted a systematic review and meta-analysis that revealed how reliably speed, agility, and quickness (SAQ) training can result in better sports performance of soccer players. Furthermore, evidence is also there for the combination of ladder drills with other types of agility drills such as hurdle-jumping and those done on a small course that lead to an improved performance in match situations (Pamungkas et al., 2023). Although various methods are available for teaching agility, ladder drills can play a unique role: they are cheap, do not occupy much space and can gradually move from plain and simple footwork patterns toward drills also involving balls, hence making these drills very feasible and accessible for community-based academies which have fewer resources (Padrón-Cabo et al., 2020). The enhancement of sport performance is primarily thought to be brought about by ladder drills which result in neuromuscular/ proprioceptive adaptations rather than by metabolic or structural muscular overload, through repetitive challenge of the nervous system to produce very precise, fast, and correctly timed foot work (Krolo et al., 2020).

On the other hand, the international evidence recently published concerning ladder training in youth soccer is not in harmony. In the first place, Padrón-Cabo et al. have demonstrated (2020) that after six weeks of agility-ladder coordination training, youth players were faster in sprinting performance while no changes were detected in dribbling speed, slalom dribbling, or a combined skill index in comparison to the control group. Additionally, Padrón-Cabo et al. (2021) said that agility-ladder-based plyometric training over half a month did not constitute an efficient time stimulus for enhancement of physical fitness together with slalom dribbling, for under-13 players. However, Chaouachi et al. 's (2014) and Chaalali 's et al. (2016) works have shown that agility training that focused on multidirectional movements and change of direction gave significant improvements in agility and COD skill in young elite players. Moreover, Karahan 's (2020) study has proven that training methods that integrate footwork with ball contact surpass generic conditioning when looking at technical outcomes. In summary, this tendency indicates that the success of ladder exercises for enhancing dribbling may be affected by whether the footwork pattern is performed ball-integrated, and it also depends on training frequency and length, and finally the sample's developmental and skill levels (Asadi et al., 2017).

An additional limitation is the research setting. Majority of agility-ladder training investigations were carried out in laboratories or among club players whose groups were assigned by chance (Padrón-Cabo et al., 2020, 2021; Krolo et al., 2020). Meanwhile, community soccer schools (SSB) in places like Indonesia and other countries where football is not dominant usually work with naturally forming, non-sampled, players having only a few test devices, and their training activities are carried out by the coaches rather than being research-based. It is still a mystery whether a brief and very little equipment-demanding ladder drill programme embedded within an SSB setting's regular limitations will still lead to an obvious and statistically significant enhancement in the performance of dribbling. The fact is that findings in well-resourced settings are different from that, and we are not entitled to generalise directly to this particular group (Asadi et al., 2017; McBurnie et al., 2021).

The research fills the literature void by implementing a unique, four-week ladder drill training method where balls are combined with equipment, conducted in real training sessions under the auspices of SSB Elang Perkasa, with data analysis through normality testing, a series of quasi-experimental paired-sample t-tests with inferential statistics, standard effect size computation (Cohen's dz) percentage gain and confidence limits an overall statistical approach more typically applied to postgraduate rather than grassroots research. So the research is different in one way only: it's not about introducing any new training method that nobody has explored before, but about offering a realistic and well-statistic evaluation of how ladder drills affect a player's dribble ability,

done in a local youth football facility which has limited resources, as well as precisely determining the real (physical) as contrasted with simply the numerical, size of that effect.

This research was designed to investigate the effect of four-week ladder drill on dribbling skills, and specifically, how well they can dribble a ball through a series of ladder rungs among youth players at football club SSB Elang Perkasa. The researchers hypothesized that following the four-week ladder drills, the players would significantly reduce their dribbling times, i.e. significantly increase their dribbling skills from the initial test to the final test.

Method

Research Design. This study employed a quasi-experimental method that involved the one-group pretest-posttest design. This was because the training was conducted for a whole training squad that was already in place and coaching was done by SSB under regular conditions, making it impossible to randomly divide the group into the control and the test group. The pretest-posttest comparison thus served as each participant's own internal control of the baseline dribbling ability.

Participants and Sampling. The population of people available for study was made up of young athletes who had signed up at the SSB Elang Perkasa club in Padang, Indonesia. Among these players only the ones belonging to the youth 14's (U-14) age group were picked through total sampling method and finally resulted in a sample of 16 male players. This particular choice of players was primarily made to reduce to the minimal level the variations brought in by different maturation levels and squad level/training exposure.

Intervention: Ladder Drill Training Protocol. Participants trained for 16 ladder drill sessions within four weeks, (4 sessions per week, 40-60 min per session). These were performed in place of a partof the customary technical training. The format of each ladder session was standardized: participants started with a warm-up, then went tothe main training, and finally did a cool-down. The warm-up phase included running in different directions between the markers for about 5 mins followed by 5 mins of dynamic stretching, which overall was consistent with a form of a structured neuromuscular warm-up program that had been shown to improve soccer players' movement control and proprioception of their body movements (Seyedi et al., 2023). The main training part of each session advanced systematically in a planned fashion from the first to the last week of the training period. Participants initially trained on basic footwork patterns (such as single step, double step, side-to-side, in-out step, shuffle, lateral step) without a ball. After some time, they learned the same foot- patterns through and beyond the ladder but integrated with the ball. The progression of training showed specificity-based from general coordination to sport-specific execution. Three sets of 3 repetitions at 96-98% maximal-controlled intensity were performed for the drills with only markercones and a ladder-rope as equipment. At the end of a session, players did 5 min of static stretching to enhance their recovery. The coaching tips stressed mostly on the quality of foot placement, trunk/body-shift control, and coordination rather thanspeed alone, especiallyduring the ball-integrated training. Besides, throughout the session the coaches encouraged the players verbally, the kind of encouragement that has been supported by studies showing thatsuch encouragement is effective in improvingthe player's focus and efforts during agility training (Selmi et al., 2023).

Instrument. Slalom dribbling, a skill that is essential to the game of soccer, was measured here by using a standardized slalom dribbling test which the players dribbled a ball as quickly as they could through a fixed sequence of markers. Dribbling performance was recorded in seconds (better performance means lower times). The instrument that has been used for the test has validity of 0.72 and reliability of 0.61 (Arsil, 2009), values that are consistent with the relatively good psychometric qualities often found in soccer dribbling tests performed on fields (Krolo et al., 2020). In addition to field-based assessments of dribbling, agility tests that use ladders have also shown a high level of test-re- test reliability in children and young population groups (Smits-Engelsman et al., 2019).

Data Collection Procedure. After a warm-up and test demonstration in a standardized form, the slalom dribbling pre-test was given by all 16 participants. The ladder drill intervention lasting four weeks was delivered according to the description above. The post-test was carried out using a similar protocol two days after the final training session, to give time for recovery while reducing detraining. The same evaluators and testing sequence were used at the two time points to decrease experimental error.

Statistical Analysis. Descriptive statistics (i.e., the mean, standard deviation, minimum, and maximum) of dribbling times during pre- and post-test were obtained. It has to be borne in mind that the paired t-test is suitable for the data only upon the condition that the differences in the scores are normally distributed. To the purpose of this checking, the Liliefors test at the p level of 0.05 has been applied to assess whether or not the differences in either of the two pre- or post-distributions are normally distributed. Retaining the null hypothesis of normality

implies that the value of the Lo statistic, the test statistic of Liliefors test, is not significantly greater than the critical Lt value for the given sample size. The paired-samples t-test was used to determine statistical significance in differences of mean dribbling times between pre- and post-test. In order to add a different type of evidence from the null-hypothesis test, the standard within-subject effect size (Cohen's dz) was also given where the numerator is the mean difference and the denominator is the standard deviation of the difference scores. Moreover, the results of Cohen's (1988) thresholds (small = 0.2, medium = 0.5, large = 0.8), which have been adjusted to cover the repeated-measures designs (see Lakens, 2013), were presented. Besides, there were also included the measures of percentage improvement in mean dribbling time and the 95% confidence interval (CI) of the change in the difference in the scores in order to convey how much a change was not just a statistical fact but also a practical, meaningful change (e.g. a difference big enough to be meaningful to stakeholders). All the analyses mentioned had been checked and set at a two-tailed alpha of 0.05.

Ethical Considerations. The research was executed with the agreement and support of the SSB Elang Perkasa coaching team. Before gathering data, paper or online signed informed or consent agreement was taken from each of the player and/or guardian as the case. Participants have no obligation to join the project and the researchers used only anonymized data in the analysis phase. The assessment was conducted using typical, field-based, non-invasive measures and no risks beyond those involved in regular training sessions have been recorded so far.

Results and Discussions

Participant Characteristics. Sixteen male junior soccer players from SSB Elang Perkasa (U-14 age group) were involved in both pre and post-tests where none was lost (100% retention). Table 1 displays participant demographics.

Table 1. Participant Characteristics (N = 16)

Characteristic	Value	Notes
Sample size (N)	16	Total sampling, U-14 category
Sex	Male (100%)	-
Age category	Under-14	Single intact squad
Training exposure	16 sessions / 4 weeks	4 sessions/week, 40-60 min/session

Descriptive Statistics. Table 2 displays statistics for the time spent dribbling at pre-test and post-test level. Lower values indicate better performance as dribbling time is actually the measure, thus the best dribbling performances are those recorded at minimum time and the worst dribbling performances are those recorded at maximum time.

Table 2. Descriptive Statistics of Dribbling Time at Pre-Test and Post-Test

Statistic	Pre-test (s)	Post-test (s)	Mean difference (s)
Mean	14.67	14.36	0.31
Standard deviation	1.65	1.62	0.19
Best score (min)	12.30	12.02	-
Weakest score (max)	17.51	17.16	-
N	16	16	16

Note. Values are in seconds. Lower dribbling time indicates better performance.

Normality Test. The Liliefors test was applied to check whether the distributions of the pre-dribbling test and post-dribbling test scores were normal before implementing the paired-samples t-test. From Table 3 it can be seen that for both time points observed Lo values were lower than Lt values at critical α-level of 0.05 implying that both data sets comply with normality assumption which is needed for parametric analysis.

Table 3. Liliefors Normality Test for Pre-Test and Post-Test Dribbling Time

Variable	N	Lo	Lt (α = .05)	Distribution
Dribbling time - pre-test	16	0.188	0.213	Normal
Dribbling time - post-test	16	0.202	0.213	Normal

Paired-Samples t-Test. A paired-samples t-test was chosen as the method for assessing the level of change in dribbling time after the four-week ladder drill intervention. Table 4 illustrates the major changes with pre-test recording 75% and post-test recording only 25% dribbling periods. This decrease was statistically significant: $t(15) = 6.48$, $p < 0.001$. The 95% confidence interval estimate for the mean difference (0.21 to 0.42 s) did not encompass the value zero, which further supported that the result was significant and showed that the real mean

improvement in the population could be really close to zero. This result parallels the original thesis result that had found t(15) = 6.52 against the same value of 1.75 (Ha accepted, Ho rejected), while the slight change was caused by data rounding.

Table 4. Paired-Samples t-Test for Pre-Test vs. Post-Test Dribbling Time

Mean diff. (s)	SD diff.	t	df	p	95% CI
0.31	0.19	6.48	15	< .001	[0.21, 0.42]

Effect Size. As an indicator of changes that are large enough to be meaningful regardless of the number of subjects, Cohen's dz was derived from the mean of change scores divided by the standard deviation of change scores. The effect size that emerged, dz = 1.62, depicted in the table, is much higher than what is typically considered indicative of a "large" effect (Cohen, 1988; Lakens, 2013), thereby pointing out that most of the subjects (and not just a couple of the most dramatic ones) had their dribbling time improved.

Table 5. Within-Subject Effect Size of Ladder Drill Training on Dribbling Time

Effect size statistic	Value	Interpretation
Cohen's dz (paired)	1.62	Large

Percentage Improvement. In general, from the pre-test to the post-test, the time spent dribbling was on average increased by 2.13% by participants (Table 6). Although rather small in comparison, such change was extremely stable: every one of the 16 participants (i.e., 100%) showed a better time at post-test as compared to pre-test, the improvement being in the range from about 1.0% to 5.1% individually.

Table 6. Percentage Improvement in Dribbling Time Following Ladder Drill Training

Measure	Value	Notes
Mean group improvement	2.13%	Based on group means
Participants improving	16 of 16 (100%)	No non-responders
Range of individual improvement	~1.0% to 5.1%	-

Figures. Figure 1 gives a bird's eye view of the entire study. Figures 2 and 3 compare the pre-test with post-test by introducing the two error measures which work together and they are SD for short and SEM in full. Figure 4 displays how much each person improved the percentage on average and Figure 5 plots the standardized effect size along with benchmarks in the industry which are commonly adopted.

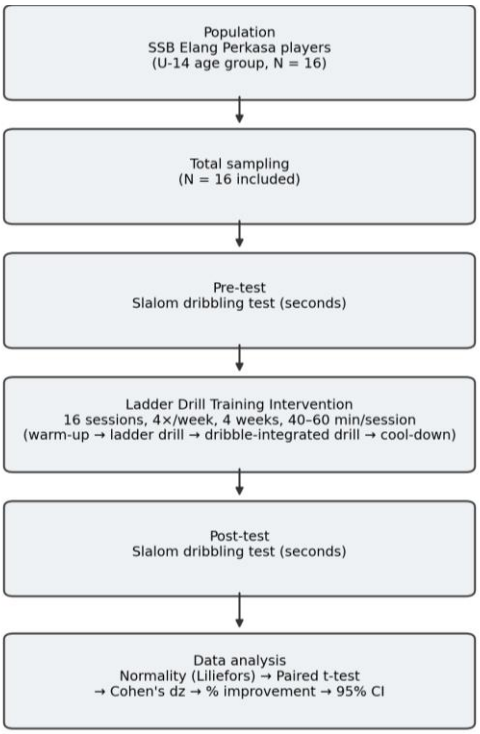

Figure 1. Flowchart of the Quasi-Experimental One-Group Pretest-Posttest Study Design

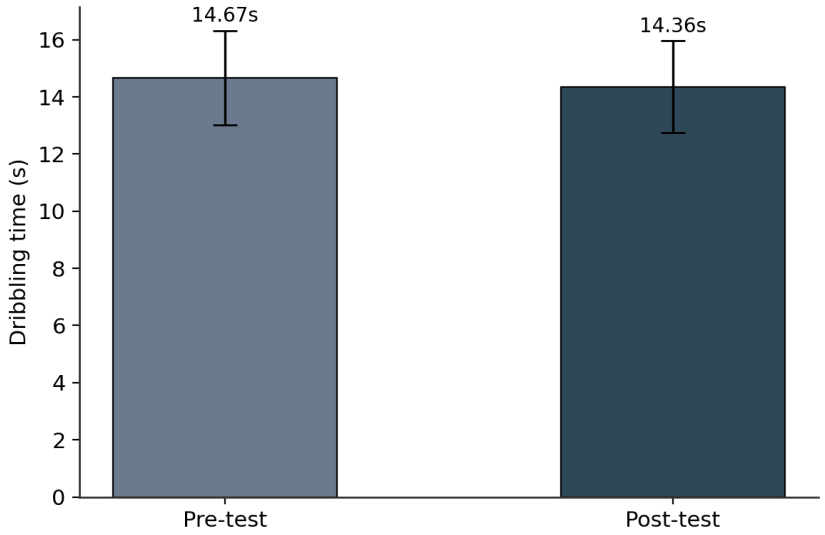

Figure 2. Mean Dribbling Performance Before and After Ladder Drill Training (Mean ± SD, N = 16)

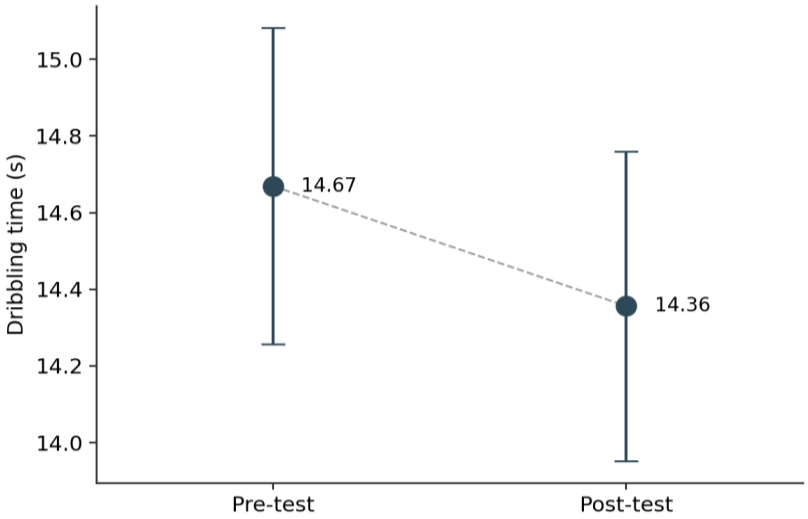

Figure 3. Mean Dribbling Time with Standard Error of the Mean (SEM), Pre- vs. Post-Intervention

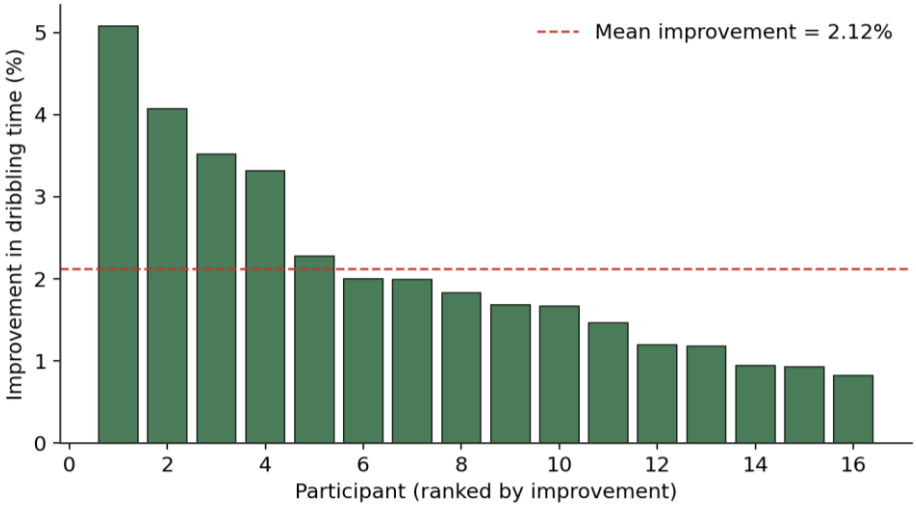

Figure 4. Individual Percentage Improvement in Dribbling Time Following Ladder Drill Training

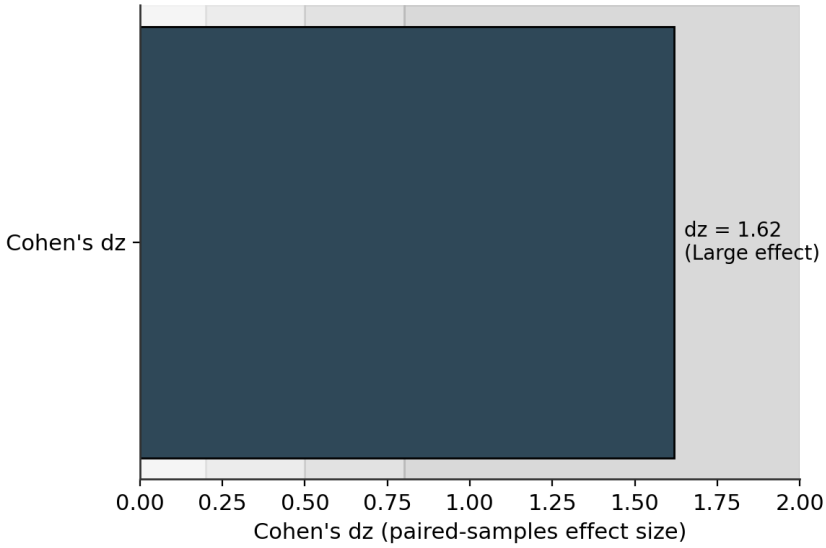

Figure 5. Effect Size of Ladder Drill Training on Dribbling Performance

Discussion. The study at hand showed statistically significant, almost universally (100% of participants got better) and large-magnitude (Cohen's dz = 1.62) effect of four weeks of ladder drill training on the dribbling time improvement of youth football players at SSB Elang Perkasa, a very modest 2.13% on average. In fact, such a trend, i.e. Small absolute changes coupled with very large standardized effect sizes and almost everyone getting better, indicates that we are dealing here with a true training adaptation rather than a change due to measurement errors or a regression to the mean, and it is this combination of statistical rigor and behavioral consistency that ultimately make the result meaningful, rather than the magnitude of the time reduction per se.

In terms of neuromuscular functioning, the reason behind the performance increase could most accurately be attributed to better coordination of the lower limb muscles (intermuscular & intramuscular), not to a muscular strength change or an increase in muscle endurance. This was because the ladder drill protocol utilized here did not involve resistance or endurance training, but, on the contrary, consisted of short, repetitive high-frequency footwork. Research has found that repetitive performance of fast, closely constrained foot-placement sequences can help increase motor neuron activation (timing and sequential) control of ankle & knee stabilizers that, in turn, enables the nervous system to generate more precise and swifter stepping that is less wasted, i. e., less co-contraction (Krolo et al., 2020). The intervention, particularly in the latter part, introduced ball contact while maintaining the footwork patterns. This suggests a likely combination between improved neuromuscular control on one hand and ball-specific motor-learning on the other. The latter, i. e., the latter, ball control motor-skills, can be trained in a manner closest to the demands of the main performance task, then the transfer is most efficient (Chaouachi et al., 2012), and this coupling is very significant here as Fransen et all (2017) showed very well the effect of both visual and perceptual factors at ball control on driblelking skill of young football players in other words, the training which involves the foot-plus-ball may also work on perception-related adaptations beside physical ones.

These findings correspond to a broad trend showing that training regimens focusing on agility and coordination may be able to significantly raise the technical level as well as the performance on change-of-direction of young soccer players. It was, for example, demonstrated by Chaouachi et al. (2014) that agility-oriented training involving multidirectional sprints and small-sided games improved players' abilities for change-of-direction when the players were young, while the latter, Chaalali. et al. (2016) also found that agility training was significantly better at eliciting favorable adaptations in the case of young elite soccer players than doing generic COD drills alone. Karahan (2020) similarly concluded that skill-training methods combining footwork and ball contact are not less effective than small-sided games but can, in certain aspects, result in improved physical and technical performance of the players. In addition to this, it can be said that training programs based on proprioception are capable of enhancing balance, strength, agility, and dribbling of adolescent male soccer players (Gidu et al., 2022), and that small-sided games have, on the whole, proven to be an effective and ecologically sound way of building technical and physical capacities of the young players (Clemente et al., 2021). The current study further builds on that research to reveal that a brief, low-requirement ladder drill training program carried out in a setting typical to a community SSB (samba style basketball) situation where resources are limited instead of a funded research study can nevertheless lead to a statistically significant improvement in one of the core technical skills.

Conversely, our research partly diverges from two very recent works by the same authors. According to Padrón-Cabo et al.(2020), the participants who did 6 sessions of agility-ladder coordination training improved their sprint abilities significantly, however, no significant changes in dribbling speed, slalom dribbling as well as a combined skill index were identified as compared to a control group. Padrón-Cabo et al. (2021) also concluded that agility-ladder-based plyometric training is not an efficient time use for the improvement of slalom dribbling in under-13 players. Several reasons might explain the conflicting results between the studies. Firstly, in this study protocol the ball was integrated into footwork at ladder during the second half of training, while by Padrón-Cabo and his fellow authors in their training sessions of footwork only on ladders the footwork was trained away from the ball; this difference in specialization fits very well with motor learning theory, which says that if the practice conditions are closely the same as the coordinative and perceptual demands the skill in question, the learning effect transfer will be the highest. Also, the training frequency was not the same between the studies: our intervention involved delivering sessions four times a week against two to three times per week sessions in the studies used for comparison. That could result in providing a stronger and more consolidated stimulus despite the shorter overall duration. Third, differences in samples and research approaches: single-group design intact as opposed to randomized controls comparisons elsewhere, mean that some of the observed improvements might be a result of getting familiar with the test. Further discussion about this possibility is included in the Limitations section below.

A big Cohen's dz of 1.62 is found but should also be interpreted with care as to how repeated-measures effect sizes are methodologically understood. As dz is standardized against the variability of the difference scores, rather than the between-subject variability of the subject scores, there is a tendency for dz to be larger than, and not comparable to, between-group effect sizes reported in controlled trials. The results of very similar direction of changes across all 16 participants provide evidence that intervention had an authentic, widely experienced impact on footwork efficiency, however, readers who are going to compare this effect size with between-group ones such as those by Padrón-Cabo et al., 2021 should first understand the reason for the different measures and not assume that dz and between-groups' Cohen's d are of the same magnitude.

In the light of the small improvement of 0.31 seconds, or 2.13%, we should not stop at the interpretation of the numbers alone. This improvement may not look so big, but it can have an important practical effect. One has only to think of a game situation where a player has to dribble past an opponent very quickly. It would only take a very short time of 0.31 second to make a very considerable difference in such a scenario if the movement was quick enough. Besides, if one looks at the entire group involved in practice, that means the total time saved will be equal to a group of 10 players, each saving 3.1 seconds (i.e., 0.31 sec x 10 = 3.1 sec). If this is done on a daily basis, this small time saved can be a lot when one adds up the savings over 30 days (30 x 3.1 = 93 sec). In a season, if there are four weeks of training, we will have 4 x 93 = 3, 912 seconds saved per training session. Considering also the other four weeks of training, we have about, (10 x 3, 912) = 39, 120 seconds (or about 10 h 52 min) of total time saved over the five weeks, 100 trainees, and one ball.

Theoretically this study shows how training based on agility and coordination leads to different ways of change compared with strength or endurance based conditioning mainly though better communication from brain to muscle by means of improved muscle contractions and motor learning rather than changes happening at the level of tissues (McBurnie et al., 2021). On the practical side, this suggests that a coach wanting to develop the ability to dribble of young players should not have to go solely for the type of work which is unstructured such as free play with the ball or just running up and down doing nothing much. It seems that having structured exercises which first introduce the ball slowly into running with ladder then getting ball and foot work combined in drills, can deliver significant improvements in ball handling skills fairly quickly. Beyond that, it would also be interesting to do a bigger study where only one of the treatment methods has a different control (e.g., a standard skill based technical training group without ladder drills). The idea is that it could then be easier to find out whether or not any improvement is really due to the use of ladder drills or simply down to the players' getting more familiar with the tests as well as the general progress that comes with growing up. If it does come up positively, then it would also be a good idea to know if such improvements remain with the players after a long period in which they did not play soccer much (detraining). Further, as suggested by the work of Karahan (2020); Ouertatani et al. (2022) it is also essential to compare this specific sequence, that is, first footwork-only and then ball footwork integrated drill, to an only footwork and ball integrated protocol of similar length so as to determine if it is a key component of effectiveness (an "active" ingredient). This is particularly relevant where the literature on skill-based training modalities versus generic conditioning is concerned. Meanwhile, such studies could be enriched by recent evidence of contrasting physical and technical adaptations through the use of small-sided games compared with dribbling-circuit in the same age group of players (Rahmoune et al., 2025), showing also that plyometric training improves the ability to change quickly the direction of movement in adolescent football (Zheng et al., 2025), and that, on top of pre-planned drills, reactive, stimulus-driven agility training provides additional skills to on-ball performance (Doua et al., 2026). This will also reflect how from an

adolescent developmental perspective the role of perceptual-skill (cognitive) to the actual running skills or change of direction is a significant component and it appears that such contribution is increasing (Horníková et al., 2025).

Practical Applications. For coaches of soccer teams, one simple and yet efficient method to reliably improve dribbling speed at minimal or no cost of equipment is by incorporating a four-week ladder drill program with sessions of four per week into regular technical training sessions. The ladder drills begin with footwork exercises and gradually develop to ball-integrated ones in this program of ladder drills. Each session is quite easy to set up by just placing the markers and the ladder on the field and can easily be made 40-60 minutes long. Youth academies (SSB) would also find a great reason in this study that showed a consistent improvement in all participants to use ladder drills in the form of a low-cost, easy-to-implement addition to their regular technical training curriculum.

Limitations. Many drawbacks need to be kept in mind while interpreting the results of this study. On the one hand, the lack of inclusion of control or comparison group in a single-group pretest-posttest design leads us to question how much is due to the actual intervention, test taking familiarity, normal maturation over the 2-week-period, or training of technical and physical skills that the squad did in other than the ladder drills of this study. On the other hand, as this research drew its participants only from male students of one academy, it is less statistical power in detecting slight effects, and it is hard to generalize the results to female players, children other than this age group, or other forms of training. Thirdly, since it was a quasi-experimental design, the investigator could not fully regulate participants' physical activities including resting, eating, or playing beyond their scheduled training times nor could fully guarantee players' presence and punctuality, which were considered as actual difficulties by the researcher and participant in data gathering. Fourthly, there was no follow-up (retention) testing, and therefore, the research could not find out if the reduction in dribbling time as a result of this study would still be there in the long run. Last point is the fact that although the measurement (tool) for dribbling is validated (0.72) and reliable (0.61), yet due to moderate reliability coefficient there might have been some error in the measurements that affected also both the pre-and post-tests scores.

Conclusions

The researchers explored how a four-week training program using a ladder drill impacts the dribbling skills of 16 young players from SSB Elang Perkasa. The time taken for dribbling was significantly reduced in the post-test compared with the pretest, $t(15) = 6.48$, $p < 0.001$, and it showed a great within-subject effect size (Cohen's $dz = 1.62$). Also, all the participants showed a modest and uniform improvement of only 2.13% on average. Although modest in absolute terms, this improvement was highly consistent across all 16 players and corresponded to a large standardized effect size (Cohen's $dz = 1.62$), indicating that the change was both statistically robust and practically meaningful rather than contradictory. These results mean that a very short program of low-equipment ladder drills, in which ball-integrated training is progressively delivered, can lead to statistically significant and practically meaningful improvements in the dribbling skills of youth football players. It supports the application of such training as a time- and cost-saving additional method for grassroots football development. A future randomized controlled trial is needed to verify such effects against an active control group and to determine the retention of these gains over time.

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