

INPLASY

The effects of balance training on physical fitness and skill-related performance in football players: a systematic review and meta-analysis

INPLASY2026100022

doi: 10.37766/inplasy2026.10.0022

Received: 5 October 2026

Published: 5 October 2026

Yang, Q; Bai, X; Wang, X; Ai, G; Pan, X; Wang, M.

Corresponding author:

Qi Upm

gs66184@student.upm.edu.my

Author Affiliation:

Institute of Physical Education,
Hainan Normal University Hainan,
China.

ADMINISTRATIVE INFORMATION**Support** - No support.**Review Stage at time of this submission** - Data analysis.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2026100022

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 5 October 2026 and was last updated on 5 October 2026.

INTRODUCTION

Review question / Objective This systematic review and meta-analysis aims to evaluate the effects of balance training on physical fitness and skill-related performance in football players. Specifically, it will determine whether balance training, including proprioceptive, sensorimotor, instability, perturbation, and other balance-oriented training interventions, improves physical fitness outcomes such as balance, strength, power, sprint performance, jumping ability, and change-of-direction ability, as well as skill-related performance such as passing, shooting, dribbling, ball control, and kicking performance, compared with usual football training, no additional intervention, or other active training interventions.

Condition being studied This review focuses on the effects of balance training on physical fitness and skill-related performance in football players. Balance ability is an important component of neuromuscular control and may contribute to

postural stability, movement efficiency, force production, and the execution of football-specific skills. The review will examine balance-oriented training interventions, including balance, proprioceptive, sensorimotor, instability, perturbation, and related neuromuscular training, and their effects on outcomes such as balance, strength, power, sprint performance, jumping ability, change-of-direction ability, passing, shooting, dribbling, ball control, and kicking performance.

METHODS

Participant or population This review focuses on the effects of balance training on physical fitness and skill-related performance in football players. Balance ability is an important component of neuromuscular control and may contribute to postural stability, movement efficiency, force production, and the execution of football-specific skills. The review will examine balance-oriented training interventions, including balance, proprioceptive, sensorimotor, instability,

perturbation, and related neuromuscular training, and their effects on outcomes such as balance, strength, power, sprint performance, jumping ability, change-of-direction ability, passing, shooting, dribbling, ball control, and kicking performance.

Intervention Balance-oriented training interventions, including standalone balance training, proprioceptive training, sensorimotor training, instability or unstable-surface training, perturbation training, postural-control training, and other related neuromuscular balance interventions. Combined training programmes will also be eligible when balance training is a clearly identifiable component, such as balance training combined with plyometric or resistance training.

Comparator Comparator conditions may include regular or usual football training, no additional training, or alternative active training interventions without the balance-training component of interest. Active comparators may include stable-surface training, resistance training, plyometric training, or other exercise programmes.

Study designs to be included Randomized controlled trials (RCTs), cluster-randomized controlled trials (cRCTs), and controlled intervention trials (CTs) with a comparison group will be included.

Eligibility criteria Studies will be included if they: (1) are original full-text research articles; (2) investigate a structured balance-oriented training intervention in football players; (3) include a comparison group; (4) report at least one physical fitness or skill-related performance outcome; and (5) provide sufficient data for outcome assessment. Studies will be excluded if they involve non-football populations, focus primarily on injury rehabilitation or prevention without performance outcomes, lack a comparator group, or are reviews, case reports, conference abstracts, protocols, editorials, or other non-original publications.

Information sources The following electronic databases will be searched: PubMed, Scopus, SPORTDiscus with Full Text, and Web of Science. Searches will be conducted from database inception to the final search date.

Main outcome(s) The main outcomes will be physical fitness measures assessed before and after the balance-training intervention, including balance/postural control, muscular strength, power, sprint performance, jumping performance,

and change-of-direction ability. Outcomes will be extracted using the measurement methods reported in the included studies. For continuous outcomes measured using the same scale or test, mean differences (MDs) with 95% confidence intervals (CIs) will be calculated. Where conceptually similar outcomes are assessed using different measurement tools or scales, standardized mean differences (SMDs) with 95% CIs will be used. Post-intervention values or change scores will be synthesized as appropriate according to the available data.

Quality assessment / Risk of bias analysis Two reviewers will independently assess the risk of bias of the included studies. Randomized controlled trials will be assessed using the Cochrane Risk of Bias 2 (RoB 2) tool, covering bias arising from the randomization process, deviations from intended interventions, missing outcome data, measurement of outcomes, and selection of the reported result. Cluster-randomized trials will be assessed using the RoB 2 version for cluster-randomized trials. Non-randomized controlled intervention studies will be assessed using the ROBINS-I tool. Any disagreements between reviewers will be resolved through discussion or consultation with a third reviewer.

Strategy of data synthesis A meta-analysis will be conducted when at least two studies report sufficiently comparable outcomes. For continuous outcomes, change scores from pre- to post-intervention will be extracted where available. Standardized mean differences (SMDs) with 95% confidence intervals (CIs) will be calculated when conceptually similar outcomes are assessed using different measurement instruments; mean differences (MDs) will be used when outcomes are reported using the same scale and units. Random-effects models will be applied because clinical and methodological heterogeneity is expected across studies in terms of participant characteristics, intervention protocols, training duration, and outcome measures. Statistical heterogeneity will be assessed using the I^2 statistic. Where quantitative pooling is inappropriate because of substantial clinical or methodological heterogeneity or insufficient data, findings will be synthesized narratively and presented in tables. For studies with multiple eligible intervention groups, data will be handled to avoid double-counting of shared control participants.

Subgroup analysis If sufficient data are available, subgroup analyses will be conducted to explore potential sources of heterogeneity. Planned subgroup factors may include participant age or

competitive level, sex, type of balance-training intervention (e.g., standalone balance training, proprioceptive or sensorimotor training, unstable-surface training, or combined training), intervention duration, and comparator type. Subgroup analyses may also be performed according to outcome category, such as balance, strength or power, sprint performance, jumping performance, change-of-direction ability, and football skill-related performance. Subgroup analyses will only be undertaken when an adequate number of studies is available within each subgroup.

Sensitivity analysis Sensitivity analyses will be conducted, where feasible, to assess the robustness of the pooled estimates. Analyses will be repeated after excluding studies judged to have a high risk of bias and by removing individual studies one at a time to examine their influence on the overall effect estimate. Where appropriate, sensitivity analyses may also compare results obtained using alternative statistical models or effect-size calculations. If the number of eligible studies is insufficient, sensitivity analyses will not be performed and this will be reported explicitly.

Country(ies) involved China; Malaysia.

Keywords balance training; football; soccer; physical fitness; skill-related performance; proprioception; neuromuscular training; meta-analysis.

Contributions of each author

Author 1 - Qi Yang.
Author 2 - Xuefeng Bai.
Author 3 - Xianfei Wang.
Author 4 - Guowen Ai.
Author 5 - Xiaoyang Pan.
Author 6 - Mengjiao Wang.