Strengthening the Evidence in Exercise Sciences Initiative (SEES Initiative): Rationale and Methods

Daniel Umpierre[1,2,3], Angélica T. De Nardi[3], Cíntia E. Botton[2,3], Lucas Helal[3,4], Lucas P. Santos[3], Nórton L. Oliveira[2,3]

1. Department of Public Health, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil.
2. National Institute of Science and Technology for Health Technology Assessment (IATS), Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil.
3. Exercise Pathophysiology Research Laboratory, Graduate Program in Cardiology and Cardiovascular Sciences, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil.
4. Centre for Journalology, Ottawa Hospital Research Institute, Ottawa, Canada

Links to topics:

Version date: April 15, 2019.

Introduction

Background

The poor quality of scientific evidence has been historically warned in medical research (1). Although the concept of *reproducible research* may be distinctly understood by researchers of different fields (2), claims for higher methodological rigor and more transparent practices have echoed more evenly in several disciplines. As some of the countermeasures to reduce the avoidable waste in research, resources such as public data repositories, registry platforms, data sharing policies, and reporting guidelines have been made available to increase transparency and reproducibility, and, ultimately, to improve the accountability and uptake of scientific evidence to multiple stakeholders.

Interventional studies and evidence syntheses have burgeoned in the scientific literature (3). Publications addressing physical activity trials have also been increasingly prominent in numbers and impact for benefits (4). However, recommended standards for research methods and scientific reporting are suboptimally addressed by authors and journal editors in exercise sciences. Preliminary evidence suggests that recommended practices for reporting randomized clinical trials (RCTs) are underused (5). Beyond interdisciplinary studies and initiatives that aim to raise awareness and improve the quality of research, we reason that a discipline-based project may capitalize the efforts to identify questionable research practices, reduce the waste in physical activity research, and propose future actions to strengthen the credibility of scientific evidence in this field.

We then seek to prospective and systematically assess methodological and reporting standards of RCTs and systematic reviews with meta-analyses (SRMAs) from selected journals in the field of exercise sciences and general medicine, as well as to disseminate our findings publicly and provide direct feedback to authors and journal editors.

Design

Collaborative nonprofit initiative for assessment of published research and dissemination of recommended practices.

Methods

Overall workflow and team organization

The project will be operationalized by trained collaborators organized in three committees:

(1) pre-assessment committee;
(2) assessment committee (composed by two teams);
(3) post-assessment committee;

Such committees will periodically carry out the tasks related to literature search and retrieval, assessment of RCTs and SRMAs, data management, and dissemination. To ensure internal consistency, established tasks of each committee will follow standardized operational procedures.

The pre-assessment committee is initially composed by two collaborators responsible for monitoring and managing literature searches and retrieval as well as providing support for the other two committees (e.g., implementing or adjusting any tools). In addition, this committee will regularly monitor general information from journals such as endorsements of recommended guidelines and proportion of clinical trials or systematic reviews for each journal issue.

The assessment committee is initially composed by four collaborators, who are divided in RCT (two coders) and SRMA teams (two coders). This committee will carry out the assessment of eligibility criteria and conduct data extraction regarding methodological and reporting evaluations of included studies.

The post-assessment committee is initially composed by two collaborators responsible for data analyses as well as storage and sharing of search and data files. In addition, this committee will disseminate outcome results from evidence appraisal, with monthly periodicity, for the SEES audience and other stakeholders through predefined means that are detailed in the dissemination section (see below).

Journals and references retrieval

Automated searches using PubMed/MEDLINE will be conducted for each journal on a monthly basis through structured queries (Appendix I). To reduce the burden with eligibility analyses, search strategies were built using highly-sensitivity filters of clinical trials and systematic reviews. After conducting pilot tests and examining specific literature (6), we therefore chose the highly sensitivity search strategy for retrieval of controlled trials by Robinson and Dickersin (7) (Cochrane Highly Sensitive Search Strategy) and a ‘sensitivity maximizer’ query by Boynton et al (8) for SRMAs. The full search strategies are presented in Appendix 1.
Whenever we potentially modify the search strategy or database queries in the future, such changes will be disseminated in the SEES Initiative website.

Publications will be periodically and prospectively retrieved from selected journals in the field of exercise sciences, as follows:

1. American Journal of Sports Medicine
2. British Journal of Sports Medicine
3. European Journal of Preventive Cardiology
4. International Journal of Behavioral Nutrition and Physical Activity

5. Journal of Physiotherapy
6. Journal of Science and Medicine in Sport
7. Medicine and Science in Sports and Exercise
8. Scandinavian Journal of Medicine & Science in Sports
9. Sports Medicine

In addition, we will periodically and prospectively retrieve exercise-related publications from the high-ranked journals in general medicine, as follows:

1. Annals of Internal Medicine (AIM)
2. British Medical Journal (The BMJ)
3. Journal of the American Medical Association (JAMA)
4. Lancet
5. New England Journal of Medicine (NEJM)

After retrieving references, the search coordinator will prepare the files for assessment of eligibility. Eligibility screening will be conducted independently and in duplicate by RCT and SRMA teams. Studies will be firstly assessed based on title and abstracts and, if needed, by full-texts.

Eligibility criteria

We will include articles reporting RCTs having at least one intervention arm based on physical activity advice or exercise program. Studies with multifaceted interventions (e.g., comprehensive lifestyle intervention or health education program) comprising a well defined component of physical activity will be eligible for inclusion. Moreover, our eligibility criteria includes not only parallel trials, but also other designs such as inferiority, equivalence, factorial, crossover or cluster designs. For articles reporting SRMA, we will include reviews which synthesized primary studies having at least one intervention arm based on exposures or interventions of physical activity or exercise programs. Therefore, we underscore that SRMAs of observational studies with a well defined physical activity exposures will be eligible for inclusion. Systematic reviews with exploratory approaches (e.g., meta-regression) using meta-analytic techniques will be considered for inclusion. For both RCTs and SRMAs, research questions should relate to health outcomes or behaviors at a minimal extent. The decision of the eligibility of research questions will be made at the discretion of assessors based on the SEES protocol. If needed, a third party will be consulted. Full data sets with publications assessed for eligibility will be publicly available at a monthly basis.

Assessment of RCTs

The items of interest to be assessed in RCTs were selected based on key information that is (*i*) suitable to be expected in most trials using physical activity interventions or structured exercise programs; and (*ii)* sensible to present methodological contents needed either for reproducibility purposes and/or knowledge translation to clinical/field practices. To guide our choice on established recommended reporting standards, our core assessment includes items from two following documents: (*a*) the CONSORT (CONsolidated Standards of Reporting Trials) 2010 guideline (9); and (*b*) Template for Intervention Description and Replication (TIDieR) checklist (10), which is a CONSORT extension for reporting of interventions. Table 1 presents the selected items regarding methodological or reporting standards in RCTs and, whether applicable, the guideline of reference.

Table 1. Items selected for assessment of RCTs.

Items for assessment by the SEES Initiative	**Reference (guideline, checklist item; unless otherwise stated)**
Title identification as a randomized trial	CONSORT, 1a
Registration	CONSORT, 23
Protocol	CONSORT, 24
Abstract: interventions intended for each group	CONSORT, Table 2
Abstract: primary outcome	CONSORT, Table 2
Abstract: effects sizes and their precisions (if quantitative results are presented)	CONSORT, Table 2
Rationale or goals related to the intervention	CONSORT, 2b TIDIER, 2
Statement of directional hypotheses or an exploratory approach	CONSORT, 2b
Description of trial design	CONSORT, 3a
Eligibility criteria for participants	CONSORT, 4a
Definitions and measurements of primary and secondary outcomes	CONSORT, 6a
Method and type of randomization	CONSORT, 8a and 8b
Allocation concealment	CONSORT, 9
Blinding/masking for measurements or analysis of outcomes	CONSORT, 11a
Sample size calculation	CONSORT, 7a
Identification of the intervention	TIDieR, 1
Materials used as part of the intervention	TIDieR, 3
Procedures or processes in each ot the interventions	TIDieR, 4

Individuals who were involved in providing the intervention	TIDieR, 5
Modes of delivery of the intervention	TIDieR, 6
Location where the intervention occurred	TIDieR, 7
Period, amount, intensity and schedule of delivery	TIDieR, 8
Description of any individual tailoring for the intervention	TIDieR, 9
Materials/strategies used regarding the intervention adherence	TIDieR, 11
Results of intervention adherence	TIDieR, 12
Statistical methods for group comparison	CONSORT, 12a
Numbers of participants who were assigned, received intervention, and were analyzed for the primary outcome	CONSORT, 13a
Dates/periods of recruitment	CONSORT, 14a
Baseline data for each group	CONSORT, 15
Actual number of participants analyzed	CONSORT, 16
Effect sizes described with their precision measures	CONSORT, 17a
Non-planned changes after the trial commenced	CONSORT, 6b TIDIER, 10
Harm or unintended effects	CONSORT, 19
Discussion of limitations (potential bias, imprecision, etc)	CONSORT, 20
Presence of potential spin bias	Based on Boutron et al (11)
Statement regarding data availability	Based on ICMJE (12)
Statement regarding sources of funding	CONSORT, 25
Statement regarding potential conflicts of interest	Not applicable

ICMJE: International Committee of Medical Journal Editors

Assessment of SRMAs

The items of interest to be assessed in SRMAs were selected based on key information that is (*i*) suitable to be expected in most systematic reviews with exercise intervention or exposures related to physical activity; (*ii)* relevant to allow methodological reproducibility purposes; and (*iii*) relevant to indicate how review authors weigh in the summarized evidence for to promote well-reasoned knowledge translation. To guide our choice on established recommended reporting and methodological standards, our core assessment includes items from three following documents: (*a*) Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (13); (*b*) A MeaSurement Tool to Assess systematic Reviews (AMSTAR 2) (14); and (*c)* the

ROBIS tool (15). Table 2 presents the selected items regarding methodological or reporting standards in SRMAs and, whether applicable, the guideline or tool of reference.

Table 2. Items selected for assessment of SRMAs.

Items for assessment by the SEES Initiative	**Reference (guideline, checklist item; unless otherwise stated)**
Registration	PRISMA, 2 and 5 AMSTAR 2, 2
Methodological protocol (publicly available)	PRISMA, 5 AMSTAR 2, 2
Title identification as a systematic review, meta-analysis, or both	PRISMA, 1
Abstract: list of data source	PRISMA, 2
Abstract: key eligibility criteria	PRISMA, 2
Abstract: description of participants or main condition(s)	PRISMA, 2
Abstract: description of intervention/exposures (independent variables)	PRISMA, 2
Abstract: number of included studies	Not applicable
Abstract: result description of main outcome	PRISMA, 2
Research question with applicable PICO elements	PRISMA, 4 AMSTAR 2, 1
Search query fully available (at least one)	PRISMA, 8
Search of non-published evidence (grey literature)	PRISMA, 7 AMSTAR 2, 5 ROBIS 2.1
Justification for restriction of time range (if any)	PRISMA, 8 ROBIS, 2.4
Languages considered for inclusion	PRISMA, 6 ROBIS, 2.4
Eligibility criteria with applicable PICO elements	PRISMA, 6 ROBIS, 1.3
Study selection in duplicate	PRISMA, 10 AMSTAR 2, 5 ROBIS, 2.5
Data extraction in duplicate	PRISMA, 11 AMSTAR 2, 6
Assessment of risk of bias	PRISMA, 12 ROBIS, 3.4
Risk of bias in duplicate	ROBIS, 3.5

Description of statistical combination (effect measure, method, effects approach)	PRISMA, 14 ROBIS, 3.3
Assessment of statistical heterogeneity	PRISMA, 14
Description of summary measures	PRISMA, 13
Number of references retrieved, assessed for eligibility and synthesized	PRISMA, 17
Sample size (individual studies)	PRISMA, 18
Full description of the characteristics of the individual studies	PRISMA, 18 AMSTAR 2, 8 ROBIS, 3.2
Study duration (follow-up lengths)	PRISMA, 18 ROBIS, 3.2
Meta-analytic summary estimates (frequencies or proportions; mean and standard deviation, and sample size for each group)	PRISMA, 21
Individual results of studies (effect size, imprecision measure, percentage weight)	PRISMA, 20
Results reported for RoB within studies	PRISMA, 22
Non-planned changes after the review commenced	AMSTAR 2, 2 ROBIS, 4.2
Presence of potential spin bias	Based on Boutron et al (11) ROBIS, C (Phase 3)
Discussion in light of the RoB in individual studies	PRISMA, 25 AMSTAR 2, 13 ROBIS, 4.6 and A (Phase 3)
Discussion of limitations at the study/outcome and review levels	PRISMA, 25 AMSTAR 2, 12 ROBIS, A (Phase 3)
Statement regarding data availability	Not applicable
Statement regarding sources of funding	PRISMA, 27 CONSORT, 25
Statement regarding potential conflicts of interest	AMSTAR 2, 16

PICO: acronym for Population, Intervention, Comparator/Control, Outcome;
RoB: risk of bias .

Analysis plan

Journals level

The 14 journals which will initially compose our cohort of RCTs and SRMAs will have their general and editorial information displayed at the SEES Initiative website. The report will be verified for any possible update at 4-month intervals, presenting the following information: publisher, editor-in-chief, issues per year (if applicable),

associated professional society (if any), peer review model (open, single-blind, or double-blind), impact factor, endorsement of guideline. In addition, we have described the proportion of publications in the journal cohort of journals in exercise sciences, therefore characterizing all citations and labelling them as (*i*) RCTs; (*ii*) SRMAs; (*iii*) consensus/guidelines; (*iv*) letters to the editor; or (*v*) others (general category including observational designs, narrative review, systematic review without meta-analysis, editorials, etc). The profile of journal publications are available at the SEES website (journal profiles).

Articles level

The assessments of articles reporting RCTs and SRMAs will be presented individually through (*i)* a full report presenting all assessed items and (*ii*) a summarized report with items aggregated into seven components, as follows: transparency, completeness, methodological rigor, participants, interventions/exposures, outcome, and critical appraisal. We attempted to propose components to reflect broad domains/purposes that would be most affected when a recommended reporting item was omitted or a methodological routine was not carried out. Because several items could be associated with more than one component, our reasoning was to attribute an item to the most related component, therefore attempting to minimize overlappings (which is only present for one item associated with two components in the SRMA assessment). The appendices 2 and 3 respectively present all items and components for RCT and SRMA assessments.

Monitoring

We stimulate post-dissemination peer review by any colleague or external stakeholder willing to audit our data sets or duplicate our assessments as a form of validation. Any corrections or substantial insights (e.g., those resulting in procedure amendments) will be indicated in individual analysis (website and PDF version) of a given assessed article.

Considerations for journals choice

Among several potential journals for continuous publication surveillance in exercises, we have considered to choose select journals based on:
(1) types of publications, requiring that RCTs or SRMAs are published with regular or often periodicity;

(2) audience reach, for which we considered whether a given journal was linked to a professional or scientific society and its impact factor.
Taking into account the plan for future journal inclusions, we will periodically monitor the frequency of articles reporting RCTs or SRMAs published by non-selected journals.
Regarding journal metrics such as the journal impact factors, we underscore that the SEES Initiative adheres to the San Francisco Declaration on Research Assessment (DORA), which advocates for switching the major attention from the journal impact factor and other metrics to the quality of published research itself (16). However, because journals with higher impact factor usually achieve greater prestige and audience reach (Matthew effect), we are compelled to scrutinize their published evidence whenever it falls within our eligibility criteria.
In addition to exercise sciences journals, we will search and retrieve RCTs and SRMAs potentially eligible to our assessments in five top-tier general medicine journals (AIM, The BMJ, JAMA, Lancet, NEJM). Such decision was taken due to the public reach and media coverage that articles addressing physical activity exposures/interventions usually achieve whenever published by these journals.

Data repository and data management

Data will be collected on standardized forms identified by PubMed unique identifier (PMID) and containing instructions of standardized operational procedures. Data will be primarily entered in Google Drive and mostly stored at the Open Science Framework (https://osf.io/ntw7d) .

Open access by-default

Whether applicable we will use the FAIR principles (findability, accessibility, interoperability and reusability) to share data. Openness will be extended to algorithms, tools, workflows, protocols, and other kinds of digital research objects that SEES comes to generate.

Data and file sharing specifications

Search and data files will be publicly shared based on a predefined periodicity (Table 3). Because changes may occur overtime, we will use an Open Annotations file to notify any modifications to this protocol.

Table 3. File types and data sharing platforms.

File type	Description and periodicity	Platform/Repository
Manual of standardized procedures	Text file with standardized procedures for article assessments. It is a dynamic document with possible updates at any time.	Google Docs
Open Annotations	Text file with important changes to this protocol or standardized procedures. It is a dynamic document with possible updates at any time.	Google Docs
Raw search	CSV files retrieved from PubMed without any manipulation. To be shared monthly.	Open Science Framework
Eligibility sheet*	Worksheet (xlsx) generated from CSV files and prepared for eligibility analysis of retrieved references. To be shared monthly.	Open Science Framework
Data extraction sheet (xlsx file)*	Worksheet containing original data sets. To be shared monthly.	Open Science Framework
Data analysis sheet	Worksheets containing formulas for component scores. To be shared every quarter.	Open Science Framework

*The shared file will be the one generated after consensus of independent assessors.

SEES Data-sharing policy

We will follow the recommendation of the International Committee of Medical Journal Editors for disclosing the willingness to share the data (or not) of the SEES project. Materials aforementioned will be available under the license CC Commons 4.0, in a credible public and open-access repository without planned time restrictions. Further, independent authors will have access to all materials at their discretion and with no time and purpose constraints imposed by the SEES team.

Dissemination

The dissemination of results will be made on a monthly basis by two main ways:
(1) website: we will present our analyses at the SEES website (www.sees-initiative.org) through a full and summarized reports as described in the Analysis Plan section (Articles level). Each article will have its own URL that will display the summarized evaluation and provide a link for the full report with all assessed items (archived at OSF);

(2) for each RCT or SRMA article assessed by our team, an individual card report will be sent to the corresponding author and respective editor-in-chief as well as archived in Open Science Framework (https://osf.io/ntw7d/);

Advisory group

We aim to establish an advisory committee which may provide critical insights and advice concerning metrics to be monitored in regard to the Initiative, manuscripts using SEES data sets, possible ways to escalate SEES actions, among other relevant consultations.

Funding

No funding has been specifically awarded to the SEES-Initiative. The project will be housed at the Hospital de Clínicas de Porto Alegre (Porto Alegre, Brazil) and primarily funded by the Graduate Program in Cardiology and Cardiovascular Sciences (Universidade Federal do Rio Grande do Sul, UFRGS, Brazil) and National Institute of Science and Technology for Health Technology Assessment (IATS, Brazil) to mostly salaries.

References

1. Altman DG. Statistics and ethics in medical research. Misuse of statistics is unethical. Br Med J. 1980 Nov 1;281(6249):1182–4.
2. Goodman SN, Fanelli D, Ioannidis JPA. What does research reproducibility mean? Sci Transl Med. 2016 Jun 1;8(341):341ps12.
3. Naci H, Ioannidis JPA. Comparative effectiveness of exercise and drug interventions on mortality outcomes: metaepidemiological study. BMJ. 2013 Oct 1;347:f5577.
4. Sallis JF, Bull F, Guthold R, Heath GW, Inoue S, Kelly P, et al. Progress in physical activity over the Olympic quadrennium. Lancet. 2016 Sep 24;388(10051):1325–36.
5. Umpierre D, Helal L, Bock PM, Santos LP. Adherence to Consolidated Standards of Reporting Trials (CONSORT) Guideline Items in Randomized Trials of Physical Activity Published in 5 Sports Medicine Journals [Internet]. International Congress on Peer Review and Scientific Publication. 2017 [cited 2019 Jan 22]. Available from: https://peerreviewcongress.org/prc17-0401
6. Lee E, Dobbins M, Decorby K, McRae L, Tirilis D, Husson H. An optimal search filter for retrieving systematic reviews and meta-analyses. BMC Med Res Methodol. 2012 Apr 18;12:51.

7. Robinson KA, Dickersin K. Development of a highly sensitive search strategy for the retrieval of reports of controlled trials using PubMed. Int J Epidemiol. 2002 Feb 1;31(1):150–3.

8. Boynton J, Glanville J, McDaid D, Lefebvre C. Identifying systematic reviews in MEDLINE: developing an objective approach to search strategy design. J Inf Sci Eng. 1998 Jun;24(3):137–54.

9. Moher D, Hopewell S, Schulz KF, Montori V, Gøtzsche PC, Devereaux PJ, et al. CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomised trials. BMJ. 2010 Mar 23;340:c869.

10. Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. BMJ. 2014 Mar 7;348:g1687.

11. Boutron I, Dutton S, Ravaud P, Altman DG. Reporting and interpretation of randomized controlled trials with statistically nonsignificant results for primary outcomes. JAMA. 2010 May 26;303(20):2058–64.

12. Taichman DB, Sahni P, Pinborg A, Peiperl L, Laine C, James A, et al. Data Sharing Statements for Clinical Trials: A Requirement of the International Committee of Medical Journal Editors. Ann Intern Med. 2017 Jul 4;167(1):63–5.

13. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. PLoS Med. 2009 Jul 21;6(7):e1000100.

14. Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017 Sep 21;358:j4008.

15. Whiting P, Savović J, Higgins JPT, Caldwell DM, Reeves BC, Shea B, et al. ROBIS: A new tool to assess risk of bias in systematic reviews was developed. J Clin Epidemiol. 2016 Jan;69:225–34.

16. Curry S. Let’s move beyond the rhetoric: it's time to change how we judge research. Nature. 2018 Feb 8;554(7691):147.

Appendix 1

1. Search strategies for journals of exercise sciences:

MEDLINE/PubMed query for clinical trials:

"Br J Sports Med"[Journal] OR "Am J Sports Med"[Journal] OR "Med Sci Sports Exerc"[Journal] OR "Eur J Prev Cardiol"[Journal] OR "Sports Med"[Journal] OR "Int J Behav Nutr Phys Act"[Journal] OR "J Physiother"[Journal] OR "J Sci Med Sport"[Journal] OR "Scand J Med Sci Sports"[Journal]
AND (randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized controlled trials[mh] OR random allocation[mh] OR double-blind method[mh] OR single-blind method[mh] OR clinical trial[pt] OR clinical trials[mh] OR (“clinical trial”[tw]) OR ((singl*[tw] OR doubl*[tw] OR trebl*[tw] OR tripl*[tw])
AND (mask*[tw] OR blind*[tw])) OR (“latin square”[tw]) OR placebos[mh] OR placebo*[tw] OR random*[tw] OR research design[mh:noexp] OR follow-up studies[mh] OR prospective studies[mh] OR cross-over studies[mh] OR control*[tw] OR prospectiv*[tw] OR volunteer*[tw])
NOT (animal[mh] NOT human[mh])
NOT (review[ti] OR “meta-analysis”[ti])

MEDLINE/PubMed query for systematic review:

"Br J Sports Med"[Journal] OR "Am J Sports Med"[Journal] OR "Med Sci Sports Exerc"[Journal] OR "Eur J Prev Cardiol"[Journal] OR "Sports Med"[Journal] OR "Int J Behav Nutr Phys Act"[Journal] OR "J Physiother"[Journal] OR "J Sci Med Sport"[Journal] OR "Scand J Med Sci Sports"[Journal]
AND (meta[tiab] OR synthesis[tiab] OR literature[tiab] OR published[tiab] OR meta-analysis[tiab] OR extraction[tiab] OR trials[tiab] OR search[tiab] OR MEDLINE[tiab] OR selection[tiab] OR sources[tiab] OR review[tiab] OR review[pt] OR articles[tiab] OR reviewed[tiab] OR english[tiab] OR language[tiab])

2. Search strategies for journals in general medicine:

MEDLINE/PubMed query for clinical trials:

“Ann Intern Med”[Journal] OR “BMJ”[Journal] OR “JAMA”[Journal] OR “Lancet”[Journal] NOT ("Lancet Respir Med"[Journal] OR "Lancet Public Health"[Journal] OR "Lancet Psychiatry"[Journal] OR "Lancet Planet Health"[Journal] OR "Lancet Oncol"[Journal] OR "Lancet Neurol"[Journal] OR "Lancet Infect Dis"[Journal] OR "Lancet Haematol"[Journal] OR "Lancet HIV"[Journal] OR "Lancet Glob Health"[Journal] OR "Lancet Gastroenterol Hepatol"[Journal] OR "Lancet Diabetes Endocrinol"[Journal] OR "Lancet Child Adolesc Health"[Journal]) NOT ("Lancet Respir Med"[Journal] OR "Lancet Public Health"[Journal] OR "Lancet Psychiatry"[Journal] OR "Lancet Planet Health"[Journal] OR "Lancet Oncol"[Journal] OR "Lancet Neurol"[Journal] OR "Lancet Infect Dis"[Journal] OR "Lancet Haematol"[Journal] OR "Lancet HIV"[Journal] OR "Lancet Glob Health"[Journal] OR "Lancet Gastroenterol Hepatol"[Journal] OR "Lancet Diabetes Endocrinol"[Journal] OR "Lancet Child Adolesc Health"[Journal]) OR “N Engl J Med”[Journal]
AND (randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized controlled trials[mh] OR random allocation[mh] OR double-blind method[mh] OR single-blind method[mh] OR clinical trial[pt] OR clinical trials[mh] OR (“clinical trial”[tw]) OR ((singl*[tw] OR doubl*[tw] OR

trebl*[tw] OR tripl*[tw]) AND (mask*[tw] OR blind*[tw])) OR (“latin square”[tw]) OR placebos[mh] OR placebo*[tw] OR random*[tw] OR research design[mh:noexp] OR follow-up studies[mh] OR prospective studies[mh] OR cross-over studies[mh] OR control*[tw] OR prospectiv*[tw] OR volunteer*[tw])
AND (exercise[tiab] OR “physical activity”[tiab] OR training[tiab] OR rehabilitation[tiab])
NOT (animal[mh] NOT human[mh])
NOT (review[ti] OR “meta-analysis”[ti])

MEDLINE/PubMed query for systematic review:

“Ann Intern Med”[Journal] OR “BMJ”[Journal] OR “JAMA”[Journal] OR “Lancet”[Journal] NOT ("Lancet Respir Med"[Journal] OR "Lancet Public Health"[Journal] OR "Lancet Psychiatry"[Journal] OR "Lancet Planet Health"[Journal] OR "Lancet Oncol"[Journal] OR "Lancet Neurol"[Journal] OR "Lancet Infect Dis"[Journal] OR "Lancet Haematol"[Journal] OR "Lancet HIV"[Journal] OR "Lancet Glob Health"[Journal] OR "Lancet Gastroenterol Hepatol"[Journal] OR "Lancet Diabetes Endocrinol"[Journal] OR "Lancet Child Adolesc Health"[Journal]) NOT ("Lancet Respir Med"[Journal] OR "Lancet Public Health"[Journal] OR "Lancet Psychiatry"[Journal] OR "Lancet Planet Health"[Journal] OR "Lancet Oncol"[Journal] OR "Lancet Neurol"[Journal] OR "Lancet Infect Dis"[Journal] OR "Lancet Haematol"[Journal] OR "Lancet HIV"[Journal] OR "Lancet Glob Health"[Journal] OR "Lancet Gastroenterol Hepatol"[Journal] OR "Lancet Diabetes Endocrinol"[Journal] OR "Lancet Child Adolesc Health"[Journal]) OR “N Engl J Med”[Journal]
AND (meta[tiab] OR synthesis[tiab] OR literature[tiab] OR published[tiab] OR meta-analysis[tiab] OR extraction[tiab] OR trials[tiab] OR search[tiab] OR MEDLINE[tiab] OR selection[tiab] OR sources[tiab] OR review[tiab] OR review[pt] OR articles[tiab] OR reviewed[tiab] OR english[tiab] OR language[tiab])
AND (exercise[tiab] OR “physical activity”[tiab] OR training[tiab] OR rehabilitation[tiab])

Appendix 2

Full assessment of RCT with individual items and associated component labels.

Component	Item
Transparency	Registration: Is the study registered in a clinical trial database?
Transparency	Protocol: Is there referral of a publicly available methodological protocol? (Note: if so, you must also use the protocol to consult information about the trial)
Completeness	Title: Is the study identified as a randomized? (Note: "random allocation", "randomly assigned" should be considered as "Yes")
Intervention	Abstract: Does the abstract list the study interventions?
Outcome	Abstract: Does the abstract inform the primary outcome (variable of interest)?
Outcome	Abstract: If any quantitative result is reported, is it accompanied by the respective precision estimate (e.g., standard deviation, confidence intervals, etc)?
Completeness	Intro/Methods-TID2: Is there a rationale, theory, or goals described to present the essential elements of the intervention?

Critical appraisal	Introduction: Is there a hypothesis stated for the outcomes of interest? (Note: if there is not a directional hypothesis, but there is explanation for an exploratory approach, answer "Yes")
Completeness	Methods: Is there a description for the trial design (e.g., parallel, factorial, cluster)?
Participants	Methods: Is there a detailed description of eligibility criteria for participants? (i.e., information that would allow to replicate the inclusion and exclusion decisions)
Outcome	Methods: Are primary and secondary outcomes listed as well as their measurements specified?
Methodological rigor	Methods: Is the type of randomization sufficiently described? (Note: (i) type, such as computer; (ii) allocation ratio; and (iii) methods of restriction (if any) such as stratification or blocking should be considered)
Methodological rigor	Methods: Is there a mention regarding the mechanism for allocation concealment?
Methodological rigor	Methods: Is there a description of blinding/masking for measurements or analysis of outcomes?
Methodological rigor	Methods: Is there a description of sample size calculation?
Completeness	Methods/Intro-TID1: Is there a brief name or a phrase that describes the intervention?
Intervention	Methods-TID3: Is there a description of physical and information materials used as part of the intervention? (i.e., information that would allow to replicate the intervention with materials for participants or intervention providers)
Intervention	Methods-TID4: Is there a description of activities or procedures used to carry out the intervention? (i.e., information that would allow to replicate the necessary steps to run the intervention)
Participants	Methods-TID5: Is there a description of individuals involved in providing the intervention? (i.e., information that would allow to replicate the necessary workforce to run the intervention)
Intervention	Methods-TID6: Is there a description of modes of delivery of the intervention? (i.e., information that would allow to replicate the delivery to run the intervention, such as face-to-face, telefone, individually or in a group)
Intervention	Methods-TID7: Is there a description of location(s) where the intervention occurred? (Note: infrastructure and relevant features should be considered)
Intervention	Methods/Results-TID8: Is there a description regarding the period, amount, intensity and schedule of delivery? (i.e., information that would allow to replicate 'when' and 'how much')
Intervention	Methods/Results-TID9: If any form of individual tailoring for the intervention was used (such as, variable exercise intensity), is there a description for the rationale and guide for tailoring?
Intervention	Methods/Results-TID11: Is there a description of materials/strategies used in regard to intervention adherence?

Intervention	Methods/Results-TID12: Is there a description of results of intervention adherence? (i.e., attrition rates)?
Critical appraisal	Methods: Is there a description of statistical methods used to compare groups for primary and secondary outcomes?
Participants	Results: Is there a participant flow (in text or diagram) reporting the numbers of participants who were assigned, received intervention, and were analyzed for the primary outcome?
Completeness	Results: Is there a description regarding the dates/periods of recruitment? (Note: if the follow-up has a variable length, the min-median-max durations should be considered)
Outcome	Results: Are baseline data for each group presented?
Outcome	Results: Is there a description on the actual number of participants analyzed? (Note: if numbers are reported only for the primary outcome, please choose "Yes")
Outcome	Results: Are the effect sizes described along with their precision measures? (e.g., continuous outcomes with standard deviation and binary outcomes with risk measures and absolute numbers)
Intervention	Results-TID10: Is there a description for non-planned modifications to the intervention during the course of the study? (Note: regards to the study level, and what-why-when for changes should be considered).
Intervention	Results: Is there a description for harm outcomes or adverse events? (Note: whether related or unrelated to interventions)
Critical appraisal	Discussion: Is there a discussion of potential bias, imprecision, multiplicity of analyses or other limitations?
Critical appraisal	Discussion: Is there a potential spin bias based on a specific reporting strategy to highlight that the experimental treatment is beneficial?
Transparency	Is there a statement regarding the data availability (data sharing plan)?
Completeness	Is there a statement regarding the sources of funding?
Completeness	Did the trial authors declare whether they had any conflicts of interest (COI)?

Component label	Number of items
Transparency	3
Completeness	7
Participants	3
Intervention	11
Methodological rigor	4
Outcome	6
Critical appraisal	4

Appendix 3

Full assessment of SRMA with individual items and associated component labels.

Component	Item
Transparency	Registration: Is the review registered in a public database?
Transparency	Protocol: Is there referral of a publicly available methodological protocol? (Note: if so, you must also use the protocol to consult information about the review)
Completeness	Title: Is the study identified as a systematic review, meta-analysis, or both?
Completeness	Abstract: Does the abstract list the data sources used in the review? (Note: if more than five databases were used, simplified or partial referral should be considered as "Yes")
Completeness	Abstract: Does the abstract inform key eligibility criteria for study selection?
Participants	Abstract: Is there a description regarding the population (participants) or main condition(s) addressed in the review?
Intervention / Exposure	Abstract: Is there a description regarding the interventions/exposures (or, broadly, independent variables) addressed in the review?
Completeness	Abstract: Is there a description of the number of included studies?
Outcome	Abstract: Is there a result description for the main outcome of interest?
Completeness	Introduction: Is there a description for the research question (with PICOS elements) or precisely stated objectives (with PICOS) ?
Transparency	Methods: Is there at least one search query fully available? (Note: a full search query should allow complete replication)
Methodological rigor	Methods: Did the search strategy include non-published evidence? ("grey literature")
Methodological rigor	Methods: If the search is restricted for evidence generated after 1980, is there an indirect or direct justification related to the time range?
Methodological rigor	Methods: How many languages were considered for study eligibility?
Completeness	Methods: Is there a detailed explanation of eligibility criteria for PICOS elements? (Note: detailed explanation should allow complete replication)
Methodological rigor	Methods: Was the study selection carried out in duplicate?
Methodological rigor	Methods: Was the data extraction carried out in duplicate?
Methodological rigor	Methods: Is there a description of the assessment of risk of biases?
Methodological rigor	Methods: Was the assessment of risk of biases carried out in duplicate?

Outcome	Methods: Is there a description of the statistical combination (meta-analysis) regarding the effect measure (e.g., relative risk or mean difference), statistical method (e.g., inverse variance), and effects approach (fixed or random)?
Outcome	Methods: Is there a description regarding the assessment of statistical heterogeneity?
Completeness	Results: Is there a full description regarding the numbers of references (retrieval, eligibility, synthesis)?
Completeness	Results: Is there a description about the sample sizes of individual studies?
Participants; Intervention / Exposure	Results: Is there a full description of characteristics? (Note: the available PICOS elements should be considered)
Completeness	Results: Is there a description of study duration (follow-up lengths)?
Outcome	Results: Is there a minimally recommended description of meta-analytic summary estimates? (Note: binary outcomes as frequencies with and without the event (or as proportions such as 12/45); continuous outcomes as the mean, standard deviation, and sample size for each group)
Outcome	Results: Is there a full description of individual results for studies composing the meta-analysis? (Note: effects size, imprecision measure and percentage weight should be considered)
Critical appraisal	Results: Is there a description of risk of bias within studies? (Note: your assessment should be based on the characteristic of the RoB tool)
Critical appraisal	Results: Is there a description for non-planned modifications to the synthesis during the course of the review? (e.g.: change in eligibility criteria or RoB tools; please, what was changed and its justification [why] should be considered).
Critical appraisal	Discussion: Is there a potential spin bias based on a specific reporting strategy to highlight that the experimental treatment (or condition of interest) leads to the hypothesized result?
Critical appraisal	Discussion: Are the results discussed in light of the risk of biases in individual studies?
Critical appraisal	Discussion: Are limitations discussed at the study/outcome and/or at the review level?
Transparency	Is there a statement regarding the data availability (data sharing plan)?
Completeness	Is there a statement regarding the sources of funding? (Note: funding for the review itself)
Completeness	Did the review authors declare whether they had any conflicts of interest (COI)?

Components are coded by colors, except the item related to full description of participants and intervention (white background), which accounts twice for both Participants and Interventions/Exposures.

Component label	Number of items
Transparency	4
Completeness	11
Participants	2
Intervention / Exposure	2
Methodological rigor	7
Outcome	5
Critical appraisal	5
Note: As a same item (relating to both Intervention/Exposure and Participants components) accounts twice, the final sum totalizes 36 items.	