

INPLASY PROTOCOL

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Effects of plyometric jump training on soccer player's balance: A systematic review and meta-analysis of randomized-controlled trials

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Conflicts of interest:
None declared.

Review question / Objective: This systematic review with meta-analysis was conducted to assess the effects of PJT programmes on dynamic and static balance in soccer players. **Condition being studied:** PJT-based programmes restricted to a minimum of 3 weeks (duration) in soccer players from any age or sex.

Information sources: Electronic databases (Cochrane, Embase, Medline (PubMed), Scopus, SPORTDiscus, and Web of Science) were searched for relevant publications.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 January 2021 and was last updated on 28 January 2021 (registration number INPLASY202110107).

Rationale: Plyometric jump training (PJT) is a training method often used to improve soccer player's athletic performance, including strength, power, jumping, sprinting, and change-of-direction. However, PJT may also improve balance through bilateral and unilateral jump-

INTRODUCTION

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landing drills. However, a systematic literature search regarding the effects of PJT on soccer player's balance is lacking.

Condition being studied: PJT-based programmes restricted to a minimum of 3 weeks (duration) in soccer players from any age or sex.

METHODS

Search strategy: Electronic databases (Cochrane, Embase, Medline (PubMed), Scopus, SPORTDiscus, and Web of Science) were searched for relevant publications. Keywords and synonyms were entered in various combinations in all fields: ("Soccer" OR "Football") AND ("plyometric*" OR "ballistic" OR "stretch-shortening cycle" OR "reactive strength" OR "jump*") AND ("balance" OR "stability"). An external expert was contacted to verify the final list of references included in this systematic review and to indicate if there was any study that was not detected through our search.

Participant or population: Soccer players from any age or sex, without injury, illness or other clinical condition.

Intervention: PJT-based programmes restricted to a minimum of 3 weeks (duration) and no restricted to frequency (number of sessions per week).

Comparator: Passive or active control groups.

Study designs to be included: Randomized controlled-trials.

Eligibility criteria: Inclusion criteria: (i) Soccer players from any age or sex, without injury, illness or other clinical condition. Futsal (indoor soccer), if any, will be included; (ii) PJT-based programmes (bilateral and/or unilateral) restricted to a minimum of 3 weeks (duration) and no restricted to frequency (number of sessions per week). PJT combined with other training methods; (iii) Passive or active control groups; (iv) Pre-post intervention values of statistic and/or dynamic balance;

(v) Randomized controlled and/or parallel trials; and (vi) Peer reviewed, original, full-text studies written in English, Portuguese and/or Spanish. Exclusion criteria: (i) Soccer players in rehabilitation or in return-to-play programmes. Other sports than soccer (e.g., volleyball, basketball, rugby, Australian or American football); (ii) Other training methods. Programmes with less than 3 weeks of intervention; (iii) Other PJT training group; (iv) Non-randomized and non-controlled studies; (v) Written in other language than English, Portuguese and/or Spanish. Reviews, letters to editors, trial registrations, proposals for protocols, editorials, book chapters, conference abstracts.

Information sources: Electronic databases (Cochrane, Embase, Medline (PubMed), Scopus, SPORTDiscus, and Web of Science) were searched for relevant publications.

Main outcome(s): The dynamic and/or static balance was chosen as the main outcome.

Additional outcome(s): Adverse effects were also extracted as secondary outcome, in case of any reported.

Quality assessment / Risk of bias analysis: The Physiotherapy Evidence Database (PEDro) scale was used to assess the methodological quality of the randomized-controlled trials included in this systematic review and meta-analysis. The scale scores the internal study validity in a range of 0 (low methodological quality) to 10 (high methodological quality). Eleven items are measured in the scale. The criterion 1 is not included in the final score. Points for items 2 to 11 were only attributed when a criterion was clearly satisfied. Two of the authors (MRG and FMC) independently scored the articles. Disagreements in the rating between both authors was resolved through discussion with a third author (DC). Aiming to control the risk of bias between authors, the Kappa correlation test was used to analyze the agreement level for the included studies. A minimum agreement level of $k = 0.90$ was established.

Strategy of data synthesis: We followed previously established methods (25,26). Briefly, analysis and interpretation of results were only conducted in the case of at least three studies provided baseline and follow-up data for the same measure. Pre-training and post-training means and standard deviations (SD) for dependent variables were used to calculate effect sizes (ES; Hedge's g) for each outcome measure in the PJT and control groups. Data were standardized using post-intervention SD values. The random-effects model was used to account for differences between studies that might impact the PJT-based effect (34,35). The ES values are presented with 95% confidence intervals (CI). Calculated ES were interpreted using the following scale: 0.6–1.2, moderate; >1.2–2.0, large; >2.0–4.0, very large; >4.0, extremely large (36). Heterogeneity was assessed using the I^2 statistic, with values of 75% considered to represent low, moderate, and high levels of heterogeneity, respectively (37). The risk of bias was explored using the extended Egger's test (38). When bias was present, the trim and fill method was applied (39), in which case LO was assumed as the default estimator for missing studies (40). All analyses were carried out using the Comprehensive Meta-Analysis software (version 2; Biostat, Englewood, NJ, USA). Statistical significance was set at $p \leq 0.05$.

Subgroup analysis: Moderated analyses were planned to use a random-effects model and independently calculated single factor analysis. When possible, the median split technique was planned (41). Moderator analysis was considered for the sex of participants (42), length (25) and weekly frequency (43) of the interventions. Only PJT and combined PJT (i.e., PJT combined with other training method, was also considered as moderator.

Sensitivity analysis: The risk of bias was explored using the extended Egger's test (38). When bias was present, the trim and fill method was applied (39), in which case LO was assumed as the default estimator for missing studies (40). All analyses were carried out using the Comprehensive Meta-

Analysis software (version 2; Biostat, Englewood, NJ, USA). Statistical significance was set at $p \leq 0.05$.

Language: English.

Country(ies) involved: Portugal; Chile; Spain.

Keywords: football; human physical conditioning; reactive strength; power.

Contributions of each author:

Author 1 - Filipe Manuel Clemente - FMC lead the project, wrote and revised the original manuscript.

Author 2 - Rodrigo Ramirez-Campillo - RRC analyzed and interpreted the data, wrote the statistical report and revised the original manuscript.

Author 3 - Daniel Castillo - Run the data search, performed the methodological assessment, conducted the data extraction, wrote and revised the original manuscript.

Author 4 - Javier Raya-González - Run the data search, performed the methodological assessment, conducted the data extraction, wrote and revised the original manuscript.

Author 5 - Markel Rico-González - Run the data search, performed the methodological assessment, conducted the data extraction, wrote and revised the original manuscript.

Author 6 - Thomas Rosemann - Wrote and revised the original manuscript.

Author 7 - Beat Knechtle - Wrote and revised the original manuscript.