

ORIGINAL ARTICLE



# The Effects of the FIFA 11+ and 11+ Kids Training on Injury Prevention in Preadolescent Football Players: A Systematic Review

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## ABSTRACT

**Background.** Most football players (58%) around the world are younger than 18 years and almost three quarters of these young players are under the age of 14 years old. The characteristics of football injuries in children aged 7 - 12 years old are different from those of the young and adult players. **Objectives.** The aim of this systematic review was to evaluate effects of FIFA 11+ and 11+ Kids warm-up programs in preventing the injuries on the pre-adolescents football players. **Methods.** PubMed and Science Direct databases were used using the search terms including FIFA 11+, 11+ kids, injury prevention, football, and pre-adolescent. A total of 520 studies were identified, of which 10 met the inclusion criteria of the review. Methodological quality of the studies were assessed through the PEDro score. **Results.** The 11+ Kids exercises reduce the injury and improve the physical fitness factors such as balance, jumping activities and lower limb isokinetic strength. Although 11+ exercises are designed for players aged over 14 years, they result in an improvement in movement patterns, stability, and trunk muscle endurance. The methodology quality of the randomized studies was in the range of 4 to 7 (out of 10) and the mean score of the studies was obtained 5.6, indicating moderate quality of the methodology. **Conclusion.** 11+ program alone or in a combination with the newly-developed 11+ Kids program may be helpful in preventing the injury and improving the performance, especially if implemented for a longer period or with more exercise sessions per week.

**KEYWORDS:** *11+ Program, 11+ Kids, Injury Prevention, Preadolescent*

## INTRODUCTION

Most football players (58%) around the world are younger than 18 years and almost three quarters of these young players are under the age of 14 years old (1). The characteristics of football injuries in children aged 7 - 12 years old are different from those of the young and adult players. For example, the rate of the bone and upper extremity injuries in the children is higher than that of the older players (2, 3). It is probably due to low skill (4), reduced muscle strength (5), lower muscle endurance and coordination (6). Anterior cruciate ligament injuries also begin to

increase between the ages of 10 and 12 years (7). Children at these ages exhibit risky motor patterns during the landing activities (8, 9). They include decreased knee flexion and increased knee valgus (10). The risk factors are traditionally divided into two categories, including intrinsic (athlete-related risk factor) and extrinsic (environmental risk factor) categories (11). In terms of the prevention and management of the sports injuries, risk factors are divided into modifiable and non-modifiable factors. To prevent or reduce the sport injuries, it is necessary to manipulate the modifiable

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factors (neuromuscular and biomechanical risk factors) (12) to ultimately reduce the risk of the injuries. Physical fitness is among the intrinsic and modifiable risk factors. The important components of the physical fitness are strength, muscle endurance, cardiorespiratory endurance, coordination, balance, flexibility, and body composition (13). Studies have indicated that people with lower levels of the physical fitness are at a higher risk of injuries (13). In recent years, many preventive programs have been designed and implemented to prevent the football injuries (14-18). Soligard et al. (2008) stated that the 11+ program can prevent the injuries in the young female football players and can generally reduce one-third of the injuries (19). Several studies have investigated the "11+" injury prevention program in 14 years of age and older players and reported a reduction (between 32 and 72%) in the incidence of the lower extremity injuries (20-22). These programs have a relative success in preventing the injuries and are widely accepted and applied by the coaches and players. In addition to preventing the injuries, they are effective in improving the performance and physical strength of the football players (17). The 11+ program has been reported to have a significant effect on the speed (23), dribble speed, accuracy of shoot, agility, and vertical jump of the football players (24). Zarei et al. observed a significant improvement in Sargent jump, Bosko repetitive jump, and dynamic balance tests after one season of "11+" exercise in the male adolescent football players. Significant improvements were not observed in Illinois agility test, 20-yard and 40-yard sprint, Yo-Yo test, flexibility, and dribbling (25). Taghizadeh et al. reported that the 11+ exercise program significantly increased strength flexion and extension of the dominant and non-dominant leg and dominant leg balance in the posterior, posterior-lateral (18). Recently, specialists at FIFA Medical Assessment and Research Center (FMARC) have designed the "FIFA 11+ Kids" while preserving the puberty and the most common injuries in children (26). This exercise program has been designed to enhance the spatial orientation, prediction, attention, increase the body stability, and movement coordination, and finally train the proper landing techniques (26). The main goal of

this program is to manipulate the intrinsic risk factors such as muscle strength and balance to reduce the risks of injury. Weakness of muscle strength is thought to be important risk factors of injury in children. Thus, two separate sections of the Kids 11+ program are allocated to plyometric and jump exercises. Rossler et al. (2015) investigated the effects of this program on neuromuscular function of the pre-adolescents compared to a conventional warm-up program and indicated the effectiveness of this program in enhancing their motor function (27). Hence, effective prevention programs in late adolescence or adult player should be considered for younger groups to improve the trauma profile and maturity status of the pre-adolescents (2). A number of studies have been conducted on the effects of FIFA injury prevention exercises on pre-adolescents and contradictory results have been obtained in this regard. The benefits of injury prevention exercise on the pre-adolescents have remained unknown. Hence, this review study was designed to investigate the effects of FIFA 11+ and 11+ kids warm-up programs in preventing the injuries in the pre-adolescents football players.

## MATERIALS AND METHODS

This systematic review has been reported using the PRISMA guidelines (28) (Figure 1). The researcher searched the combination of keywords in PubMed and Science Direct databases. The keywords included FIFA 11+, 11+ kids, injury prevention, football, and pre-adolescent. We included studies published since 2006 (FIFA 11+ was launched) to 2019. The two reviewers examined the abstracts and titles independently according to inclusion criteria. Ultimately 10 paper met the inclusion criteria of the review.

**Inclusion Criteria.** Studies conducted on preadolescent player under the age of 14 years.

Articles included FIFA 11+ and 11+ kids programs.

All studies were randomized controlled trial, case control.

**Exclusion Criteria.** Subjects over 14 years. Training programs other than FIFA exercises. Review articles and case reports.

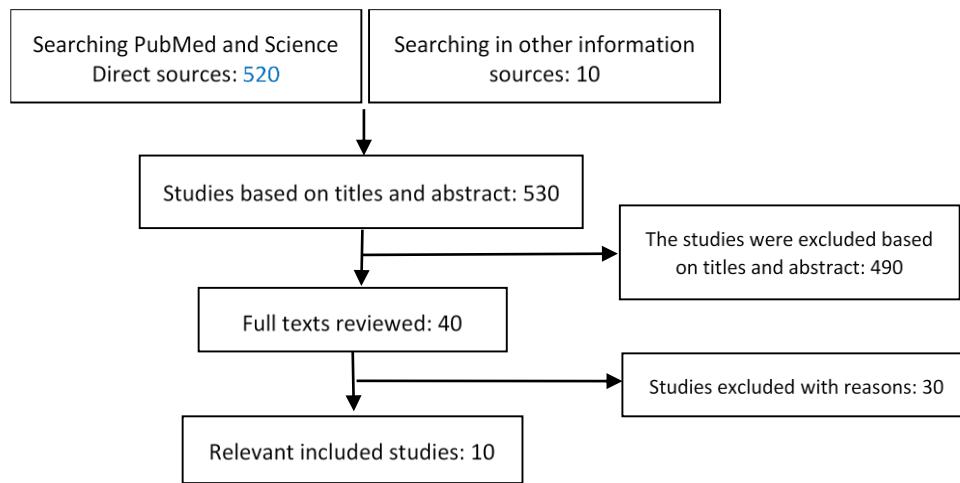


Figure 1. PRISMA Guidelines

Table 1. Evaluation of the Study According to the PEDro Scale

PEDro Scale	Pomars Noguera et al. (29)	Gatterer et al. (30)	Nemati et al. (31)	Zarei et al. (32)	Rosler et al. (33)	Baeza et al. (34)	Rosler et al. (35)	Zarei et al. (36)	Parsons et al. (34)	Thompson et al. (12)
1. Eligibility criteria were specified	+	+	+	+	+	+	+	+	+	+
2. Random allocation of the subjects	+	+	+	+	+	+	+	+	+	+
3. Allocation was concealed	+	-	-	-	+	-	+	+	+	-
4. Groups similar at the baseline	+	+	+	+	-	+	-	-	-	-
5. There was blinding of all subjects	-	-	-	-	-	-	-	-	-	-
6. Blinding of therapists	-	-	-	-	-	-	-	-	-	-
7. Blinding of assessors	+	-	-	+	+	+	-	-	+	-
8. > 1 Key outcome was obtained from more than 85% of subjects initially allocated to groups	+	+	+	+	+	+	+	+	+	+
9. All subjects received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by 'intention to treat'	-	-	-	-	-	-	+	-	-	-
10. Results of between-group statistical comparisons were reported for at least one key outcome	+	+	+	+	+	+	+	+	+	+
11. The study provided both point measures and measures of variability for at least one key outcome	+	+	+	+	+	+	+	+	+	+
Total score	7	5	5	6	6	6	6	5	6	4

To evaluate the quality of the methodology, PEDro scale was used for randomized studies (37). The score of each study was determined by two authors. The PEDro scale includes 11 items and the first item evaluates the external validity. This item is usually not included in the study evaluation. Thus, the evaluation based on the items 2 to 11 in the present study was performed according to the Moher et al. guidelines. The score 1 was given for the option “yes” and the score zero was given for the option “no”. The studies with this scale ranged from 0 to 4 as poor methodological quality, 5 or 6 moderate, and

those with scores of 7 and above had high methodological quality.

**RESULTS**

The methodology quality of the randomized studies was in the range of 4 to 7 (out of 10) and the mean score of the studies was obtained 5.6, indicating moderate quality of the methodology. Table 1 has presented the scores of the reviewed articles according to the PEDro scale.

The details of the reviewed articles have been presented in Table 2. Studies were randomized controlled trial. The age range of the participants was 9 to 14 years old. FIFA warm-up exercise

program included 11+ kids and 11+ exercises, which differed in the duration, frequency, and content. Some researchers evaluated the physical factors (29-31, 38) and others evaluated movement pattern through FMS (31, 34). In one study, isokinetic strength (32), and in two other

studies, the rate of incidence of the injuries and costs (33, 35) were examined. Lower extremity angles and torque were assessed in tests such as preplanned cutting, double-leg jump, and single-leg jump in the study conducted by Thompson et al. (2017) (12).

Table 2. Details of Articles

Authors/Year	Sample	Intervention	Outcome Measures	Results
Pomares-Noguera et al. (29), 2018	20 Youth players age: 11.8 ± 0.3 years	RCT 1) exp: 11+ kids program 2) con: normal warm up routine two times a week for four weeks	Range of motion, dynamic postural, 20 m sprint time, slalom dribble with a ball, agility, vertical jumping height, horizontal jump distance, Wall Volley Standing long jump performance and body stability	Significant between-group differences for dynamic postural, agility run, vertical jump height, drop jump, horizontal jump distance
Gatterer et al. (30), 2018	Sixteen young soccer players (aged 10 years)	RCT 1) exp: 11+ FIFA program 2) con: conventional two session per week five week training	Functional movement screen (FMS) scores	Significant improvements in the stability index in both groups. Training had no effect on standing long jump performance.
Nemati et al. (31), 2017	28 players age: 14 years	RCT 1) exp: FIFA+11 2) con: ordinary warm-up program four weeks (three times a week)	Functional movement screen (FMS) scores	Significant difference in FMS scores between the intervention and control groups after the intervention.
Zarei et al. (32), 2019	Thirty-one players mean age 11.5 ± 0.8 years	RCT 1) exp: 11+ kids program 2) usual training Ten week intervention	Isokinetic strength of the hip adductors and abductors, knee flexors and extensors, and ankle invertors and evertors	Significant difference between two groups for isokinetic strength of the hip adductors, knee flexors, ankle evertors and invertors.
Rosser et al. (33), 2017	3895 boys and girls age under 9 years, under 11 years and under 13 years	cluster-randomized controlled trial 1) exp: 11+ kids program 2) con: usual training	Primary outcome: Overall risk of football-related injuries. Secondary outcomes: The risks of severe and lower extremity injuries	The overall injury rate in the intervention group was reduced by 48% compared with the control group. Severe 74% reduction and lower extremity injuries of 55% reduction.
Baeza et al. (34), 2017	22 athletes Under 14 years	RCT 1) exp: FIFA 11+ Program 2) con: conventional training 3 times a week For six weeks	Functional Movement Screen	There was no significant differences between the post-intervention results of the EG and the CG.
Rosser et al. (35), 2018	Cluster randomized controlled trial under-9 to under-13 age groups)	RCT 1) exp: 11+ Kids program 2) con: usual training	Costs per 1000 hours of exposure	The '11+ Kids' program reduced the healthcare costs by 51% and was dominant (ie, the INT group had lower costs and a lower injury risk) compared with a usual warm-up.
Zarei et al. (39), 2018	56 adolescent players	RCT 1) exp: 11+kids 2) con: routine training For ten weeks	Slalom dribbling, Illinois, sit and reach, standing long jump, triple hop, Y balance, 40 and 20-yard sprint, plank and side plank tests.	Different significance in Y balance, triple hop distance, and 40-yard speed tests between two groups. No significance in the slalom dribbling, Illinois, sit and reach, standing long jump, 20-yard sprint, plank, and side plank between the groups.
Parsons et al. [34], 2019	47 girls 9 - 11 years	RCT 1) exp: 11+ program 2) con: conventional training	Landing Error Scoring System (LESS) and Y-Balance test (YBT), agility, vertical jump (VJ) height, and trunk muscle endurance	No differences between the groups in LESS or YBT scores, T-test time, or VJ height after The indoor soccer season. Static plank hold time in the IG increased significantly, and demonstrated a medium effect size compared to the CG.
Thompson et al. [12], 2017	51 female athletes aged 10 to 12 years	RCT 1) exp: F-MARC 11+ program 2) con: conventional training	Preplanned cutting, unanticipated cutting, double-leg jump, and single-leg jump tasks. Lower extremity joint angles and moments	No significant differences in the change in peak knee valgus moment were found between the groups for all activities. Improvement in peak ankle eversion moment after training during preplanned cutting, unanticipated cutting, and the double-leg jump, compared with the control group.

## DISCUSSION

The studies conducted on the effectiveness of the 11+ Kids exercises have shown how a simple warm-up program can reduce the rate of the injuries and the medical costs for both boys and girls under the age of 14 years (33, 35). In general, the teams that implemented the 11+ exercise program had 30 to 70 percent fewer injured players (19, 39, 40). The effect of the 11+ Kids exercises on the lower extremity injuries was consistent with the results of other prevention programs presented as warm-up exercises. In a randomized controlled trial among 4,564 Swedish players aged 12 to 17 years old, Walden et al. (41) reported that neuromuscular warm-up program consisted of 6 trunk and lower extremity fitness and jump-landing exercises significantly reduced the incidence of anterior cruciate ligament (ACL) injuries in adolescent female football players, while a number of other randomized controlled interventions also showed that prevention

programs targeting the football players could reduce the rate of injuries (42). The FIFA 11+ kids program two times per week for 4 weeks lead to small to moderate improvements in some [dynamic postural control, agility run, and jumping (standing long jump, CMJ, and DJ) measures] but not all [20 m sprint time, slalom dribble, wall volley, and ROMs (with the exception of the knee flexion ROM) measures] of the physical performance parameters analyzed (30). This was in line with the study conducted by Zarei et al., in which a significant difference was observed in the balance and triple hop and no significant differences was observed between two groups in the skills of wall volley and slalom dribble. In the balance test, these results were not in line with those of the study conducted by Parsons et al. (38). Pre-adolescents did not show a progress in the dynamic balance scores. One of the most important reasons can be considered the lack of a similarity in some stages of the 11+kids and 11+ exercises. 11+ Kids exercises mainly focus on improving

coordination, balance, landing technique, strengthening the leg muscles and core stability muscles and may be more appropriate than 11+ exercises for the pre-adolescents (36). Two and three balance exercises, especially on one leg and jump exercises (Exercises 1, 2 and 3) might be reasons for the success of 11+ Kids exercises in enhancing the dynamic balance and jump tests in the pre-adolescent players (36). The balance exercises increase the neural adaptation and inhibitory stimulation of spinal reflexes, such as stretching reflexes, and increase the co-contraction pattern in the agonist and antagonist muscles, ultimately leading to improved balance (43). Similar improvements in postural control (anterior Y balance), agility, and jumping activities have been reported after twice weekly for 10 weeks in a large cohort of young football players (27). However, in contrast to this article, the same authors found progresses in the slalom dribble and wall volley tests. A possible explanation for these inconsistent results may be different duration of the intervention phase, the number of participants, and the level of physical activity. Therefore, 4 weeks of 11+ Kid exercise program may not result in exercise responses in the speed tests and specific coordinated activities of slalom dribble and wall volley (29). Nemati et al. used the FMS test to evaluate the underlying movement patterns and concluded that the FIFA 11+ program significantly increased FMS scores in the intervention group compared to the control group. Also, 57% of the subjects in the intervention group obtained scores above 14, while no changes was observed in the control group (31). These results can be compared with the observations of Kiesel et al. and Bodden et al., which obtained an increase of 52% and 66%, respectively, in people who scored higher than 14 (10, 44). These results were in contrast to those of the research conducted by Baeza et al., which did not find a significant difference between the two groups. However, in the intervention group, after 6 weeks of 11+ exercise program, a progress was observed in 4 tests out of 7 tests. A significant increase in the overall scores and the scores above 14 showed a possible reduction in the injury based on the clinical outcomes (34).

FIFA 11+ is a special football warm-up program that can improve the strength, balance, core stability and proprioception (26). It can improve the quality and movement patterns of regular football players. Thompson et al. evaluated the changes in the biomechanical risk factors for

anterior cruciate ligament injury after participating in the 11+ program in pre-adolescent players and observed a reduction in maximal torque of knee valgus in the double leg jump. However, there was no differences between the two groups in maximal torque of knee valgus in single-leg jump and cutting tests (12). Since the methodological quality of this study is poor, the results of this study cannot be sufficiently satisfied. In another study conducted by Zarei et al., the effect of the 11+ Kids exercise program on isokinetic strength was examined and showed positive effects on hip adductor, knee flexor, ankle evertors and invertors in the intervention group, compared to the control group (32). Of the ten reviewed studies, none of the studies investigated the principle of blinding a therapist and a subject. Of these, five studies have focused on the blinding of the assessor. Therefore, in order to obtain more reliable results, it is suggested to consider these cases in future studies. Among the reviewed studies, most articles evaluated the physical factors and the rate of injuries in the pre-adolescents. It is recommended for future studies to investigate the effect of the 11+ Kids and 11+ exercise programs on the biomechanical and neuromuscular risk factors in children aged below 14 years old.

## CONCLUSION

Based on the available evidence, The FIFA 11+ and 11+ kids program for pre-adolescent can potentially influence some of the factors related to sport injuries, which can benefit players by positively manipulating documented internal risk factors in favor of preventing sport injuries. The 11+ Kids exercises reduce the injury and improve the physical fitness factors such as balance, jumping activities and lower limb isokinetic strength. But there is No significance in the slalom dribbling, Illinois, sit and reach, standing long jump, 20-yard sprint, plank, and side plank between the groups.

Although 11+ FIFA exercises are designed for players aged over 14 years, they result in an improvement in movement patterns, stability, and trunk muscle endurance for children. 11+ kids exercises do not focus on soccer skills and cannot be expected to improve dribble speed. Exercises are also performed at low speeds and few changes in direction, so that they cannot make significant progress in agility. Therefore, using the 11+ program alone or in a combination with the newly-developed 11+ Kids program may improve performance of players and may contribute to a

reduction of injury risk, especially if implemented for a longer period or with more exercise sessions per week. Further studies are needed to examine the effects of comprehensive football warm-up exercises on the injury prevention in pre-adolescents.

#### APPLICABLE REMARKS

- To improve Players performance, minimize injury risk and medical costs, coaches and

trainers are recommended to implement FIFA 11+ and 11+ kids training programs at a pre-adolescent age.

- Football Players should increase their awareness of injury prevention strategies and be familiar with FIFA warm-up programs more over learn to how perform each exercise with proper movement patterns.

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