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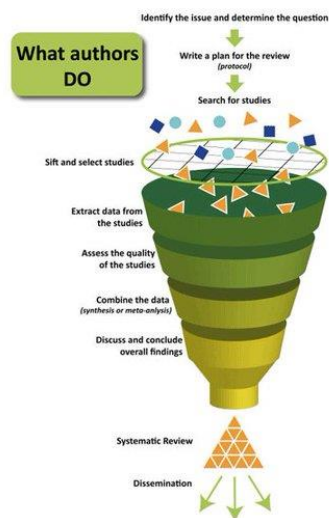




# Introduction to Systematic Review and Meta-Analysis in Exercise Science

آشنایی با مرور سیستماتیک و متا آنالیز با هدف ارتقای کیفیت مطالعات مروری  
در علوم ورزشی

Systematic review process:

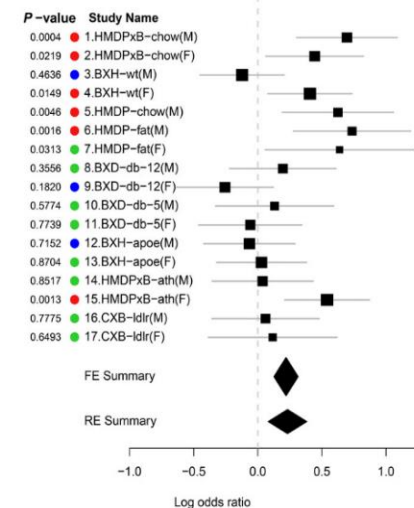


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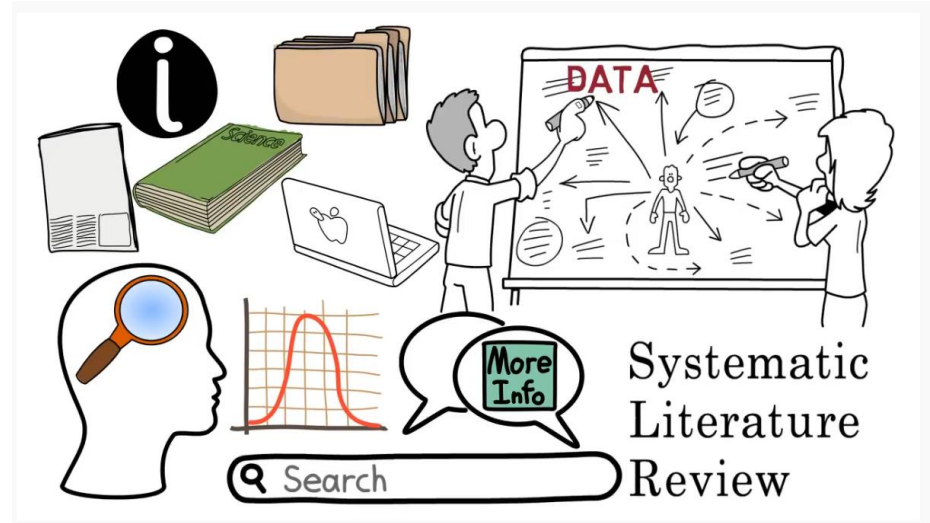
هفته سرآمدی آموزش سال ۱۳۹۹  
[webinar3.um.ac.ir/varzeshi](http://webinar3.um.ac.ir/varzeshi)  
دوشنبه 15 اردیبهشت ساعت ۱۸ تا ۱۹

## Meta-analysis



# Overview

- **Narrative Review vs Systematic Review**
- **What is a systematic review in research?**
- **Systematic review Steps**
  - Define the research question “?”
  - Determine databases to be searched
  - Develop search strategy
  - Select studies based on inclusion/exclusion criteria
  - Extract relevant data
  - Assess the risk of bias in the included studies
  - Analyze the data and undertake meta-analyses
  - Present the final results of the review
- **What is a meta-analysis?**
- **Systematic Review and Meta analysis Timeline**
- **Systematic Review and Meta-Analysis in Sport, Exercise, and Physical Activity**
- **Take-home message**



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**Table 1 - Main Differences Between Systematic Literature Review and Narrative Literature Review.**

Features	Narrative Literature Review	Systematic Literature Review
Question	Broad	Specific
Source	Not usually specified, potentially biased	Comprehensive sources, explicit search approach
Selection	Not usually specified, potentially biased	Criterion-based selection, uniformly applied
Evaluation	Variable	Rigorous critical evaluation
Synthesis	Often Qualitative	Quantitative *
Inferences	Sometimes evidence-based	Usually evidence-based

\* A quantitative synthesis that includes a statistical method is a meta-analysis (Cook, 1997).

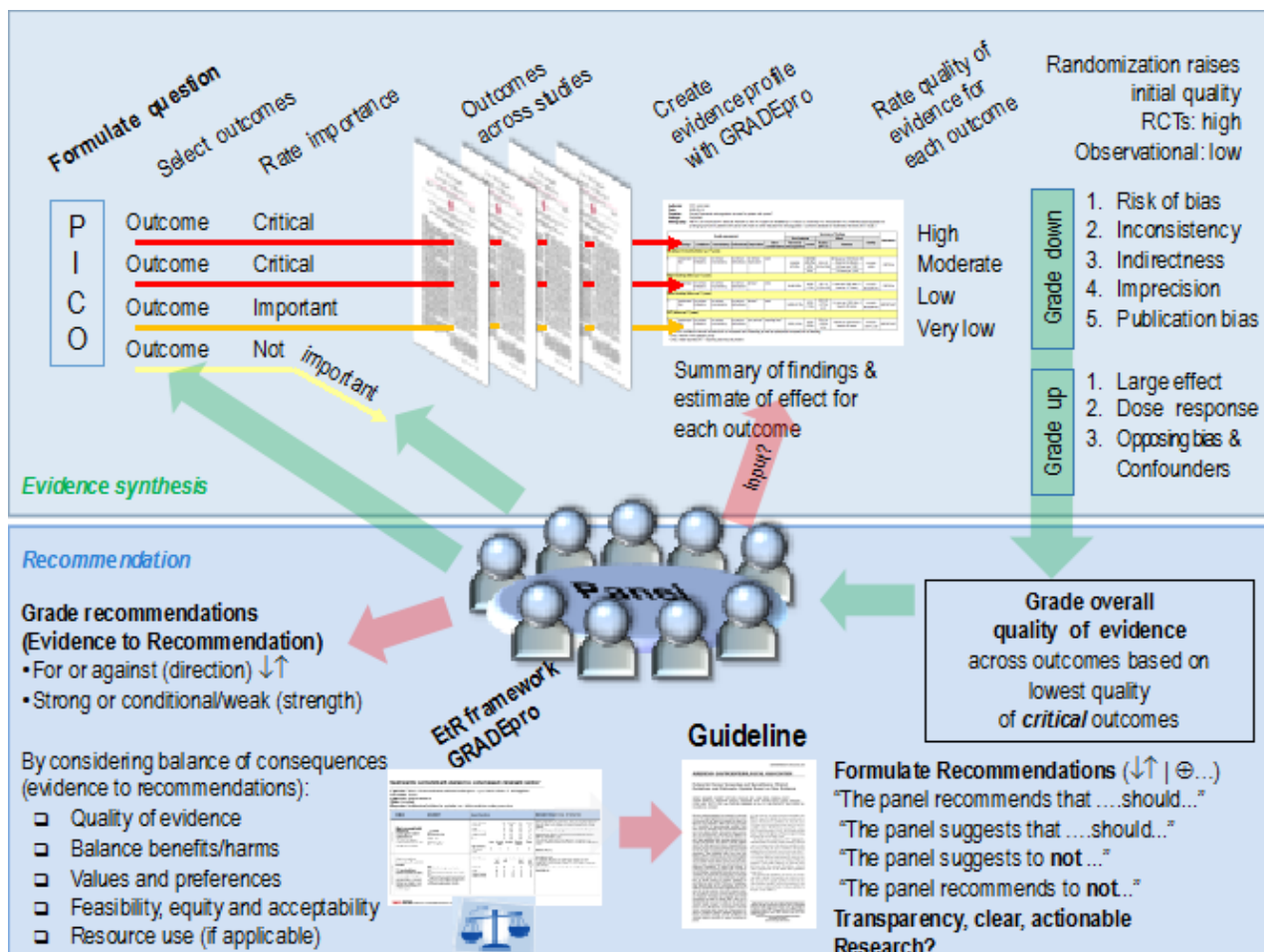
Cook D J. et. al. Ann Intern Med 1997;126:376-380

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# مرور سیستماتیک



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# What is a systematic review in research?

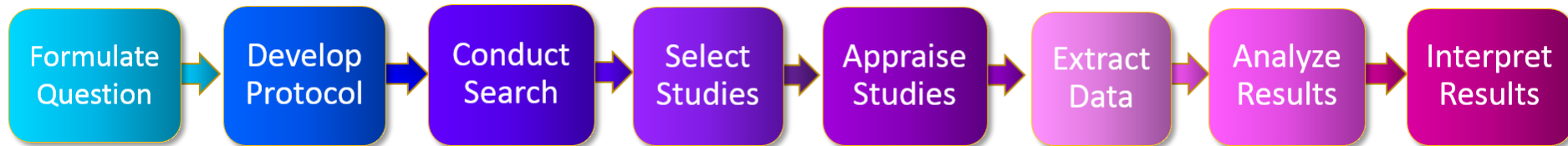
- A systematic review is a form of analysis that researchers carry out to synthesize all the available evidence on a particular question, such as **how effective a drug is**.
- A panel of experts usually leads the researchers who carry out a systematic review.
- A systematic review is a high form of evidence. The conclusions help medical experts to form an **agreement on the best form of treatment**.
- The findings also inform **policies set by state healthcare** systems, such as whether they should fund a new drug.



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# Systematic review Steps

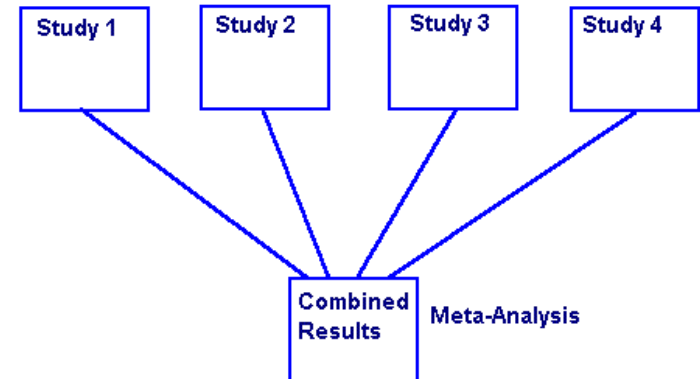
- Define the research **question** “?”
- Determine databases to be searched
- Develop search strategy
- Review and select studies based on inclusion and exclusion criteria
- Extract relevant data
- Assess the risk of bias in the included studies
- Analyze the data and undertake meta-analyses
- Present the final results of the review



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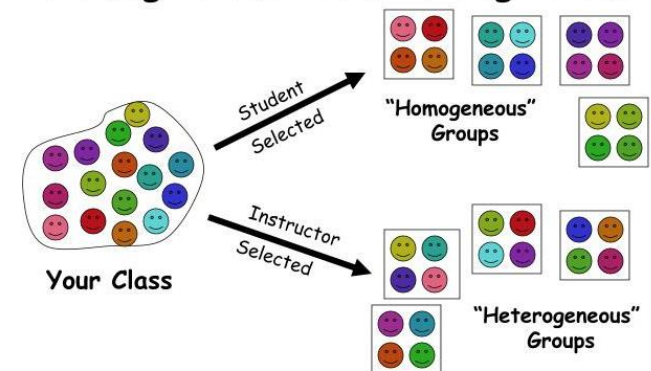
# Meta-analysis

- **Meta-analysis** should only be considered when a group of studies is sufficiently **homogeneous** in terms of participants, interventions and outcomes to provide a meaningful summary.



- **Homogeneity vs Heterogeneity**
  - Clinical: Differences in participants, interventions or outcomes
  - Methodological: Differences in study design, risk of bias
  - Statistical: Variation in intervention effects or results

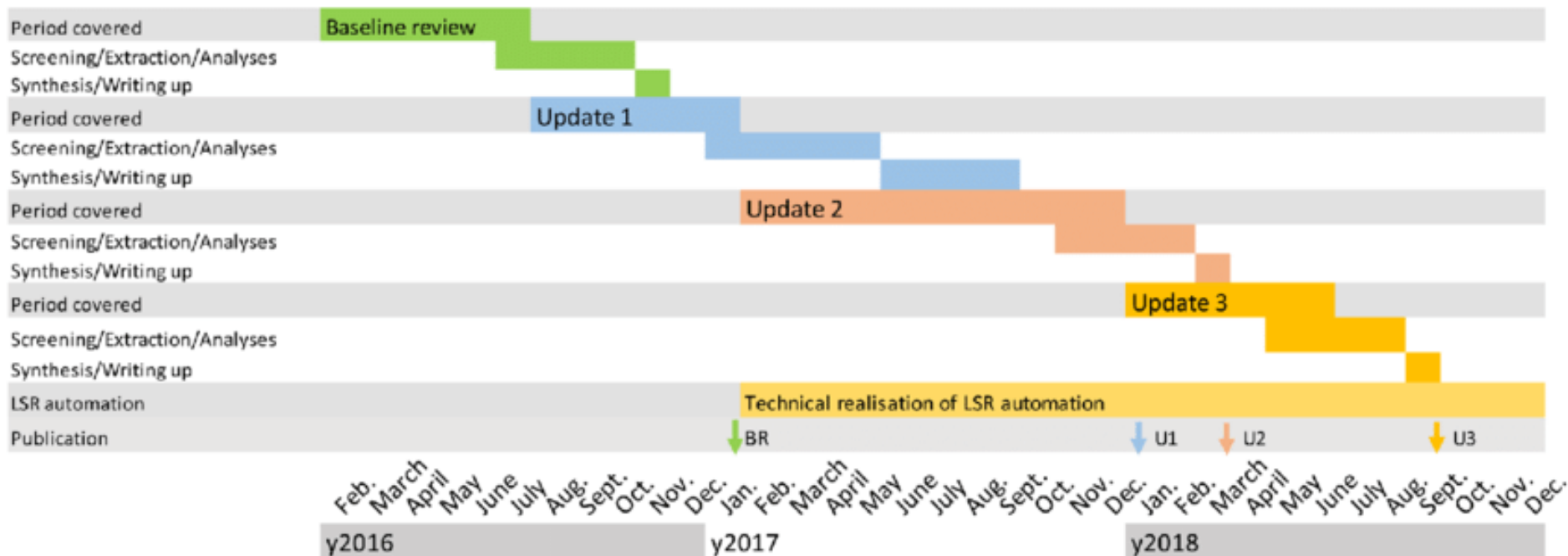
## Forming Groups Homogeneous vs. Heterogeneous



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# Systematic Review and Meta analysis Timeline



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# Systematic Review and Meta-Analysis in Sport, Exercise, and Physical Activity

Increased numbers of researchers and academics in the field. Sport, exercise, and physical activity-related fields have experienced considerable growth over the last 30–40 years. Tod, D. (2019). *Conducting Systematic Reviews in Sport, Exercise, and Physical Activity*. Springer Nature .

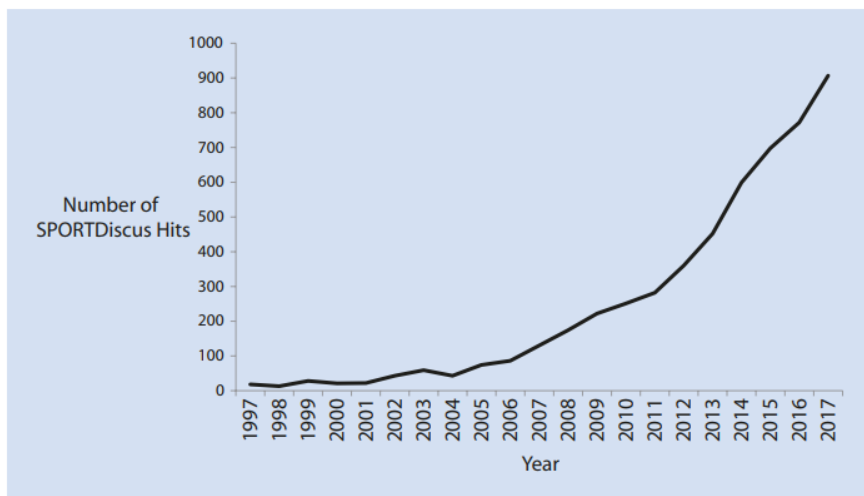
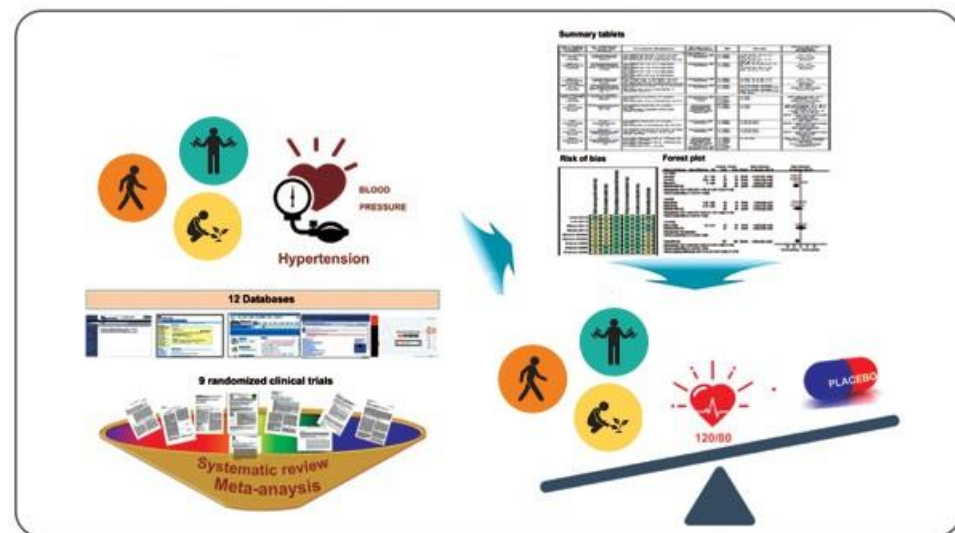


Fig. 1.1 Number of SPORTDiscus hits from the search “meta-analysis or systematic review in title”



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# The effect of exercise training on lower trunk muscle morphology: a systematic review

**Shahtahmassebi B**, Hebert JJ, Stomski N, Hecimovich M, Fairchild T. *The effect of exercise training on lower trunk muscle morphology: a systematic review*. Sports Medicine. 2014 Oct;44(10):1439-58 doi: 10.1007/s40279-014-0213-7. <http://link.springer.com/article/10.1007/s40279-014-0213-7>

## The Effect of Exercise Training on Lower Trunk Muscle Morphology

Behnaz Shahtahmassebi, Jeffrey J. Hebert, Norman J. Stomski, Mark Hecimovich & Timothy J. Fairchild

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SYSTEMATIC REVIEW

### The Effect of Exercise Training on Lower Trunk Muscle Morphology

Behnaz Shahtahmassebi · Jeffrey J. Hebert · Norman J. Stomski · Mark Hecimovich · Timothy J. Fairchild

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#### Abstract

**Background** Skeletal muscle plays an important role in maintaining the stability of the lumbar region. However, there is conflicting evidence regarding the effects of exercise on trunk muscle morphology.

**Objective** To systematically review the literature on the effects of exercise training on lower trunk muscle morphology to determine the comparative effectiveness of different exercise interventions.

**Data Source and Study Selection** A systematic search strategy was conducted in the following databases: PubMed, SportDiscus, CINAHL, the Cochrane Library and PEDro. We included full, peer-reviewed, prospective longitudinal studies, including randomized controlled trials and single-group designs, such as pre- to post-intervention and crossover studies, reporting on the effect of exercise training on trunk muscle morphology.

**Study Appraisal and Synthesis** Study quality was assessed with the Cochrane risk-of-bias tool. We classified each exercise intervention into four categories, based on the primary exercise approach: motor control, machine-based resistance, non-machine-based resistance or cardiovascular.

**Electronic supplementary material** The online version of this article (doi:10.1007/s40279-014-0213-7) contains supplementary material, which is available to authorized users.

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Published online: 12 July 2014

Treatment effects were estimated using within-group standardized mean differences (SMDs).

**Results** The systematic search identified 1911 studies; of which 29 met our selection criteria: motor control ( $n = 12$ ), machine-based resistance ( $n = 10$ ), non-machine-based resistance ( $n = 5$ ) and cardiovascular ( $n = 2$ ). Fourteen studies (48 %) reported an increase in trunk muscle size following exercise training. Among positive trials, the largest effects were reported by studies testing combined motor control and non-machine-based resistance exercise (SMD [95 % CI] = 0.66 [0.06 to 1.27]) to 3.39 [2.80 to 3.98]) and machine-based resistance exercise programmes (SMD [95 % CI] = 0.52 [0.01 to 1.03] to 1.79 [0.87 to 2.72]). Most studies investigating the effects of non-machine-based resistance exercise reported no change in trunk muscle morphology, with one study reporting a medium effect on trunk muscle size (SMD [95 % CI] = 0.60 [0.03 to 1.16]). Cardiovascular exercise interventions demonstrated no effect on trunk muscle morphology (SMD [95 % CI] = -0.16 [-1.14 to 0.81] to 0.09 [-0.83 to 1.01]).

**Limitations** We excluded studies published in languages other than English, and therefore it is possible that the results of relevant studies are not represented in this review. There was large clinical heterogeneity between the included studies, which prevented data synthesis. Among the studies included in this review, common sources of potential bias were random sequence generation, allocation concealment and blinding. Finally, the details of the exercise parameters were poorly reported in most studies.

**Conclusion** Approximately half of the included studies reported an increase in lower trunk muscle size following participation in an exercise programme. Among positive trials, studies involving motor control exercises combined with non-machine-based resistance exercise, as well as

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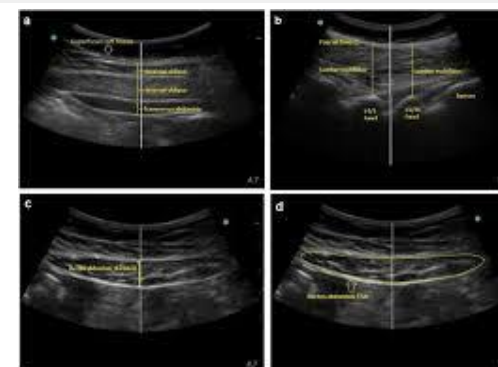
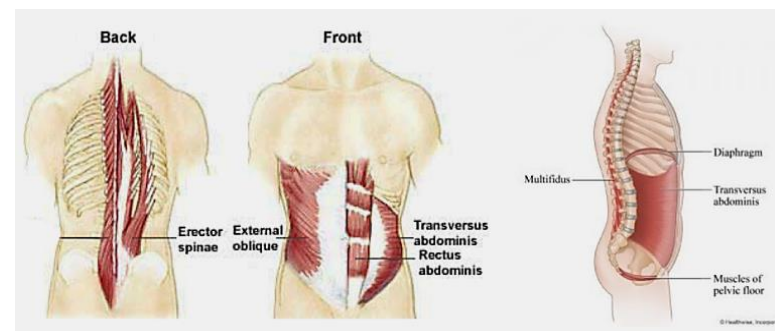
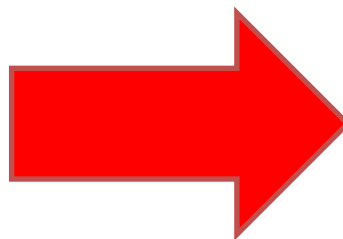
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# RESEARCH QUESTION



- Can trunk muscle morphology (size) be altered through exercise program?
- Which exercise program has the largest effect on trunk muscle morphology (size)?





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# The effect of exercise training on lower trunk muscle morphology: a systematic review

*The Effect of Exercise Training on Lower Trunk Muscle Morphology*

Behnaz Shahtahmassebi, Jeffrey J. Hebert, Norman J. Stomski, Mark Hecimovich & Timothy J. Fairchild

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## Key Findings

**Shahtahmassebi., et al (2014)** identified that the largest changes in **trunk muscle morphology** resulted from exercise programs combining **motor control exercises** with **non-machine-based resistance** exercises.

**Shahtahmassebi B.**, Hebert JJ, Stomski N, Hecimovich M, Fairchild T. *The effect of exercise training on lower trunk muscle morphology: a systematic review.* Sports Medicine. 2014 Oct;44(10):1439-58 doi: 10.1007/s40279-014-0213-7. <http://link.springer.com/article/10.1007/s40279-014-0213-7>

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# Database of Systematic Reviews

بسته شماره ۲ : پایگاه های مفید برای آشنایی با مرورهای سیستماتیک

The Cochrane Library	<a href="http://www.cochrane.org">www.cochrane.org</a>
The Joanna Briggs Institute	<a href="http://www.joannabriggs.edu.au/pubs/systematic_reviews.php">www.joannabriggs.edu.au/pubs/systematic_reviews.php</a>
The Campbell Collaboration	<a href="http://www.campbellcollaboration.org">www.campbellcollaboration.org</a>
The Centre for Evidence-Based Medicine	<a href="http://www.cebm.net">www.cebm.net</a>
The NHS Centre for Reviews and Dissemination	<a href="http://www.york.ac.uk/inst/crd">www.york.ac.uk/inst/crd</a>
Bandolier	<a href="http://www.medicine.ox.ac.uk/bandolier">www.medicine.ox.ac.uk/bandolier</a>
PubMed Clinical Queries: Find Systematic Reviews	<a href="http://www.ncbi.nlm.nih.gov/entrez/query/static/clinical.shtml">www.ncbi.nlm.nih.gov/entrez/query/static/clinical.shtml</a>

<http://journal.ihepsa.ir/article-1-44-fa.html>

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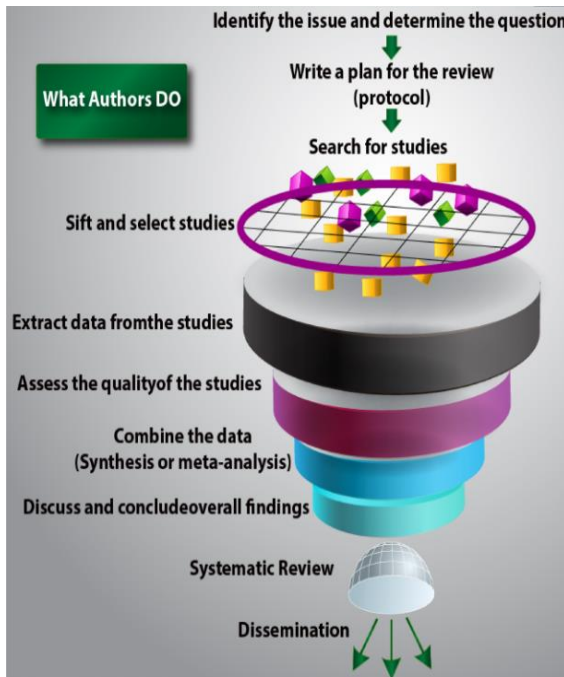
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# Take-home message

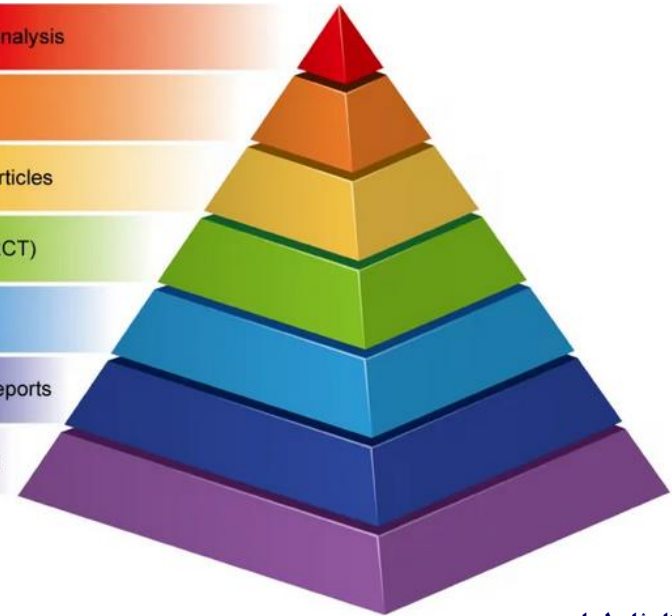


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- 1 Systematic reviews and meta-analysis
- 2 Critically-appraised topics
- 3 Critically-appraised individual articles
- 4 Randomized controlled trials (RCT)
- 5 Cohort studies
- 6 Case-controlled/Case series/Reports
- 7 Background info/Expert opinion



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- [Systematic reviews and meta-analyses: a step-by-step guide](https://www.ccace.ed.ac.uk/research/software-resources/systematic-reviews-and-meta-analyses) , <https://www.ccace.ed.ac.uk/research/software-resources/systematic-reviews-and-meta-analyses>
- [PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses](http://www.prisma-statement.org) [www.prisma-statement.org](http://www.prisma-statement.org)
- [PROSPERO is an international database of prospectively registered systematic reviews in health and social care](https://www.crd.york.ac.uk/prospero/) <https://www.crd.york.ac.uk/prospero/>
- Introduction to Systematic Review and Meta-Analysis, <https://www.coursera.org/learn/systematic-review>
- Covidence - Better systematic review management, <https://www.covidence.org/home>

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