INPLASY PROTOCOL

To cite: Afonso et al. Systematic review and meta-analysis of the effects of exclusively resistance training-based protocols on range of motion in comparison with non-resistance training-based protocols. Inplasy protocol 202090009. doi: 10.37766/inplasy2020.9.0009

Received: 02 September 2020

Published: 02 September 2020

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Support: **None.**

Review Stage at time of this submission: **Data analysis.**

Conflicts of interest:
The authors declare no conflict of interests regarding the publication of this manuscript.

Systematic review and meta-analysis of the effects of exclusively resistance training-based protocols on range of motion in comparison with non-resistance training-based protocols

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Review question / Objective: **The aim of this study was to systematically review randomized trials assessing the effects of resistance training protocols lasting a minimum of 4 weeks on the ROM in humans of any health status, in comparison with training interventions not using resistance training.**
Condition being studied: **Resistance training.**
Information sources: **The search was date-limited, having considered only articles published from the year 2010 onwards, to capture only the most up-to-date research. Due to the specificity of each search engine, some aspects differed for each database: (i) in PubMed, the search was limited to Title or Abstract, not contemplating keywords; (ii) the same was true for the search in PEDro, with the additional selection of the criterion "clinical trial", to exclude practice guidelines and systematic reviews; PEDro also requires multiple searches to be conducted, as the different combinations are not realizable simultaneously; (iii) in Web of Science, "Topic" is the term used to refer to title, abstract and keywords; (iv) in Scopus, the document type was limited to "Article".**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 02 September 2020 and was last updated on 02 September 2020 (registration number INPLASY202090009).

INTRODUCTION

Review question / Objective: **The aim of this study was to systematically review randomized trials assessing the effects of resistance training protocols lasting a minimum of 4 weeks on the ROM in humans of any health status, in comparison**

with training interventions not using resistance training.

Rationale: In the last decade, research has suggested that resistance training (RT) may improve range of motion (ROM). However, most protocols do not seem to isolate the effects of resistance training. Therefore, our goal was to systematically review the effects of exclusive resistance training on ROM.

Condition being studied: Resistance training.

METHODS

Search strategy: Articles had to respect two criteria: (i) the title had to have the expressions "strength training" OR "resistance training" OR "weight training"; AND (ii) the title, abstract or keywords had to have the expressions "mobility" OR "flexibility" OR "range of motion"; AND (iii) the title, abstract or keywords also had to include the expression "randomized".

Participant or population: Humans of any health status.

Intervention: Resistance training.

Comparator: Contrast groups performing alternative training protocols (e.g., stretching, endurance training).

Study designs to be included: Randomized trials.

Eligibility criteria: Five databases were used to search and retrieve the articles: Cochrane Library, Web of Science, PEDro, PubMed, and Scopus. The search was conducted in early September 2020. Boolean operators were applied in our search strategy. Articles had to respect two criteria: (i) the title had to have the expressions "strength training" OR "resistance training" OR "weight training"; AND (ii) the title, abstract or keywords had to have the expressions "mobility" OR "flexibility" OR "range of motion"; AND (iii) the title, abstract or keywords also had to include the expression "randomized".

Information sources: The search was date-limited, having considered only articles published from the year 2010 onwards, to capture only the most up-to-date research. Due to the specificity of each search engine, some aspects differed for each database: (i) in PubMed, the search was limited to Title or Abstract, not contemplating keywords; (ii) the same was true for the search in PEDro, with the additional selection of the criterion "clinical trial", to exclude practice guidelines and systematic reviews; PEDro also requires multiple searches to be conducted, as the different combinations are not realizable simultaneously; (iii) in Web of Science, "Topic" is the term used to refer to title, abstract and keywords; (iv) in Scopus, the document type was limited to "Article".

Main outcome(s): The average magnitude of changes in ROM for intervention and comparators, differences between groups (excluding pure, non-exercising control groups)

Quality assessment / Risk of bias analysis: Risk of bias in individual studies and across studies was assessed using the Cochrane risk-of-bias tool for randomized trials (RoB 2).

Strategy of data synthesis: Data items were divided according to different topics: (i) Population: subjects, health status, sex/gender, age, training status and selection of subjects; (ii) Intervention and comparators: study length in weeks, weekly frequency of the sessions, weekly training volume in minutes, duration of the sessions in minutes, number of exercises per session, number of sets and repetitions per exercise, type of loads (e.g., % 1RM), full vs. partial ROM, existence of supervision and supervision ratio; (iii) ROM testing: joints that were tested and planes and positions of testing, mode of testing (i.e., active, passive, both), type and duration of warm-up, timing of testing (i.e., pre- and post-tests, intermediate tests, retention tests), which results were considered as valid for a given test (e.g., average of three measures), reporting of

data reliability, number of testers and instructions provided during testing.

Subgroup analysis: **None.**

Sensibility analysis: **None.**

Language: **English.**

Country(ies) involved: **Portugal; Brazil; Chile.**

Keywords: **systematic review and meta-analysis; resistance training; flexibility; mobility; range of motion.**

Contributions of each author:
Author 1 - José Afonso - Conceptualization; Main writing and revision of the article.
Author 2 - João Moscão - Main writing and organization of the manuscript.
Author 3 - Tiago Rocha - Main writing and organization of the manuscript.
Author 4 - Rodrigo Zacca - Data collection process; Revision of the article.
Author 5 - Alexandre Martins - Data collection process and revision of the article.
Author 6 - André Milheiro - Data collection process and revision of the article.
Author 7 - João Ferreira - Data collection process and revision of the article.
Author 8 - Rodrigo Ramirez-Campillo - Data analysis and statistical report; revision of the article.
Author 9 - Filipe Manuel Clemente - Additional contributions to the introduction and discussion; data collection and revision of the article.