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Judul	The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)
Penulis	Sri Sumartiningsih*, Anggit Risdiyanto, Ashril Yusof, Setya Rahayu, Eko Handoyo, Maria Ayu Puspitasari, Sugiharto, Siti Baitul Mukarromah, Lim Boon Hooi, Johansyah Lubis, Yulingga Nanda Hanief, Rifqi Festiawan, Jens Eiberger
Corresponding author	sri.sumartiningsih@mail.unnes.ac.id
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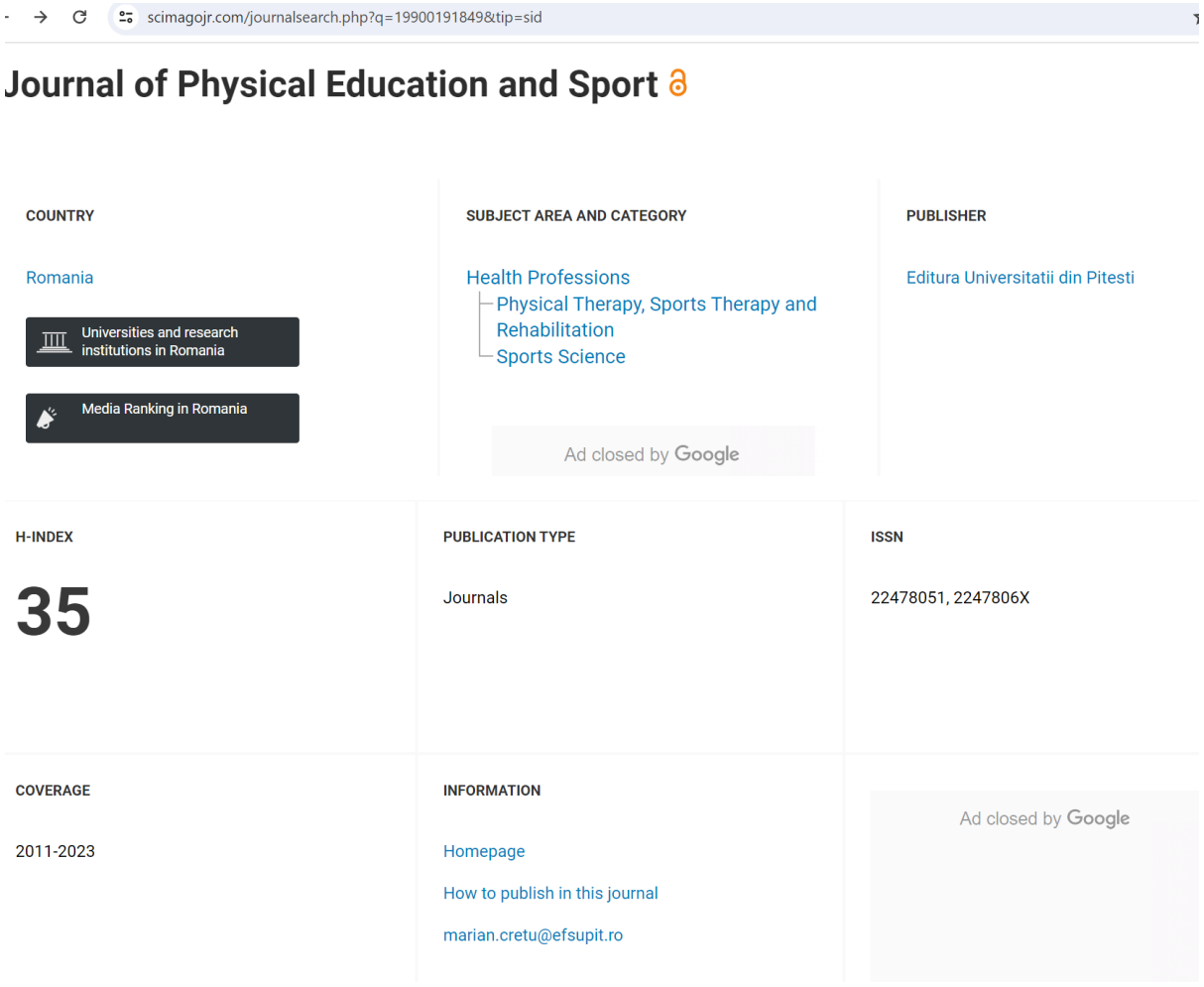

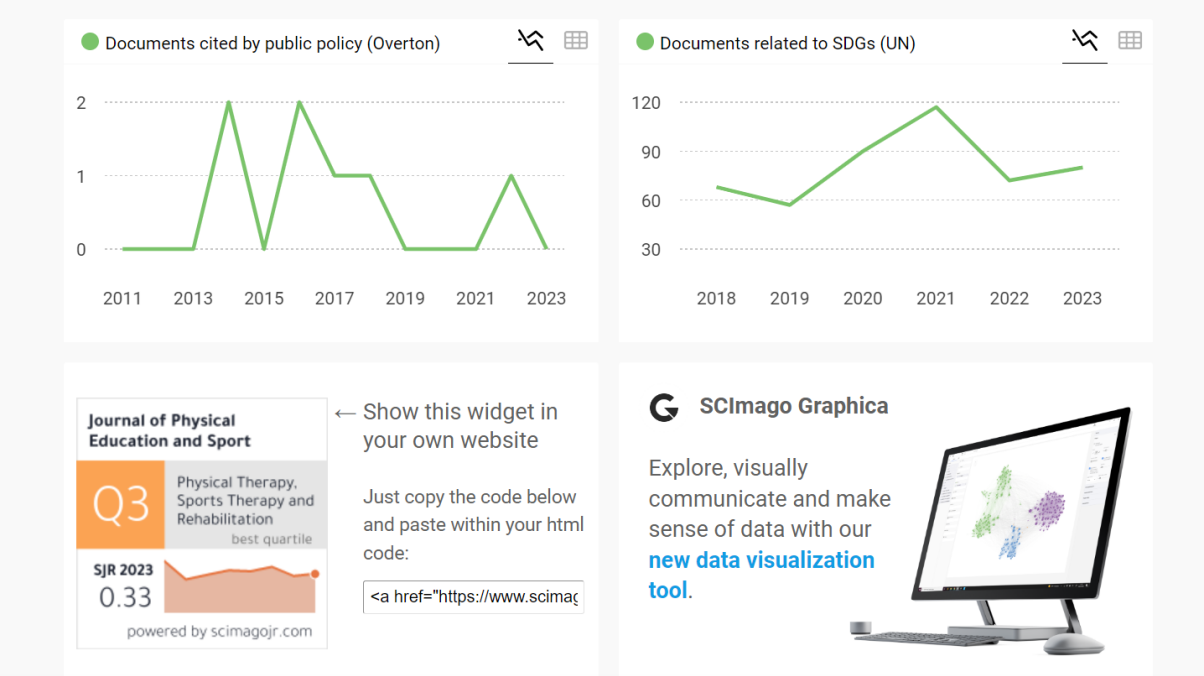

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2	Review artikel	15 September 2022
3	Revisi artikel	21 september 2022
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8	Publication	25 Desember 2022

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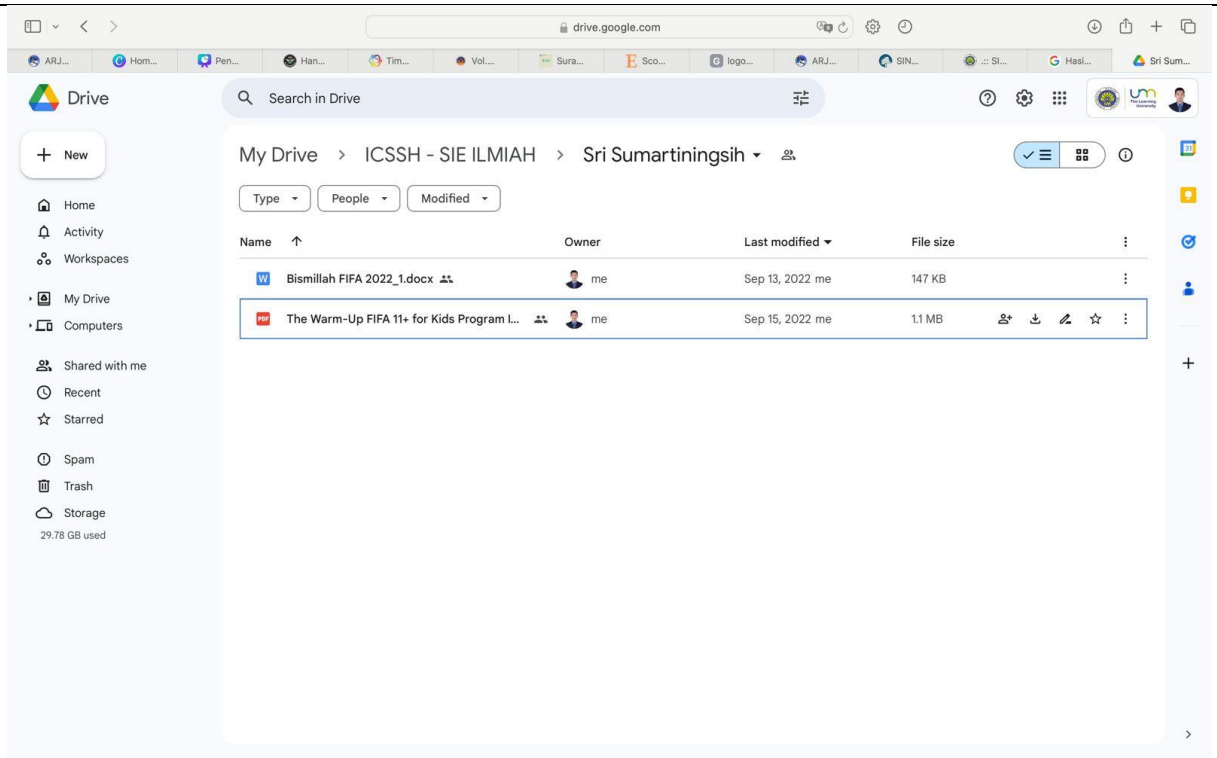
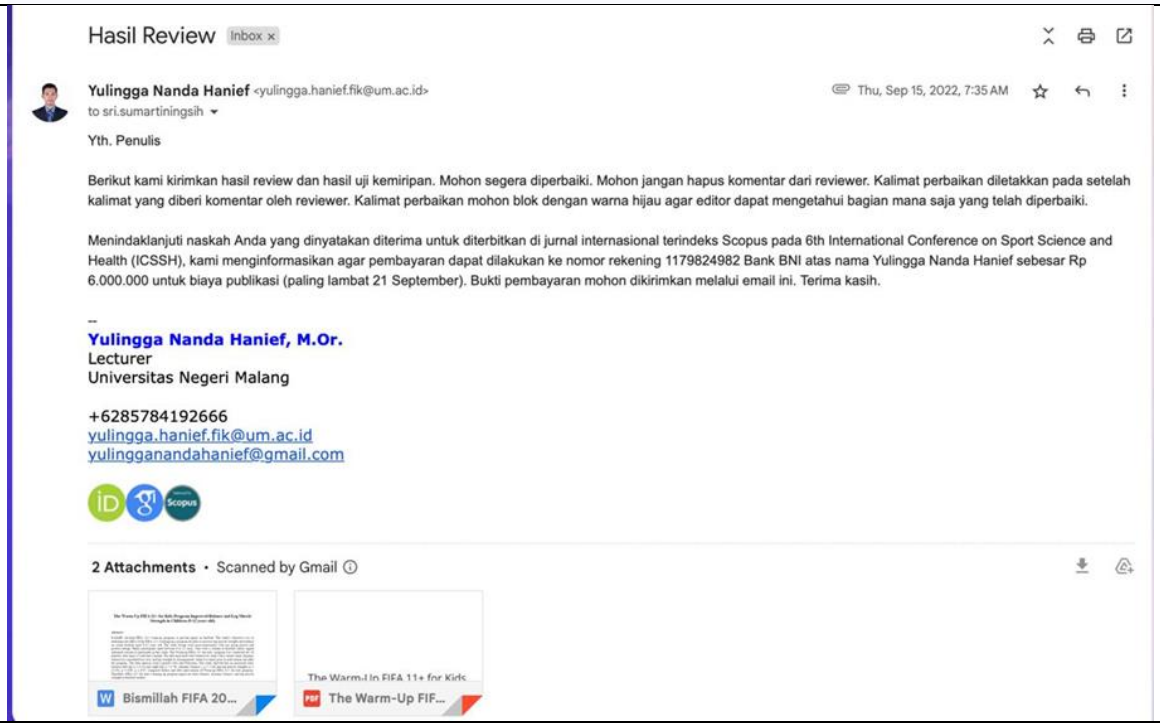
1	 drive.google.com Drive Search in Drive New Home Activity Workspaces My Drive Computers Shared with me Recent Starred Spam Trash Storage 29.78 GB used My Drive › ICSSH - SIE ILMIAH › Sri Sumartiningsih Type People Modified Name Owner Last modified File size Bismillah FIFA 2022_1.docx me Sep 13, 2022 me 147 KB The Warm-Up FIFA 11+ for Kids Program I... me Sep 15, 2022 me 1.1 MB
2	 Hasil Review Inbox × Yulingga Nanda Hanief <yulingga.hanief.fik@um.ac.id> to sri.sumartiningsih Thu, Sep 15, 2022, 7:35 AM Yth. Penulis Berikut kami kirimkan hasil review dan hasil uji kemiripan. Mohon segera diperbaiki. Mohon jangan hapus komentar dari reviewer. Kalimat perbaikan diletakkan pada setelah kalimat yang diberi komentar oleh reviewer. Kalimat perbaikan mohon blok dengan warna hijau agar editor dapat mengetahui bagian mana saja yang telah diperbaiki. Menindaklanjuti naskah Anda yang dinyatakan diterima untuk diterbitkan di jurnal internasional terindeks Scopus pada 6th International Conference on Sport Science and Health (ICSSH), kami menginformasikan agar pembayaran dapat dilakukan ke nomor rekening 1179824982 Bank BNI atas nama Yulingga Nanda Hanief sebesar Rp 6.000.000 untuk biaya publikasi (paling lambat 21 September). Bukti pembayaran mohon dikirimkan melalui email ini. Terima kasih. -- Yulingga Nanda Hanief, M.Or. Lecturer Universitas Negeri Malang +6285784192666 yulingga.hanief.fik@um.ac.id yulingganandahanief@gmail.com 2 Attachments • Scanned by Gmail Bismillah FIFA 20... The Warm-Up FIF...

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Sri Sumartiningsih <sri.sumartiningsih@mail.unnes.ac.id> Wed, Sep 21, 2022, 8:03 PM

to me

Assalamualaikum Pak Yulingga,
Berikut saya kirimkan manuscript yang telah di revisi dan penambahan satu author terimakasih atas bantuanipun.

Wassalam.

--
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Sri Sumartiningsih <sri.sumartiningsih@mail.unnes.ac.id> Sep 21, 2022, 5:21 PM

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Berikut saya kirimkan manuskrip yang telah direvisi sesuai dengan permintaan reviewer, beserta hasil uji turnitin.
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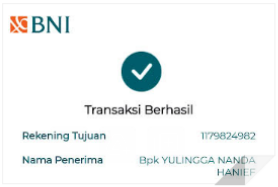

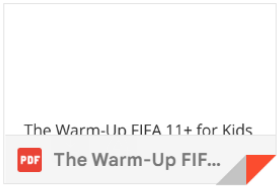

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We are pleased to announce that your manuscript has been accepted for presentation at the 6th International Conference on Sports and Science Health (ICSSH 2022). The list of accepted manuscripts can be seen in the attachment to this letter.

We would like to take this opportunity to express our sincere thanks to all submitters for your contribution to the 6TH INTERNATIONAL CONFERENCE ON SPORTS SCIENCE AND HEALTH (ICSSH 2022). We expect you to present your manuscript at a virtual conference on September 29, 2022. If you have any questions, please contact the conference secretariat at icssh.fik@um.ac.id. Please join to Whatsapp Group by click https://chat.whatsapp.com/DJkWIkIXmFwG0B4nbmknhc.

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Dear Yulingga,
Here is my manuscript revision.
Please kindly check it.

Thank you.

Best regards,
Titin

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FIFA 11+ Kids JPE...

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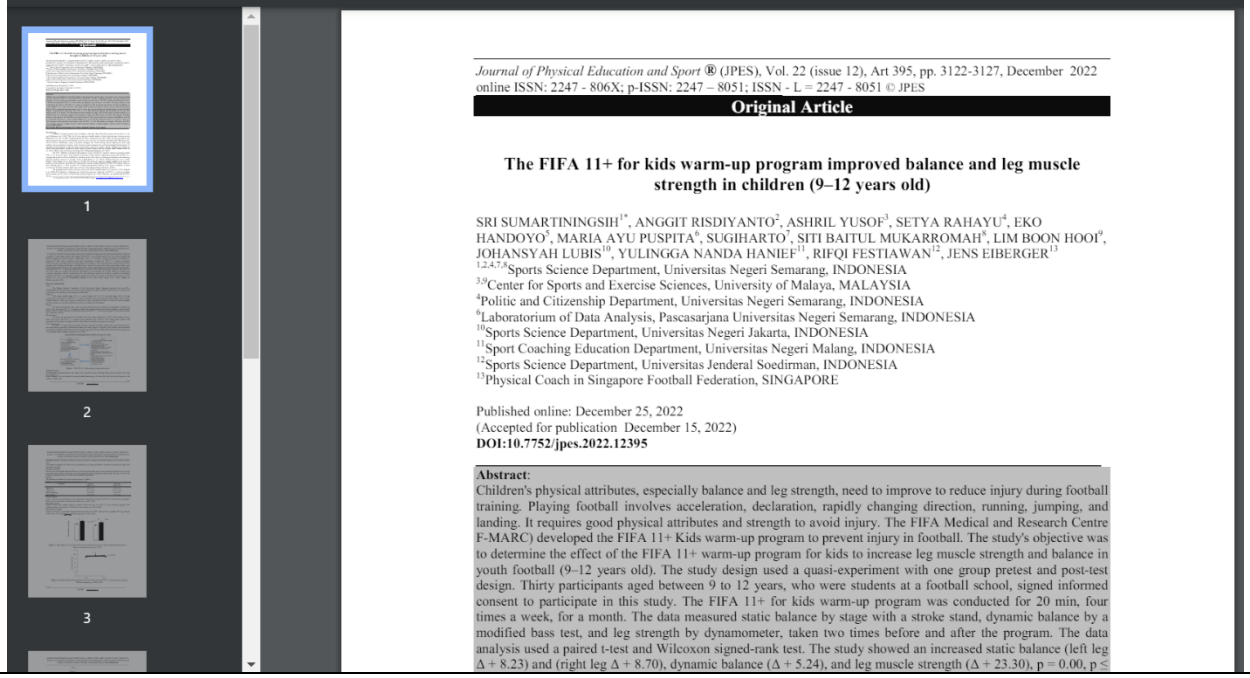

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Original Article

The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

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Abstract:
Children's physical attributes, especially balance and leg strength, need to improve to reduce injury during football training. Playing football involves acceleration, declaration, rapidly changing direction, running, jumping, and landing. It requires good physical attributes and strength to avoid injury. The FIFA Medical and Research Centre F-MARC) developed the FIFA 11+ Kids warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warm-up program for kids to increase leg muscle strength and balance in youth football (9–12 years old). The study design used a quasi-experiment with one group pretest and post-test design. Thirty participants aged between 9 to 12 years, who were students at a football school, signed informed consent to participate in this study. The FIFA 11+ for kids warm-up program was conducted for 20 min, four times a week, for a month. The data measured static balance by stage with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times before and after the program. The data analysis used a paired t-test and Wilcoxon signed-rank test. The study showed an increased static balance (left leg $\Delta + 8.23$) and (right leg $\Delta + 8.70$), dynamic balance ($\Delta + 5.24$), and leg muscle strength ($\Delta + 23.30$), $p = 0.00$, $p \leq$

The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

By Sri Sumartiningsih

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The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

SRI SUMARTININGSIH[1*], ANGGIT RISDIYANTO[2], ASHRIL YUSOF[3], SETYA RAHAYU[4], EKO HANDOYO[5], MARIA AYU PUSPITA[6], SUGIHARTO[7], SITI BAITUL MUKARROMAH[8], LIM BOON HOOI[9], JOHANSYAH LUBIS[10], YULINGGA NANDA HANIEF[11], RIFQI FESTIAWAN[7], JENS EIBERGER[13]

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Abstract:
Children's physical attributes, especially balance and leg strength, need to improve to reduce injury during football training. Playing football involves acceleration, declaration, rapidly changing direction, running, jumping, and landing. It requires good physical attributes and strength to avoid injury. The FIFA Medical and Research Centre (F-MARC) developed the FIFA 11+ Kids warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warm-up program for kids to increase leg muscle strength and balance in youth football (9–12 years old). The study design used a quasi-experiment with one group pretest and post-test design. Thirty participants aged between 9 to 12 years, who were students at a football school, signed informed consent to participate in this study. The FIFA 11+ for kids warm-up program was conducted for 20 min, four times a week, for a month. The data measured static balance by stage with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times before and after the program. The data analysis used a paired t-test and Wilcoxon signed-rank test. The study showed an increased static balance (left leg $\Delta + 8.23$) and (right leg $\Delta + 8.70$), dynamic balance ($\Delta + 5.24$), and leg muscle strength ($\Delta + 23.30$), $p = 0.00$, $p \leq 0.05$, between before and after intervention using the FIFA 11+ for kids warm-up program. Therefore, the FIFA 11+ for kids warm-up program results in improved static balance, dynamic balance, and leg muscle strength in youth football players.

***Key* Words:** Injury prevention, static balance, dynamic balance, leg strength

Introduction

Football is the most popular sport worldwide, with more than 200 million people who are active in the sport (Barengo et al., 2014). The risk of injury during a football match is higher than during a training session (Ekstrand et al., 2011b; FIFA Communications Division, Information Services, 2006). During tournaments and training sessions, the specific and dominant injuries were in the lower extremities and thigh strain (Ekstrand et al., 2011a, 2011b). Additionally, injury prevention strategies are crucial during weekly macrocycles with high loading, such as competitive seasons, where injuries are most common. It is well acknowledged that the amount of training required depends on the age group, training day, week, and position played. Coaches have chance to match training and match variables for static balance, dynamic balance, and leg strength (Jaka Pratama Galeko Et Al., 2022; Marek Tvrdý & Miroslav Holienka, 2022; Muhammad Hamdan et al., 2022)

The FIFA Medical Assessment and Research Center (F-MARC) created a warm-up procedure called FIFA 11+ to lower the rate of injury (Bizzini & Dvorak, 2015b). Various studies have shown that the FIFA 11+ program has a positive effect on athletes by minimizing the risk of injury, increasing performance, and enhancing physical attributes (Bizzini & Dvorak, 2015a; Pardos-Mainer et al., 2019a; Pomares-Noguera et al., 2018a; Rössler, 2016; Rössler et al., 2016; Spurrier, 2019a). The warm-up training program includes seven forms of motion exercises that are performed for a maximum of twenty minutes (Spurrier, 2019b). The motions focus on three training aspects: 1) three exercises for unilateral and dynamic stability of the lower extremities, 2) three exercises for full body strength, and 3) one exercise for the falling technique (Spurrier, 2019b).

The program helps to reduce the injury rate by 20–50% in football players (Al Attar et al., 2016; Soligard et al., 2008). Nevertheless, in Semarang city, Central Java province, Indonesia, the FIFA 11+ warm-up program was minimally used for kids in football clubs (Sumartiningsih et al., 2020). Therefore, we implemented the FIFA 11+

warm-up for kids to evaluate static and dynamic balance and leg muscle strength before and after using the program in youth football players.

The impact of the FIFA 11+ as a football player injury prevention program has been investigated in earlier research. Additionally, FIFA 11+'s efficacy in enhancing athletic performance is required for both injury prevention and sport performance. Analyse the FIFA 11+ warm-up program's effectiveness at preventing injuries in football players of all genders. This study also aims to assess about how this program affects athletes' performance. Football players' muscle strength, sprint speed, jump height, balance, and proprioception are all factors in their performance. This review's main objective is to determine whether or not the teams should use the FIFA 11+ training program during their practices. Due to the high danger of injuries, particularly to the lower limbs, in football, the practical applications of this research are crucial. Warm-up regimens are extremely important, which is supported by the fact that these injuries are primarily caused by controllable variables. The FIFA 11+ program's suggestion that these initiatives be simple to implement and inclusive of all players is in line with this (Muhammad Hamdan et al., 2022; Ömer Aksoy et al., 2022; Vlachas & Paraskevopoulos, 2022).

Materials and methods

Ethics

The Human Subjects Committee of the Universitas Negeri Semarang approved the study (No. /KEPK/EC/2020). Before the experiment, each participant provided informed written consent. All procedures conformed to the standards of the Declaration of Helsinki.

Subjects

Thirty male children (age, 10.5 ± 1.1 years; height, 141.13 ± 13.8 cm; body mass, 34.8 ± 9.6 kg) volunteered to participate in the FIFA 11+ warm-up program. These children attended a football club in Jatayu Football School in Solo city. Inclusion criteria in the study required the children to follow the entire program without any absence, not take supplements, and have no cardiovascular diseases.

Design

The quasi-experimental study with one group pretest and post-test design was designed to analyze the effect of the four-week FIFA 11+ program on static and dynamic balance and muscle strength in youth football players. Before football training, the participants perform the FIFA 11+ warm-up program for 20 min each session for 16 sessions a month.

Measurements

The study was performed on the football field, with a mean temperature of 29°C, 70% humidity, and 10 km/h wind speed; the FIFA 11+ warm-up was performed from 15:00 to 15:20 during each session. The participants were tested for dynamic balance, static balance, and back and leg muscle strength.

Training programs

The FIFA 11+ kids warm-up program focuses on spatial orientation, anticipation, perception [especially when dual tasking (avoiding unintentional contact with other players or objects)], body stability and movement coordination (common rather than specific) and learning proper falling techniques (to minimize the consequences of unavoidable falls) (Pomares-Noguera et al., 2018b).

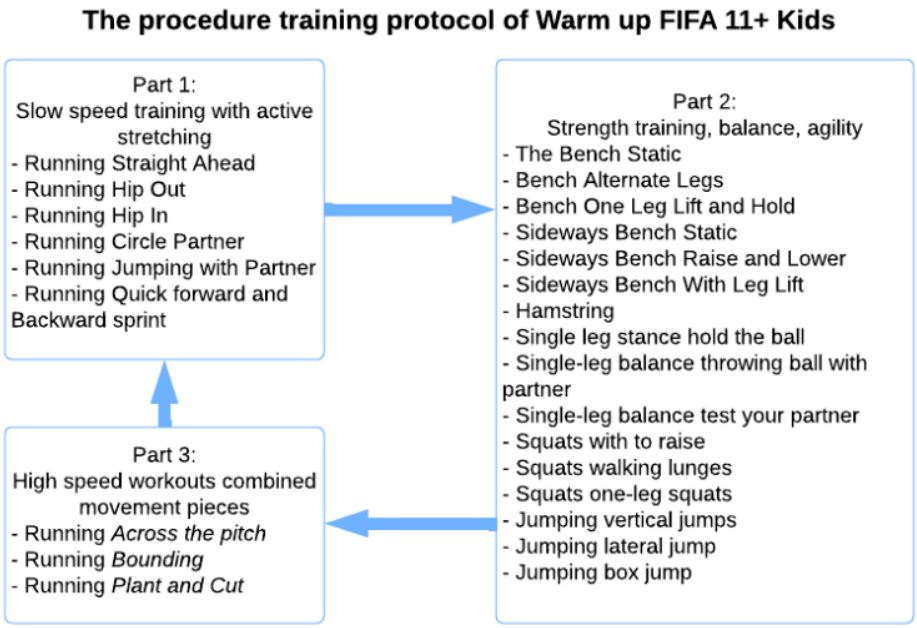

Figure 1. The FIFA 11+ kids warm-up program procedure

Testing protocol

Anthropometric measurements were taken before physical testing. Standing height (cm) and body mass (kg) were measured.

Static balance. The stock stand test was performed (balancing on left and right foot) by the participants on the outdoor football field.

Dynamic balance. The bass modified test was performed to evaluate the dynamic balance on the outdoor football field.

Leg muscle strength. The back and leg dynamometer test was performed to evaluate the participant's back and leg muscle strength.

Statistical analysis

Paired t-tests for standard data and Wilcoxon test for abnormal data were used to determine differences in pre- and post-intervention effects. All results were presented as the mean ± standard deviation (SD). The type 1 error of 5% or less in comparing mean differences was considered significant.

Results

The characteristic data of the participants is shown in Table 2.

Table 1. Characteristics data of the participants (n = 30)

Parameter	Pretest Mean ± SD	Post-test Mean ± SD
Age (year)	10.5 ± 1.2	10.6 ± 1.2
Height (cm)	141.1 ± 13.8	141.1 ± 13.8
Body weight (kg)	34.9 ± 9.6	35.0 ± 9.5
BMI (kg/cm^2)	17.3 ± 2.2	17.4 ± 2.2

Static balance

Figure 1 shows the static balance for the right and left leg before and after the FIFA 11+ kids warm-up program. Both legs showed similar increased static balance ($p = 0.00 < 0.05$).

Dynamic balance

Figure 2 shows the dynamic balance condition before and after the FIFA 11+ kids warm-up program. The dynamic balance improved by +5.67 after the intervention ($p = 0.00 < 0.05$).

Leg muscle strength

Figure 3 shows the leg muscle strength before and after the FIFA+ kids warm-up program. The leg strength increased by +23.30 kg after the warmup program ($p = 0.00 < 0.05$).

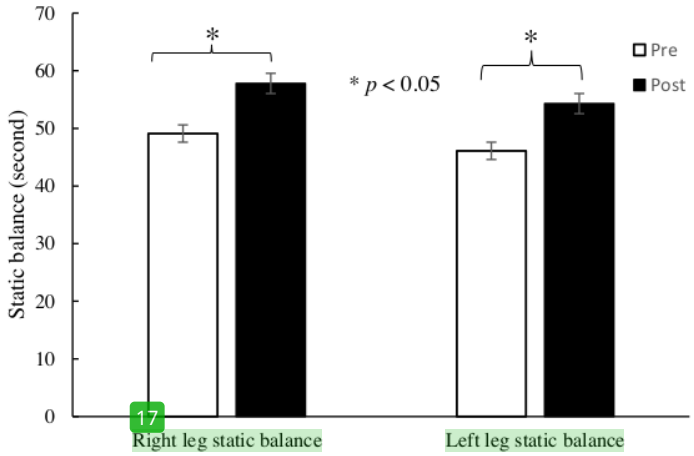

Figure 2. Static balance for the right and left leg; the paired t-test analysis showed significance difference between pretest and post-test, $p < 0.05$.

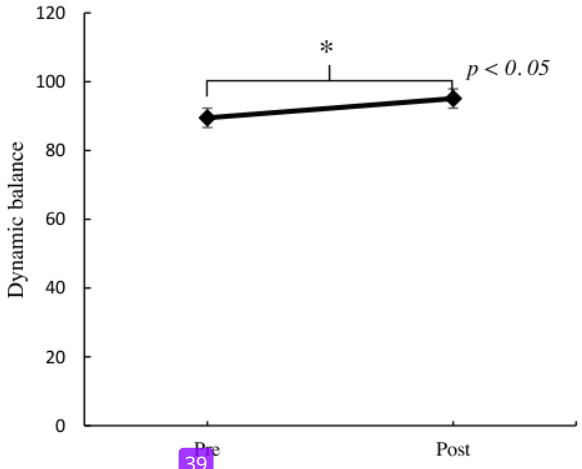

Figure 3. Dynamic balance before and after the intervention using the FIFA 11+ kids warm-up program; Wilcoxon analysis, $p = 0.000 < 0.05$

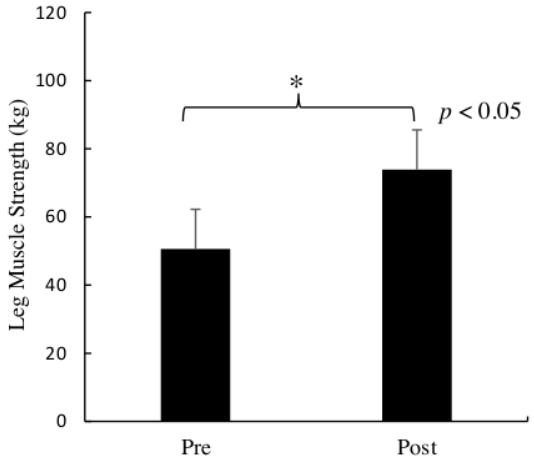

Figure 4. Leg muscle strength compared pre- and post-FIFA 11+ kids warm-up program; the paired t-test analysis was used, $p = 0.000 < 0.05$.

Discussions

The obtained results showed that the FIFA 11+ warm-up program performed for 20 min, 4 times a week for 1 month can improve static and dynamic balance in 9–12-year-old boys. A previous study showed that the FIFA 11+ warm-up program improved the balance of futsal players in high school students in Narmada (Yusuf et al., 2018). The score for right leg static balance at the pretest was 50 for only seven participants (23.3%). After the program, the score increased to 58 for 9 participants (30%). The left leg static balance before the program showed a score of 45 in 13.3% of the participants. After the program, the score increased to 60 for 9 participants. Our study was in line with the previous study. The FIFA 11+ warm-up program increased stability better than normal warm-ups in children under 10 years old (Gatterer et al., 2018). In the right foot static balance test, the pretest score was 49 for as many as 7 (23.3%) samples, while the post-test results increased by 9 scores or 27% to the pre-test.

Similar to a previous study, our study reported that the FIFA 11+ warm-up program increased dynamic balance in football athletes aged 18–20 years (Mu'allimah & Wijianto, 2019). Our study obtained a similar result. Specifically, dynamic balance increased by +5.67 from 26.7% of the participants to 33.3% in football school students aged 9–12 years old. Another study found that six weeks of FIFA 11+ warm-up improved dynamic balance in young soccer players (Dunsky et al., 2017).

This study found a significant increase of 53% in leg muscle strength in 9–12-year-old football school students. Based on the leg muscle strength, the obtained results confirmed that the FIFA 11+ warm-up program reduced injuries by 21–32% in the lower extremities in 13–19 years old football players (Pardos-Mainer et al., 2019b) and by almost 50% in 7–13-year-old football players (Spurrier, 2019b).

Conclusions

This research investigated the effect of the FIFA 11+ warm-up program in injury prevention and performance in football players. The FIFA 11+ kids warm-up program improved static and dynamic balance as well as leg muscle strength in 9–12-year-old children. The results showed that the FIFA 11+, to avoid injury and enhance the physical attributes in youth football athletes, the coaches need to use the FIFA 11+ warm-up procedures. More high-quality studies are needed in order to increase the transparency of its clinical implications.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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The authors would like to thank Falcon Scientific Editing (https://falconediting.com) for proofreading the English language in this paper.

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The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

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The Warm-Up FIFA 11+ for Kids Program Improved Balance and Leg Muscle Strength in Children (9-12 years old)

Abstract:

F-MARC develop FIFA 11+ warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warming up a program for kids to increase leg muscle strength and balance on youth football aged 9-12 years old. The study design used quasi-experiment with one group pretest and posttest design. Thirty participants aged between 9 to 12 years, who were a student at football school signed informed consent to participate in this study. The Warm-up FIFA 11+ for kids' program was conducted for 20 minutes, four times a week and a month. The data measured static balance by stage with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times prior to intervention and after the program. The data analysis used a paired t-test and Wilcoxon. The study showed that an increased static balance (left leg $\Delta + 8.23$) and (right leg $\Delta + 8.70$), dynamic balance ($\Delta + 5.24$) and leg muscle strength ($\Delta + 23.30$), $p = 0.00$, $p \leq 0.05$, compared before and after intervention of Warm-up FIFA 11+ for kids program. Therefore, FIFA 11+ for kids warming up program improved static balance, dynamic balance, and leg muscle strength in football student.

Key Words: - Injury prevention, static balance, dynamic balance, leg strength

Commented [Reviewer1]: Please replace it with a sentence that describes the background of this study

Introduction

The most popular sport worldwide, with more than 200 million people active in the sport, is football (Barengo et al., 2014). The risk of injury during a football match was higher than during a training session (Count, 2006; Ekstrand et al., 2011b). During tournament and training sessions, the specific and dominant injuries were in the inferior extremity and thigh strain (Ekstrand et al., 2011b, 2011a).

The FIFA Medical Assessment and Research Center (F-MARC) creates a protocol warming up called FIFA 11+ to reduce the injury percentage (Bizzini & Dvorak, 2015). Various studies showed a positive effect of the FIFA 11+ program on athletes (Daneshjoo et al., 2013; Gatterer et al., 2018; Pomares-Noguera et al., 2018; Rössler et al., 2016; Zarei et al., 2018). The warming-up program performed seven kinds of movement in exercises for 15-20 minutes(Spurrier, 2019). The exercises are focused on three exercises for unilateral and dynamic stability on the inferior extremity, three exercises for whole body strength, and one exercise for the falling technique (Spurrier, 2019).

The effectiveness of the FIFA 11+ warming up program was investigated. Numerous studies found that the FIFA 11+ reduced risk of injury in the inferior extremity enhanced performance, and improved physical attributes in football players (Bizzini & Dvorak, 2015; Daneshjoo et al., 2012, 2013; Pardos-Mainer et al., 2019; Pomares-Noguera et al., 2018; Rössler et al., 2016; Spurrier, 2019). The program is positively useful reduce the injury rate of 20-50% in football players (Al Attar et al., 2016; Soligard et al., 2008). Based on the background study, we conducted the FIFA 11+ warm-up for kids to evaluate both static and dynamic balance, and the leg muscle strength before exercise training in youth football players.

Commented [Reviewer2]: It is necessary to add a sentence that emphasizes the research gap, while research on the effects of the FIFA 11+ warming up program has been presented.

Material & methods

Ethics

The study was approved by the Human Subjects Committee of the Universitas Negeri Semarang (No. 146/KEPK/EC/2020). Before the experiment, each participant provided informed written consent. All the procedures conformed to the standards of the Declaration of Helsinki.

Subjects

Thirty male children with a mean ± standard deviation (age; 10.5 ± 1.1 years, height; 141.13 ± 13.8-centimetre, body mass; 34.8 ± 9.6 kg), volunteered to participate in FIFA 11+ warm up program. These children were attending football club in Jatayu Football School at Solo city. Inclusion criteria in the study required the children following the full program without any absence, not taking supplement, no cardiovascular diseases.

Design

The quasi-experimental study with one group pre-test and post-test design was designed to analyze the effect of four-week FIFA 11+ program on static and dynamic balance, and muscle strength in youth football players. Before football training the participant was following the FIFA 11+ warming up program for 20 minutes in each session for 16 sessions in a month.

Measurements

All study was performed in the football field, with mean of the temperature 29^0 Celsius, humidity 70%, and wind 10 km/hours at 3.00 to 3.20 pm in each session of FIFA 11+ warming up. The participants were test for dynamic balance, static balance and back and leg muscle strength.

Training Programs

The FIFA 11+ for Kids Warming up program focus on spatial orientation, anticipation, and attention particularly while dual tasking (to avoid unintended contact with other players or objects); body stability and movement coordination (more general than specific); learning appropriate fall techniques (to minimize the consequences of unavoidable falls).

Table 1. The FIFA 11+Kids Program

No	Exercise	Movement	Duration
1	Jog and Look at the coach (to stop)	listen to the command	3 x 5 stop command
		watch for the command	3 x 5 stop command
		Keep the ball in the hands and listen to the command	3 x 5 stop command
		keep the ball in the hands and watch for the command	3 x 5 stop command
		Juggle the ball and listen to the command	3 x 5 stop command
2	Skating Hop	practice how to land on one leg	2 x 10 hops (5 on each leg)
		keep ball in the hands	2 x 10 hops (5 on each leg)
		balance the ball on one hand	2 x 10 hops (5 on each leg)
		touch the ground with the ball	2 x 10 hops (5 on each leg)
		balance and stretch forward with the ball	2 x 10 hops (5 on each leg)
3	One leg stance	throw the ball	1 x right/left and 5 passes per player
		circle the ball around the leg & throw it	1 x right/left and 5 passes per player
		Pass the ball	1 x right/left and 5 passes per player
		throw the ball & play it back	1 x right/left and 5 passes per player
		Challenge your balance	1 x right/left for 20 seconds
4	Push up	make a tunnel & roll the ball underneath	2 x until each kid rolls 1 X the ball (max 8 kids)
		in a plank position & roll the lower legs on the ball	3 x @ 15 seconds
		keep position & roll the ball between hands	3 x @ 15 seconds
		keep position & roll the ball between hands and feet	3 x @ 15 seconds
		Hands on the ball & challenge your position	3 x @ 10 seconds
5	One leg hops	Hop forwards	2 x hops on right leg and 5 hops on left leg
		hop forwards & backwards	2 x hops on right leg and 5 hops on left leg

		Hop sideways	2 x hops on right leg and 5 hops on left leg
		follow the command & hop	2 x hops on right leg and 5 hops on left leg
		follow the command & hop while holding the ball in the hands	2 x hops on right leg and 5 hops on left leg
6	Spiderman	touch the ball with alternating feet	3 x @15 seconds
		stretch out the position	3 x @15 seconds
		crawling	3 x over 5 – 10 meters
		Crawling & move the ball between the feet	3 x over 5 – 10 meters
		crawling with the hands & move the ball with the feet	3 x over 5 – 7 meters
7	Roll over	crouch and roll over	5 x 7 per side
		from standing, slowly roll over	5 x 7 per side
		from standing, quickly roll over	5 x 7 per side
		slow walk & roll over	5 x 7 per side
		Jog & roll over	5 x 7 per side

Testing Protocol

Anthropometric measurements were taken before the physical testing. Standing height (cm) and body mass (kg) were measured.

Static Balance. The stock stand test was performed balance left and right foot participant in outdoor football field.

Dynamic Balance. The bass modified test was performed to evaluate the dynamic balance in outdoor football field.

Leg muscle strength. Back and leg dynamometer test was performed to evaluate the back and leg muscle strength of the participant.

Statistical Analysis

All results were presented as mean ± standard deviation (SD). Type 1 error equal or less than 5% for comparing mean difference was considered significant. Paired t-test for normal distribution data and Wilcoxon for anormal data was used to determine of difference effect before and after intervention.

Results

The characteristic data of participant showed in the Table 2.

Table 2. Characteristics data of participants (n = 30)

Parameter	Pre-test Mean ± SD	Post-test Mean ± SD
Age (year)	10. 5±1.2	10.6±1.2
Height (centimeter)	141.1±13.8	141.1±13.8
Body Weight (kilogram)	34.9±9.6	35.0±9.5
BMI (kg/cm^2)	17.3±2.2	17.4±2.2

Static balance

Figure 1 shows the static balance in the right leg and left leg condition before intervention and after warm-up FIFA 11+ for kids' program. Both legs showed similar increased static balance ($p = 0.00 < 0.05$).

Dynamic balance

Figure 2 shows the dynamic balance condition prior to program and after the warm-up FIFA 11+ kids program. The dynamic balance improved +5,67 after intervention.

Leg Muscle Strength

Figure 3 shows the leg muscle strength condition before and after intervention Warm-up FIFA+ kids program. The leg strength increased by +23,30 kg after the warm up program.

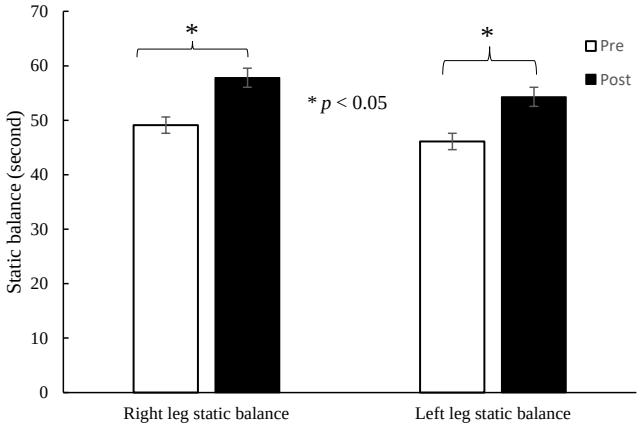

Figure 1. Static balance in the right and left leg, analysis paired t-test, showed significance pre-test and post-test, $p < 0.05$.

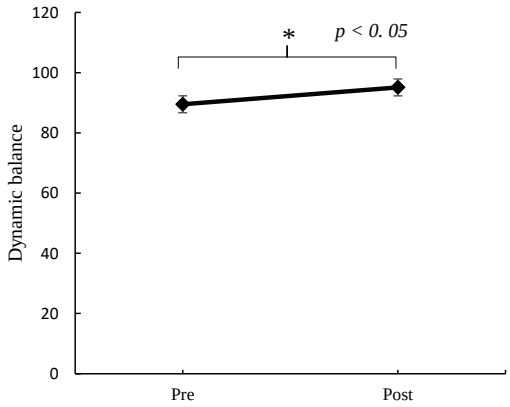

Figure 2. Dynamic balance before and after intervention of Warm-up FIFA 11+ for Kids Program, Wilcoxon analysis $p = 0.000 < 0.05$

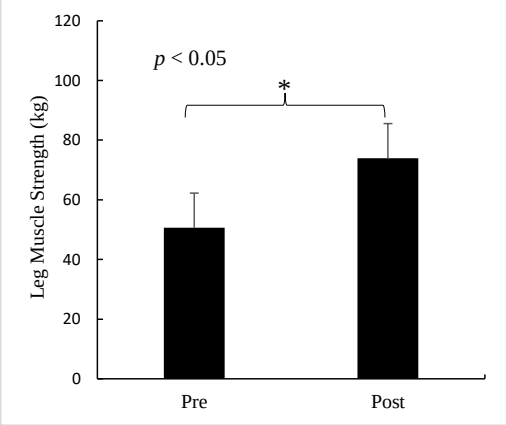

Figure 3. Leg Muscle Strength compared pre and post warm-up FIFA 11+ for Kids program, Analysis used paired t-test, $p = 0.000 < 0.05$

Discussion

The results showed that the FIFA 11+ warm-up program for 20 minutes, 4 times/week for 1 month could improve balance, both static and dynamic in boys aged 9-12 years old. This study supported that FIFA 11+ program improved balance of futsal player of High school student Narmada (Yusuf et al., 2019). The score right leg static balance at pre-test was 50 only seven participant (23.3%), and after program increased 58 score to be 9 participant (30%), in the left leg static balance before program showed 13.3% participant score 45, and after the program the score increased to 60 score for 9 participants. Our study was in line with the previous study, that is warm-up FIFA 11+ program increased greater stability than normal warm-up in children aged below 10 years old (Gatterer et al., 2018). In the right foot static balance test, the pre-test score was 50 as many as 7 (23.3%) samples, while the results of the post-test.

Our study similar result in the previous study reported that the FIFA 11+ program increased dynamic balance in football athletes aged 18-20 years old (Mu'allimah et al., 2019). Our study similar result that dynamic balance increased +5,67 from 26.7% participant to 33.3% in the football school students aged 9-12 years old. Similar result found that six weeks Warm-up FIFA 11+ improved dynamic balance in young soccer players (Dunsky et al., 2017).

The study found that significant increased 53% leg muscle strength in football school at children 9-12 years old, was supported that FIFA 11+ program reducing 21-32% injuries in the inferior extremity in the aged 13-19 years old (Pardos-Mainer et al., 2019) and reduced almost 50% in the aged 7-13 years old (Spurrier, 2019).

Conclusions

The Warm-Up FIFA 11+ for kids program improved balance in static and dynamic also leg muscle strength in children 9-12 years old.

Conflicts of interest - no conflicts of interest to declare.

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The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

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Abstract:
Children's physical attributes, especially balance and leg strength, need to improve to reduce injury during football training. Playing football involves acceleration, declaration, rapidly changing direction, running, jumping, and landing. It requires good physical attributes and strength to avoid injury. The FIFA Medical and Research Centre F-MARC) developed the FIFA 11+ Kids warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warm-up program for kids to increase leg muscle strength and balance in youth football (9–12 years old). The study design used a quasi-experiment with one group pretest and post-test design. Thirty participants aged between 9 to 12 years, who were students at a football school, signed informed consent to participate in this study. The FIFA 11+ for kids warm-up program was conducted for 20 min, four times a week, for a month. The data measured static balance by stage with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times before and after the program. The data analysis used a paired t-test and Wilcoxon signed-rank test. The study showed an increased static balance (left leg $\Delta + 8.23$) and (right leg $\Delta + 8.70$), dynamic balance ($\Delta + 5.24$), and leg muscle strength ($\Delta + 23.30$), $p = 0.00$, $p \leq 0.05$, between before and after intervention using the FIFA 11+ for kids warm-up program. Therefore, the FIFA 11+ for kids warm-up program results in improved static balance, dynamic balance, and leg muscle strength in youth football players.

Key Words: Injury prevention, static balance, dynamic balance, leg strength

Introduction

Football is the most popular sport worldwide, with more than 200 million people who are active in the sport (Barengo et al., 2014). The risk of injury during a football match is higher than during a training session (Ekstrand et al., 2011b; FIFA Communications Division, Information Services, 2006). During tournaments and training sessions, the specific and dominant injuries were in the lower extremities and thigh strain (Ekstrand et al., 2011a, 2011b). Additionally, injury prevention strategies are crucial during weekly macrocycles with high loading, such as competitive seasons, where injuries are most common. It is well acknowledged that the amount of training required depends on the age group, training day, week, and position played. Coaches have chance to match training and match variables for static balance, dynamic balance, and leg strength (Jaka Pratama Galeko Et Al., 2022; Marek Tvrdý & Miroslav Holienka, 2022; Muhammad Hamdan et al., 2022)

The FIFA Medical Assessment and Research Center (F-MARC) created a warm-up procedure called FIFA 11+ to lower the rate of injury (Bizzini & Dvorak, 2015b). Various studies have shown that the FIFA 11+ program has a positive effect on athletes by minimizing the risk of injury, increasing performance, and enhancing physical attributes (Bizzini & Dvorak, 2015a; Pardos-Mainer et al., 2019a; Pomares-Noguera et al., 2018a; Rössler, 2016; Rössler et al., 2016; Spurrier, 2019a). The warm-up training program includes seven forms of motion exercises that are performed for a maximum of twenty minutes (Spurrier, 2019b). The motions focus on three training aspects: 1) three exercises for unilateral and dynamic stability of the lower extremities, 2) three exercises for full body strength, and 3) one exercise for the falling technique (Spurrier, 2019b).

The program helps to reduce the injury rate by 20–50% in football players (Al Attar et al., 2016; Soligard et al., 2008). Nevertheless, in Semarang city, Central Java province, Indonesia, the FIFA 11+ warm-up program was minimally used for kids in football clubs (Sumartiningsih et al., 2020). Therefore, we implemented the FIFA 11+

warm-up for kids to evaluate static and dynamic balance and leg muscle strength before and after using the program in youth football players.
The impact of the FIFA 11+ as a football player injury prevention program has been investigated in earlier research. Additionally, FIFA 11+'s efficacy in enhancing athletic performance is required for both injury prevention and sport performance. Analyse the FIFA 11+ warm-up program's effectiveness at preventing injuries in football players of all genders. This study also aims to assess about how this program affects athletes' performance. Football players' muscle strength, sprint speed, jump height, balance, and proprioception are all factors in their performance. This review's main objective is to determine whether or not the teams should use the FIFA 11+ training program during their practices. Due to the high danger of injuries, particularly to the lower limbs, in football, the practical applications of this research are crucial. Warm-up regimens are extremely important, which is supported by the fact that these injuries are primarily caused by controllable variables. The FIFA 11+ program's suggestion that these initiatives be simple to implement and inclusive of all players is in line with this (Muhammad Hamdan et al., 2022; Ömer Aksoy et al., 2022; Vlachas & Paraskevopoulos, 2022).

Materials and methods

Ethics

The Human Subjects Committee of the Universitas Negeri Semarang approved the study (No. 146/KEPK/EC/2020). Before the experiment, each participant provided informed written consent. All procedures conformed to the standards of the Declaration of Helsinki.

Subjects

Thirty male children (age, 10.5 ± 1.1 years; height, 141.13 ± 13.8 cm; body mass, 34.8 ± 9.6 kg) volunteered to participate in the FIFA 11+ warm-up program. These children attended a football club in Jatayu Football School in Solo city. Inclusion criteria in the study required the children to follow the entire program without any absence, not take supplements, and have no cardiovascular diseases.

Design

The quasi-experimental study with one group pretest and post-test design was designed to analyze the effect of the four-week FIFA 11+ program on static and dynamic balance and muscle strength in youth football players. Before football training, the participants perform the FIFA 11+ warm-up program for 20 min each session for 16 sessions a month.

Measurements

The study was performed on the football field, with a mean temperature of 29°C, 70% humidity, and 10 km/h wind speed; the FIFA 11+ warm-up was performed from 15:00 to 15:20 during each session. The participants were tested for dynamic balance, static balance, and back and leg muscle strength.

Training programs

The FIFA 11+ kids warm-up program focuses on spatial orientation, anticipation, perception [especially when dual tasking (avoiding unintentional contact with other players or objects)], body stability and movement coordination (commons rather than specific) and learning proper falling techniques (to minimize the consequences of unavoidable falls) (Pomares-Noguera et al., 2018b).

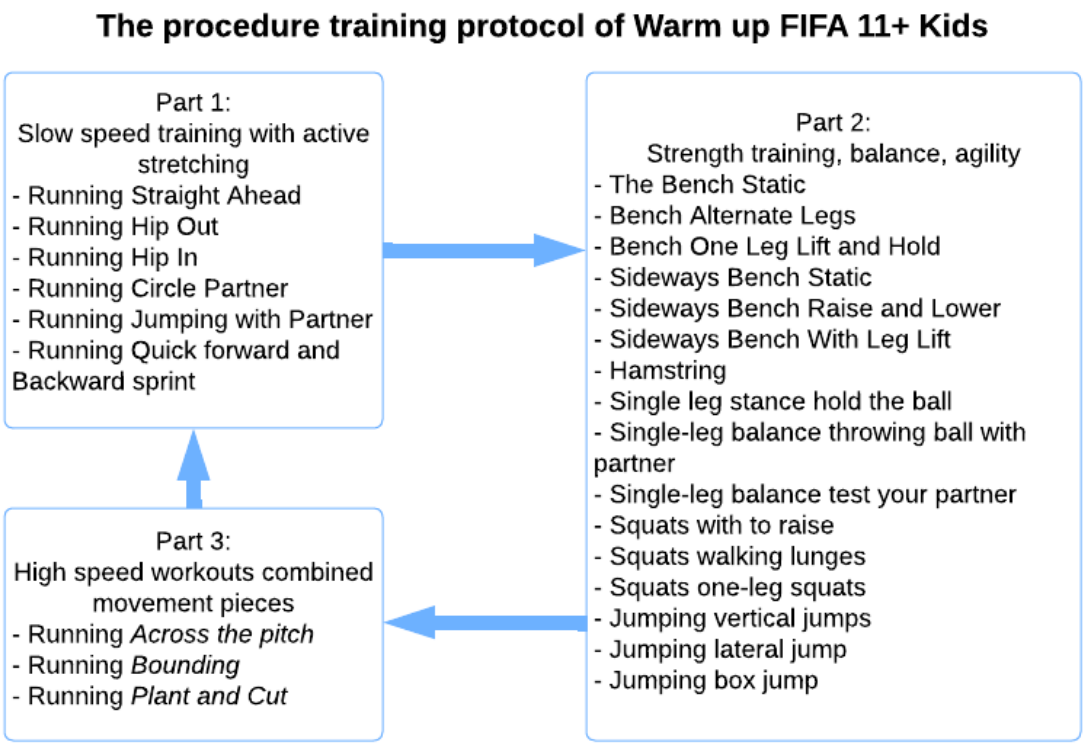

Figure 1. The FIFA 11+ kids warm-up program procedure

Testing protocol

Anthropometric measurements were taken before physical testing. Standing height (cm) and body mass (kg) were measured.

Static balance. The stock stand test was performed (balancing on left and right foot) by the participants on the outdoor football field.

Dynamic balance. The bass modified test was performed to evaluate the dynamic balance on the outdoor football field.

Leg muscle strength. The back and leg dynamometer test was performed to evaluate the participant's back and leg muscle strength.

Statistical analysis

Paired t-tests for standard data and Wilcoxon test for abnormal data were used to determine differences in pre- and post-intervention effects. All results were presented as the mean ± standard deviation (SD). The type 1 error of 5% or less in comparing mean differences was considered significant.

Results

The characteristic data of the participants is shown in Table 2.

Table 1. Characteristics data of the participants (n = 30)

Parameter	Pretest Mean ± SD	Post-test Mean ± SD
Age (year)	10.5 ± 1.2	10.6 ± 1.2
Height (cm)	141.1 ± 13.8	141.1 ± 13.8
Body weight (kg)	34.9 ± 9.6	35.0 ± 9.5
BMI (kg/cm^2)	17.3 ± 2.2	17.4 ± 2.2

Static balance

Figure 1 shows the static balance for the right and left leg before and after the FIFA 11+ kids warm-up program. Both legs showed similar increased static balance ($p = 0.00 < 0.05$).

Dynamic balance

Figure 2 shows the dynamic balance condition before and after the FIFA 11+ kids warm-up program. The dynamic balance improved by +5.67 after the intervention ($p = 0.00 < 0.05$).

Leg muscle strength

Figure 3 shows the leg muscle strength before and after the FIFA+ kids warm-up program. The leg strength increased by +23.30 kg after the warmup program ($p = 0.00 < 0.05$).

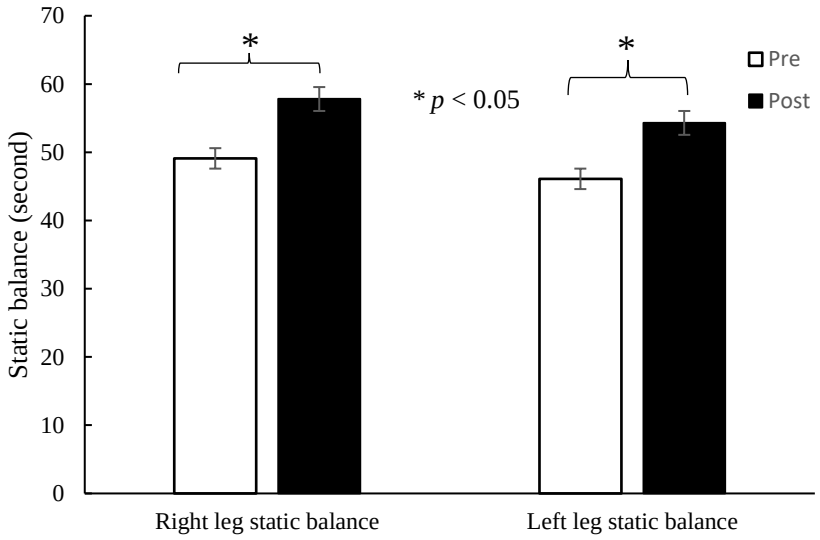

Figure 2. Static balance for the right and left leg; the paired t-test analysis showed significance difference between pretest and post-test, $p < 0.05$.

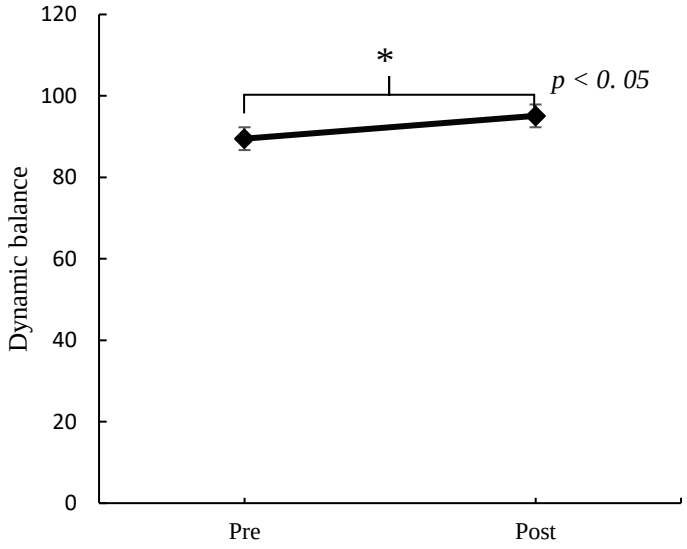

Figure 3. Dynamic balance before and after the intervention using the FIFA 11+ kids warm-up program; Wilcoxon analysis, $p = 0.000 < 0.05$

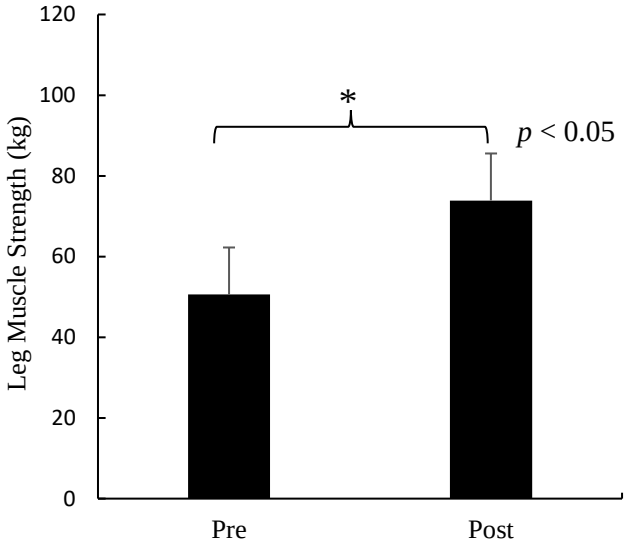

Figure 4. Leg muscle strength compared pre- and post-FIFA 11+ kids warm-up program; the paired t-test analysis was used, $p = 0.000 < 0.05$.

Discussions

The obtained results showed that the FIFA 11+ warm-up program performed for 20 min, 4 times/week for 1 month can improve static and dynamic balance in 9–12-year-old boys. A previous study showed that the FIFA 11+ warm-up program improved the balance of futsal players in high school students in Narmada (Yusuf et al., 2018). The score for right leg static balance at the pretest was 50 for only seven participants (23.3%). After the program, the score increased to 58 for 9 participants (30%). The left leg static balance before the program showed a score of 45 in 13.3% of the participants. After the program, the score increased to 60 for 9 participants. Our study was in line with the previous study. The FIFA 11+ warm-up program increased stability better than normal warm-ups in children under 10 years old (Gatterer et al., 2018). In the right foot static balance test, the pretest score was 49 for as many as 7 (23.3%) samples, while the post-test results increased by 9 scores or 27% to the pre-test.

Similar to a previous study, our study reported that the FIFA 11+ warm-up program increased dynamic balance in football athletes aged 18–20 years (Mu'allimah & Wijianto, 2019). Our study obtained a similar result. Specifically, dynamic balance increased by +5.67 from 26.7% of the participants to 33.3% in football school students aged 9–12 years old. Another study found that six weeks of FIFA 11+ warm-up improved dynamic balance in young soccer players (Dunsky et al., 2017).

This study found a significant increase of 53% in leg muscle strength in 9–12-year-old football school students. Based on the leg muscle strength, the obtained results confirmed that the FIFA 11+ warm-up program reduced injuries by 21–32% in the lower extremities in 13–19 years old football players (Pardos-Mainer et al., 2019b) and by almost 50% in 7–13-year-old football players (Spurrier, 2019b).

Conclusions

This research investigated the effect of the FIFA 11+ warm-up program in injury prevention and performance in football players. The FIFA 11+ kids warm-up program improved static and dynamic balance as well as leg muscle strength in 9–12-year-old children. The results showed that the FIFA 11+, to avoid injury and enhance the physical attributes in youth football athletes, the coaches need to use the FIFA 11+ warm-up procedures. More high-quality studies are needed in order to increase the transparency of its clinical implications.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Acknowledgment

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The Warm-Up FIFA 11+ for Kids Program Improved Balance and Leg Muscle Strength in Children (9-12 years old)

by Sssri Sumartiningsih

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Word count: 2269
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The Warm-Up FIFA 11+ for Kids Program Improved Balance and Leg Muscle Strength in Children (9-12 years old)

Abstract:

Children's physical attributes, especially balance and leg strength, need to improve and reduce injury during training football. The situation of playing football is essentially acceleration, declaration, changing direction rapidly, running, jumping, and landing. It needs physical attributes good and stronger to avoid injury. F-MARC developed FIFA 11+ Kids warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warming up program for kids to increase leg muscle strength and balance in youth football aged 9-12. The study design used quasi-experiment with one group pretest and post-test design. Thirty participants aged between 9 to 12 years who were a student at a football school signed informed consent to participate in this study. The Warm-up FIFA 11+ for kids' program was conducted for 20 minutes, four times a week and a month. The data measured static balance by stage with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times before and after the program. The data analysis used a paired t-test and Wilcoxon. The study showed that an increased static balance (left leg Δ + 8.23) and (right leg Δ + 8.70), dynamic balance (Δ + 4) and leg muscle strength (Δ + 23.30), $p = 0.00$, $p \leq 0.05$, compared before and after intervention of Warm-up FIFA 11+ for kids' program. Therefore, FIFA 11+ for kids warming up program suggests improved static balance, dynamic balance, and leg muscle strength for youth football players.

Key Words: - Injury prevention, static balance, dynamic balance, leg strength

Commented [Reviewer1]: Please replace it with a sentence that describes the background of this study

Commented [SS2R1]: Thanks for your suggestion. I add the background study

Introduction

The most popular sport worldwide, with more than 200 million people active in the sport, is football (Barengo et al., 2014). The risk of injury during a football match was higher than during a training session (Ekstrand et al., 2011b; FIFA Communications Division, Information Services, 2006). During tournament and training sessions, the specific and predominant injuries were in the lower extremity and thigh strain (Ekstrand et al., 2011a, 2011b).

The FIFA Medical Assessment and Research Center (F-MARC) creates the procedure warming up called FIFA 11+ to lower the rate of injury (Bizzini & Dvorak, 2015b). Various studies showed that FIFA 11+ program has a positive effect on athletes to minimize the risk of injury, increasing performance, and enhancing physical attributes (Bizzini & Dvorak, 2015a; Pardos-Mainer et al., 2019a; Pomares-Noguera et al., 2018a; Rössler, 2016; Rössler et al., 2016; Spurrier, 2019a). The warm-up training program performed seven forms of motion exercises for a maximum of twenty minutes (Spurrier, 2019b). The motion focus on three training: 1) Three exercises for unilateral and dynamic stability on the lower extremity, 2) three exercises for full body strength, and 3) one exercise for the falling technique (Spurrier, 2019b).

The program is positively helpful in reducing the injury rate of 20-50% in football players (Al Attar et al., 2016; Soligard et al., 2008). Nevertheless, in Semarang city, Central Java province, the application of FIFA 11+ for kids was a minimum football clubs (Sumartiningsih et al., 2020) . Therefore, we conducted the FIFA 11+ warm-up for kids to evaluate static and dynamic balance and leg muscle strength before and after the program training in youth football players.

Commented [Reviewer3]: It is necessary to add a sentence that emphasizes the research gap, while research on the effects of the FIFA 11+ warming up program has been presented.

Commented [SS4R3]: Yes, I deleted it. Thanks for the suggestion.

Material & methods

Ethics

The Human Subjects Committee approved the study of the Universitas Negeri Semarang (No. 146/UNNES/KEC/2020). Before the experiment, each participant provided informed written consent. All the procedures conformed to the standards of the Declaration of Helsinki.

Subjects

Thirty male children with a mean ± standard deviation (age; 10.5 ± 1.1 years, height; 141.13 ± 13.8-centimeter, body mass; 34.8 ± 9.6 kg) volunteered to participate in FIFA 11+ warm-up program. These children attended a football club in Jatayu Football School in Solo city. Inclusion criteria in the study required the children to follow the entire program without any absence, not take a supplement, and have no cardiovascular diseases.

Design

The quasi-experimental study with one group pretest and post-test design was designed to analyze the effect of the four-week FIFA 11+ program on static and dynamic balance and muscle strength in youth football players. Before football training, the participant follows the FIFA 11+ warming up the program for 20 minutes each session for 16 sessions a month.

Measurements

All study was performed on the football field, with a mean temperature of 29^0 Celsius, a humidity of 70%, and wind of 10 km/hours from 3.00 to 3.20 pm in each session of FIFA 11+ warming up. The participants were tested for dynamic balance, static balance and back and leg muscle strength.

Training Programs

The FIFA 11+ kids warm-up program focuses on spatial orientation, anticipation, and perception, especially when dual tasking (avoiding unintentional contact with other players or objects). Body stability and movement coordination (commons rather than specific); learning proper fall techniques (to minimize the consequences of unavoidable falls)(Pomares-Noguera et al., 2018b).

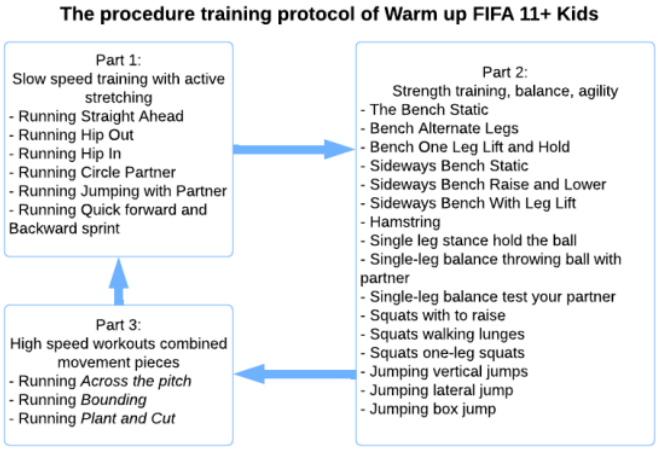

Figure 1. The procedure for warm-up FIFA 11+Kids Program

Testing Protocol

Anthropometric measurements were taken before the physical testing. Standing height (cm) and body mass (kg) were measured.

Static Balance. The stock stand test was performed balance left and right foot participants on the outdoor football field.

Dynamic Balance. The bass modified test was performed to evaluate the dynamic balance on the outdoor football field.

Leg muscle strength. The back and leg dynamometer test were performed to evaluate the participant's back and leg muscle strength.

Statistical Analysis

Paired t-tests for standard data and Wilcoxon test for abnormal data were used to determine differences in pre- and post-intervention effects. All results were presented as mean ± standard deviation (SD). The type 1 error of 5% or less in comparing mean differences was considered significant.

Results

The characteristic data of participants showed in Table 2.

Table 1. Characteristics data of participants (n = 30)

Parameter	Pretest Mean ± SD	Post-test Mean ± SD
Age (year)	10.5 ± 1.2	10.6 ± 1.2
Height (centimeter)	141.1 ± 13.8	141.1 ± 13.8
Body Weight (kilogram)	34.9 ± 9.6	35.0 ± 9.5
BMI (kg/cm^2)	17.3 ± 2.2	17.4 ± 2.2

Static balance

Figure 1 shows the static balance in the right leg and left leg condition before and after warm-up FIFA 11+ for the kids' program. Both legs showed similar increased static balance ($p = 0.00 < 0.05$).

Dynamic balance

Figure 2 shows the dynamic balance condition before and after the FIFA 11+ kids' program warm-up. The dynamic balance improved +5.67 after intervention ($p = 0.00 < 0.05$).

Leg Muscle Strength

Figure 3 shows the leg muscle strength before and after the Warm-up FIFA+ kids' program. The leg strength increased by +23.30 kg after the warmup program ($p = 0.00 < 0.05$).

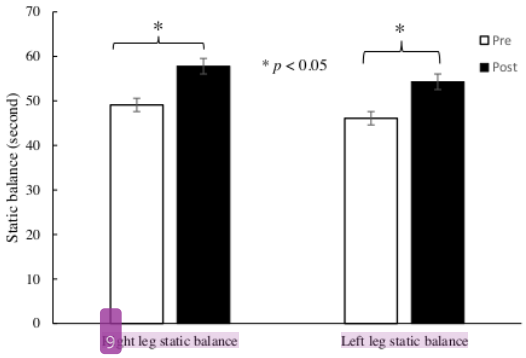

Figure 2. Static balance in the right and left leg, analysis paired t-test, showed significance pretest and post-test, $p < 0.05$.

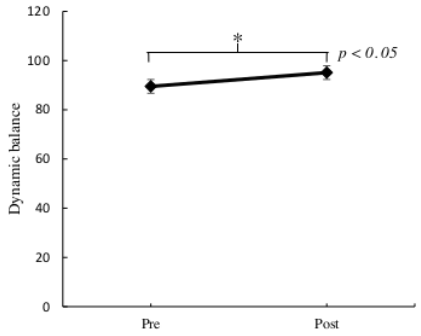

Figure 3. Dynamic balance before and after the intervention of Warm-up FIFA 11+ for Kids Program, Wilcoxon analysis $p = 0.000 < 0.05$

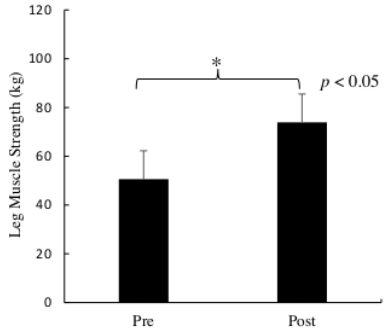

Figure 4. Leg Muscle Strength comparative and post-warm-up FIFA 11+ for Kids program, Analysis used paired t-test, $p = 0.000 < 0.05$

Discussion

The results showed that the FIFA 11+ warm-up program 20 minutes, 4 times/week for 1 month, could improve static and dynamic balance in boys aged 9-12 years old. This study supported that the FIFA 11+ program improved the balance of futsal players in High school students in Narmada (Yusuf et al., 2018). The score for right leg static balance at the pretest was 50 for only seven participants (23.3%). After the program increased 58 scores to 9 participants (30%), the left leg static balance before the program showed a 13.3% participant score of 45. After the program, the score increased to 60 scores for 9 participants. Our study was in line with the previous study; the warm-up FIFA 11+ program increased more excellent stability than normal warm-ups in children under 10 years old

(Gatterer et al., 2018). In the right foot static balance test, the pretest score was 50, with as many as 7 (23.3%) samples, while the post-test results.

Our study, similar to the previous study, reported that the FIFA 11+ program increased dynamic balance in football athletes aged 18-20 (Mu'allimah & Wijianto, 2019). Our study had a similar result: dynamic balance increased +5,67 from 26.7% of participants to 33.3% in football school students aged 9-12 years old. A similar result found that six weeks of Warm-up FIFA 11+ improved dynamic balance in young soccer players (Dunsky et al., 2017).

The study found that significant increase of 53% in leg muscle strength in football school among children 9-12 years old. The result supported that the FIFA 11+ program reduced 21-32% of injuries in the inferior extremity in the 13-19 years old (Pardos-Mainer et al., 2019b) and reduced almost 50% in the aged 7-13 years old (Spurrier, 2019b).

Conclusions

The Warm-Up FIFA 11+ for kids program improved balance in static and dynamic also leg muscle strength in children 9-12 years old.

Conflicts of interest - no conflicts of interest to declare.

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The Warm-Up FIFA 11+ for Kids Program Improved Balance and Leg Muscle Strength in Children (9-12 years old)

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The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

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The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

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Abstract:
Children's physical attributes, especially balance and leg strength, need to improve to reduce injury during football training. Playing football involves acceleration, declaration, rapidly changing direction, running, jumping, and landing. It requires good physical attributes and strength to avoid injury. The FIFA Medical and Research Center (F-MARC) developed the FIFA 11+ Kids warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warm-up program for kids to increase leg muscle strength and balance in youth football (9–12 years old). The study design used a quasi-experiment with one group pretest and post-test design. Thirty participants aged between 9 to 12 years, who were students at a football school, signed informed consent to participate in this study. The FIFA 11+ for kids warm-up program was conducted for 20 min, four times a week, for a month. The data measured static balance by stagy with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times before and after the program. The data analysis used a paired t-test and Wilcoxon signed-rank test. The study showed an increased static balance (left leg $\Delta + 8.23$) and (right leg $\Delta + 8.70$), dynamic balance ($\Delta + 5.24$), and leg muscle strength ($\Delta + 23.30$), $p = 0.00$, $p \leq 0.05$, between before and after intervention using the FIFA 11+ for kids warm-up program. Therefore, the FIFA 11+ for kids warm-up program results in improved static balance, dynamic balance, and leg muscle strength in youth football players.

Key Words: Injury prevention, static balance, dynamic balance, leg strength

Introduction

Football is the most popular sport worldwide, with more than 200 million people who are active in the sport (Barengo et al., 2014). The risk of injury during a football match is higher than during a training session (Ekstrand et al., 2011b; FIFA Communications Division, Information Services, 2006). During tournaments and training sessions, the specific and dominant injuries were in the lower extremities and thigh strain (Ekstrand et al., 2011a, 2011b).

The FIFA Medical Assessment and Research Center (F-MARC) created a warm-up procedure called FIFA 11+ to lower the rate of injury (Bizzini & Dvorak, 2015b). Various studies have shown that the FIFA 11+ program has a positive effect on athletes by minimizing the risk of injury, increasing performance, and enhancing physical attributes (Bizzini & Dvorak, 2015a; Pardos-Mainer et al., 2019a; Pomares-Noguera et al., 2018a; Rössler, 2016; Rössler et al., 2016; Spurrier, 2019a). The warm-up training program includes seven forms of motion exercises that are performed for a maximum of twenty minutes (Spurrier, 2019b). The motions focus on three training aspects: 1) three exercises for unilateral and dynamic stability of the lower extremities, 2) three exercises for full body strength, and 3) one exercise for the falling technique (Spurrier, 2019b).

The program helps to reduce the injury rate by 20–50% in football players (Al Attar et al., 2016; Soligard et al., 2008). Nevertheless, in Semarang city, Central Java province, Indonesia, the FIFA 11+ warm-up program was minimally used for kids in football clubs (Sumartiningsih et al., 2020). Therefore, we implemented the FIFA 11+ warm-up for kids to evaluate static and dynamic balance and leg muscle strength before and after using the program in youth football players.

Materials and methods

Ethics

The Human Subjects Committee of the Universitas Negeri Semarang approved the study (No. 28/KEPK/EC/2020). Before the experiment, each participant provided informed written consent. All procedures conformed to the standards of the Declaration of Helsinki.

Subjects

Thirty male children (age, 10.5 ± 1.1 years; height, 141.13 ± 13.8 cm; body mass, 34.8 ± 9.6 kg) volunteered to participate in the FIFA 11+ warm-up program. These children attended a football club in Jatayu Football School in Solo city. Inclusion criteria in the study required the children to follow the entire program without any absence, not take supplements, and have no cardiovascular diseases.

Design

The quasi-experimental study with one group pretest and post-test design was designed to analyze the effect of the four-week FIFA 11+ program on static and dynamic balance and muscle strength in youth football players. Before football training, the participants perform the FIFA 11+ warm-up program for 20 min each session for 16 sessions a month.

Measurements

The study was performed on the football field, with a mean temperature of 29°C, 70% humidity, and 10 km/h wind speed; the FIFA 11+ warm-up was performed from 15:00 to 15:20 during each session. The participants were tested for dynamic balance, static balance, and back and leg muscle strength.

Training programs

The FIFA 11+ kids warm-up program focuses on spatial orientation, anticipation, perception [especially when dual tasking (avoiding unintentional contact with other players or objects)], body stability and movement coordination (commons rather than specific) and learning proper falling techniques (to minimize the consequences of unavoidable falls) (Pomares-Noguera et al., 2018b).

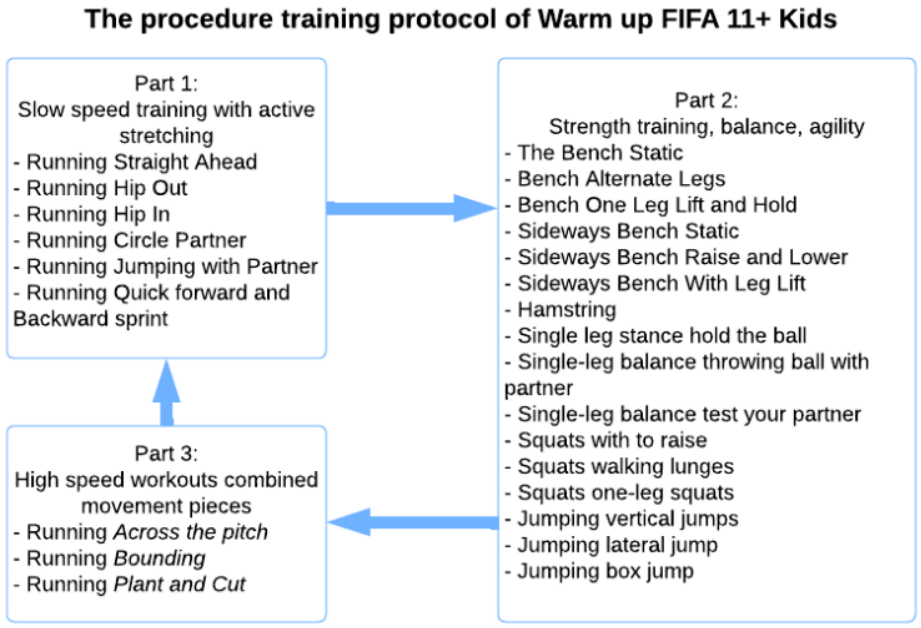

Figure 1. The FIFA 11+ kids warm-up program procedure

Testing protocol

Anthropometric measurements were taken before physical testing. Standing height (cm) and body mass (kg) were measured.

Static balance. The stock stand test was performed (balancing on left and right foot) by the participants on the outdoor football field.

Dynamic balance. The bass modified test was performed to evaluate the dynamic balance on the outdoor football field.

Leg muscle strength. The back and leg dynamometer test was performed to evaluate the participant's back and leg muscle strength.

Statistical analysis

Paired t-tests for standard data and Wilcox test for abnormal data were used to determine differences in pre- and post-intervention effects. All results were presented as the mean ± standard deviation (SD). The type 1 error of 5% or less in comparing mean differences was considered significant.

Results

The characteristic data of the participants is shown in Table 2.

Table 1. Characteristics data of the participants (n = 30)

Parameter	Pretest Mean ± SD	Post-test Mean ± SD
Age (year)	10.5 ± 1.2	10.6 ± 1.2
Height (cm)	141.1 ± 13.8	141.1 ± 13.8
Body weight (kg)	34.9 ± 9.6	35.0 ± 9.5
BMI (kg/cm^2)	17.3 ± 2.2	17.4 ± 2.2

Static balance

Figure 1 shows the static balance for the right and left leg before and after the FIFA 11+ kids warm-up program. Both legs showed similar increased static balance ($p = 0.00 < 0.05$).

Dynamic balance

Figure 2 shows the dynamic balance condition before and after the FIFA 11+ kids warm-up program. The dynamic balance improved by +5.67 after the intervention ($p = 0.00 < 0.05$).

Leg muscle strength

Figure 3 shows the leg muscle strength before and after the FIFA+ kids warm-up program. The leg strength increased by +23.30 kg after the warmup program ($p = 0.00 < 0.05$).

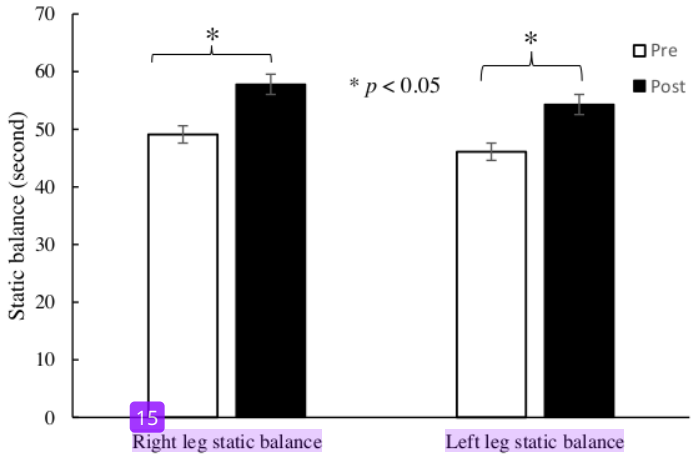

Figure 2. Static balance for the right and left leg; the paired t-test analysis showed significance difference between pretest and post-test, $p < 0.05$.

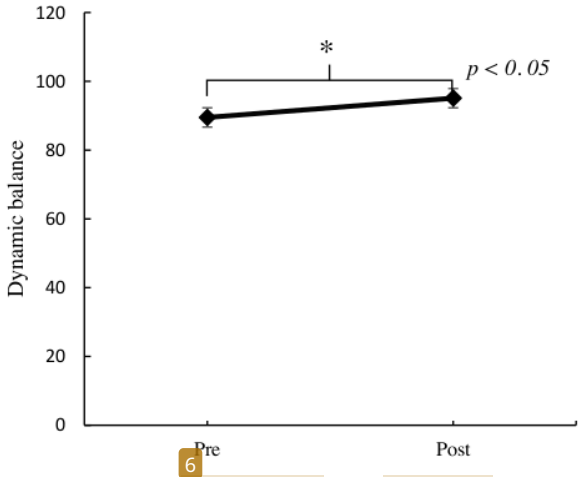

Figure 3. Dynamic balance before and after the intervention using the FIFA 11+ kids warm-up program; Wilcoxon analysis, $p = 0.000 < 0.05$

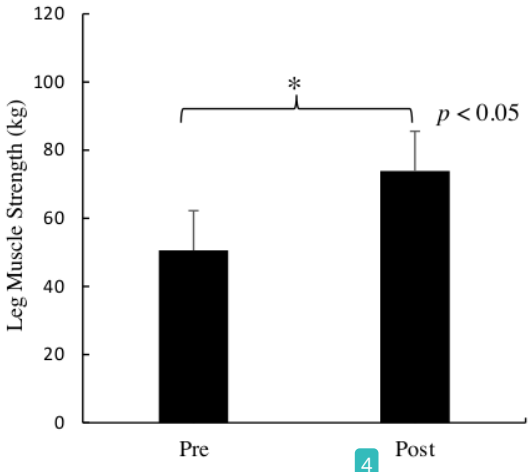

Figure 4. Leg muscle strength compared pre- and post-FIFA 11+ kids warm-up program; the paired t-test analysis was used, $p = 0.000 < 0.05$.

Discussions

The obtained results showed that the FIFA 11+ warm-up program performed for 20 min, 4 times/week for 1 month can improve static and dynamic balance in 9–12-year-old boys. A previous study showed that the FIFA 11+ warm-up program improved the balance of futsal players in high school students in Narmada (Yusuf et al., 2018). The score for right leg static balance at the pretest was 50 for only seven participants (23.3%). After the program, the score increased to 58 for 9 participants (30%). The left leg static balance before the program showed a score of 45 in 13.3% of the participants. After the program, the score increased to 60 for 9 participants. Our study was in line with the previous study. The FIFA 11+ warm-up program increased stability better than normal warm-ups in children under 10 years old (Gatterer et al., 2018). In the right foot static balance test, the pretest score was 49 for as many as 7 (23.3%) samples, while the post-test results increased by 9 scores or 27% to the pre-test.

Similar to a previous study, our study reported that the FIFA 11+ warm-up program increased dynamic balance in football athletes aged 18–20 years (Mu'allimah & Wijianto, 2019). Our study obtained a similar result. Specifically, dynamic balance increased by +5.67 from 26.7% of the participants to 33.3% in football school students aged 9–12 years old. Another study found that six weeks of FIFA 11+ warm-up improved dynamic balance in young soccer players (Dunsky et al., 2017).

This study found a significant increase of 53% in leg muscle strength 5 9–12-year-old football school students. Based on the leg muscle strength, the obtained results confirmed that the FIFA 11+ warm-up program reduced injuries by 21–32% in the lower extremities in 13–19 years old football players (Pardos-Mainer et al., 2019b) and by almost 50% in 7–13-year-old football players (Spurrier, 2019b).

Conclusions

The FIFA 11+ kids warm-up program improved static and dynamic balance as well as leg muscle strength in 9–12-year-old children. According to the findings, to avoid injury and enhance the physical attributes in youth football athletes, the coaches need to use the FIFA 11+ warm-up procedures.

2

Conflicts of interest

The authors declare that there are no conflicts of interest.

Acknowledgment

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The Warm-Up FIFA 11+ for Kids Program Improved Balance and Leg Muscle Strength in Children (9-12 years old)

by Sri Sumartiningsih

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The Warm-Up FIFA 11+ for Kids Program Improved Balance and Leg Muscle Strength in Children (9-12 years old)

Abstract:

F-MARC develop FIFA 11+ warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warming up a program for kids to increase leg muscle strength and balance on youth football aged 9-12 years old. The study design used quasi-experiment with one group pretest and posttest design. Thirty participants aged between 9 to 12 years, who were a student at football school signed informed consent to participate in this study. The Warm-up FIFA 11+ for kids' program was conducted for 20 minutes, four times a week and a month. The data measured static balance by stage with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times prior to intervention and after the program. The data analysis used a paired t-test and Wilcoxon. The study showed that an increased static balance (left leg $\Delta + 8.23$) and (right leg $\Delta + 8.70$), dynamic balance ($\Delta + 5.24$) and leg muscle strength ($\Delta + 23.30$), $p = 0.00$, $p \leq 0.05$, compared before and after intervention of Warm-up FIFA 11+ for kids program. Therefore, FIFA 11+ for kids warming up program improved static balance, dynamic balance, and leg muscle strength in football student.

Key Words: - Injury prevention, static balance, dynamic balance, leg strength

Introduction

The most popular sport worldwide, with more than 200 million people active in the sport, is football (Barengo et al., 2014). The risk of injury during a football match was higher than during a training session (Count, 2006; Ekstrand et al., 2011b). During tournament and training sessions, the specific and dominant injuries were in the inferior extremity and thigh strain (Ekstrand et al., 2011b, 2011a).

The FIFA Medical Assessment and Research Center (F-MARC) creates a protocol warming up called FIFA 11+ to reduce the injury percentage (Bizzini & Dvorak, 2015). Various studies showed a positive effect of the FIFA 11+ program on athletes (Daneshjoo et al., 2013; Gatterer et al., 2018; Pomares-Noguera et al., 2018; Rössler et al., 2016; Zarei et al., 2018). The warming-up program performed seven kinds of movement in exercises for 15-20 minutes(Spurrier, 2019). The exercises are focused on three exercises for unilateral and dynamic stability on the inferior extremity, three exercises for whole body strength, and one exercise for the falling technique (Spurrier, 2019).

The effectiveness of the FIFA 11+ warming up program was investigated. Numerous studies found that the FIFA 11+ reduced risk of injury in the inferior extremity enhanced performance, and improved physical attributes in football players (Bizzini & Dvorak, 2015; Daneshjoo et al., 2012, 2013; Pardos-Mainer et al., 2019; Pomares-Noguera et al., 2018; Rössler et al., 2016; Spurrier, 2019). The program is positively useful reduce the injury rate of 20-50% in football players (Al Attar et al., 2016; Soligard et al., 2008). Based on the background study, we conducted the FIFA 11+ warm-up for kids to evaluate both static and dynamic balance, and the leg muscle strength before exercise training in youth football players.

Material & methods

Ethics

The study was approved by the Human Subjects Committee of the Universitas Negeri Semarang (No. 23/KEPK/EC/2020). Before the experiment, each participant provided informed written consent. All the procedures conformed to the standards of the Declaration of Helsinki.

Subjects

Thirty male children with a mean ± standard deviation (age; 10.5 ± 1.1 years, height; 141.13 ± 13.8-centimetre, body mass; 34.8 ± 9.6 kg), volunteered to participate in FIFA 11+ warm up program. These children were attending football club in Jatayu Football School at Solo city. Inclusion criteria in the study required the children following the full program without any absence, not taking supplement, no cardiovascular diseases.

Design

The quasi-experimental study with one group pre-test and post-test design was designed to analyze the effect of four-week FIFA 11+ program on static and dynamic balance, and muscle strength in youth football players. Before football training the participant was following the FIFA 11+ warming up program for 20 minutes in each session for 16 sessions in a month.

Measurements

All study was performed in the football field, with mean of the temperature 29^0 Celsius, humidity 70%, and wind 10 km/hours at 3.00 to 3.20 pm in each session of FIFA 11+ warming up. The participants were test for dynamic balance, static balance and back and leg muscle strength.

Training Programs

The FIFA 11+ for Kids Warming up program focus on spatial orientation, anticipation, and attention particularly while dual tasking (to avoid unintended contact with other players or objects); body stability and movement coordination (more general than specific); learning appropriate fall techniques (to minimize the consequences of unavoidable falls).

Table 1. The FIFA 11+Kids Program

No	Exercise	Movement	Duration
1	Jog and Look at the coach (to stop)	listen to the command	3 x 5 stop command
		watch for the command	3 x 5 stop command
		Keep the ball in the hands and listen to the command	3 x 5 stop command
		keep the ball in the hands and watch for the command	3 x 5 stop command
		Juggle the ball and listen to the command	3 x 5 stop command
2	Skating Hop	practice how to land on one leg	2 x 10 hops (5 on each leg)
		keep ball in the hands	2 x 10 hops (5 on each leg)
		balance the ball on one hand	2 x 10 hops (5 on each leg)
		touch the ground with the ball	2 x 10 hops (5 on each leg)
		balance and stretch forward with the ball	2 x 10 hops (5 on each leg)
3	One leg stance	throw the ball	1 x right/left and 5 passes per player
		circle the ball around the leg & throw it	1 x right/left and 5 passes per player
		Pass the ball	1 x right/left and 5 passes per player
		throw the ball & play it back	1 x right/left and 5 passes per player
		Challenge your balance	1 x right/left for 20 seconds
4	Push up	make a tunnel & roll the ball underneath	2 x until each kid rolls 1 X the ball (max 8 kids)
		in a plank position & roll the lower legs on the ball	3 x @ 15 seconds
		keep position & roll the ball between hands	3 x @ 15 seconds
		keep position & roll the ball between hands and feet	3 x @ 15 seconds
		Hands on the ball & challenge your position	3 x @ 10 seconds
5	One leg hops	Hop forwards	2 x hops on right leg and 5 hops on left leg
		hop forwards & backwards	2 x hops on right leg and 5 hops on left leg

		Hop sideways	2 x hops on right leg and 5 hops on left leg
		follow the command & hop	2 x hops on right leg and 5 hops on left leg
		follow the command & hop while holding the ball in the hands	2 x hops on right leg and 5 hops on left leg
6	Spiderman	touch the ball with alternating feet	3 x @15 seconds
		stretch out the position	3 x @15 seconds
		crawling	3 x over 5 – 10 meters
		Crawling & move the ball between the feet	3 x over 5 – 10 meters
		crawling with the hands & move the ball with the feet	3 x over 5 – 7 meters
7	Roll over	crouch and roll over	5 x 7 per side
		from standing, slowly roll over	5 x 7 per side
		from standing, quickly roll over	5 x 7 per side
		slow walk & roll over	5 x 7 per side
		Jog & roll over	5 x 7 per side

Testing Protocol

Anthropometric measurements were taken before the physical testing. Standing height (cm) and body mass (kg) were measured.

Static Balance. The stock stand test was performed balance left and right foot participant in outdoor football field.

Dynamic Balance. The bass modified test was performed to evaluate the dynamic balance in outdoor football field.

Leg muscle strength. Back and leg dynamometer test was performed to evaluate the back and leg muscle strength of the participant.

Statistical Analysis

All results were presented as mean ± standard deviation (SD). Type 1 error equal or less than 5% for comparing mean difference was considered significant. Paired t-test for normal distribution data and Wilcoxon for anormal data was used to determine of difference effect before and after intervention.

Results

The characteristic data of participant showed in the Table 2.

Table 2. Characteristics data of participants (n = 30)

Parameter	Pre-test Mean ± SD	Post-test Mean ± SD
Age (year)	10. 5±1.2	10.6±1.2
Height (centimeter)	141.1±13.8	141.1±13.8
Body Weight (kilogram)	34.9±9.6	35.0±9.5
BMI (kg/cm^2)	17.3±2.2	17.4±2.2

Static balance

Figure 1 shows the static balance in the right leg and left leg condition before intervention and after warm-up FIFA 11+ for kids' program. Both legs showed similar increased static balance ($p = 0.00 < 0.05$).

Dynamic balance

Figure 2 shows the dynamic balance condition prior to program and after the warm-up FIFA 11+ kids program. The dynamic balance improved +5,67 after intervention.

Leg Muscle Strength

Figure 3 shows the leg muscle strength condition before and after intervention Warm-up FIFA+ kids program. The leg strength increased by +23,30 kg after the warm up program.

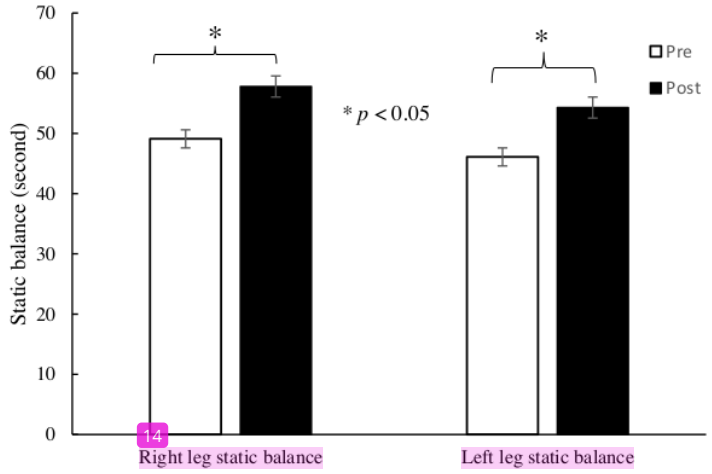

Figure 1. Static balance in the right and left leg, analysis paired t-test, showed significance pre-test and post-test, $p < 0.05$.

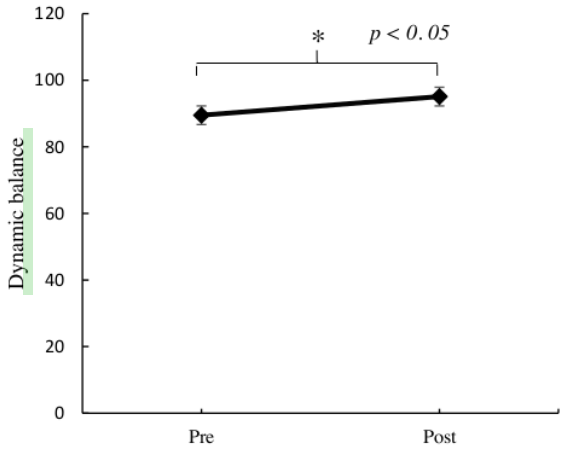

Figure 2. Dynamic balance before and after intervention of Warm-up FIFA 11+ for Kids Program, Wilcoxon analysis $p = 0.000 < 0.05$

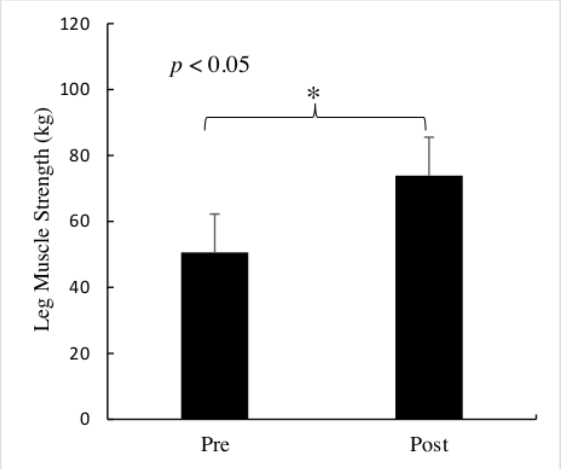

Figure 3. Leg Muscle Strength compared pre and post warm-up FIFA 11+ for Kids program, Analysis used paired t-test, $p = 0.000 < 0.05$

Discussion

The results showed that the FIFA 11+ warm-up program for 20 minutes, 4 times/week for 1 month could improve balance, both static and dynamic in boys aged 9-12 years old. This study supported that FIFA 11+ program improved balance of futsal player of High school student Narmada (Yusuf et al., 2019). The score right leg static balance at pre-test was 50 only seven participant (23.3%), and after program increased 58 score to be 9 participant (30%), in the left leg static balance before program showed 13.3% participant score 45, and after the program the score increased to 60 score for 9 participants. Our study was in line with the previous study, that is warm-up FIFA 11+ program increased greater stability than normal warm-up in children aged below 10 years old (Gatterer et al., 2018). In the right foot static balance test, the pre-test score was 50 as many as 7 (23.3%) samples, while the results of the post-test.

Our study similar result in the previous study reported that the FIFA 11+ program increased dynamic balance in football athletes aged 18-20 years old (Mu'allimah et al., 2019). Our study similar result that dynamic balance increased +5,67 from 26.7% participant to 33.3% in the football school students aged 9-12 years old. Similar result found that six weeks Warm-up FIFA 11+ improved dynamic balance in young soccer players (Dunsky et al., 2017).

The study found that significant increased 53% leg muscle strength in football school at children 9-12 years old, was supported that FIFA 11+ program reducing 21-32% injuries in the inferior extremity in the aged 13-19 years old (Pardos-Mainer et al., 2019) and reduced almost 50% in the aged 7-13 years old (Spurrier, 2019).

Conclusions

The Warm-Up FIFA 11+ for kids program improved balance in static and dynamic also leg muscle strength in children 9-12 years old.

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Original Article

The FIFA 11+ for kids warm-up program improved balance and leg muscle strength in children (9–12 years old)

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Abstract:
Children's physical attributes, especially balance and leg strength, need to improve to reduce injury during football training. Playing football involves acceleration, declaration, rapidly changing direction, running, jumping, and landing. It requires good physical attributes and strength to avoid injury. The FIFA Medical and Research Centre F-MARC) developed the FIFA 11+ Kids warm-up program to prevent injury in football. The study's objective was to determine the effect of the FIFA 11+ warm-up program for kids to increase leg muscle strength and balance in youth football (9–12 years old). The study design used a quasi-experiment with one group pretest and post-test design. Thirty participants aged between 9 to 12 years, who were students at a football school, signed informed consent to participate in this study. The FIFA 11+ for kids warm-up program was conducted for 20 min, four times a week, for a month. The data measured static balance by stage with a stroke stand, dynamic balance by a modified bass test, and leg strength by dynamometer, taken two times before and after the program. The data analysis used a paired t-test and Wilcoxon signed-rank test. The study showed an increased static balance (left leg $\Delta + 8.23$) and (right leg $\Delta + 8.70$), dynamic balance ($\Delta + 5.24$), and leg muscle strength ($\Delta + 23.30$), $p = 0.00$, $p \leq 0.05$, between before and after intervention using the FIFA 11+ for kids warm-up program. Therefore, the FIFA 11+ for kid's warm-up program results in improved static balance, dynamic balance, and leg muscle strength in youth football players.
Key Words: Injury prevention, static balance, dynamic balance, leg strength

Introduction

Football is the most popular sport worldwide, with more than 200 million people who are active in the sport (Barengo et al., 2014). The risk of injury during a football match is higher than during a training session (Ekstrand et al., 2011b; FIFA Communications Division, Information Services, 2006). During tournaments and training sessions, the specific and dominant injuries were in the lower extremities and thigh strain (Ekstrand et al., 2011a, 2011b). Additionally, injury prevention strategies are crucial during weekly macrocycles with high loading, such as competitive seasons, where injuries are most common. It is well acknowledged that the amount of training required depends on the age group, training day, week, and position played. Coaches have chance to match training and match variables for static balance, dynamic balance, and leg strength (Jaka Pratama Galeko Et Al., 2022; Marek Tvrdý & Miroslav Holienka, 2022; Muhammad Hamdan et al., 2022)

The FIFA Medical Assessment and Research Center (F-MARC) created a warm-up procedure called FIFA 11+ to lower the rate of injury (Bizzini & Dvorak, 2015b). Various studies have shown that the FIFA 11+ program has a positive effect on athletes by minimizing the risk of injury, increasing performance, and enhancing physical attributes (Bizzini & Dvorak, 2015a; Pardos-Mainer et al., 2019a; Pomares-Noguera et al., 2018a; Rössler, 2016; Rössler et al., 2016; Spurrier, 2019a). The warm-up training program includes seven forms of motion exercises that are performed for a maximum of twenty minutes (Spurrier, 2019b). The motions focus on three training aspects: 1) three exercises for unilateral and dynamic stability of the lower extremities, 2) three exercises for full body strength, and 3) one exercise for the falling technique (Spurrier, 2019b).

The program helps to reduce the injury rate by 20–50% in football players (Al Attar et al., 2016; Soligard et al., 2008). Nevertheless, in Semarang city, Central Java province, Indonesia, the FIFA 11+ warm-up program was minimally used for kids in football clubs (Sumartiningsih et al., 2020). Therefore, we implemented the FIFA

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11+ warm-up for kids to evaluate static and dynamic balance and leg muscle strength before and after using the program in youth football players. The impact of the FIFA 11+ as a football player injury prevention program has been investigated in earlier research. Additionally, FIFA 11+'s efficacy in enhancing athletic performance is required for both injury prevention and sport performance. Analyse the FIFA 11+ warm-up program's effectiveness at preventing injuries in football players of all genders. This study also aims to assess about how this program affects athletes' performance. Football players' muscle strength, sprint speed, jump height, balance, and proprioception are all factors in their performance. This review's main objective is to determine whether the teams should use the FIFA 11+ training program during their practices. Due to the high danger of injuries, particularly to the lower limbs, in football, the practical applications of this research are crucial. Warm-up regimens are extremely important, which is supported by the fact that these injuries are primarily caused by controllable variables. The FIFA 11+ program's suggestion that these initiatives be simple to implement and inclusive of all players is in line with this (Muhammad Hamdan et al., 2022; Ömer Aksoy et al., 2022; Vlachas & Paraskevopoulos, 2022).

Materials and methods

Ethics

The Human Subjects Committee of the Universitas Negeri Semarang approved the study (No. 146/KEPK/EC/2020). Before the experiment, each participant provided informed written consent. All procedures conformed to the standards of the Declaration of Helsinki.

Subjects

Thirty male children (age, 10.5 ± 1.1 years; height, 141.13 ± 13.8 cm; body mass, 34.8 ± 9.6 kg) volunteered to participate in the FIFA 11+ warm-up program. These children attended a football club in Jatayu Football School in Solo city. Inclusion criteria in the study required the children to follow the entire program without any absence, not take supplements, and have no cardiovascular diseases.

Design

The quasi-experimental study with one group pretest and post-test design was designed to analyze the effect of the four-week FIFA 11+ program on static and dynamic balance and muscle strength in youth football players. Before football training, the participants perform the FIFA 11+ warm-up program for 20 min each session for 16 sessions a month.

Measurements

The study was performed on the football field, with a mean temperature of 29°C, 70% humidity, and 10 km/h wind speed; the FIFA 11+ warm-up was performed from 15:00 to 15:20 during each session. The participants were tested for dynamic balance, static balance, and back and leg muscle strength.

Training programs

The FIFA 11+ kids warm-up program focuses on spatial orientation, anticipation, perception [especially when dual tasking (avoiding unintentional contact with other players or objects)], body stability and movement coordination (commons rather than specific) and learning proper falling techniques (to minimize the consequences of unavoidable falls) (Pomares-Noguera et al., 2018b).

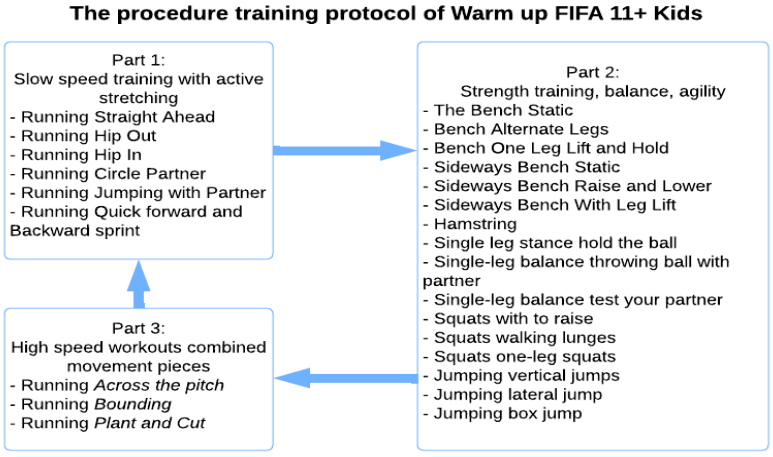

Figure 1. The FIFA 11+ kids warm-up program procedure

Testing protocol

Anthropometric measurements were taken before physical testing. Standing height (cm) and body mass (kg) were measured.

Static balance. The stock stand test was performed (balancing on left and right foot) by the participants on the outdoor football field.

Dynamic balance. The bass modified test was performed to evaluate the dynamic balance on the outdoor football field.

Leg muscle strength. The back and leg dynamometer test was performed to evaluate the participant's back and leg muscle strength.

Statistical analysis

Paired t-tests for standard data and Wilcoxon test for abnormal data were used to determine differences in pre- and post-intervention effects. All results were presented as the mean ± standard deviation (SD). The type 1 error of 5% or less in comparing mean differences was considered significant.

Results

The characteristic data of the participants is shown in Table 2.

Table 1. Characteristics data of the participants (n = 30)

Parameter	Pretest Mean ± SD	Post-test Mean ± SD
Age (year)	10.5 ± 1.2	10.6 ± 1.2
Height (cm)	141.1 ± 13.8	141.1 ± 13.8
Body weight (kg)	34.9 ± 9.6	35.0 ± 9.5
BMI (kg/cm^2)	17.3 ± 2.2	17.4 ± 2.2

Static balance

Figure 1 shows the static balance for the right and left leg before and after the FIFA 11+ kids warm-up program. Both legs showed similar increased static balance ($p = 0.00 < 0.05$).

Dynamic balance

Figure 2 shows the dynamic balance condition before and after the FIFA 11+ kids warm-up program. The dynamic balance improved by +5.67 after the intervention ($p = 0.00 < 0.05$).

Leg muscle strength

Figure 3 shows the leg muscle strength before and after the FIFA+ kids warm-up program. The leg strength increased by +23.30 kg after the warmup program ($p = 0.00 < 0.05$).

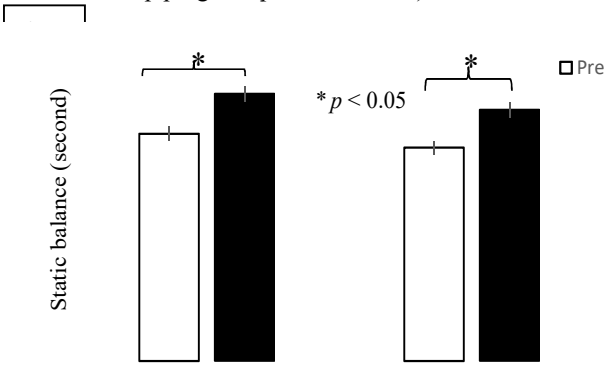

Figure 2. Static balance for the right and left leg; the paired t-test analysis showed significance difference between pretest and post-test, $p < 0.05$.

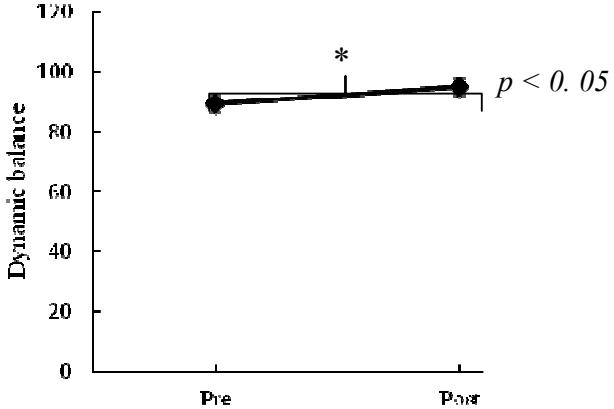

Figure 3. Dynamic balance before and after the intervention using the FIFA 11+ kids warm-up program; Wilcoxon analysis, $p = 0.000 < 0.05$

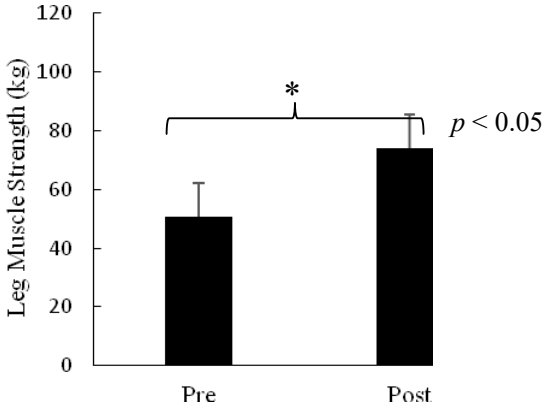

Figure 4. Leg muscle strength compared pre- and post-FIFA 11+ kids warm-up program; the paired t-test analysis was used, $p = 0.000 < 0.05$.

Discussions

The obtained results showed that the FIFA 11+ warm-up program performed for 20 min, 4 times/week for 1 month can improve static and dynamic balance in 9–12-year-old boys. A previous study showed that the FIFA 11+ warm-up program improved the balance of futsal players in high school students in Narmada (Yusuf et al., 2018). The score for right leg static balance at the pretest was 50 for only seven participants (23.3%). After the program, the score increased to 58 for 9 participants (30%). The left leg static balance before the program showed a score of 45 in 13.3% of the participants. After the program, the score increased to 60 for 9 participants. Our study was in line with the previous study. The FIFA 11+ warm-up program increased stability better than normal warm-ups in children under 10 years old (Gatterer et al., 2018). In the right foot static balance test, the pretest score was 49 for as many as 7 (23.3%) samples, while the post-test results increased by 9 scores or 27% to the pre-test.

Similar to a previous study, our study reported that the FIFA 11+ warm-up program increased dynamic balance in football athletes aged 18–20 years (Mu'allimah & Wijianto, 2019). Our study obtained a similar result. Specifically, dynamic balance increased by +5.67 from 26.7% of the participants to 33.3% in football school students aged 9–12 years old. Another study found that six weeks of FIFA 11+ warm-up improved dynamic balance in young soccer players (Dunsky et al., 2017).

This study found a significant increase of 53% in leg muscle strength in 9–12-year-old football school students. Based on the leg muscle strength, the obtained results confirmed that the FIFA 11+ warm-up program reduced injuries by 21–32% in the lower extremities in 13–19 years old football players (Pardos-Mainer et al., 2019b) and by almost 50% in 7–13-year-old football players (Spurrier, 2019b).

Conclusions

The study concluded that The FIFA 11+ Kids warm-up program for 20 minutes each session in 16 times, improved static balance and dynamic balance as well as leg muscle strength in children 9-12 years old at Football club in Semarang city. FIFA 11+ Kid warm-up program aims to avoid injury and improve physical attributes of football players. The physical attributes like static balance, dynamic balance, and leg strength effect on their performance during game. Enhance physical attributes is a key to avoid and reduce injury in athletes. Recommendation to the coaches apply FIFA 11+ warming up program to improve physical performance and injury prevention in their young athletes.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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