

# Effects of the FIFA 11 training program on injury prevention and performance in football players: A systematic review and meta-analysis

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## Abstract

**Objective:** To investigate the effects of FIFA 11 training on injury prevention and performance in football players.

**Design and methods:** Systematic review and meta-analysis. We conducted a systematic search using four databases (CINAHL, Cochrane Library, EMBASE, and PubMed) to find controlled trials evaluating the effects of FIFA 11 on injury prevention and performance among football players. Weighted mean differences, standard mean differences, risk ratios, and 95% confidence intervals were calculated, and heterogeneity was assessed using the  $I^2$  test.

**Results:** We analyzed 11 trials, including 4700 participants. FIFA 11 resulted in a significant reduction in injury risk (risk ratio = 0.69; 95% confidence interval, 0.49–0.98;  $P=0.02$ ) and improvements in dynamic balance (weighted mean difference = 2.68; 95% confidence interval, 0.44–4.92;  $P=0.02$ ) and agility (standard mean difference =  $-0.36$ ; 95% confidence interval, 0.70–0.02;  $P=0.04$ ). The meta-analysis indicated a non-significant improvement in jump height (standard mean difference = 0.25; 95% confidence interval, 0.08–0.59;  $P=0.14$ ) and running sprint (standard mean difference =  $-0.24$ ; 95% confidence interval, 0.58–0.10;  $P=0.17$ ) in the FIFA 11 group.

**Conclusions:** FIFA 11 can be considered as a tool to reduce the risk of injury. It may improve dynamic balance and agility and can be considered for inclusion in the training of football players.

## Keywords

Exercise, muscle injury, motor performance, physical training, soccer

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## Background

Despite scientific advances in the understanding of injury mechanisms and screening techniques, the high injury rate in football players persists and is among the highest in sports.<sup>1,2</sup> Junge and Dvorak, reported 10 to 35 injuries per 1000 hours of match play and two to seven per 1000 hours of training in international football players.<sup>3</sup>

Studies have described risk factors for football players' injuries and discussed possible strategies for prevention,<sup>3,4</sup> however, few programs incorporate football-specific components. Moreover, extensive time and special equipment are needed for these programs to be effective.<sup>3-5</sup> A warm-up program called FIFA 11, developed with the support of the World Football Association (FIFA), was proposed as a complete warm-up focusing on prevention of football injuries.<sup>6</sup> The FIFA 11 program requires no technical equipment other than a ball and can be completed in 10–15 minutes. In addition, other programs used in prevention protocols have also been shown to have performance effects among football players.<sup>7</sup>

A recent systematic review was performed to evaluate the impact of FIFA 11 on the incidence of injury, compliance, and cost effectiveness among football players. The authors reported considerable reductions in the number of injured players (ranging between 30% and 70%). However, individual studies reported conflicting results, and the authors did not perform any meta-analysis. Hence, the effects of FIFA 11 are still unknown.<sup>8</sup> In addition, to the best of our knowledge, no meta-analysis of the effects of FIFA 11 on performance among football players has been published to date. The aim of this systematic review with meta-analysis was to analyze the published randomized controlled trials (RCTs) that have investigated the effects of FIFA 11 on injury prevention and exercise performance among football players.

## Methods

This meta-analysis was completed in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.<sup>9</sup>

## Eligibility criteria

This systematic review included RCTs that investigated the effects of FIFA 11 on injury prevention and exercise performance of football players.

Trials enrolling football players were included in this systematic review. To be eligible, the trial must have randomized football players to a single group in which the FIFA 11 program was performed at least two times per week for at least four weeks. Studies that enrolled non-athletes or athletes from other sports were excluded. The main outcomes of interest were injury and exercise performance (balance, running sprint, and agility).

## Search methods used to identify studies

We searched MEDLINE, PEDro, EMBASE, SciELO, Cumulative Index to Nursing and Allied Health (CINAHL), and the Cochrane Library for relevant studies published up to August 2016 without language restrictions. A standard protocol for this search was developed and whenever possible, controlled vocabulary (MESH terms for MEDLINE and Cochrane and Emtree for EMBASE) was used. Keywords and their synonyms were used to sensitize the search. The strategy developed for the Cochrane Collaboration<sup>10</sup> included study design, participants, and interventions, was used to identify the RCTs.

The references of the eligible articles for this systematic review were analyzed to detect other potentially eligible studies. Authors were contacted by email for ongoing studies or when the confirmation of data or additional information was needed.

## Data collection and analysis

The titles and abstracts identified in the search strategy were screened by two independent reviewers. If, at least, one of the authors considered one reference eligible, the full text was obtained for complete assessment. The reviewers independently evaluated full-text articles for eligibility using inclusion and exclusion criteria. In case of any disagreement, all of the authors discussed the reasons for their decisions and a final decision was made by consensus.

Two authors independently extracted data from the published reports using standard forms adapted from the Cochrane Collaboration's<sup>10</sup> model for data extraction. Aspects of the study population, intervention, follow-up and loss to follow-up, outcome measures, and results were reviewed. Disagreements were resolved by one of the authors. Any further information required from the original author was requested by email.

### Quality of meta-analysis evidence

The quality of the RCTs was classified by two researchers using the PEDro scale, which is based on concealed allocation, intention-to-treat analysis, and adequacy of follow-up. These characteristics make the PEDro scale a useful tool for assessing the quality of physiotherapy and rehabilitation trials.<sup>11</sup>

The PEDro scale consists of 11 items and is based on a Delphi list.<sup>12</sup> One item on the PEDro scale (eligibility criteria) is related to external validity and is generally not used to calculate the method score, leaving a score range of 0 to 10.<sup>13</sup> Any disagreements were resolved by a third investigator.

### Data analysis

Pooled-effect estimates were obtained by comparing the least-square mean percentage change from baseline to study end for each group and were expressed as the weighted mean difference (WMD), standard mean difference (SMD), or risk ratio (RR) between the groups. Calculations were done using a random-effects model. When the standard deviation (SD) of change was not available, the SD of the baseline measure was used for the meta-analysis. One comparison was made: FIFA 11 vs. the control group. An  $\alpha$  value of 0.05 was considered significant. Statistical heterogeneity of the treatment effect among studies was assessed using Cochran's Q-test and the inconsistency  $I^2$  test, in which values above 25% and 50% were considered indicative of moderate and high heterogeneity, respectively.<sup>14</sup> All analyses were conducted using Review Manager Version 5.0 (Cochrane Collaboration).<sup>15</sup>

## Results

The initial search led to the identification of 302 abstracts, from which 24 studies were considered as potentially relevant and retrieved for full-text analysis. After the complete reading, 13 studies were excluded. Finally, 11 articles<sup>16–26</sup> met our eligibility criteria. Figure 1 shows the PRISMA flow diagram of included studies in this study. The results of the PEDro scale are presented individually in Table 1 (available online).

Of the 11 included articles, five investigated exercise performance in FIFA 11 vs. control groups,<sup>16–20</sup> whereas the other six studies investigated injury prevention in FIFA 11 vs. controls.<sup>21–26</sup>

The final sample ranged from 24<sup>19</sup> to 2020<sup>24</sup> football players. Mean age of participants ranged from 39.3<sup>16</sup> to 46.2<sup>23</sup> years. Table 2 summarizes the included participants, sample size, outcomes, and results of the included studies.

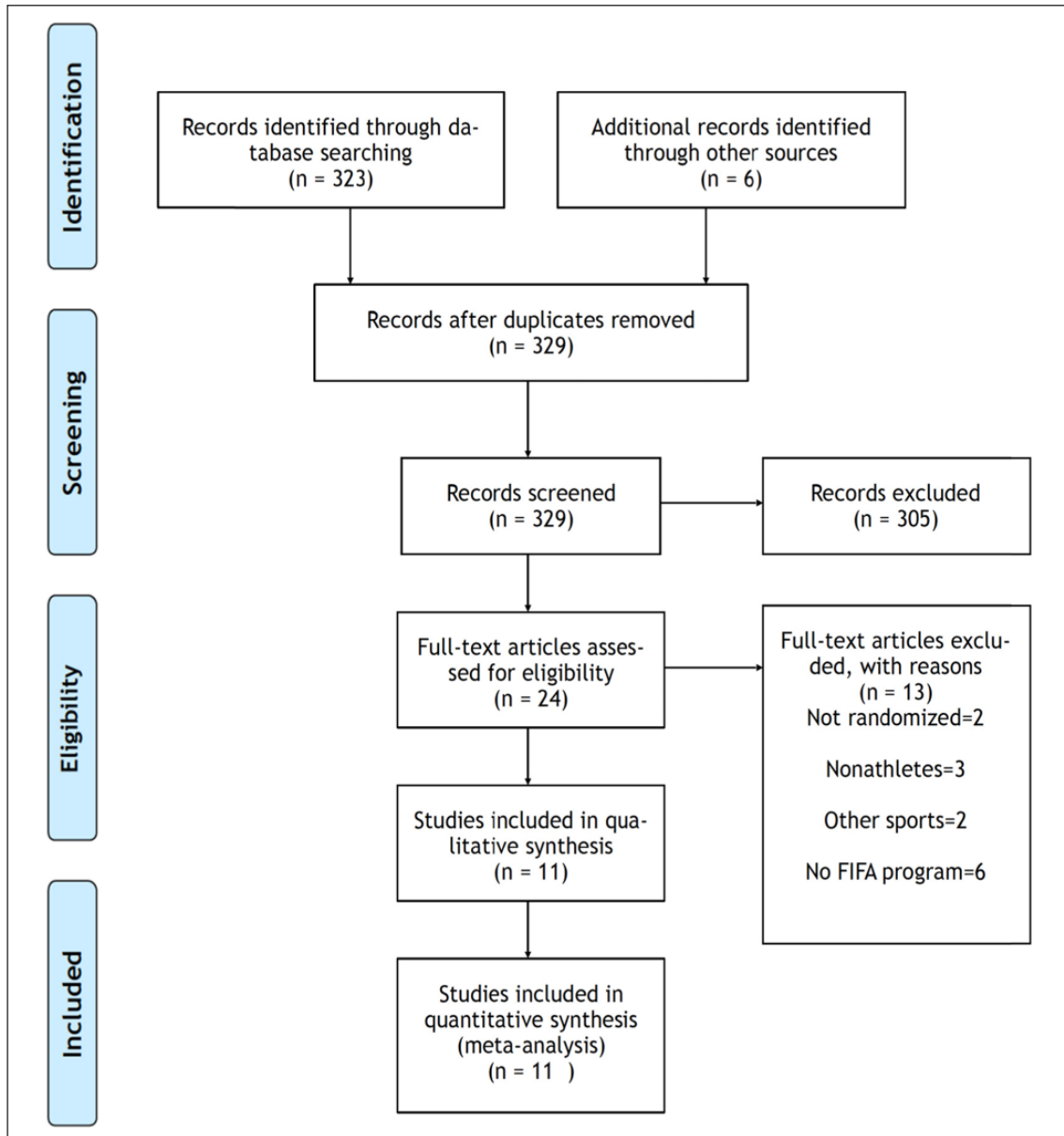
The parameters used in the application of FIFA 11 were reported in most studies. Table 3 (available online) summarizes the FIFA 11 characteristics of included studies.

Figure 2 shows the meta-analysis of injury prevention between FIFA 11 and control groups. The RR was 0.64 (95% CI, 0.43 to 0.96), indicating a significant reduction of risk of injury in the FIFA 11 group ( $P=0.03$ ).

Figure 3 shows the meta-analysis of dynamic balance between the FIFA 11 and control groups. For this meta-analysis, two studies were included. The total number of subjects in the FIFA 11 group was 54, whereas 51 subjects were included in the control group. FIFA 11 treatment significantly enhanced dynamic balance (WMD = 2.68; 95% confidence interval (CI), 0.44 to 4.92;  $P=0.02$ ) when compared with the control group.

Figure 4 shows the meta-analysis of agility between the FIFA 11 and control groups. For this meta-analysis, three studies were included. The total number of subjects in the FIFA 11 group was 68, whereas 68 subjects were included in the control group. Analysis of agility showed significant improvements with FIFA 11 vs. control (SMD =  $-0.36$ ; 95% CI,  $-0.70$  to  $-0.02$ ;  $P=0.04$ ).

Figure 5 shows the meta-analysis of jump height between the FIFA 11 and control groups. For this



**Figure 1.** Methods used to search and select studies for systematic review according PRISMA.

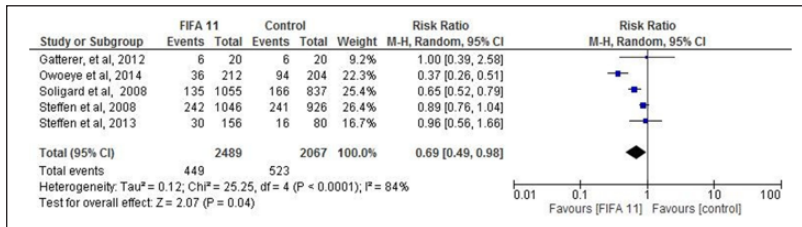
meta-analysis, three studies were included. The total number of subjects in the FIFA 11 group was 68, whereas 68 subjects were included in the control group. This analysis indicated a non-significant improvement in jump height in the FIFA 11 group (SMD = 0.25; 95% CI, 0.08 to 0.59;  $P=0.14$ ).

Figure 6 shows the meta-analysis of running sprint between the FIFA 11 and control groups. For this meta-analysis, three studies were included. The total number of subjects in the FIFA 11 group was 71, whereas 65 subjects were included in the control group. This analysis indicated a

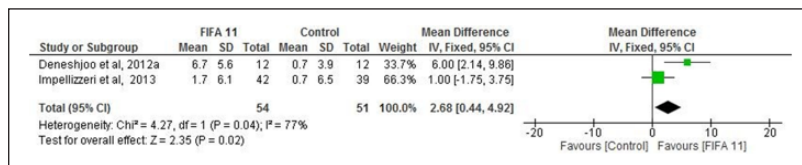
**Table 2.** Characteristics of the included studies.

Study	Participants (N analyzed, age, gender)	Outcome measures				Key findings
		Dynamic balance	Agility	Jump	Injury prevention	
Impellizzeri et al., 2013	N = 80, 39.3 years, male	SEBT	Agility T-test	Jump height	20-m sprint	Dynamic balance, agility, jump height, and running sprint improved in FIFA II group compared with control ( $p=0.05$ )
Deneshjoo et al., 2012 a/b	N = 63, 43.2 years, male	SEBT SSBT	NA	NA	NA	Dynamic balance improved in FIFA II group compared with control ( $p=0.05$ )
Kilding et al., 2008	N = 40, 41.8 years, 100% male	NA	IAT	Jump height	20-m sprint	Agility, jump height, and running sprint improved in FIFA II group compared with control ( $p=0.05$ )
Steffen et al., 2008	N = 38, 41.5 years, female	Speed dribbling	NA	Jump height	NA	Agility and jump height improved in FIFA II group compared with control ( $p=0.05$ )
Owoeye et al., 2014	N = 35, 43.5 years, 100% male	NA	NA	NA	NA	There was a significantly lower risk of injuries and all lower extremity injuries in the FIFA II group ( $p<0.05$ )
van Beijsterveldt, 2012	N = 456, 27.5 years, 100% male	NA	NA	NA	NA	Compared with players in the control group, players in the FIFA II group had not a lower injury risk
Steffen et al., 2013	N = 38, 41.5 years, 100% female	NA	NA	NA	NA	Compared with players in the control group, players in the FIFA II group had not a lower injury risk
Steffen et al., 2008	N = 38, 41.5 years, 100% female	NA	NA	NA	NA	No difference was observed in the overall injury rate between the FIFA II group and control group ( $P=0.94$ )
Solligard et al., 2008	N = 38, 41.5 years, 100% female	NA	NA	NA	NA	There was a significantly lower risk of injuries overall, overuse injuries, and severe injuries in the FIFA II group ( $p<0.05$ )
Silvers-Granelli et al., 2015	N = 1,525, 20.5 years, 100% male	NA	NA	NA	NA	There was a significantly lower risk of injuries overall and decrease time loss to injury in the FIFA II group ( $p<0.01$ )

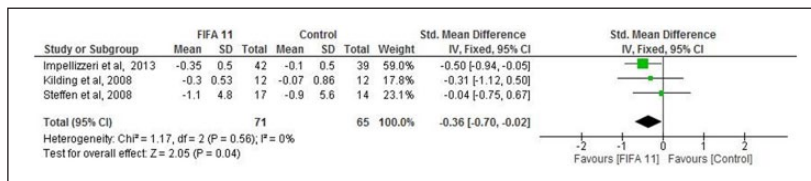
SEBT: star excursion balance test; BTUS: balance test unstable seat; SSBT: stork stand balance test; IAT: Illinois Agility Test; NA: not assessed; LE: lower extremity.



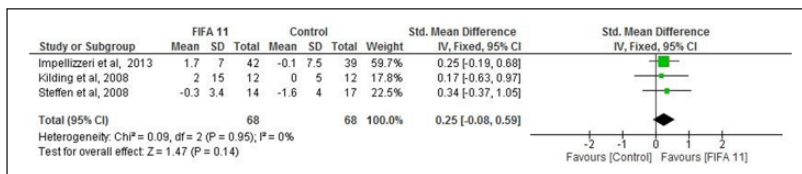
**Figure 2.** Injury prevention in the FIFA 11 vs. control groups (Review Manager version 5.2, the Cochrane Collaboration, 2013).



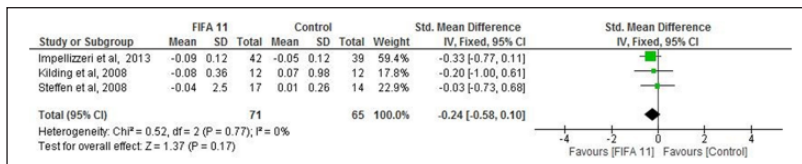
**Figure 3.** Dynamic balance in the FIFA 11 vs. control groups (MWD and 95% CI).



**Figure 4.** Running in the FIFA 11 vs. control groups (Review Manager version 5.2, the Cochrane Collaboration, 2013).



**Figure 5.** Agility in the FIFA 11 vs. control groups (Review Manager version 5.2, the Cochrane Collaboration, 2013).



**Figure 6.** Jump height in the FIFA 11 vs. control groups (Review Manager version 5.2, the Cochrane Collaboration, 2013).

non-significant improvement in running sprint in the FIFA 11 group (SMD= -0.24; 95% CI, 0.58 to 0.10;  $P=0.17$ ).

## Discussion

The main results of our meta-analysis indicate that FIFA 11 was effective in reducing the rates of injuries in football players. The FIFA 11 program was also effective in increasing dynamic balance and exercise performance in football players.

FIFA 11 is a well-established warm-up program widely used to decrease the incidence of injuries among male and female amateur football players. Despite some published studies, we did not find any meta-analysis that evaluated the impact of FIFA 11 on physiological parameters and exercise performance of football players. Barengo et al.,<sup>8</sup> performed a systematic review to evaluate the effects of FIFA 11 on injury prevention in football players. However, the study included clinical trials, observational cohort, and explorative studies, and no meta-analysis were performed. This meta-analysis is relevant because it analyzes FIFA 11 as a relevant tool to minimize the risk of injury and at the same time improves exercise performance.

Steffen et al.<sup>22</sup> reported that a 20-min neuromuscular injury prevention warm-up program improved dynamic and functional balance and reduced by 72% the risk of injury among players that strictly adhered to the intervention during the season. In another study, high adherence to the FIFA 11 resulted in significant improvements in functional balance and a reduction on risk of injury.<sup>22</sup> Improvements on neuromuscular control appear to be a key element of FIFA 11, which is associated with improvements on technical and tactical performance of football players.

The eligibility of dynamic balance testing as an outcome in this systematic review is important, because the higher the skill levels, the better functional performance that are associated with a lower risk of injury.<sup>27</sup> It has been reported that impaired balance is indirectly associated to an increased risk of ankle and knee sprain injuries.<sup>28,29</sup> Lower performances on dynamic balance tests is also associated with an elevated injury risk. Butler et al.<sup>30</sup> assessed

dynamic balance using the Star Excursion Balance Test in 59 football players and reported that those who had a score of less than 89% were at increased risk of injury. Athletes with a positive Star Excursion Balance Test result (<89% limb length composite score) had a substantially higher probability of sustaining a non-contact lower extremity injury (37.7%–68.1%).<sup>30</sup>

Moreover, proper functional balance and control of the lower extremities are essential for both technical and tactical performance among football players, and such attributes are assumed to decrease the risk of injury.<sup>31</sup> Peterson et al. found that young players with low skill levels had a two-fold increased incidence of all injuries when compared with more skilled athletes.<sup>32</sup>

FIFA 11 also includes agility and plyometric exercises. Thus, the exercises used in FIFA 11 can be associated with an improvement in agility performance. Although the main aim of the FIFA 11 is injury prevention, the knowledge of training effects elicited by this program can also lead to benefits in exercise performance.

FIFA 11 is easy to perform and takes approximately 10–15 minutes. FIFA 11 can be performed and integrated into regular football practice and requires no additional equipment. Thus, professionals can easily add this program for the training of athletes.

Given the small amount of available studies, caution is warranted when interpreting our results. Further investigation is required to investigate how to sustain the positive effects of FIFA 11 in football players over time. Considering the moderate quality of the included studies, additional well-controlled RCTs are required to reinforce the conclusion that FIFA 11 is an important warm-up program for football players. Additionally, future studies should ensure that intention-to-treat analysis and more adequate randomization procedures are used to reduce the impact of issues related to internal validity.

This systematic review with meta-analysis showed that FIFA 11 is an important warm-up program that can be used to decrease the rates of injuries, and improve dynamic balance and agility among football players.

### Clinical message

FIFA 11 significantly reduces the rate of injury and increases dynamic balance and agility in football players.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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