International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY PROTOCOL

To cite: Deng et al. Effects of Plyometric Training on Skill and Physical Performance in Healthy Tennis Players: A Systematic Review and Meta-Analysis. Inplasy protocol 202250146. doi: 10.37766/inplasy2022.5.0146

Received: 26 May 2022

Published: 26 May 2022

Corresponding authors:
NuanNuan Deng

gs61303@student.upm.edu.my

Kim Geok Soh

kims@upm.edu.my

Author Affiliation:
Universiti Putra Malaysia.

Support: **None.**

Review Stage at time of this submission: **Piloting of the study selection process.**

Conflicts of interest:
None declared.

Effects of Plyometric Training on Skill and Physical Performance in Healthy Tennis Players: A Systematic Review and Meta-Analysis

Deng, N[1]; Soh, KG[2]; Huang, D[3]; Abdullah, B[4]; Luo, S[5].

Review question / Objective: The first objective of this review was to summarize the state of the available literature on this topic while identifying gaps in the state of the field. Second, we intended to finally quantify the effects of plyometric training on tennis players to clarify the impact of this type of exercise on skill and physical performance.
Condition being studied: As a consequence of the increasing popularity of tennis, the sport is getting more competitive in all age groups. Since technique, tactical skills, and physical abilities are important predictors of success in competition. Plyometric training consists of the dynamic and rapid stretching of muscles (eccentric action) immediately followed by a concentric shortening action of the same muscles and connective tissues. Plyometric training has also been utilized to help prevent knee injuries, and enhance speed, muscular strength, power, balance, body composition, agility , flexibility, and muscular endurance.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 26 May 2022 and was last updated on 26 October 2022 (registration number INPLASY202250146).

INTRODUCTION

Review question / Objective: The first objective of this review was to summarize the state of the available literature on this topic while identifying gaps in the state of the field. Second, we intended to finally quantify the effects of plyometric training on tennis players to clarify the impact of this type of exercise on skill and physical performance.

Condition being studied: As a consequence of the increasing popularity of tennis, the

sport is getting more competitive in all age groups. Since technique, tactical skills, and physical abilities are important predictors of success in competition. Plyometric training consists of the dynamic and rapid stretching of muscles (eccentric action) immediately followed by a concentric shortening action of the same muscles and connective tissues. Plyometric training has also been utilized to help prevent knee injuries, and enhance speed, muscular strength, power, balance, body composition, agility , flexibility, and muscular endurance.

METHODS

Search strategy: Database searches were conducted using SCOPUS, PubMed, Web of Science, and SPORTDiscus (via EBSCOhost) electronic databases from inception until 30 May 2022. A systematic investigation of the topic was carried out utilizing the Boolean operations AND and OR. The keywords are as follows: ("plyometric training" OR "plyometric exercise*" OR "plyometric drill*" OR "plyometr*" OR "ballistic six" OR "ballistic training" OR "explosive" OR "force-velocity" OR "stretch-shortening cycle" OR "stretch-shortening exercise" OR "complex training" OR "jump training") AND ("tennis" OR "tennis player*" OR "tennis athlete*"). Moreover, a search was also conducted on Google Scholar and based on the reference lists of selected papers, previously relevant reviews and meta-analyses.

Participant or population: Healthy tennis players, with no restrictions on their gender or age.

Intervention: A plyometric training program, defined as upper-body plyometrics (medicine ball exercises, push-ups, and chess press) or lower-body plyometrics (unilateral or bilateral bounds, jumps, and hops) or combined upper and lower-body plyometrics that commonly utilize a pre-stretch or countermovement stressing the stretch-shortening cycle.

Comparator: Two or more groups and single-group trials.

Study designs to be included: Randomization control design or non-randomization control design.

Eligibility criteria: To qualify for inclusion in the meta-analysis, studies were required to include: 1) healthy tennis players, with no restriction for sex or age; 2) a plyometric training program; 3) a control group; 4) a measure of skill performance (e.g., maximal stroke velocity, stroke accuracy)or physical performance (e.g., jump height, sprint speed, agility). Only full-text, peer-reviewed, original studies written in English were considered, excluding cross-sectional, review papers, or training-related studies that did not focus on the effects of plyometric exercises). Retrospective studies, prospective studies, studies for which only the abstract was available, case reports, special communications, letters to the editor, invited commentaries, errata, overtraining studies, and patents were excluded.

Information sources: Four electronic databases were searched: SCOPUS, PubMed, EBSCOhost (SPORTDiscus), and Web of Sciences. In addition, the reference lists of included studies and previous reviews and meta-analyses were examined to detect studies potentially eligible for inclusion.

Main outcome(s): Skill performance such as maximal stroke velocity, stroke accuracy, and physical performance (e.g., jump height, sprint speed, agility). Means and standard deviations for a measure of pre-post-intervention performance were used in the analyses, and converted to Hedge`s g effect size (ES).

Data management: Data were extracted from included articles, using a form created in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA). If there was a lack of clear or complete reporting of the required data, the authors of the article were contacted to inquire about it.

Quality assessment / Risk of bias analysis: Two reviewers independently utilized the revised Cochrane risk of bias assessment for randomized trials (RoB-2) to assess the risk of bias of each of the identified RCTs. The Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool was used to assess the risk of bias in non-RCTs. In accordance with the guidelines in the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) handbook, the GRADE approach was used to assess and summarize the certainty of evidence. Firstly, two reviewers classified all eligible studies based on their reported outcomes. Then, to evaluate the confidence of evidence, the following six major aspects were included: research design, study limitations, inconsistency, indirectness, imprecision, and publication bias. Outcomes were assessed separately for RCTs and non-RCTs.

Strategy of data synthesis: For analysis and interpretation of results, meta-analyses were conducted if at least three studies provided data for the same parameter. Meta-analytical If three or more relatively homogeneous studies explicitly provided pre and post-test data for the experimental and control groups with the same parameters, these studies were pooled for meta-analysis. Conversely, a narrative synthesis of the findings is conducted. Using pre- and post-intervention performance means and standard deviations, between-group effect sizes (ES; Hedge's g) were calculated (SD). Post score SD was used to standardize the data. The inverse-variance random-effects model for meta-analyses was used. If the essential information was not accessible in the original article or supplementary material, the authors were contacted. The study was eliminated from the meta-analysis if contact was not returned or data could not be given. The ES values were presented with 95% confidence intervals (95% CIs). The ES magnitudes 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. In some investigations with more than one PT group, the control group was proportionately divided to facilitate comparison across all participants. The I2 statistic was used to explore heterogeneity. Values of 25%, 25-75%, and >75% were defined as low, moderate, and high levels of heterogeneity, respectively. The risk of publication bias across studies was assessed using the extended Egger's test. Notably, a sensitivity analysis was undertaken when Egger's test was significant ($p < 0.05$). An analysis of all available data was carried out using Comprehensive Meta-Analysis (version 3; Biostat, Englewood, NJ, USA).

Subgroup analysis: None.

Sensitivity analysis: A sensitivity analysis was undertaken when Egger's test was significant ($p < 0.05$). In order to examine the effects of each result from each study on the overall findings, results were analyzed with each study deleted from the model once.

Language: Only articles published in English were considered.

Country(ies) involved: China: Malaysia.

Keywords: plyometric training:skill:physical performance:tennis.

Contributions of each author:

Author 1 - NuanNuan Deng - Department of Sports Studies, Faculty of Educational Studies, Universiti Putra Malaysia, Selangor, Malaysia.
Email: gs61303@student.upm.edu.my
Author 2 - Kim Geok Soh - Department of Sports Studies, Faculty of Educational Studies, Universiti Putra Malaysia, Selangor, Malaysia.
Email: kims@upm.edu.my
Author 3 - Dandan Huang - College of Physical Education, Chong Qing University, Chongqing, China.
Author 4 - Borhannudin Abdullah - Department of Sports Studies, Faculty of Educational Studies, Universiti Putra Malaysia, Selangor, Malaysia.
Author 5 - Shengyao Luo - Department of Sports Studies, Faculty of Educational Studies, Universiti Putra Malaysia, Selangor, Malaysia.