

The “FIFA 11+” injury prevention program improves body stability in child (10 year old) soccer players

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ABSTRACT: The suitability of the FIFA 11+ prevention programme to improve selected performance outcomes in children aged < 14 years has not been established yet. This study aimed to investigate the effects of the FIFA 11+ programme on jump ability and stability in 10-year-old child soccer players. Sixteen young soccer players (aged 10 years) were randomly assigned to a conventional or a FIFA 11+ warm-up group. During a 5-week training period with 2 sessions per week the FIFA 11+ group warmed up with the 11+ programme, whereas the control group subjects performed their usual warm-up programme (e.g. running exercises with dribbling and/or passing techniques included). After the warm-up, both groups performed the same training exercises during each session. Before and after the training period, standing long jump performance and body stability (S3 Check, unstable uniaxial platform) were assessed. Significant improvements in the stability index were found in both groups (5.6 ± 1.1 to 3.5 ± 1.0 and 5.5 ± 0.8 to 4.0 ± 1.5 for the FIFA 11+ and the control group, respectively, $p < 0.001$, partial $\eta^2 = 0.886$ for the training effect of the analysis of variance) with likely (qualitative inference analysis) greater improvements in the FIFA 11+ group compared to the control group ($p = 0.078$, partial $\eta^2 = 0.205$ for the training x group interaction effect of the analysis of variance). Training had no effect on standing long jump performance ($p > 0.05$). Data indicate that in 10-year-old soccer players the FIFA 11+ programme may have the potential to improve stability. Thus, the FIFA 11+ programme might contribute to injury prevention and possibly to better soccer performance as well. This might especially apply if the programme is performed over a longer period and/or with more weekly training sessions. Based on the present results the inclusion of such a programme within the training practice of the child soccer player can be recommended.

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INTRODUCTION

Soccer is a very popular sport and is played starting from a young age [1]. Beside health promoting effects [2] soccer is also associated with a certain risk of injury [3]. In both adult and young players, high injury rates have been recorded [1,3,4], leading to the development of different preventive strategies [5,6,7].

The FIFA 11+ injury prevention programme was developed by the FIFA medical research centre (F-MARC) for players aged 14 years and older [1], and the efficacy to prevent injuries has been proven in several interventional studies [8]. Recently, FIFA also introduced the FIFA 11+ Kids programme for the age group < 10 years, and several beneficial effects on various performance parameters have been reported [9]. Even though the kids programme may be more suitable for children than the FIFA 11+, exercises of the original programme have been proven effective and children often want to imitate adult's behaviour. Thus combining or alternating the FIFA 11+ kids with the original programme could increase motivation and

compliance. However, the suitability of the original FIFA 11+ programme for ages < 14 years to improve performance outcomes and to reduce injury occurrence has not yet been established.

Only one study applying the FIFA 11 programme, an ancestor of FIFA 11+, has investigated the impact of the programme on physical performance parameters in children younger than 14 years [1]. The authors found improvements in leg power and speed over 20 m and a tendency towards improved agility and stability in comparison to the control group [1]. The authors speculated that such improvements may contribute to the injury prevention effect of the programme [1]. However, to the best of our knowledge, no study has investigated the effect of the advanced FIFA 11+ programme on selected performance parameters in players aged < 14 years so far.

Therefore, the present study investigated whether or not the FIFA 11+ programme performed on a regular basis before the regu-

lar training sessions leads to improved jump ability and stability in 10-year-old child soccer players. We hypothesized that performing the FIFA 11+ exercises over a 5-week period improves jump ability and stability in the 10-year-old children. If confirmed, the original FIFA 11+ programme could be alternately used with the recently developed FIFA 11+ Kids programme [9] to improve performance parameters linked to injury prevention in this age group.

MATERIALS AND METHODS

Subjects

Sixteen healthy male 10-year-old children (height: 1.29 ± 0.10 m, weight: 42.5 ± 13.1) playing in the same soccer team (non-professional structure) were enrolled in the study. Parents gave written informed consent for the participation of their children. Afterwards, players were randomly assigned to a control (CG, $n=8$) or a FIFA 11+ intervention group ($n=8$) stratified by the jump height and stability index outcome of the baseline tests (a detailed description of the test procedures is provided below). The study was carried out in conformity with the ethical standards of the Declaration of Helsinki and has been approved by the Institutional Review Board of the Department of Sport Science of the University of Innsbruck.

Procedures and Measurements

To investigate whether the FIFA 11+ warm-up programme performed on a regular basis improves players' body stability and jump ability more than the usual warm-up, body stability and jumping ability (for a detailed description of tests see below) were determined before and after a 5-week in-season training period. The tests were performed after a 5 min run in the afternoon before the start of the regular training session. During the 5-week period, 2 training sessions per week were completed in the afternoon. The FIFA 11+ group included the FIFA 11+ programme as a warm-up programme before each training session, whereas the CG performed their usual warm-up programme. During the usual warm-up programme children were moving around within a small area applying different dribbling and/or passing techniques. Additionally, to increase intensity, which is also demanded by the FIFA 11+ programme, children were occasionally requested by whistle to catch team mates. Instructions of the FIFA 11+ exercises were provided and checked for correct execution by a sport scientist, who was the coach of the team at the same time. The assistant coach supervised the warm-up of the control group. The duration of the warm-up was equal for both groups and lasted approximately 30 min. The regular training session that followed the warm-up was identical for both groups and included small side games, goal kicks and a final match. It lasted for an additional hour. Due to illness 2 players of the CG missed 1 training session, while no training loss within the FIFA 11+ group was recorded.

The FIFA 11+ programme is described in detail elsewhere [6] and can be downloaded from the F-MARC homepage (<http://f-marc.com/11plus/home/>). In short, the programme combines cardiovas-

cular activation and preventive neuromuscular exercises [10] and consists of 3 parts with a total of 15 exercises performed in a specified sequence at the start of the training session. Part 1 includes running exercises at a slow speed combined with active stretching and controlled partner contacts. Part 2 consists of six sets of exercises, focusing on core and leg strength, balance, and plyometrics/agility, each with 3 levels of increasing difficulty. The final part includes running exercises at moderate/high speed combined with planting/cutting movements.

Standing long jump

The jump ability was tested by a standing long jump, considered as a general index of muscular fitness in youth [11]. The players stood behind the starting line, with feet together, and were instructed to push off vigorously forward as far as possible. The distance was measured from the take-off line to the point where the back of the heel landed. The players performed several familiarization trials (no more than 5), after which the test was repeated twice, and the best score was retained (in cm) [11]. The standing long jump was reported to be an adequate test for assessing muscular strength in 11-year-old boys with the association coefficient of $r^2 = 0.726-0.910$ between lower body muscular strength and standing long jump performance [11].

Stability

The stability was tested after a familiarization trial with the MFT S3-Check system (Grosshöfle, Austria). The players were instructed to stand as stable as possible on the platform with the feet hip width apart. The test was conducted without shoes and with free choice of arm posture. The standard test time was set at 30 s twice, with an interval of 30 s between the two test trials, and the better attempt was chosen as the test result [13]. The test device is described in detail elsewhere [12,13]. Briefly, the MFT S3-Check is a test device for functionally assessing body stability and the ability to regulate the sensory motor system in a standing position. The test system consists of an unstable uniaxial platform, with an integrated sensor [12]. The test system measures the movements of the platform and calculates a sensory index. A symmetry index is quantified by movements of the horizontal platform position to the left and right. Both factors result in a stability index. The measurement values of the sensory and the stability index are graded on a nine-point scale (minimum value 1 = very good, maximum value 9 = very weak). Symmetry is assessed according to 3 categories. Movement symmetry of 40:60 to 50:50% indicates no preference for one side of the body. A slight preference is indicated by 25:75 to 39:61% and results less than 24:76% indicate a noticeable preference for one movement side [12]. Norms for the MFT S3-Check outcomes exist for the age group 8–70 years, and reliability and validity of the test have been proven for the age group 10–18 years [12].

Statistical analysis

Data analyses were performed using the SPSS statistical software package (PASW Statistic 21). Sample size was given from the team size. According to a power analysis performed on the body stability outcomes of a recent intervention study in adults [10], a total sample size of $n=12$ resulted in a power of > 0.80 . Unpaired t-tests were used to examine baseline differences between the groups. An analysis of variance with repeated measurement design was used to determine changes due to training (main effect: training) and whether the changes differed between groups (interaction: training x group). Effect size (ES, partial η^2) was calculated for all parameters. A partial η^2 of 0.02 was defined as small, one of 0.13 as medium, and one of 0.26 as large [14]. If a medium or large interaction effect was noted for the performance parameters, practical significance was assessed based on an approach to determine the magnitude of differences [15]. Quantitative chances of greater or lower values were assessed qualitatively as follows: $<1\%$, most unlikely; $1\%–5\%$, very unlikely; $5\%–25\%$, unlikely; $25\%–75\%$, possible; $75\%–95\%$, likely; $95\%–99\%$, very likely; $>99\%$, most likely. If the chances of having higher or lower values were both $>5\%$, the true difference was assessed as unclear [15]. Results are presented as mean \pm SD. Statistical significance was set at $p \leq 0.05$.

RESULTS

At baseline, no group differences were detected in the standing long jump and stability parameters ($p > 0.05$). Outcomes of the standing long jump and body stability before and after the 5-week training period are shown in Table 1. Both the sensory and stability indices improved over time (training effect: $p < 0.001$, ES = 0.794 and 0.886, respectively). Furthermore, a tendency for an interaction effect

(group x training: $p = 0.078$) with a medium effect size (ES = 0.205) was found. The magnitude-based analysis showed a likely larger improvement of the stability index in the FIFA 11+ group compared to the control group.

DISCUSSION

The main findings of the present study were that stability increased in both groups after 5 weeks of training with likely better outcome for the FIFA 11+ group and that standing long jump was not affected by either of the warm-up programmes.

The present study shows that the FIFA 11+ prevention programme was able to effectively improve stability in 10-year-old soccer players even though the programme was designed for players aged ≥ 14 [1]. Stability is thought to contribute to injury prevention [10,16,17] and might be considered a factor for good soccer performance [18]. Thus, the implementation of the programme, whether alone or in combination with the newly introduced FIFA 11+ Kids programme [9], might contribute to injury prevention and improved soccer performance as well. It has to be mentioned that both groups improved in stability. The improvements in the control group presumably represent normal training adaptations, whereas the likely better outcomes of the FIFA 11+ group might be linked to the specific exercises of the FIFA 11+ programme.

Standing long jump performance was not affected by the programme. This is in contrast to the findings of Kilding et al. and Rössler et al., who observed improved jump ability and sprint performance after performing the FIFA 11 and the FIFA 11+ Kids programme [1,9]. The differences might be explained by different training volumes. In the present study the FIFA 11+ was performed only twice per week for 5 weeks during the regular training sessions. In contrast, in the

TABLE 1. Jump and body stability outcomes before and after the 5-week training period.

	FIFA 11+		CG		ANOVA						Qualitative inference
	before	after	before	after	group effect (p-value)	ES	training effect (p-value)	ES	training x group effect (p-value)	ES	training x group effect
standing long jump	147.6 \pm 20.7	143.3 \pm 17.1	136.0 \pm 29.3	131.6 \pm 30.0	0.357	0.061	0.098	0.183	1.000	<0.001	-
sensory index	4.9 \pm 1.0	2.8 \pm 1.1	4.7 \pm 1.1	3.3 \pm 1.4	0.863	0.002	<0.001	0.794	0.153	0.140	likely positive
symmetry index	47.4 \pm 7.2	51.6 \pm 13.2	54.0 \pm 9.0	52.6 \pm 11.1	0.289	0.080	0.715	0.010	0.478	0.037	unclear
stability index	5.6 \pm 1.1	3.5 \pm 1.0	5.5 \pm 0.8	4.0 \pm 1.5	0.759	0.007	<0.001	0.886	0.078	0.205	likely positive

effect size (ES, partial η^2).

study of Kilding *et al.* players performed the FIFA 11 programme 5 times per week for 6 weeks [1] and in the study of Rössler *et al.* a 10-week lasting training programme was applied [9]. Furthermore, lack of specificity between the warm-up and training exercises and the standing long jump could be another explanation why jump performance was not improved.

Some limitations of the study need to be acknowledged. Sample size resulted from the team size and could be considered small, even though a power analysis estimated $n=12$ as an appropriate sample size. Furthermore, training frequency was low (2 sessions per week) but may be considered normal for this age group and performance level. Nevertheless, it is noteworthy that despite these limitations, a likely better stability in the FIFA 11+ group was found, indicating that the programme should be effective. Moreover, we did not record physical activity outside the study programme. Different physical activity levels of the groups certainly would impact the results. Nonetheless, children enrolled in the present study live in the same social environment with the same possibilities and interests (small town)

and were allocated to the groups stratified by performance test outcomes. Additionally, the study was performed in-season and during the school year; thus it is unlikely that routine habits were changed during the study period.

CONCLUSIONS

In conclusion, the FIFA 11+ warm-up programme compared to regular warm-up led to a likely greater stability improvement in the child soccer player. Therefore, the FIFA 11+ programme might be recommended as a method to improve stability with possible positive effects on injury prevention in the child soccer players [9], especially if performed over a longer period and/or with more weekly training sessions.

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