Original Article

Improving footballers agility performances outcomes with the smart ladder drill prototype inventory for exercising efficiency

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ABSTRACT

The first started to investigate the agility characteristics of athletes to improve the agility and speed of football training development into football agility performances using the Illinois Agility Run Test (IART) and the Smart Ladder Test (SLT) were monitored and evaluated three times: previous training, after the fourth week, and after the eighth weekly training with the means of collecting data were measured. The 40 footballer volunteers from Kasetsart University divided into 20 experimental and 20 control footballer groups. The analysis was compared with the means of their agility and speed with the independent and dependent variables of their previous training three times. The agility and speed tests of footballers with IART Testing in two groups are not significantly different at .05 in the previous and after the fourth week of training; but after the eighth week, the two groups are significantly different at .05. However, for SLT testing showed a significant difference at the .01level after the fourth and eighth weekly training sessions. Footballers' sports that demand agility, the ability to change direction at speed from an athlete under control when moving at speed, will have an advantage are applied to Basketball, Rugby, Tennis, etc. The IART and SLT measure the development of these key skills. This study can be useful, giving name of areas, disciplines, etc. Commonly used test of agility in sports, and there are many norms available, the test is an electronically timed test and requires maximum speed and effort from applicants to negotiate several traffic cones.

Keywords: Illinois Agility Run Test (IART); Smart Ladder Test (SLT); Agility efficiency; Speed efficiency; Improvement; Development; Means information data; Performance analysis of sport.

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INTRODUCTION

There are wide varieties of sport activities to choose from in Thailand. Golf is the most popular Thai sport, in addition to badminton, soccer, boxing, football, tennis, and bowling. Football is the most popular sport in Thailand (Maps of the World, 2012). Although professional football leagues are new to Thai people, football was introduced to Thailand as far back as 1897. Many Thais also watch football on local and paid cable TV. Many matches, especially those in the English FA Premier League, can be watched free on local channels (Football Association of Thailand, 2016). The footballers are designed to help them accelerate faster so they can speed past the defence and reach those long crosses for a magnificent finish with their exercises. When they go on a sprint, they essentially put all of your power into one leg at a time (Murray, 2013).

Power and explosiveness are the qualities that define a football player. This requires a strict training plan to build muscle, as well as working on your cardio to become a good all-round athlete. The body of a football player is completely different from that of a conventional bodybuilder. In this article we will look at how you would need to train to get a body like the football players for their performance measurement outcomes (US. Myprotein, 2019). The use of performance outcome measures as endpoints in research performed at international benchmark events in athletics. The state of knowledge concerning methods to employ performance metrics as endpoints in studies conducted in major athletic competitions has been summarized. Constructing a methodology that combines the performance metric variables (continuous and ordinal) that are currently used as endpoints remains a challenge (Raysmith et al., 2019).

The agility performance metric is demonstrated using data from four manufacturing plants, which represent the four possible combinations of success and turbulence. The agility metric developed is consistent with the theoretical model, as well as empirical evidence from the demonstration companies. Further validation of the metric is necessary to fully establish this approach as a valid and reliable assessment tool (Yauch, 2011). The examiner of agility performances according to the playing positions of soccer players consisted of 68 soccer players who were tested for agility performance using the Illinois agility test and the Agility-T test after the completion of warm-up. Players were divided into 4 subgroups (goalkeepers, defenders, midfielders, and strikers) according to their self-reported best position on the field. The midfielders had the fastest agility values. Goalkeepers are slower than the positions of the other players. Regarding the conclusion of this study, measuring and reporting the agility performances of players at regular intervals can provide significant benefits in the training process to improve the performance levels of athletes playing in different positions (Goral, 2015).

Agility is our body's ability to be fast and nimble, change direction, and change position of our body while our body is actively in motion. For some athletes, this is easier said than done. However, agility training can help improve skills that result in enhanced athletic performance. Agility training improves flexibility, balance, and control. Agility helps the body maintain proper alignment and posture during movement. In addition, agility drills encourage our body to learn how to maintain the correct body placement. Agility exercises benefit athletes in any sport that requires movement! That's right, whether you are moving on the field, the ice, or the balance beam, you will benefit from agility training. Whether football players are training for strength, endurance, or a combination of both, every athlete will benefit from improved balance, faster feet, and faster reaction times, adding agility training into their training routine can benefit (Vertimax, 2016).

Football is a family of team sports that involve, to varying degrees, kicking a ball to score a goal. Unqualified, the word football normally means the form of football that is the most popular where the word is used. Sports commonly called football include association football; gridiron football; Australian rules football; rugby football;

and Gaelic football (Reilly & Gilbourne, 2003). These various forms of football share common origins are to varying degrees and are known as football codes. The Football League was founded in England, becoming the first of many professional football competitions. During the twentieth century, several types of football grew to become some of the most popular team sports in the world. In all codes, common skills include passing, tackling, and evasion of tackles, catching, and kicking (Douge, 2011).

The smart modular agility ladder is a versatile portable training tool that provides coaches and athletes with a tool that can be manipulated by length or width for the best agility training tool. The special design of the ladder allows for a variety of different patterns and drills. Simply connect the rungs together using the Quick Connect System to create the desired pattern or course. There are an unlimited number of exercises and drills that can be performed using the Modular Agility Ladder (Performance Health, 2017). It safe & reliable, smart ladders meet the highest international quality standards, and the integrated levelling system is certified. A ladder with the smart ladder system is levelled, and ladders with the top safe system are stuck to a wall. As a professional that wants to have the best tools, there are tools to meet the highest quality standards at a very competitive price (Smart Level Ladder, 2020).

This research study focused on improving the agility of football players using a smart ladder for football players of the Kasetsart University Football Club in 2019, in two groups. The control group is a football player who practices a football training program for 8 weeks and will test his agility. Using Smart Ladder Invention and the Illinois Agility Rum Test, we performed the test for 4 weeks of training and 8 weeks after training. Are these target groups improving the outcomes of football agility performances with a smart ladder drill prototype inventory to exercise efficiency, differently?

Research indicates that exercise is effective in improving mood and preventing the development of depression in young people (Parker, 2020). A team of successful researchers from across the full range of subdisciplines in sport, exercise and health discuss real pieces of research, describing the processes they went through, the decisions they made, the problems they encountered, and the things they would have done differently (Neil et al., 2014). Sport research is designed to explain the underlying mechanisms of how athletes' function. It helps coaches form beliefs about how to develop programs and coaching techniques (Sports Training Advisor, 2018). Sport and physical activity make sportsmen fitter and improve their mental health. It could be a team sport like football, netball, or hockey. Or it could be individual like running or yoga. We also know that sport can sometimes be stressful (Childline.com, 2018).

Research on footballers' sports; Performance data for college football players were analysed to determine whether player position, body weight, body fat and training time were correlated with changes in performance in the following events: power clean (PC), bench press (BP), squat (SQ), vertical jump (VJ), 40-yd dash (40yd) and 20-yd shuttle (20yd). Individual positions were combined into the following three groups. Increases in body fat were negatively correlated with performance in PC and VJ for all groups. When individual training data were analysed longitudinally, a non-linear increase in performance was observed PC, BP and SQ as training time increased (Miller et al., 2002).

Academic knowledge, behaviours, and skills that students are expected to learn and demonstrate in a performance task (Stanford Center for Assessment, Learning, and Equity, 2015). A performance outcome is a statement of a result. What is most powerful is when it is written about people or groups of people. The result is specific in space and time and is measurable with a number of methods to know if it has happened (Jay B Hancock.com, 2011). Given the above structure, the tendency is to look at the measurement and

performance level and then use that as a tool to plan the actions. As we take action, our action will have an impact or not on the outcome we seek to achieve (Fetters & Tilson, 2012).

Performance-based measuring outcome measures may provide a score, an interpretation of results, and at times a risk categorization of the patient. Before providing any intervention, an outcome measure provides baseline data (Gvozdyev et al., 2017). However, performance outcomes - positive and negative experiences can influence the ability of an individual to perform a given task. If one has performed well on a task previously, they are more likely to feel competent and perform well on a related task (Tinsley, 2016). Based on this research of the four sources, performance outcomes are the most effective in influencing self-efficacy, since they are derived from personal experiences (Redmond, 2010).

However, few intervention studies have examined the effects of mindfulness practice on physiological and psychological performance surrogates or on performance outcomes in sports (Bühlmayer et al., 2017). In most codes, there are rules restricting the movement of players offside, and players scoring a goal must place the ball under or over a crossbar between the goalposts (The Football Association, 2015). Agility training improves flexibility, balance, and control. Agility helps the body maintain proper alignment and posture during movement. Additionally, agility drills encourage our body to learn how to maintain correct body placement. With proper agility training, sensitive areas such as the lower back, shoulders, and ankles are protected while moving quickly (Reilly & Doran, 2001).

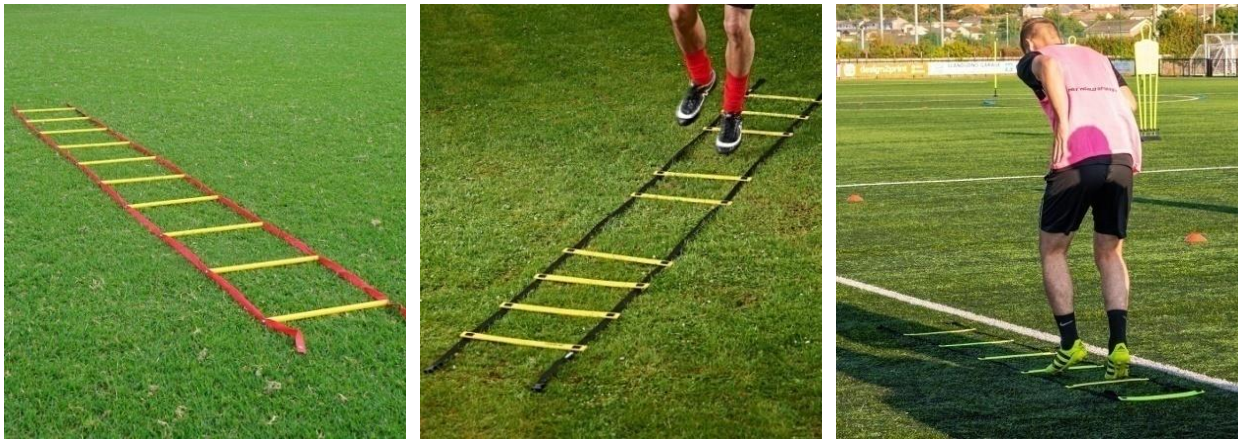
The agility performance metric was developed by creating a theoretical model and then operating the model through literature review, case studies, and pilot survey data. That skill is agility, the ability to change directions without greatly decreasing your speed in just one area. Agility combines a number of skills in the equation: balance, strength, coordination, speed, and reflexes. (Zoid Fitness Team, 2019). The agility ladder is not a specific exercise. It is a piece of equipment that can be used to perform a wide number of agility drills. These quick movements raise your heart rate, challenge your balance and coordination, and can improve speed and athletic performance (McCall, 2014).

Improves footballers' performances, in football sports and at different levels benefit from agility training exercises are improved. Agility exercises are commonly included in sports-athletic in programs such as volleyball, soccer, and football to boost performance (Frey, 2020). Agility ladder drills are often a component of specific types of fitness training. Each type of training provides substantial benefits. The researchers noted significant gains in fitness, mobility, and power after a 12-week training program. The study authors also concluded that agility training helped the participant process visual information better in order to perform more effectively on obstacle course challenges (Reed-Jones et al., 2012). They should have healthy knees and feet to use an agility drill ladder. Some physical therapists use an agility ladder as part of their treatment protocols for hip and other lower body injuries but should work with a qualified professional if you use the device for rehab (Lennemann et al., 2013).

Creating an important foundation for this athlete, another important element is the development of speed and agility. At present, there are a variety of training styles, such as running back and forth, zigzag, and changing direction. One device that can improve speed and agility is the Smart Agility Ladder Drill, which is a two-sided rope in the middle of a step-like plastic ladder, ranging in lengths from 4 m, 5 m, 8 m, and 10 m with several steps from 10 steps or more depending on the training area and the pattern of training. This helps to develop agility and speed for training with smart ladders that need to be quick to move short distances. Establish a relationship between the brain and movement (Coordination) of the feet. In training with a smart ladder drill, if the trained person is developed and trained, often they will have more skills. In addition, they can apply it

in daily life such as walking or running with movement. This will allow you to estimate the distance of your walking or running steps. They can use movement more efficiently and as a basis for playing almost any sport, especially football. Footballers will give them more speed and agility whether they are moving in different directions on the field. Take advantage of or approach and cut the ball off from their opponent. Dribbling will have faster dodging skills than their opponent (Figure 1).

Normally, agility ladder speed training equipment/speed ladders for football, soccer & other sports - 20 feet length 12 adjustable rungs. Each exercise will also help with the cardio training itself. Because there will be continuous training each time they train, our heart rate beats faster and harder and is in zones that help reduce fat levels as well. They can practice the smart agility ladder in a variety of ways: Run with two feet to touch the gap; jump with your legs along the gap until the last one. Then jump back; Trump your feet outside the monkey ladder. Then tread inside, go up and down to the end and trudge back as it was; Use the Squat position, Squat outside and jump feet together inside. Then jump outside to the next step. Then jump feet close to the inside. Make it to the end and come back; and put your feet on the monkey ladder and slide slowly sideways. Switch your feet to touch the inside. Until the last box and slide your feet to touch the inside back.



Source: Gorilla Sports Australia (GSA) (2020).

Figure 1. Smart ladder agility drill for footballers' training.

They should practice this way, 4 rounds, 3 sets each should use a stopwatch every time. To know how much time each round takes to practice? To improve this skill again in the future, the more practice it takes, the more agility and speed. Making it do various activities can improve and can also help you to have a strong health. The body is more fit. However, to improve speed and agility, athletes must practice and record the number of trips, and the number of steps of the movement of the footstep is measured. So that athletes can see their own development and be new and challenging motivated to train and test because athletes can know and assess their ability are improved.

As above, for the foregoing reasons, the researchers are therefore interested in developing a smart agility ladder drill that can accurately count the number of steps and feet, which will make football training effective. Trainers can easily control and view results through the screen of a mobile phone type with the smart phone.

METHODOLOGY

This research is quasi-experimental research to improve the agility of footballers by using the smart agility ladder drill.

Objective

To improve the outcomes of football agility performances with the inventory of smart ladder drill prototypes to exercise efficiency.

Hypothesis

A group of footballers who trained with a training program using the smart agility ladder together with a football training program is better at agility than a group of footballers trained in a single soccer training program.

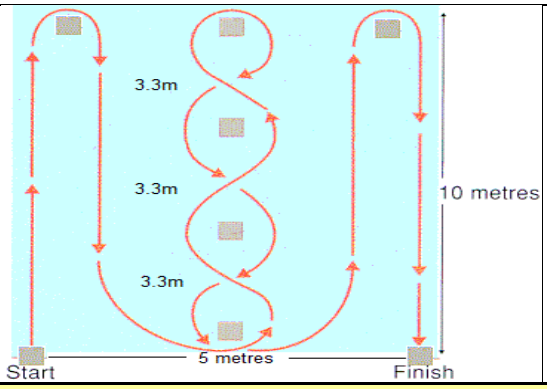
Sample size

The sample group used for the agility training program was selected with a purpose-based random sampling method that consisted of 40 footballers to develop agility of football players using the smart agility ladder in the Kasetsart University Footballer Club was the sample size into 2 groups by means of dividing the samples in a matching group.

Control Group: The 20 footballers who follow the usual training program of the Kasetsart University Footballer Club.

Experimental Group: The 20-footballers who trained using a Smart Agility Ladder program in conjunction with football training, the usual program of the Kasetsart University Footballer Club.

Procedures



Gender	Excellent	Above Average	Average	Below Average	Poor
Male	<15.2 secs	15.2 - 16.1 secs	16.2 - 18.1 secs	18.2 - 19.3 secs	>19.3 secs
Female	<17.0 secs	17.0 - 17.9 secs	18.0 - 21.7 secs	21.8 - 23.0 secs	>23.0 secs

Gender Male Time seconds Assessment

Source: (Getchell, 1979).

Figure 2. Illinois agility run test.

Step 1: Athletes of the Football Club performed Kasetsart University Agility tests using the Illinois Agility Run Test (Getchell, 1979) and recorded the time the athlete took the test. This test requires the athlete to run the

red line route in the diagram below as fast as possible. The analysis of the test result is by comparing it with the athlete's previous results for this test. It is expected that with appropriate training between each test, the analysis would indicate an improvement in the athlete's agility and speed (Getchell, 1979) (Figure 2).

This test requires the athlete to run the red line route in the diagram below as fast as possible.

Step 1: The athlete warms up for 10 minutes.
Step 2: The assistance sets up the course as detailed in the diagram.
Step 3: The athlete lies face down on the floor at the 'Start' cone.
Step 4: The assistant gives the command 'GO' and starts the stopwatch.
Step 5: The athlete jumps to his feet and negotiates the course around the cones following the red line route as shown in the diagram to the finish.
Step 6: The assistant stops the stopwatch and records the time when the athlete passes the 'Finish' cone.

The following normative data are available for this test. For evaluating the athlete's performance, select the gender, enter the total time, and then select the 'Calculate' button. Calculations are based on the above normative data table.

Step 1: Test time statistics are used to rank athletes who can do the least time in the test to find the best time.
Step 2: Select a sample group of athletes who can record test time from 1st to 4th place.
Step 3: Means of a matching group divided into 2 groups of 20 people per sample group.
Step 4: Make a lottery to determine the experimental group 1. Practice using the smart ladder program in conjunction with the football training program and the second group, practice with the football program.

Variables
Independent variable: The smart agility ladder training program and the footballers training program.
Dependent variable: The agility of footballers.

Instruments
1. The agility training program using the Smart Agility Ladder of Singchainara et al. (2019).
2. An 8-week footballers training program
3. Using the Illinois Agility Run Test and the Smart Agility Ladder Test.

Smart ladder drill user manual timer mode and counting number of steps automatically.

Smart ladder for agility prototype model.

Source. a) and b) Singchainara et al. (2019).

Figure 3. Smart ladder for agility prototype.

Data collections

1. We sent a letter requesting cooperation in the collection of data from the Kasetsart University Football Club for 40 footballers to request assistance to determine the date and time of data collection, and request permission to use the facility, equipment and samples used for this study.
2. Investigate research methods, tools, equipment, and research sites.
3. The footballers met to clarify the training procedures and methods of the experimental group for the research project.
4. Preparation on the training equipment record sheet in place to store information.
5. Taking two groups of 20 footballers, each to test their speed using the agility test.
6. Start ladder training according to the agility training program using the ladder of the genius for 8 weeks, in 3 days/week: Monday, Wednesday and Friday that trained from 5:00 pm to 7:00 pm by completing the previous training practice of the training program on each day.
7. Taking a previous dexterity test. After the 4th week and after the 8th week was trained, the 2 research tests were tested in two groups, and recorded the best time only once.
8. We analyse the test results for statistical data.
9. Conclusions of the research findings and suggestions derived from this research study.

Data analysis

1. We analysed the mean and SD of the time statistics in the agility test before and after weeks 4 and 8 of the two sample groups.
2. The Bonferroni method of two groups was compared with a one-way analysis of variance with repeated measures using the Illinois Agility Run test.
3. Mean and SLT, S.D. of the agility testing of two groups using the Smart Agility Ladder.
4. The one-way analysis of variance with repeated measures was compared using the Bonferroni method of two groups using the Smart Agility Ladder.
5. We compared the differences between two groups (independent T-test) using the Illinois Agility Run test and the Smart Agility Ladder test.
6. Present data in tabular form and collating arrangement.

Ethical consideration

The investigator will adhere to the three principles of human research ethics: Respect the person by providing complete information that is well understood by those invited to participate in the research and making independent decisions on giving consent to participate in research. The investigator will respect the privacy and confidentiality of the research subjects. The recorded form does not contain any indicative information. Identifiers of the subject volunteer. Benefit principles not causing harm (beneficence/no malfeasance) subject volunteers will not receive any benefit. There may be a slight risk to the subject volunteer. The investigator will keep the subject confidential and fair. Justice means that there are clear criteria for elimination and elimination criteria, with equal distribution of benefits and risks without prejudice.

RESULTS

The means and SD of the agility test with the Illinois Agility Run Test (IART) of the two groups were trained previous training, after the fourth week, and after the eighth week of training testing three times, as reported in Table 1.

Table 1 also showed fewer differences in mean time among the experimental group with the IART on their previous training, after the fourth week, and after the eighth week of timing measurements.

Table 1. Means, S.D. of the agility test of experimental and control groups.

Trial	IART Timing (Second)			
	Experimental group		Control group	
	Mean	S.D.	Mean	S.D.
Previous training	17.79	0.93	17.49	1.04
After the 4th week training	16.61	0.77	16.99	1.00
After the 8th week training	15.63	0.74	16.45	0.95

Note. N = 20 for each group.

Using the one-way variance, and repeat measures were tested. We performed the mean double difference test using the previous IART training, after the fourth week, and after the eighth week training three times of the two groups reported in Table 2.

As reported in Table 2, the differences can be distributed individually. Similarly, the variance in the control group of the experimental period resulted in a statistically significant improvement in agility at .05. The differences could also be distributed individually.

Table 2. Comparisons between the results of difference tests three times for the IART.

Variance	Experimental group					Control group				
	SS	Df	MS	F	*p*-value	SS	Df	MS	F	*p*-value
Time period	46.675	2	23.338	35.992*	.000	10.841	2	5.420	12.493*	.000
Error	24.640	38	0.648			16.487	38	.434		

Note. N = 20 for each group.

To investigate the intercorrelation circumplex nature scale of the two groups were assessed with the IART prior to their training, after the 4th week, and after the 8th week of training three times through the mean double difference test. The results are presented in Table 3.

Table 3. The intercorrelation circumplex nature of the two groups with the IART through the mean double difference test.

Trial	Experimental group				Control group			
	Mean	Previous training	After 4th week training	After 8th week training	Mean	Previous training	After 4th week training	After 8th week training
Previous training	17.79		-1.17*	-2.15*	17.49		-0.50*	-1.04*
After 4th week training	16.61			-0.98*	16.99			-0.54*
After 8th week training	15.63				16.45			

Note. N = 20 for each group.

The double difference test of the mean agility of the IART in terms of previous training, after the fourth week and after the eighth, showed a statistically significant difference in the IART of .05 with a decrease in the meantime.

Comparisons of footballers' agility between two groups were tested with the IART on their previous training, after the 4th week, and after the 8th week training using the t-test analysis was analysed that reports in Table 4.

As reported in Table 4, the results of the agility test of the footballers with the IART of the experimental group and the control group were not significantly different at .05 in the trainings prior and after the fourth week. However, after the eighth week, the two groups are significantly different at .01 levels.

Table 4. Comparison of the agility of footballers between two groups with the IART.

Previous training				
Trial	**Mean**	**S.D.**	**t-test**	**Significant**
Experimental group	17.194	0.933	0.948	.349
Control group	17.497	1.040		
After the 4th week training				
Experimental group	16.618	0.771	-1.323	.194
Control group	16.994	1.000		
After the 8th week training				
Experimental group	15.637	0.741	-0.302**	.004
Control group	16.456	0.958		

*Note. N = 20 for each group, *p < .0, **p < .01, ***p < .001.*

Similarly, in Table 1 the means and SD of the agility test with the SLT reported in Table 5. In Table 5, it was found that the change in time in the valuation of agility was determined. Somewhat changed and there was not much difference compared to the experimental group compared to the two groups.

Table 5. Means, S.D. of the agility test of experimental and control groups.

Trial	**SLT Timing (Second)**			
	Experimental group		Control group	
	Mean	S.D.	Mean	S.D.
Previous training	1.92	0.06	1.88	0.06
After the 4th week training	1.80	0.04	1.84	0.04
After the 8th week training	1.71	0.05	1.80	0.05

Note. N = 20 for each group.

Similarly in Table 2 using the Smart Ladder was tested that reports in Table 6. As reported in Table 6, the differences can be distributed individually. Similarly, the variance in the control group of the experimental period resulted in a statistically significant improvement in agility at .05. The differences could also be distributed individually.

Table 6. Comparisons between the results of the experimental and control groups of their mean double difference tests three times for SLT.

Variance	**Experimental group**					**Control group**				
	SS	Df	MS	F	*p*-value	SS	Df	MS	F	*p*-value
Time period	0.429	2	0.215	70.804*	.000	0.059	2	0.029	22.21*	.000
Error	0.115	1.00	0.003			0.050	38	0.001		

*Note. N = 20 for each group, *p < .05.*

To investigate the intercorrelation circumplex nature of two groups, the SLT was assessed that similarly in Table 3, the results are presented in Table 7.

Table 7. The intercorrelation circumplex nature of the two groups with the SLT of their previous training, after the fourth week, and after the eighth week of training through the mean double difference test.

Trial	Experimental group				Control group			
	Mean	Previous training	After 4th week training	After 8th week training	Mean	Previous training	After 4th week training	After 8th week training
Previous training	1.92		-0.123*	-0.206*	1.88		-0.037*	-0.077*
After 4th week training	1.80			-0.083*	1.84			-0.039*
After 8th week training	1.71				1.80			

*Note. N = 20 for each group, *p < .05.*

The double difference test of the mean agility of the SLT in terms of previous training, after the fourth week and after the eighth, showed a statistically significant difference in the SLT of .05 with a decrease in the mean time for the experimental and control groups.

A comparison of footballers' agility between experimental and control groups

Similarly in Table 4, using the Smart Ladder was tested, the results reported in Table 8.

Table 8. Comparison of the agility of footballers between two groups with the SLT.

Previous training				
Trial	**Mean**	**S.D.**	**t-test**	**Significant**
Experimental group	1.923	0.060	1.892	.066
Control group	1.885	0.066		
After the 4th week training				
Experimental group	1.801	0.042	-3.321**	.002
Control group	1.848	0.046		
After the 8th week training				
Experimental group	1.717	0.057	-5.270***	.000
Control group	1.809	0.051		

*Note. N = 20 for each group, *p < .0, **p < .01, ***p < .001.*

As reported in Table 8, the results of the agility test of the footballers with the SLT of the experimental and control groups were not significantly different at the .05 levels of their previous training. But the result showed a significant difference at the .01level after the 4th week trainings. However, they were trained after the eighth week; the two groups are significantly different at .001 levels.

DISCUSSION

Effective training can lead to increased compliance with regulations. It can even lead to a happier, more satisfied, and engaged workforce, which in turn reduces turnover and costly new employee on boarding. (Winkler, 2020). Some common problems include creating training that does not support a true business goal, or that is intended to solve a problem that training cannot fix, or without first identifying the true purpose of the training, or that includes too much information, or maybe all of those things (Industry: Industrial & Manufacturing, (2014). Evaluate and advise individuals to assist recovery from or avoid athletic-related injuries or illnesses, or maintain peak physical fitness, may provide first aid or emergency care (Athletic Trainers, North Central University, 2020).

The physiological laws of training; An attempt of a theoretical analysis of the most important physiological laws of ontogeny and their applicability to the process of adaptation to physical exercise as a result of sports training was made. Indeed, for long-term adaptation, are important principles of heterochrony and of periodization, while other systemic patterns that are typical for ontogeny cannot be observed in the process of adaptation to exercise or have some specific features of manifestation? (Son'kin, 2015), the best fitness training programs are built on three principles: overload, progression, and specificity. Using these principles, you can design an exercise program that improves performance, skill, ability, and physical fitness (Catherine, 2019).

Training means engaging in activity to improve performance and/or fitness; this is best accomplished by understanding the general principles of sports training: overload, reversibility, progression, individualization, periodization, and specificity (Kasper, 2019). Every sport activity needs a specific type of physical fitness, and hence, the improvement of various components of physical and skills related fitness like strength, speed, coordination, endurance, and flexibility is an important aim and objective of sports training (National Council of Educational Research & Training. (2019). Establishing a relationship between the principles of sports training and the processes of cognitive development of humans whose general objective lies in the design of a methodological alternative. In this sense, sports training is understood to be one of the most widely disseminated and researched topics on an international level in the field of sports, where there is a wealth of theories and trends that help to base and investigate human development processes; hence it is understood to be one of the central categories of this work (Vera-Rivera, Guzman-Pinzon & Rodriguez-Neira, 2019).

Any physical activity leads to anatomical, physiological, biochemical, and psychological changes. The efficiency of a physical activity results from its duration, distance, and repetitions (volume); load and velocity (intensity); and the frequency of performance (density). When planning the dynamics of training, consider these aspects, referred to as the variables of training. Model all these variables according to the functional and psychological characteristics of a competition. As a major component of training, volume is the quantitative prerequisite for high technical, tactical, and physical achievements. The volume of training sometimes incorrectly called the duration of training (Bompa, 2019).

Principles of training agility in sports; Accelerating, stopping suddenly, shuffling, taking tight turns to the right and left, and backpedalling are all components of agility. However, they are transitional movements and are rarely performed for long distances. They should be practiced, but you should combine them with other skills that, when mastered, have more application to your sport (Cissik, 2012). The agility training resulted in significant improvements in change direction tests ($p < .05$) in straight sprint performance. These findings have implications for the design of speed and agility training and testing protocols (Young, 2001). Reactive agility tests can also be used as a training drill to improve an athlete's perceptual and response times by

using a sport-specific stimulus, while pre-planned agility drills may not (Inglis & Bird, 2016). Reactive agility and illustrates several drills to develop your ability to react at high speed. Training that develops the ability to react to a stimulus quickly and efficiently, at high speed, is called reactive agility (STACK expert Bill Rom, 2014). Although the terms 'agility' and 'change of direction speed', this infers that traditional agility tests (e.g., t-test and pro-agility) are not actually capable of measuring agility and thus should be referred to as change of direction speed tests. Recent research has shown that athletes of higher levels perform better on agility tests than athletes of lower levels, but the same applies to change of direction speed tests (Walker, 2016).

Training to develop agility; Speed training: the ability to achieve maximum velocity. Agility Training: the ability to rapidly change direction without losing speed, coordination, balance, strength, or body control (VertiMax Soccer Drills, 2016). Agility is defined as an athlete's ability to move at an accelerated pace in one direction and then immediately decelerate and shift position within a matter of seconds. It is the one aspect of sports training that can separate a good athlete from a great one. Whatever sport you participate in, these agility drills can improve your performance by strengthening the joints and muscles that are largely untested in daily life (Quinn, 2020).

Smart agility ladder drills; agility ladder drills require you to focus and concentrate, connecting your brain to your body. This type of improved coordination not only benefits your daily life but keeps your mind young. Improves Speed, Agility, and Quickness: These three factors not only improve your athletic performance in other sports and activities but can help to increase your fitness level for virtually any type of exercise you do (Orthopedic One, 2016). The best agility ladders 2021 are made of durable nylon straps that come with adjustable plastic rungs, and they come in bags that make it easy to carry and easy to store. Some of these Agility Ladders come with metal stakes to protect the straps during outdoor use. This new exercise tool offers a great way to improve speed and coordination in your own stride. You just need to spread out the Agility Ladder on the flat surface to perform different exercises, including jump lunges, hurdle jumps, scissor jumps, and other exercises without using any other gym equipment (Presley, 2020).

In this research study, using the agility tests performed with the Smart Agility Ladder and the Illinois Agility Rum Test, the two groups of footballers at Kasetsart University Football Club were tested, Bangkok Thailand. The Illinois Agility Rum Test: The aim of the test is to complete the running course in the shortest possible time. The cones mark the course. The subject starts face down, with the head to the start line and hands by the shoulders. At the whistle, the subject runs the course, without knocking down any cones (Champaign, 2001). Focused on the Illinois Agility Run Test (Getchell, 1979) and the Smart Agility Ladder Test (Singchainara et al., 2019) monitors the athlete's agility development, it was modified to the footballers in two groups (experimental and control groups), each group consisted of 20 footballers. Designing the training three times; previous training, after the 4th and 8th week trainings, was tested and compared.

Testing and measurement are the means of collecting information that is used to make subsequent performance evaluations and decisions. In the analysis, we need to keep in mind the factors that can influence the results. The required resources were to conduct these tests on a flat non-slip surface, eight cones, stopwatch, and assistant. These tests required the athlete to run the red line route in the diagram below as fast as possible. The footballer jumped to his feet and negotiated the course around the cones following the red line route as shown in the diagram to the finish. The assistant stops the stopwatch and records the time when the footballer passes the 'Finish' cone. The following normative data were available for this test for assessment. The analysis of the test result was by comparing it with the footballer's previous results for this test. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the footballer's agility and speed.

We might be tested reliability, referring to how a test was consistent and stable in measuring what it was intended to measure. Reliability would depend upon how strict the test was conducted and the individual's level of motivation to perform the test. The following link provides various factors that may influence the results and therefore test reliability. Especially, we should test the validity that referred to the degree to which the test measures what it claims to measure and the extent to which inferences, conclusions, and decisions made based on test scores were appropriate and meaningful. These tests provided the means and standard deviation to monitor training on the physical development of the experimental group of footballers. However, minimal equipment required, simple to set up and conduct, the athlete can administer the test can be conducted almost anywhere for supporting advantage our research study, significantly.

CONCLUSIONS

This research aims to improve the agility of football players by using a smart ladder. The population used in this research was football players at Kasetsart University Football Club in 2019, Bangkok, Thailand, 60 footballers used the purposive random sampling was selected by dividing the sample into 2 groups. The experimental group was football players who trained using the smart agility ladder with football drills and the control group was football players who practiced a football program for 8 weeks. We performed agility tests with the Smart Agility Ladder and the Illinois Agility Rum Test. We performed the test before training, after 4 weeks of training, and after 8 weeks of training. We analysed the data the footballers got from the test. One-way analysis of variance with repeated measures and comparable pairs was analysed using the Bonferroni method and the t-test independently.

During the training period, the results of the agility test of the experimental group and the control group did not show statistically significant differences at the level of.05. After 4 weeks of training, the two groups had no statistically significant differences at the level of.05. But it was found that the mean values in the agility test in two groups decreased of the values from the first week of previous training.

After 8 weeks of training, the results of the agility test of the experimental group and the control group, there was a statistically significant difference at the .05 level, the means in the agility test of the experimental group increased with the smart agility ladder drill. It concluded that there is a lower average than the test average of the control group than the improvement of agility of football players with the smart agility ladder drill that can train and improve the efficiency of agility to be better than with a footballer training program for each training session of the general training program.

AUTHOR CONTRIBUTIONS

Juthamas Singchainara contributed substantially to the conception and design of the study. Natchanon Sungpook made senses of the acquisition of data, or the analysis and interpretation. Achara Soachalem drafted or provided critical revision of the article. Kanlapruk Polsorn provided final approval of the version to publish. Toansakul Tony Santiboon agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors read and approved the final manuscript.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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