

The effect of FIFA 11+ kids warm-up program on agility in football: An experimental study El efecto del programa de calentamiento FIFA 11+ kids en la agilidad en el fútbol: Un estudio experimental

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Abstract. Injury is one of the problems that often occurs in young football players. The players are encouraged to carry out the FIFA 11+ Kids, a warm-up program to minimize injuries for football players. This study aims to determine the effect of this program on young football players' agility. This research was an experimental study with a pretest and posttest control group design. Using a purposive sampling technique, the research selected 20 football school students as the research sample. The samples were 11-12 years old. To collect data, the research used the Illinois agility test, aiming to measure the level of agility. The data were then administered using the Wilcoxon test with a significant p-value <5%. This study found a significant difference between the results of speed measurements before and after being given the FIFA 11+ Kids warm-up treatment. In the treatment group, the average pretest result was 19.03 ± 0.74 , with a score range of 17.50-20 seconds. Meanwhile, the average posttest result was 18.28 ± 0.84 , with a score range of 16.75-19.78 seconds. The p-value was 0.005 ($p < 5\%$). This study concludes that the FIFA 11+ Kids program can improve the agility of young football players. Despite the promising results, this research suggests further investigation to add research samples from various demographic characteristics.

Keywords: Warm-Up Program, Injury Prevention, Physical Condition, Sport Medicine

Resumen. Las lesiones son uno de los problemas que suelen producirse en los jóvenes futbolistas. Se anima a los jugadores a llevar a cabo el FIFA 11+ Kids, un programa de calentamiento para minimizar las lesiones de los futbolistas. Este estudio pretende determinar el efecto de este programa en la agilidad de los jóvenes jugadores de fútbol. Esta investigación fue un estudio experimental con un diseño de grupo de control pretest y posttest. Utilizando una técnica de muestreo intencional, la investigación seleccionó a 20 alumnos de escuelas de fútbol como muestra de la investigación. La muestra tenía entre 11 y 12 años. Para recoger los datos, la investigación utilizó la prueba de agilidad de Illinois, destinada a medir el nivel de agilidad. A continuación, los datos se administraron mediante la prueba de Wilcoxon con un valor p significativo <5%. Este estudio encontró una diferencia significativa entre los resultados de las mediciones de velocidad antes y después de recibir el tratamiento de calentamiento FIFA 11+ Kids. En el grupo de tratamiento, el resultado medio de la prueba previa fue de $19,03 \pm 0,74$, con un rango de puntuación de 17,50-20 segundos. Mientras tanto, el resultado medio tras la prueba fue de $18,28 \pm 0,84$, con un intervalo de puntuación de 16,75-19,78 segundos. El valor p fue de 0,005 ($p < 5\%$). Este estudio concluye que el programa FIFA 11+ Kids puede mejorar la agilidad de los jóvenes futbolistas. A pesar de los prometedores resultados, esta investigación sugiere seguir investigando para añadir muestras de investigación de diversas características demográficas.

Palabras clave: Programa de calentamiento, Prevención de lesiones, Condición física, Medicina deportiva

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Introduction

Young athlete's competency generally comes from structured and directed coaching (Susanto et al., 2023). Young football athletes are usually coached in a particular place called a football academy. This is where an initial approach can be taken to develop youth football. In Indonesia, football academies are found in many regions, indicating that football coaching is rapidly developing (Anam, Nurrachmad, et al., 2022). The rapid development of football coaching will have a positive impact on Indonesian football. Academic footballers will receive tighter supervision to help them improve their physical, technical, and tactical skills (Kraynik et al., 2019; Syafrianto et al., 2023; Thomas et al., 2019). Footballers between 9 and 16 typically participate in football academy development programs and engage in 12 hours of weekly training above the match (Sothorn & Gorman, 2021). During the training, they are required to cover distances of approximately 7-9 km, make explosive attacks, and have the ability to run at high-

intensity speeds (Briggs et al., 2017). Although the football academy provides a structured training system, optimal results still depend on the athlete's physical and readiness nature of training (Zanada et al., 2023). Scholars argue that an ideal physical condition will support a player's ability to master soccer techniques (Adelina & Anam, 2023; Azmi & Anam, 2023; Ciešlicka et al., 2021; Modric & Uljevic, 2022). If a soccer player is in good physical condition, they can avoid difficulties in performing basic soccer techniques, fatigue, and injury (Hrysonmallis, 2007; Timmins et al., 2016). Physical conditions also indirectly affect the number of occurrences of the athlete's injuries, as good physical condition will reduce the injury occurrence (Mucha et al., 2017; Neto et al., 2016; Shitara et al., 2022). Other factors that must be considered are the athlete's Body Mass Index (BMI) and previous injury history. Thus, a biomechanical review is needed before implementing the training program (Anam et al., 2024; Irawan et al., 2023, 2024).

Football is a high-intensity sports activity. Football players often perform fast running, changes in the direction of

movement and speed, and many situations that result in frequent direct contact between players in football matches (Kalinowski et al., 2021; Zarei et al., 2018). It is complex, as it requires physiological characteristics as well as technical, tactical, and psychological skills (Forsman et al., 2016; Krolo et al., 2020). Thus, physical condition components participate in players' success in a football match (Sonesson et al., 2021). Players must perform technical actions successfully during the match and be in good physical condition to achieve match success (Johnston et al., 2018). In short, when football players are physically good, they can optimize their football techniques in football gameplay (Womsiwor et al., 2020).

One of the components of physical condition that has a significant influence on football is agility. It is a complex and varied skill considered necessary in every sport. It is defined as a rapid change in body movement or direction in response to a stimulus (Büchel et al., 2022; Young et al., 2021). Some movements that require a player's agility are sprint and the direction-changing movement that occurs during the game (Forsman et al., 2016). Agility also supports players in performing other movements, such as tackling, blocking, and jumping (Paul et al., 2016). Based on the player's position, a striker needs agility to maintain the ball and avoid opponents. This position requires a quick footwork strategy or deceptive movements to maintain possession. On the other hand, for defensive players, agility is needed to move quickly and block the attacker by gaining control of the ball (Young et al., 2021). These statements emphasize that agility has a considerable effect on the proficiency of a football player.

However, previous research has not yet shown many efficient training programs that football academies can implement to improve agility. This is evidenced by the fact that older players have a better level of agility than young players (Bekris et al., 2018). Meanwhile, in all age groups, especially young footballers, agility is the most crucial performance variable in football matches (Mathisen & Pettersen, 2015; Paul et al., 2016). It has a high-intensity sprint composition, creating a fast rotation during the game (Forsman et al., 2016). With each player's high level of agility, a team can keep the ball as long as possible, and the opponent does not quickly take it over (Bekris et al., 2018; Trecroci et al., 2016).

The Fédération Internationale de Football Association Medical Assessment and Research Center (F-MARC) developed a training program called FIFA 11+ Kids. This program aims to improve the component of players' physical condition (Rössler et al., 2016). FIFA 11+ Kids is a special football warm-up program that can improve football players' quality and movement patterns (Yalfani et al., 2020). Based on previous literature, the application of the FIFA 11+ kids program for approximately ten weeks with a minimum of 2 times supports player health, improves the potential performance of increased motor control, and reduces the occurrence of injuries (Ardern et al., 2018; Rössler et al., 2016; Spurrier, 2019; Zarei et al., 2020).

Many researchers discussing the program found that it has a primary efficacy in reducing players' injuries (Beaudouin et al., 2019; Parish, 2020; Rössler et al., 2016, 2018; Yalfani et al., 2020; Zarei et al., 2020). Rössler et al. (2016), for example, observed the implementation of this program. They found that injury can be prevented by improving motor performance. Their finding aligns with other reports that proved the effectiveness of the FIFA 11+ Kids program in injury prevention (Beaudouin et al., 2019). Unfortunately, earlier research solely focused on injury prevention. The research did not pay attention to any factors or focused less on one problem that could minimize the occurrence of injuries, such as the factor of the physical condition component owned by the player (Pomares-Noguera et al., 2018; Trecroci et al., 2019). In addition, research focusing on the effect of this program on players' agility is scarce. In fact, individuals with a high level of agility can overcome situations requiring rapid changes in movement with good coordination (Mijatovic et al., 2022). This can help individuals avoid injury because they can respond quickly to changes in situations that have the potential to cause injury (Ardiansyah et al., 2024). Therefore, this study aims to determine the effect of FIFA 11+ Kids on soccer players' agility levels.

Materials and methods

Participants

This research screened 115 students from the Diponegoro Muda Semarang Soccer Academy to be aimed as research samples. It used a purposive sampling technique with specific considerations to find data sources called inclusion criteria. The inclusion criteria for the research sample included a) male footballers, b) aged 11-12 years, c) following soccer training regularly, and d) willing to participate as a sample from the beginning to the end of the study. At the same time, the exclusion criteria were also applied for this study, such as the sample that was injured and unwilling to follow until the end of the research process. Fifty-six students met the required inclusion criteria, but 36 were absent on the test day or did not do all the required tests. As a result, this study used a sample of 20 students divided into two groups: the control and the treatment groups. Table 1 below shows the demographics of the study group.

Table 1.

Demographics of the study group (n=20)

	Age (year)	Weight (kg)	Height (cm)	BMI (kg/m ²)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
TG (n=10)	11.3±0.4	40±7.7	147.9±6.6	18.19±3.7
CG (n=10)	11.4±0.5	39.1±14.4	150.05±8.1	17.04±4.5

Note. TG= Treatment Group, CG= Control Group, BMI= Body Mass Index, SD= Standard Deviation, n= Number of samples

Research Design

This research employed an experimental research design. It involved a pre-test-post-test control group design. The groups were divided into the treatment group and the control group. The division of the two groups used the A-B-B-A matching subject technique. This research has

received ethical clearance from the Health Ethics Commission of Universitas Negeri Semarang with Number 036 KEPK/EC/2022.

Data Collection Procedures

This study used the Illinois Agility Test instrument to measure agility with a validity of 0.87 (Pamungkas et al., 2023; Sarvestan et al., 2018; Singh et al., 2018). The length of the Illinois Agility Test track was 10 meters, which was marked with four cones. One cone with the next cone in a straight line was 3.3 m away, and the four corner cones were placed 2.5 m from the center cone (Soares et al., 2024).

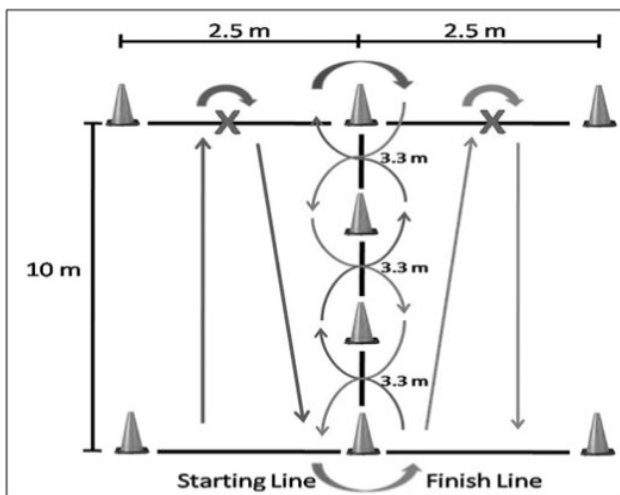


Figure 1. Illinois agility test area

The test began with participants lying on their backs behind the starting line with their hands at their sides and their heads facing forward. When the "Go" signal was heard, the participant got up and ran fast, following the path to the finish line. The time to complete the test was recorded in seconds. Disqualification was given to participants if they could not perform according to the instructions.

Statistical Analysis

The next step was analyzing the data using the IBM SPSS v.25.0 statistical program. Due to the small sample size, the analysis of this study employed non-parametric tests. It used the Wilcoxon test, which could be used to compare whether there were differences in pretest and posttest results, considered significant if the p-value was <5% (de Moura et al., 2015).

Results

This section provides the results of research, revealing the data on whether the FIFA 11+ Kids program affects both control and treatment groups. The research found that applying FIFA 11+ Kids can increase agility in football players. The description of the research data in the control and treatment groups can be seen in Table 2 below.

Table 2.

Descriptive statistics of Illinois Agility Test results (n=20)

Statistics	Control group		Treatment group	
	Agility (sec)		Agility (sec)	
	Pretest	Posttest	Pretest	Posttest
Mean	19.14	20.34	19.03	18.28
SD	2.48	3.47	0.74	0.84
Min.	17	18	17.50	16.75
Max.	26	30	20	19.78

Note. SD= Standard Deviation, Min. = Minimum value, Max. = Maximum value, sec = Seconds

Based on the descriptive statistical table of research data, the average pretest agility in the control group was 19.14 ± 2.48 , with a score range of 17-26 seconds. The average of the posttest in the control group slightly increased to 20.34 ± 3.47 , with a score range of 18-30 seconds. In the treatment group, the average result of the pretest was 19.03 ± 0.74 , with a score range of 17.50-20 seconds. This score was higher than the posttest score by 18.28 ± 0.84 , with a range of 16.75-19.78 seconds.

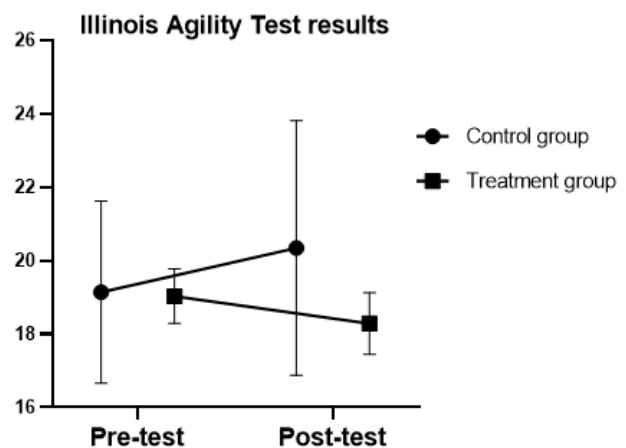


Figure 2. Graphic of Illinois Agility Test results

After analyzing the descriptive data, the Wilcoxon test was conducted to prove whether there was an influence between the research variables. Asymptotic significance sig. (2-tailed) was used to test the hypothesis and influence. Ho is accepted, while Ha is rejected if $p > 5\%$. Otherwise, Ho is rejected, and Ha is accepted if $p < 5\%$. The calculation of the Wilcoxon test can be seen in Table 3 below.

Table 3.

Results of Wilcoxon Signed Rank Test Statistics

	N	Mean Rank	Sum of Ranks	Asymp. Sig. (2-tailed)
Posttest - Pretest	Negative Ranks	10 ^a	55.00	.005
	Positive Ranks	0 ^b	.00	
	Ties	0 ^c		
Total	10			

Note.

- a. Posttest < Pretest
- b. Posttest > Pretest
- c. Posttest = Pretest

The results of the Wilcoxon signed rank test were placed in negative ranks of 10 (N), which means that the results of the pretest and posttest agility tests of 10 samples

experienced a decrease from the pretest and posttest data. In addition, the mean rank or average decrease is 5.50, and the number of positive or sum of ranks is 55.00. Meanwhile, positive ranks show that the 0 (N) sample increased from the pretest and posttest results. The agility posttest results obtained after the FIFA 11+ Kids treatment decreased the travel time when doing the agility test.

After that, the Wilcoxon test calculation generated asymptotic significance (2-tailed) variable agility in the treatment group of 0.005 ($p < 0.05$). This statement explains that FIFA 11 + Kids affects agility. In other words, it can be said that H_a is accepted and H_0 is rejected. In short, the results conclude that there are significant changes in the treatment group's pretest and posttest agility data.

Discussion

Football is a team sport that is highly intense and competitive. Frequent physical contact between players and sudden changes in direction make this sport have a high risk of injury (Faude et al., 2018; Neto et al., 2016; van Beijsterveldt et al., 2013). Injuries in soccer are highest among young soccer players, which may be due to weaknesses in technique and tactics as well as muscle strength, endurance, and coordination in young, inexperienced players (Sinovas et al., 2020). In addition, football games often change speed quickly in response to external stimuli such as the movement of the ball, teammates, or opponents in the situation of putting the ball in the goal (Krolo et al., 2020). Thus, young soccer players are required to improve their tactics and techniques in football. The rapid response to external stimuli requires high agility skills. This is the reason why agility is one of the dominant criteria for team sports, like soccer, which requires stability in foot movements when competing (Paul et al., 2016; Sarvestan et al., 2018; Susanto et al., 2023).

The results of this research revealed that implementing FIFA 11+ Kids for 12 weeks might increase the agility component in footballers aged 11-12 years. Increasing agility can minimize injuries during matches and training. The FIFA 11+ Kids program focuses on improving strength, movement skills, and strategies in competition (Zarei et al., 2020). In general, the FIFA 11+ Kids program contains many elements. The volume and intensity of the training even improve physical skills (Zarei et al., 2018).

Increased physical skills require proficiency and agility. Increased agility helps improve body control during fast movements, improving intramuscular coordination and reducing the risk of injury (Raya et al., 2013). For that reason, increased agility is in accordance with efforts to improve technical skills in football that require fast movement and can minimize injuries. This argument has also been confirmed by (Fernández-Rio et al., 2019), reporting that increasing agility has a positive impact on football performance. In addition, research that explores injury prevention efforts has explained that agility training and change of direction are among the most important components in

injury prevention programs (Owoeye et al., 2018; Read et al., 2018). Agility is related to coordination, mobility, strength, power, and speed. Getting maximum speed in the shortest possible time requires instantaneous leg strength that can push the entire body mass to produce agility (Zarei et al., 2018). Competitive team sports, one of which is football, recognize agility as the most critical conditioning capacity (Krolo et al., 2020). Agility is closely related to the proficiency of soccer players when competing in technical movements and playing tactics (Haycraft et al., 2017; Sarmento et al., 2018).

FIFA 11+ Kids is proven to prevent injury, reduce the risk, and has a positive effect on performance, balance, stability, and rapid recovery of physical and neuromuscular performance after a football match (Attar et al., 2016; Gatterer et al., 2018; Trecroci et al., 2019). The program focuses on three areas of injury prevention, including unilateral and dynamic stability in the lower limbs, whole-body strength, and training on fall techniques (Beaudouin et al., 2019; Silva et al., 2018; Spurrier, 2019; Teixeira et al., 2021). Scholars agree that it is one of the training-based injury prevention programs that improves basic and specific motor skills or whole-body biomechanics (Anam, Sumartiningsih, et al., 2022; Pomares-Noguera et al., 2018; Randell et al., 2021). In practice, the FIFA 11+ Kids injury prevention program consists of seven exercises performed in a warm-up program, which lasts 15 to 20 minutes (Spurrier, 2019). The seven drills in FIFA 11+ Kids include a running game, two jumping drills, balance/coordination drills, two that target body stability, and drills to improve falling techniques (Pomares-Noguera et al., 2018). FIFA 11+ Kids consists of several levels with a progressive level of difficulty that is achieved at the first level and continues to the next level. Therefore, if FIFA 11+ Kids can be done according to the description, it will provide a more significant increase in agility (Rössler et al., 2016, 2018).

Conclusions

In conclusion, this research supports the application of the FIFA 11+ Kids warm-up program because it can affect the agility of 11-12-year-old football players. Several tests have been conducted on two groups of football players in a football academy. The results prove improvement among students in the treatment group. Nevertheless, further research is still suggested, in particular, to examine the dominant physical condition components in football thoroughly.

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Conflict of interest

There is no conflict of interest.

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