

# An Introduction to Systematic Reviews that Include Meta-analyses for Policy Makers and Analysts

## Uma Introdução às Revisões Sistemáticas que incluem meta-análises para Analistas e Decisores Políticos

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**Abstract:** Many governments are moving towards evidence-based policy-making (EBPM), but policy-makers and policy analysts may struggle with the vast amounts of research available to them. Systematic reviews and meta-analyses may be useful tools for policy-makers and analysts wishing to implement EBPM. But many policy-makers and analysts may be unfamiliar with the method. This paper provides an introduction to these research methods. It answers the following questions: What are systematic reviews and meta-analyses? How can they be useful to meta-analyses? What are their advantages over other kinds of research? And, what should policy-makers look for when critically evaluating systematic reviews and meta-analyses? The paper concludes with final reflections and resources for policy-makers and analysts wishing to evaluate systematic reviews or conduct their own systematic reviews.

**Keywords:** Systematic review; Meta-analysis; Evidence-based policy; Policy-makers; Policy-analysts; Quality evaluation

**Resumo:** Muitos governos têm se apropriado da formulação de política baseada em evidências "evidence-based policy-making" (EBPM) ainda que os tomadores de decisão e analistas de política possam ter dificuldades dada a grande quantidade de dados e pesquisa disponíveis. As revisões sistemáticas e as meta-análises podem ser ferramentas úteis para os decisores políticos e os analistas que desejam implementar o modelo EBPM. Entretanto, muitos tomadores de decisão e analistas podem não estar familiarizados com essas metodologias. Este artigo fornece uma introdução à estes métodos de investigação e pretende responder às seguintes questões: O que são revisões sistemáticas e meta-análises? Como esses métodos

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podem ser úteis para a realização de meta-análises? Quais são as vantagens desses métodos sobre outros modelos de pesquisa? E, por fim, sobre o que os decisores políticos devem se atentar ao avaliar criticamente revisões sistemáticas e meta-análises? O artigo é finalizado com algumas reflexões e indicações para decisores políticos e os analistas que desejam avaliar revisões sistemáticas ou mesmo realizar suas próprias revisões em busca de evidências.

**Palavras-chave:** Revisão sistemática; Meta-análise; Políticas baseadas em evidências; Decisores políticos; Analistas de política; Avaliação da qualidade de políticas.

## 1. Introduction

Policy-making is an immensely complex process. In considering the policy problem, policy-makers and policy analysts take into account several considerations—including their political ideology, ethical implications, their own values, public opinion, and fiscal considerations, among others. Further, policy decisions are influenced by countless contextual factors such as cultural and historical factors, as well as bureaucratic, societal, and political structures (DAVIES, 2004; MILJAN, 2012). In addition to these factors, scientific research and other forms of evidence often feature highly in a government's policy decisions (NUTLEY et al., 2007).

Evidence-based policy-making (EBPM) refers to a practice of making policy that is, at its core, based on the best available evidence. As defined by Davies (2004, p.3), EBPM is “an approach that helps people make well-informed decisions about policies, programs and projects by putting the best available evidence from research at the heart of policy development and implementation”. This approach to policy-making does not exclude other considerations, but it emphasizes evidence as a basis for policy decisions rather than untested views of groups or individuals (DAVIES, 2004). While the idea of using evidence to inform policy-making is not new, EBPM is undergoing renewed popularity among many governments (COBURN et al., 2009; DAVIES, 2004; FOX, 2005; LEVIN, 2013; SHAXSIN, 2005;

SOLESBURY, 1999; YOUNG, 2013). Many governments around the world, including the United States, the United Kingdom, Australia, Canada, and Northern European Countries, have recently expressed desires to move increasingly toward EBPM (CABINET OFFICE, 1999; DAVIES, 2004; FOX and OXMAN, 2001; FOX, 2005).

It is often the task of public policy-makers and analysts to review research or other forms of evidence in order to make or provide advice for policy decisions; if policy decisions are based on evidence, it is often these actors who have made it so. But they face some barriers to evidence-based policy-making. One barrier is that the amount of “evidence” on a given topic is too great for a policy-makers or analysts to adequately process. The past few decades have seen an exponential growth in scientific research. The overwhelming amount of research in medicine and health fields has been especially well-described (CASTILHO and ABRAHAM, 2008; DAWES and SAMPSON, 2003; NOONE et al. , 1998; TRICCO et al. , 2011), but this it extends to a variety of policy areas, such as education (LEVIN, 2013; SLOCUM et al., 2012), economics (WALKER et al., 2012), and environmental science (NURSEY-BRAY et al., 2014; PULLIN and STEWART, 2006) among others. Because of the sheer volume of bodies of research in various domains, it has been difficult to integrate and combine research to achieve clear, usable conclusions (DAWES e SAMPSON, 2003; RINGQUIST and ANDERSON, 2013). Moreover, within a body of literature, research often conflicts. It is very common for some researchers to find an effect they deem “significant” and for other researchers to find no such effect. Given the problem that very large bodies of literature could be relevant to a policy decision, and that the research within that literature may present conflicting evidence, the prospect of realizing EBPM may be daunting for a policy-maker or analyst.

In response to quickly growing bodies of research, many have advocated the use of systematic reviews and meta-analysis to inform decisions (MURAD et al., 2014; RIED, 2006). Systematic reviews of research literature have the potential to be useful in summarizing and integrating research on a given topic and may allow

policy analysts to more easily evaluate evidence for a policy decision. They have several advantages over single research studies and traditional narrative research reviews that make them likely to become increasingly important to policy-making, especially as it moves further towards being evidence-based. However, systematic reviews and meta-analyses are likely under-utilized by policy-makers, possibly because of their lack of familiarity with the method and ability to judge their quality (LAUPACIS and STRAUS, 2007).

This paper provides an introduction to systematic reviews and meta-analyses so that policy-makers and analysts may become more familiar with these research methods and how they may be of value to informing policy decisions. It aims to answer the following questions: What are systematic reviews and meta-analyses? How can they be useful to meta-analyses? What are their advantages over other kinds of research? And, what should policy-makers look for when critically evaluating systematic reviews and meta-analyses? The first few sections of this paper answer these questions in turn. The paper concludes with some final reflections and some further resources for conducting a systematic review and meta-analysis as well as evaluating their methodological quality.

## **2. Systematic Reviews and Meta-analyses**

A systematic review is an integrated and comprehensive summary of a body of research literature on a given topic. Systematic reviews are different from traditional narrative research reviews because of the systematic way that they are conducted (FOX, 2005; TRICCO et al., 2011). Whereas traditional narrative reviews present some research on a topic selected by the author, systematic reviews include all studies that meet a pre-specified set of criteria. Systematically reviewing the literature allows these reviews to provide more reliable findings and thus may provide better evidence than traditional narrative reviews (ANTMAN et al., 1992; FOX, 2005; OXMAN and GUYATT, 1993). Characteristics of systematic

reviews include a reproducible methodology, a systematic search that is likely to include all studies that meet specified criteria, and an assessment of the validity of the studies included. Systematic reviews often, but not always, include meta-analyses.

Meta-analysis is a set of techniques for synthesizing the quantitative results from multiple empirical studies (BORENSTEIN et al., 2009; GLASS, 1976). Meta-analyses usually combine effect sizes from primary studies. An effect size is an index of the magnitude of a relationship between two variables (e.g., correlation coefficient, squared correlation coefficient, standardized mean difference, etc.). Primary studies are the original, individual studies that have produced the effect sizes that will be combined in a meta-analysis. (BORENSTEIN et al., 2009). The resulting combination is called the summary effect (or sometimes the summary coefficient). It is the weighted average of the effect sizes from all of the primary studies included in a meta-analysis (BORENSTEIN et al., 2009). There are several methods of combining and weighting effect sizes from primary studies, and they differ between meta-analyses. Meta-analysis was formalized first by Gene Glass in the 1970s to synthesize education research (GLASS, 1976). Since then, meta-analysis has grown in popularity, as evidenced by the number of meta-analyses being currently conducted, the acceptance it garners from academic journals, and the breadth of domains in which it is currently used (GLASS, 2000; HUNT, 1997; RINGQUIST and ANDERSON, 2013).

Meta-analyses are often used as part of a systematic review, but they do not have to be; some meta-analyses are not intended to review bodies of literature (for an example in psychology, see (TODTENKOPF et al., 2005). Similarly, while many systematic reviews include a quantitative synthesis of statistical results (a meta-analysis), some do not. This paper focuses on introducing systematic reviews that include a meta-analysis because these may be especially useful to policy-makers and analysts.

### **3. How Policy-Makers and Analysts can use Systematic Reviews**

In their guide to conducting meta-analyses in public policy, Ringquist and Anderson (2013) discuss four primary ways that policy-makers can use systematic reviews that include meta-analyses. First, systematic reviews can aid problem identification. Individual studies often measure the extent of policy problems in specific contexts; but by integrating these individual studies, systematic reviews are able to give a sense of the scope and magnitude of a particular problem across contexts. Second, policy decisions often require accurate measurements of various quantities. While individual studies can provide estimates of these quantities, systematic reviews and meta-analyses can provide more precise and more robust estimates of a variety of quantities. Third, systematic reviews are able to help evaluate the outcomes of policies and programs. While individual studies may be limited to a few outcomes or to geographical areas, systematic reviews can provide policy-makers with a summary of a policy or program on a number of outcomes across multiple areas. Fourth, meta-analyses can help test hypotheses and build theory. For example, some theorize that decentralizing services by giving more responsibility to local or municipal governments results in more effective and responsive services for communities. Individual studies may examine the effects of decentralization in particular contexts; but systematic reviews that include meta-analysis may be able to give a sense of whether, in general, decentralization leads to improved service delivery, and what factors may influence when decentralization is more or less effective.

### **4. Advantages of Systematic Reviews**

All research may be useful to policy-makers, including traditional narrative literature reviews of research. However, advocates of systematic reviews and meta-analysis argue that these studies have many advantages over traditional

literature reviews (GLASS, 1976; LAUPACIS and STRAUS, 2007; RINGQUIST and ANDERSON, 2013; TRICCO et al., 2011). These advantages may make them especially useful to policy-makers and analysts.

#### *4.1. Systematic Reviews can Summarize Large Bodies of Literature*

Advocates of systematic reviews argue that narrative reviews are incapable of summarizing large bodies of literature. For example, Glass (1976) asserts that if you want to make sense of 500 studies on the relationship between class size and educational outcomes, you cannot meaningfully summarize them all in a traditional narrative literature review. Because a traditional literature review cannot meaningfully analyze all of the studies that might bear on a given issue, the author must decide which ones to include (GLASS, 1976). In contrast, systematic reviews that include meta-analyses are designed to find all studies relevant to a given research question that meet certain criteria, and integrate their findings. These studies may therefore provide policy-makers and analysts with more complete summaries of a body of literature.

#### *4.2. Systematic Reviews can Resolve Conflicting Results*

Traditional literature reviews are also ill-suited to reviewing bodies of literature with conflicting results (HUNT, 1997; RINGQUIST and ANDERSON, 2013). Narrative reviews typically consider whether studies find significant results, and then, because significant results will be found in some studies and not others, a common conclusion of these reviews is that more research must be conducted to clarify the literature (GLASS, 1976; HUNT, 1997). However, significant results may not be found in some studies for various reasons beyond there actually not being an effect; for example, there may not have been a large enough sample size, or the effect under study may not be very strong. Meta-



analysis, by virtue of working with effect size estimates, allows researchers to determine whether the insignificant results of some research are in fact conflicting with the research that has found significant results, or whether the effects are there but simply did not reach significance (GLASS, 1976). In other words, non-zero effects are considered in meta-analysis.

For example, we could imagine that a study finds a small effect for an intervention on increasing health outcomes in an experimental group. The difference between the experimental group and the control group, however, is not statistically significant because the sample size was small, and so the study lacked the power to detect the small effect. A traditional narrative review on the effectiveness of the intervention would count this study as non-supporting evidence for the effectiveness of the program because the results were not statistically significant. In contrast, a meta-analysis would count this as contributing to an overall summary effect size estimate (the resulting effect from combining effect sizes from all of the primary studies). The contribution of this study might be small: studies in a meta-analysis are weighted by their sample size, and because this study has a small sample size, it would carry relatively little weight in the overall summary effect. However, any effect, regardless of its size, is included in a meta-analysis, and will contribute to the balance of evidence. This makes meta-analysis a better tool for reconciling differences among studies in a body of research literature.

#### *4.3. Systematic Reviews Provide more Precise Estimates than Individual Studies*

How precise an estimate of an effect size is depends in part on how large the sample is on which the estimate was based. Individual studies increase precision by obtaining as large a sample as possible (GARG et al., 2008). Meta-analyses combine data from samples of multiple primary studies, and therefore are able to obtain larger sample sizes than the primary studies included. This allows them to



provide more precise estimates of an effect size than any of the included studies (GARG et al., 2008).

#### *4.5. Systematic Reviews can be Less Biased than Traditional Narrative Reviews*

Systematic reviews may be less biased than in traditional reviews. In a traditional literature review, the researcher decides which studies to include, how to present the findings, and how to describe conflicting findings. Many argue that because of these features, traditional reviews are easily biased, even unintentionally (CHALMERS et al., 2002; SHAPIRO and SHAPIRO, 1983). In contrast, a systematic review is done using a systematic and replicable process, where the author chooses and justifies criteria for which studies are relevant and can be included. Then all studies that meet these criteria are included. Because the criteria are explicit, other authors can replicate the procedures or even argue that other criteria are better, and conduct the review again with different criteria. Because the author is not making decisions about selecting individual studies, systematic reviews are potentially less biased than traditional literature reviews.

#### *4.6. Systematic Reviews are More Efficient for Policy-Makers and Analysts*

Systematic reviews are conducted with the aim of synthesizing an entire research body in a given research domain. Rather than a policy-maker or analyst accessing each individual research study, systematic reviews allow a policy-maker or analyst to read a single review and still learn about the evidence from an entire body of literature. In this way, systematic reviews can save time for decision-makers.

#### *4.7. Systematic Reviews are Applicable to a Wide Variety of Policy Areas*

Systematic reviews and meta-analyses can be useful to informing a range of policy issues. Policy-makers and analysts in public health may use meta-analyses showing that school-based diet and physical activity interventions are effective at preventing obesity in children (WANG et al., 2013). Policy-makers in North America have applied systematic reviews on drug costs and effectiveness to make policy decisions regarding which drugs are covered by insurance and Workers Compensation coverage (FOX, 2005). With respect to addressing crime, systematic reviews can inform policy-makers on strategies to reduce corporate crime (SIMPSON et al., 2014), prevent sexual violence in young people (DE LA RUE et al., 2014), and reduce criminal recidivism (VILLETIAZ et al., 2015). Those in environmental policy may use systematic reviews to choose between different forest management practices (SAMII et al., 2014) or to guide decisions around the creation of marine reserves for protecting fish species (STEWART et al., 2008). Systematic reviews can be useful to policy-makers in labour policy (FILGES et al., 2015), foreign affairs and trade policy (BRUNO and CAMPOS, 2011; OTT and MONTGOMERY, 2015); and transportation policies (HEATH et al., 2006). The potential application of systematic reviews extends to virtually all policy areas.

### **5. Methodological Quality of Systematic Reviews that include Meta-analyses**

For all of the previously described reasons, some have argued that meta-analyses represent an important—and sometimes the best—source of research evidence (GUYATT et al., 2000; MURAD et al., 2014), and may be especially useful for policy-makers and analysts trying to create evidence-based policy (FOX, 2005). While there is much potential for systematic reviews that include meta-analyses to inform policy, like any research, systematic reviews can be of high or low methodological quality depending on how well the methods match the research questions (MOHER et al., 2007; MOHER et al., 1999; SCHULZE, 2007; SHEA et al.,

2007; SHEA et al. , 2001). There are a number of biases and issues that systematic reviewers need to address when conducting their research. This section presents a brief, non-technical description of what good systematic reviews should include and some ways they can be biased. It is an incomplete list, but it should be useful as a starting place for policy-makers and analysts who are new to systematic review and meta-analysis methodology.

### *5.1. Systematic Methodology and Complete Reporting*

A primary strength of a systematic review and meta-analysis is that it is systematic and transparent, with an explicit methodology that allows it to be reproduced and verified (RINGQUIST and ANDERSON, 2013). A good systematic review should include clear criteria about which primary studies will be included or excluded. Further, these criteria should be determined before having collected data. Establishing clear criteria beforehand reduces the likelihood that the author is biased in the selection of studies (GARG et al., 2008). Similarly, the way that data is extracted from the studies, coded, and combined into summary effects should be explained in detail. The detailed reporting of the decisions made throughout the conduction of a systematic review allow the author to critically evaluate the research, and enable other researchers to reproduce the research if necessary (RINGQUIST and ANDERSON, 2013).

### *5.2. Addressing publication bias*

Publication bias refers to the tendency for research studies that find significant results to be published more frequently than those that do not find significant results. Consequently, the published literature may tend to have more significant results than the complete literature does. If a systematic review only includes published literature, it is likely to overestimate the size of an effect

(RINGQUIST and ANDERSON, 2013). There are several strategies for addressing publication bias, but an important one is for systematic reviews and meta-analyses to include a comprehensive search strategy (RINGQUIST and ANDERSON, 2013). A comprehensive search uses several strategies to identify all relevant studies, including published research as well as unpublished and grey literature, including theses, dissertations, conference presentations, think-tank research, government white papers, and so on (HOPEWELL et al., 2005; RINGQUIST and ANDERSON, 2013).

Another aspect of publication bias relates to the language of publication of the primary study. Many systematic reviews include only English-language articles (GREGOIRE et al., 1995). Including only English language articles can lead to a language bias in which authors that find negative results in their study may be less confident about publishing in a widely disseminated English-language journal and instead submit to a local journal (EGGER et al., 1997; GREGOIRE et al., 1995). Similarly, English-language journals may be more competitive and may therefore be less likely to publish negative results. In both cases, the result is that English-language articles may have larger effect sizes than non-English articles (EGGER et al., 1997). A systematic review of only English articles may therefore not be representative of the entire population of articles; it may be biased towards finding significant effects. Higher quality systematic reviews will not restrict included studies in terms of language and will actively search for articles published in other languages.

### *5.3. Ensuring Accuracy of Data Extraction*

After deciding which studies are included in the systematic review, the reviewer must read and recording the characteristics of those studies (RINGQUIST and ANDERSON, 2013; SÁNCHEZ-MECA and BOTELLA, 2010). This includes the statistical results to be combined, but also other characteristics including who was

included in the study sample, the location of the study, methodological variables of the study, and so on. It is important that the recording of study characteristics is done accurately, and so higher quality systematic reviews will have two or more researchers read and code the studies (SHEA et al., 2007). They will also report the degree of agreement between coders and how differences were resolved (SÁNCHEZ-MECA and BOTELLA, 2010).

#### *5.4. Assessing Quality of Primary Studies*

There has been much debate by methodologists around whether poor quality original studies should be included in a meta-analysis (GLASS, 2000). Some methodologists argue that poor quality studies should be excluded. They argue that “garbage in equals garbage out”; that is, including original studies that are low-quality can only result in a low-quality meta-analysis (ANDERSSON, 1999; GARG et al., 2008; MOSTELLER and COLDITZ, 1996). Other methodologists argue that to exclude original studies a priori on the basis of their quality can lead to a biased summary effect size and loss of information (DICKERSIN and BERLIN, 1992; FISKE, 1983; GLASS, 2000). While there is some controversy around the inclusion of poor quality primary studies, methodologists seem to agree that at the very least, a systematic review should include some evaluation of quality of primary studies (GLASS, 2000; JONES, 1995; SHEA et al., 2007). This allows the analyst to examine the extent to which the quality of original studies affects the summary effect size (RINGQUIST and ANDERSON, 2013).

#### *5.5. Appropriate Statistical Model*

Within meta-analyses that combine effect sizes, several different statistical models have been distinguished: fixed-effect models, random-effects models, and mixed models (BORENSTEIN et al., 2009; HEDGES, 1992). These models are

mainly differentiated in terms of what they presume is represented (i.e., in the population) by the estimated effect (i.e., in the sample). Within the fixed-effect model, the effect size reported in each primary study is taken to be an estimate of a single fixed population effect. Therefore, the summary effect estimate from a combination of those primary studies is also taken to be an estimate of a single population effect. In contrast, within the random-effects model, each of the individual studies' effect size estimates are presumed to come from a population of possible population effects. In other words, each of the individual studies estimates the effect size for a unique population; the summary effect that is estimated in a given meta-analysis represents, in this case, a (weighted) average of population effects. Mixed effect models represent a combination of the two, and model effects for both random and fixed factors. These different models warrant different kinds of conclusions: whereas using a fixed-effect model allows the reviewer to make inferences about the studies included, a random-effects model permits the meta-analyst to make inferences to a population of studies. In other words, the results of a meta-analysis that uses a random-effects model are more general.

There is debate around which of these models should be used in which contexts. It is often recommended that reviewers base their decision about which statistical model to use on an assessment of heterogeneity. Briefly, heterogeneity refers to how similar the effect sizes in the primary studies are to each other (BORENSTEIN et al., 2009). A group of effect sizes is said to be homogenous when they are similar to each other; when the effect sizes are quite different from each other, they are said to be heterogeneous. If the effect sizes to be combined in a meta-analysis are homogenous, they are more likely to be estimated a single effect, so a fixed-effect model may be appropriate. If the effect sizes are quite heterogeneous, it is unlikely to be the case that they are estimating the same, fixed effect. Therefore, a random-effects model is more appropriate with a set of heterogeneous effect-sizes (RINGQUIST and ANDERSON, 2013).

Systematic reviews and meta-analyses will use different methods to assess heterogeneity, and will make different decisions about statistical models. Properly evaluating whether the decision was a good one requires some expertise in systematic review methodology; however policy-makers and policy analysts that do not have this expertise can still evaluate these decisions to some extent. At the very least, a systematic review that includes a meta-analysis should include an assessment of heterogeneity and a description of which statistical model was used, along with some justification of why this model choice makes sense for the phenomenon under study (SHEA et al., 2007). Further, if there is heterogeneity, the review should discuss what factors could be causing this; i.e. why the primary studies may be estimating effect sizes of different magnitudes (SÁNCHEZ-MECA and BOTELLA, 2010).

## **6. Conclusion**

Policy-making is complex and policy-makers use multiple pieces of information to inform policy decisions. For governments and policy-makers working towards EBPM, systematic reviews that include meta-analyses have the potential to be very useful—and in some cases they may be one of the best sources of evidence for policy decisions. However, research is most useful to policy-makers when it is of high quality; policy-makers and analysts will need to evaluate the quality of a systematic review that includes a meta-analysis in order to use it to inform a policy decision. This paper has presented an introduction to systematic reviews and meta-analyses along with information aimed at facilitating a critical reading of these studies in order to facilitate quality judgments by policy-makers.

The information presented in this paper is useful as an introduction to systematic reviews and meta-analyses, but it is incomplete. Policy-makers and analysts wishing to learn more about systematic reviews and meta-analyses may find the following resources useful. Julio Sánchez-Meca and Botella (2010) have



produced a list of questions aimed at guiding a critical reading of systematic reviews and meta-analyses for clinical psychologists wishing to use systematic reviews as the basis for clinical decisions (included in Appendix A). While this guide is not designed specifically for policy-makers or policy analysts, it still provides a useful and relatively thorough structure for making evaluations of the quality of systematic reviews for policy decisions (SÁNCHEZ-MECA and BOTELLA, 2010). Beverley Shea and colleagues have also produced a tool for evaluating systematic reviews in health fields, called the AMSTAR, which has been validated to some extent (Shea et al., 2007; SHEA et al., 2009).

Another indication of the quality of a systematic review is endorsement by research organizations. There are at least six major organizations dedicated to producing high quality meta-analyses as part of systematic reviews: the Cochrane collaboration, which focuses on reviews in the health field; the Campbell collaboration, which focuses on public policy research in areas such as education, international development, and criminology; the What Works Clearinghouse, which conducts systematic reviews primarily in the area of education; the Collaboration for Environmental Evidence, which prepares systematic reviews on environmental research topics; the Joanna Briggs Institute, which supports high-quality research syntheses (including of qualitative research) of nursing research; and the Meta-analysis of Economics Research Network, which aims to improve the quality of meta-analyses conducted in the field of economics. These organizations have rigorous standards for their systematic reviews, and so their endorsement can help steer policy-makers and analysts towards higher-quality reviews (although this shouldn't replace a critical reading by the policy-maker). Readers interested in how to conduct their own systematic review or learning more about technical aspects of meta-analyses may consider consulting (BORENSTEIN et al., 2009; COOPER, 2010; COOPER et al., 2009; RINGQUIST and ANDERSON, 2013).

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## Appendix A: List of Questions oriented to the critical reading of Systematic Reviews and Meta-analyses

Table 1: List of questions oriented to the critical reading of srs and MAs

1. Is the study identified as an MA?		yes
		No
		Not available
2. Does it include an Abstract that presents the objectives, method, results and principal conclusions? A structured abstract should be provided, covering: justification; objectives; data sources; study selection criteria, participants and interventions; quality rating of the studies and synthetic methods; results; study limitations; conclusions and implications of the principal results.		yes
		No
		Not available
3. Does the Introduction section describe in an explicit way the questions and the objectives of the MA? There should be an explicit declaration of the questions intended to be answered, with reference to the participants, the interventions, the comparisons, the outcome variables and the design of the studies (PICOS: Participants, Interventions, Comparisons, Outcomes, and Study design).		yes
		No
		Not available
4. Does the Method section specify the inclusion criteria for the studies? There should be specification of the characteristics of the studies (e.g., PICOS, duration of follow-up period) and the characteristics of the studies used as eligibility criteria, stating the reasons for their consideration (e.g., years considered, languages, publication status).		yes
		No
		Not available
5. Does the Method section indicate the procedures used for the study search? All the information sources used in the search should be described (e.g., databases with the dates they cover, contacts with authors of the studies to identify additional studies), as well as the last date of search. The complete electronic search strategy of at least one database should be presented, including possible limitations imposed, so that any researcher can repeat it.		yes
		No
		Not available
6. Does the Method section specify the study variables coded? It should include a description of the method for extracting data from the primary studies (e.g., coding forms applied independently by two or more coders), and of any processes for obtaining and confirming data employed by the reviewers. It should also include a list of all the variables recorded in the studies, as well as their definition (e.g., PICOS, sources of funding), together with information on any assumptions and simplifications made.		yes
		No
		Not available
7. Does the Method section refer to the reliability of the coding? A good MA should have analyzed the reliability of		yes
		No

the coding of the moderator variables of the studies, and should present the results of that analysis in terms of kappa indices and intra-class correlations.		Not available
8. Does the Method section specify the effect size index/indices? The effect size index or indices used in the MA should be specified (e.g., standardized difference of means, odds ratio).		yes
		No
		Not available
9. Does the Method section describe the statistical methods used in the MA? There should be a description of the data treatment methods, and of how the results of the studies were combined (e.g., fixed effects model, random effects model or mixed effects model). Reference should also be made to the measures of consistency employed for analyzing the heterogeneity of the effects (e.g., Q and I <sup>2</sup> ). There should be some assessment of the risk of bias that might affect the accumulated evidence (e.g., publication bias, selective reporting within the studies). Additional analysis methods should be described (e.g., sensitivity analyses, analyses by subgroups, meta-regression).		yes
		No
		Not available
10. Does the Results section present the characteristics of the studies? There should be a description of the characteristics of the studies included; a table should be provided showing these characteristics on an individual basis, or the reader should at least be given the possibility of access to such a table.		yes
		No
		Not available
11. Does the Results section include analysis of the studies according to their quality? The methodological quality of the studies should have been coded and its relation to the effect sizes considered, with the aim of identifying possible biases due to poor quality. If both randomized and non-randomized studies have been included, their results should be compared.		yes
		No
		Not available
12. Does the Results section present the mean effects and the consistency measures? The results of each MA carried out should be presented, including the mean effect sizes with their confidence intervals and the measures of consistency or heterogeneity (e.g., Q, I <sup>2</sup> ). Optionally, the results of the individual studies and of each MA can be presented by means of a 'forest plot'.		yes
		No
		Not available
13. If there has been heterogeneity, does the Results section present the analysis of moderators? In the case that there is heterogeneity between the effect sizes, mixed effects models should be applied, such as analyses by subgroups (ANOVAs) and meta-regression (regression analysis) to identify characteristics that moderate the results.		yes
		No
		Not available
14. Does the Results section include any sensitivity		yes

analysis? If the design included sensitivity analyses for assessing the consistency and robustness of the MA results, they should be described in this section.		No
		Not available
15. Does the Results section include a publication bias analysis? The MA should have carried out some publication bias analysis to check whether it could represent a threat to the validity of the results.		yes
		No
		Not available
16. Does the Discussion section summarize the evidence? It should include a summary of the principal results, including a reference to the evidence obtained for each principal outcome variable; there should also be some consideration of the relevance for different groups (e.g., healthcare professionals, users and politicians).		yes
		No
		Not available
17. Does the Discussion section consider the limitations of the MA? Limitations should be discussed at the level of the studies, at that of outcome variables (e.g., risks of bias) and at that of the review (e.g., incomplete recovery of studies, reporting bias).		yes
		No
		Not available
18. Does the Discussion section consider the implications for professional practice? There should be some discussion of the implications of the main results of the MA for professional clinical practice, managers, and political decision-makers.		yes
		No
		Not available
19. Does the Discussion section consider the implications for future research? It should provide a general interpretation of the results in the context of other proof and evidence, as well as discussing the implications for future research.		yes
		No
		Not available
20. Are the funding sources specified? There should be a description of the sources of funding of the SR or MA, as well as of other assistance received (e.g., provision of data) and of the role played by the funders in the systematic review, with a view to assessing possible conflicts of interest.		yes
		No
		Not available

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