International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

An umbrella review of resistance training to promote increases in muscle function and hypertrophy

INPLASY202360071
doi: 10.37766/inplasy2023.6.0071
Received: 24 June 2023
Published: 24 June 2023

Corresponding author:
Stuart Phillips

phillis@mcmaster.ca

Author Affiliation:
McMaster University.

Currier, BS[1]; Fiatarone Singh, M[2]; Lowisz, CV[3]; Rawson, ES[4]; Schoenfeld, BJ[5]; Smith-Ryan, AE[6]; Steen, JP[7]; Thomas, GA[8]; Triplett, NT[9]; Washington, T[10]; Phillips, SM[11].

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Formal screening of search results against eligibility criteria.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202360071

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 June 2023 and was last updated on 05 August 2023.

INTRODUCTION

Review question / Objective The proposal is to undertake a structured, systematic umbrella review of systematic reviews and meta-analyses that have included randomized controlled trials (RCT) of resistance training (RT) and to identify Frequency, Intensity, Type and Time (FITT) principles that lead to the largest effects.
PICO Questions for An umbrella review of resistance training to promote increases in muscle function and hypertrophy.
Does chronic RT (I), compared to a comparator group (C), increase muscular strength, power, endurance, contraction velocity and hypertrophy (muscle biopsy, ultrasound, MRI, CT, DXA, BIA, creatinine, D3-Cr) (O) among younger (> 18yr) and older (> 55yr) adults (P)?
The influence of resistance training (RT) program variables (Frequency [training session per week], Intensity [load, work to fatigue], Type [free weight, machine-guided], Time [under tension, high/low velocity]) in promoting gains in strength (variously measured), power, endurance, contraction velocity and hypertrophy in younger (18-55) adults.

Rationale There are numerous systematic reviews of resistance training manipulating a multitude of training-related variables. The most effective prescription to promote gains in strength and hypertrophy is unknown.

Condition being studied Resistance Training.

METHODS

Search strategy Search Notes:
• Imposing language for adults had less impact than adding in Study Design/Publication Type
• "Otherwise healthy" is difficult to search on and doing so would eliminate relevant articles.
Database: OVID Medline Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to

Present
Search Strategy:
---
1 Resistance Training/ (10773)
2 Weight Lifting/ (4889)
3 Isometric Contraction/ (16099)
4 exercise, isometric/ (128219)
5 ((weight* or isometric or strength or resistance) adj3 (train* or lift* or exercise*)).ti,ab,kf,kw. (37582)
6 external resistance.ti,ab,kf,kw. (474)
7 (isometric* adj2 contract*).ti,ab,kf,kw. (9668)
8 or/1-7 (176837)
9 muscle strength/ or hand strength/ or pinch strength/ (40255)
10 ((muscle* or muscular) adj3 (function* or strength* or hypertroph* or mass or power or size or biops* or endurance or velocit* or thick* or ultrasound* or CT or MRI or tomography imag*)).ti,ab,kf,kw. (113518)
11 hypertrophy/ (23848)
12 Creatinine/ (58988)
13 creatinine.ti,ab,kf,kw. (123343)
14 krebiozen.ti,ab,kf,kw. (30)
15 (DXA or x-ray or xray).ti,ab,kf,kw. (374425)
16 (bio-electrical impedance or bioelectrical impedance or BIA).ti,ab,kf,kw. (8267)
17 BODY COMPOSITION/ and Electric Impedance/ (3299)
18 or/9-17 (677547)
19 8 and 18 (28324)
20 (animals/ or exp Animals, Laboratory/ or models, animal/ or exp disease models, animal/) not (humans/ and animals/) (4924070)
21 ((animal* or monkey* or pig or pigs or piglet* or rat or rats or porcine or rodent* or mice or mouse or horse or sheep* or lamb* or primate* or murine or hamster* or rabbit*) not (animal* and human*)).ti,ab,kw,kf. (3894809)
22 20 or 21 (6118922)
23 19 not 22 (26630)
24 Meta-Analysis as Topic/ (20734)
25 meta analy*.mp. (257360)
26 metaanaly*.mp. (2842)
27 Meta-Analysis/ (151871)
28 (systematic adj (review*1 or overview*1)).mp. (262421)
29 exp Review Literature as Topic/ (18642)
30 or/24-29 (397309)
31 8 and 18 and 30 (1187)
32 31 not 22 (1180)
33 limit 32 to english language (1151)
34 remove duplicates from 33 (1135)
****

Participant or population Adults >18 years.

Intervention Resistance training.

Comparator Control (no resistance exercise) OR an alternative prescription for resistance exercise.

Study designs to be included Systematic reviews.

Eligibility criteria Subject > 18 years, but less than 55 or >55 (two age classifications); apparently-healthy or with no defined disease(s); RT interventions encompassing at least (lower limit) 6wk, with 2 sessions per week (12 exposures), with no upper limit; any RT status (novice or trained); employed, as a comparator: non-exercise control, other exercise control conceived of as sham (i.e., stretching, callisthenics), or other (note of what); contained any aspect of the FITT (see above) of the RT intervention; reported pre-and post-intervention strength (or at least one outcome related to muscle function) or hypertrophy data for both the RT and comparator arm(s); if a supplement or nutritional intervention or other co-intervention (e.g., behavioural therapy, medication, counselling) is applied, it must be received by intervention and comparator groups.

Information sources Databases of publications MEDLINE, Embase, Emcare, SPORTDiscus, CINAHL, and Web of Science.

Main outcome(s) Strength (any test), power, endurance, and hypertrophy (muscle mass gain) as measured using the methods described.

Data management Papers screened in Rayyan https://www.rayyan.ai/ Data extracted into customized data-sheets.

Quality assessment / Risk of bias analysis Consensus Analysis Strategy
1. All reviews will be scored using the AMSTAR (A Measurement Tool to Assess Systematic Reviews) tool (Shea et al. BMC Med Res Methodol.2007;7:10). This 11-item tool assesses the degree to which review methods avoided bias. The methodological quality is rated as high (score 8–11), moderate (score 4–7) or low (score 0–3).
2. The quality of the evidence (QoE) supporting each bottom-line statement will be rated by using a method based on the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach for primary evidence (1 - very low; 2 - low; 3 - moderate; 4 - high). This method considers study design (meta-analysis: yes or no) and AMSTAR rating of the included systematic reviews.

Strategy of data synthesis To organize the evidence, the authors will systematically

synthesize the extracted data of each review. This results in standardized effectiveness statements (i.e., sufficient evidence, some evidence, insufficient evidence, insufficient evidence to determine) about the treatment effect of the interventions in the individual systematic reviews. See (https://onlinelibrary.wiley.com/doi/10.1002/jcsm.13030) "An umbrella review of systematic reviews of β-hydroxy-β-methyl butyrate supplementation in ageing and clinical practice" for more details.

Subgroup analysis Younger (18-55) and older (>55) persons.

Sensitivity analysis None planned.

Language restriction English reviews only.

Country(ies) involved Canada, United states, Australia.

Other relevant information This review is undertaken on behalf of ACSM.

Keywords resistance training, muscle, strength, power.

Dissemination plans Presentation and publication.

Contributions of each author

Author 1 - Brad Currier - undertook the search of articles; synthesized data; reviewed evidence recommendations.
Email: currierb@mcmaster.ca
Author 2 - Maria Fiatarone Singh - designed and conceived the review; reviewed evidence recommendations.
Email: maria.fiataronesingh@sydney.edu.au
Author 3 - Caroline Lowisz - undertook the search of articles; synthesized data; reviewed evidence recommendations.
Email: lowiszc@mcmaster.ca
Author 4 - Eric Rawson - designed and conceived the review; reviewed evidence recommendations.
Email: erawson@messiah.edu
Author 5 - Brad Schoenfeld - designed and conceived the review; reviewed evidence recommendations.
Email: brad.schoenfeld@lehman.cuny.edu
Author 6 - Abbie Smith-Ryan - designed and conceived the review; reviewed evidence recommendations.
Email: abbsmith@email.unc.edu
Author 7 - Jeremy Steen - undertook the search of articles; synthesized data; reviewed evidence recommendations.
Email: jeremy.steen@mail.utoronto.ca
Author 8 - Gwendolyn Thomas - designed and conceived the review; reviewed evidence recommendations.
Email: gat112@psu.edu
Author 9 - N. Travis Triplett - designed and conceived the review; reviewed evidence recommendations.
Email: triplttnt@appstate.edu
Author 10 - Tyrone Washington - designed and conceived the review; reviewed evidence recommendations.
Email: tawashin@uark.edu
Author 11 - Stuart Phillips - designed and conceived the review; reviewed evidence recommendations
Email: phillis@mcmaster.ca