

INPLASY PROTOCOL

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Effects of Training Programs on Movement Patterns Measured by the Functional Movement Screen in Youth Athlete: A Protocol for Systematic Review

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Review question / Objective: This review will systematically examine and compare the outcomes of different training programs to evaluate the training effects on the athletic youth performance in the Functional Movement Screen test and identify the characteristics of the effective training programs.

Condition being studied: Functional movement competency is considered one important index for youth athlete's professional development, especially for those at a crucial transition into higher-level physical demands of future training and competition. The Functional Movement Screen (FMS) has been used to screen athletes' fundamental movement quality, identify limitations and asymmetries, and establish their risk for sustaining an injury. The seven fundamental movement patterns tested in the FMS include deep squat (DS), hurdle step (HS), inline lunge (ILL), shoulder mobility (SM), active straight leg-raise (ASLR), trunk stability push-up (PU) and rotary stability (RS). Each movement pattern is scored on a 0-3 numeric scale based on standardized criteria, with the score from all sub-tests summed to provide a composite score out of 21. An increased risk of injury was associated with FMS composite scores ≤ 14 . Notably, studies have shown that youth athletes commonly demonstrate lower FMS scores and indicate that they may be in the face of higher risk of injury because of their poor-quality movements. Therefore, this review will focus on the youth athlete functional movement quality measured by the FMS test.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 05 August 2022 and was last updated on 05 August 2022 (registration number INPLASY202280021).

INTRODUCTION

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on the athletic youth performance in the Functional Movement Screen test and identify the characteristics of the effective training programs.

Rationale: The Functional Movement Screen (FMS) is a widely used screening tool to identify athletes' functional movement limitations and their risk of sustaining an injury. An FMS score less than 14 indicates deficits in movement patterns and is associated with higher risks of sports injuries. Many studies have attempted to quantify youth athlete functional movement quality using the FMS test and then formulate training interventions to enhance their movement patterns. However, gaps still exist in these studies and there is limited review-level evidence evaluating effects of different training interventions on youth athlete performance in the FMS test.

Condition being studied: Functional movement competency is considered one important index for youth athlete's professional development, especially for those at a crucial transition into higher-level physical demands of future training and competition. The Functional Movement Screen (FMS) has been used to screen athletes' fundamental movement quality, identify limitations and asymmetries, and establish their risk for sustaining an injury. The seven fundamental movement patterns tested in the FMS include deep squat (DS), hurdle step (HS), inline lunge (ILL), shoulder mobility (SM), active straight leg-raise (ASLR), trunk stability push-up (PU) and rotary stability (RS). Each movement pattern is scored on a 0-3 numeric scale based on standardized criteria, with the score from all sub-tests summed to provide a composite score out of 21. An increased risk of injury was associated with FMS composite scores ≤ 14 . Notably, studies have shown that youth athletes commonly demonstrate lower FMS scores and indicate that they may be in the face of higher risk of injury because of their poor-quality movements. Therefore, this review will focus on the youth athlete functional movement quality measured by the FMS test.

METHODS

Search strategy: A comprehensive electronic search of the literature will be

undertaken in the following databases: SPORTDiscus, MEDLINE, PsycINFO, PubMed, Scopus, Web of Science and Researchgate from 1998 when the FMS was first published by Cook, Burton, Fields, and Kiesel to June 2022. Database limitations applied at the search phase were (i) English language, (ii) peer-reviewed articles and (iii) full-text available. Reference lists of included studies and published reviews will be manually screened for additional potentially relevant articles. The database search will be carried out in the form of subject headings combined with free words. The search terms will include "sport programs," "training programs," "movement pattern," "functional movement screen," "FMS," and "youth athlete."

Participant or population: Studies focusing on youth athletes from 7 to 18 years old inclusive involved in organized/formal sports training and competitions will be included. No restrictions will be applied on gender, race, or region.

Intervention: Any type of sport training interventions, either general training or purpose-designed training to improve FMS scores, will be included in this review. For the controlled trials, the control group will be defined as participants receiving no targeted training interventions.

Comparator: The control group will be defined as participants receiving no targeted training interventions.

Study designs to be included: Randomized/non-randomized controlled trials will be included in this review.

Eligibility criteria: Studies will be excluded if: (i) population of focus was not youth athletes aged from 7 to 18; (ii) other movement competency measurements rather than the FMS were used for assessing movement quality; (iii) The duration of the intervention was less than 4 weeks because we were interested in long-term effects; (iv) studies not written in English; or (v) studies that only have abstracts available.

Information sources: SPORTDiscus, MEDLINE, PsycINFO, PubMed, Scopus, Web of Science and Researchgate

Main outcome(s): The primary outcome measures include the FMS composite and individual scores before and after the intervention. The secondary outcome measures include training duration, frequency and volume.

Data management: The following data will be extracted: the first author's name; year of publication; participant demographics (age, weight, height and sex); sample size; training interventions (duration, training methods, and tasks exercises); and main outcomes (average values and standard deviations) including the FMS composite scores and scores of individual tasks if reported. Two authors will collate the extracted data for accuracy and consistency. Disagreement will be resolved through group discussion or by including a third author as a referee.

Quality assessment / Risk of bias analysis: The methodological quality of all included studies will be rated according to the guidelines of the Physiotherapy Evidence Database (PEDro) scale. Two authors will independently conduct the quality assessment process. Initial disagreements will be resolved by discussion between the two authors or by including a third author as a referee. All included studies will be classified according to the PEDro score with the recommended reference indicator of the methodological quality (9 -10 = excellent; 6 - 8 = good; 4-5 = fair; <4 = poor).

Strategy of data synthesis: For all the included studies, the percentage change in FMS scores from baseline will be calculated and compared. RevMan 5.3 software will be used to calculate effect size. For the dichotomous data, a risk ratio with 95% CI will be used to present the intervention effect, and for continuous data, mean difference or standardized mean difference with 95% CI will be used.

Subgroup analysis: If heterogeneity over the substantial level is identified in the included studies, a subgroup analysis will be performed based on the training type, training design, and age group.

Sensitivity analysis: If the included studies are sufficient, sensitivity analysis will be performed to assess the robustness of studies according to methodological quality, sample size, and missing data.

Country(ies) involved: China.

Keywords: training, movement pattern, Functional Movement Screen, youth athlete.

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