A NEW CLASSIFICATION OF SPIN IN SYSTEMATIC REVIEWS AND META-ANALYSES WAS DEVELOPED AND RANKED ACCORDING TO THE SEVERITY

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ABSTRACT

OBJECTIVES

We aimed to 1) identify and classify spin (i.e., a description that overstates efficacy and/or understates harm) in systematic reviews and 2) rank spin in abstracts of systematic reviews according to their severity (i.e., the likelihood of distorting readers' interpretation of the results).

STUDY DESIGN

First, we used a four-phase consensus process to develop a classification of different types of spin. Second we ranked the types of spin in abstracts according to their severity using a Q-sort survey with members of the Cochrane Collaboration.

RESULTS

We identified 39 types of spin, 28 from the main text and 21 from the abstract; 13 were specific to the systematic review design. Spin was classified into 3 categories: (1) misleading reporting, (2) misleading interpretation and (3) inappropriate extrapolation. Spin ranked as the most severe by the 122 people who participated in the survey were 1) recommendations for clinical practice not supported by findings in the conclusion, 2) misleading title and 3) selective reporting.

CONCLUSION

This study allowed for identifying spin that is likely to distort interpretation. Our classification could help authors, editors and reviewers avoid spin in reports of systematic reviews.

Key words: bias; data interpretation; distortion; spin; systematic reviews; classification

Running title: Spin in Systematic Review

WHAT IS NEW?

- **Key findings:** We identified 39 types of spin: 28 could occur in the main text and 21 in abstracts; 13 were specific to the systematic review design.
- **What this adds to what is known**: The ranking of spin in abstracts according to their severity highlighted that the most severe spin were 1) recommendations for clinical practice not supported by findings in the conclusion, 2) misleading title and 3) selective reporting.
- **What is the implication, what should change now:** This classification of spin could help editors and reviewers identify spin and reduce misinterpretation of review findings and also help authors avoid spin when reporting a systematic review.

BACKGROUND

Clinical and health-policy decision-making should be based on the best evidence. Systematic reviews and meta-analyses are the cornerstones of therapeutic evaluation because they summarize all available evidence. Clinicians, decision makers and researchers often use systematic reviews and meta-analyses (henceforth referred to as systematic reviews) to keep up to date with the medical literature, develop clinical practice guidelines and sometimes plan future research[1,2]. Patients can also use systematic reviews to help inform treatment options. An accurate presentation and interpretation of results of systematic reviews is therefore essential for appropriate dissemination and application of results. However, authors usually have broad latitude in writing their reports of scientific results[3], with the possibility of adding "spin"[4].

The term spin was used in the medical literature for the first time by Horton [5] about the rhetoric of research. Horton defined spin as "the conscious and unconscious tricks of authorial rhetoric". Then, the term spin was used in the first study that systematically assessed distorted interpretation in published articles[4]. In this study, spin included intentional or non-intentional misrepresentation of study findings.

The presence of spin in scientific reports was systematically studied initially in reports of randomized controlled trials (RCTs)[4,6,7]. Spin has been noted in about 60% of abstract conclusions in RCT reports[4] and its presence was found to affect clinicians' interpretation of the research findings[8]: clinicians were more likely to rate a treatment as beneficial despite the primary outcome being statistically non-significant. Recent studies have described and proposed classifications of spin for other study designs, such as diagnostic accuracy studies[9], non-randomized studies or observational studies[10–14]. These studies have shown that the use of spin by authors is diverse and very prevalent and common, particularly

in the abstract conclusions [4,7,9,15,16]. Furthermore, spin in published articles is disseminated to the public through press releases and news items[6,17] and leads to misinterpretation of the study findings by readers[8].

Authors have highlighted and described some cases of the distorted interpretation of review findings [18] or misleading reporting that could bias readers' interpretation of the results[19,20]. Despite the importance of systematic reviews[21,22], the interpretation of their findings is still problematic[23–27]. Identifying spin in reports is a subjective task, and a classification of spin with a clear definition of the different types of spin would be useful for authors and reviewers to aid in identifying spin in reports. We are not aware of a previously published classification scheme for spin for systematic reviews.

Abstracts are a primary source of dissemination of research findings. Readers often base their initial assessment of research on the information reported in an abstract, and in some geographic areas, the abstract may be all that health professionals have easy access to[28]. The title and abstract conclusions deliver the simplest take-home message that is easy to memorize. The presentation and interpretation of study results specifically in the title and abstract is therefore essential.

We aimed to 1) develop a classification scheme for spin in reports of systematic reviews and 2) rank types of spin that could occur in abstracts of systematic reviews according to their perceived severity (i.e., the likelihood of distorting readers' interpretation).

METHODS

First, in a four-phase consensus process, we identified, by literature review and interviews, potential types of spin in systematic reviews of the effects of therapeutic interventions and developed a classification scheme of spin. Second, we ranked types of spin in abstracts according to their severity by using a Q-sort survey with invited members of the Cochrane Collaboration.

Definition

We defined spin as a specific way of reporting, intentional or not, to highlight that the beneficial effect of the experimental treatment in terms of efficacy or safety is greater than that shown by the results (i.e., overstate efficacy and/or understate harm). In this definition we did not consider spin that understated the beneficial effect of the experimental intervention in terms of safety and efficacy (i.e., understate efficacy and/or overstate harm) because this types of spin were not considered in previous works about spin for other study designs[4,7,9,11]. Further, to allow an accurate assessment of the severity of the spin by participants, it was important to focus on a homogeneous definition. Spin is a part of a larger concept of biased reporting where some important elements are omitted, modified or reported in a misleading manner by authors.

We defined the severity of a spin as the perceived likelihood of distorting readers' interpretation when reading the abstract. The different types of spin could be more or less likely to distort readers' interpretation. For example, a selective reporting of outcomes favoring the beneficial effect of a treatment could be more misleading for readers than the use of linguistic spin.

Development of a classification scheme of spin in systematic reviews and meta-analyses

We developed a classification scheme of spin in systematic reviews of therapeutic interventions in a four-phase consensus process.

All the authors of this study had expertise in conducting and reporting systematic reviews and participated in the development of the classification scheme of spin in systematic reviews.

Phase 1: We performed a literature review about misleading, biased, misconducted or misinterpreted systematic reviews to identify potential types of spin that could overstate efficacy or understate harm. We searched 1) important methodological work on spin and extracted potential types of spin that could be apply to systematic reviews, 2) recommendations on how a systematic review should be reported and interpreted and determined how this could be spin (For this purpose we searched the Cochrane Handbook, part 2: "general methods for Cochrane review"[29] and the Methodological standards for the conduct of Cochrane Intervention Review version 2 [30]); 3) letters, comments or editorials about the interpretation of systematic review findings, which could be a potential strategy of spin, in two databases, MEDLINE and the Cochrane Methodology Register; and 4) main articles with recommendations about systematic reviews and meta-analysis interpretation [31–37]. More details are available in the appendix.

Phase 2: Two authors (AY and IB) classified potential types of spin retrieved in phase 1 according to their location in the article (i.e., spin that could occur in the main text of the report or that could occur in the abstract or the title of the report).

Phase 3: Interviews face to face or by conference call were organized with all the authors. After a presentation of the concept of spin, we (AY and IB) presented the list of potential spin types developed in phase 2. Then, in an open exchange, we discussed each potential type of

spin, during which clarifications, rewording, opinions, justifications or new ideas were expressed.

Phase 4: The list of spin types was refined, taking into account the comments made in phase 3. Then we obtained a classification scheme of spin for systematic reviews and meta-analyses of therapeutic interventions. We re-sent the classification scheme for approval to all the authors.

Ranking spin in the abstract according to its perceived severity: an online survey

Study design

We planned an online survey in which participants were asked to rank different types of spin in the article abstract (including the title) according to their perceived severity.

The survey focused on spin in the title and abstract because these sections are the most widely read and often the only freely available part of the report. They are the first and sometimes the only source of information for readers[28,38].

Participants

We invited the following members of the Cochrane Collaboration to participate in the survey: 1) the coordinating editors in any review or method group, 2) the members of the Methodology Review Group and Bias Method Group, 3) all editors of the 6 review groups that published the largest number of reviews between 2010 and 2013: musculoskeletal, pregnancy and childbirth, anesthesia, neonatal, airway and pain, palliative and supportive care groups. The survey occurred between February 27 and April 10, 2015, and 476 people were invited to take part in the survey.

Survey

A standardized and personalized e-mail was used to invite all potential participants to participate in a survey to sort spin in article abstracts according to the perceived severity of the spin defined as the likelihood that the spin distorted the interpretation of the results. The email is available in the appendix. We sent 1 or 2 reminders in absence of a response to the previous e-mail.

Participants ranked spin by using the Q-sort survey. This research method, first described by William Stephenson in 1935, combines qualitative and quantitative methods and provides a scientific foundation for studying subjectivity or a person's viewpoint[39–42]. In a Q-sort survey, people are shown a sample of statements on a topic and asked to rank-order them from their point of view according to some preference, judgment or feeling about each statement.

Ranking involved 3 steps. Each type of spin was reported on a virtual "card". First, participants had to read the cards carefully and divide them into 3 groups according to their severity: 1) less severe, 2) medium severity and 3) more severe. Second, participants were asked to take the cards from each group (less severe / medium severity / more severe), read them again and place each of them in one of 7 bins on a score sheet ranging from -3, less severe, to +3, more severe. Once they placed all cards on the score sheet, they could review the distribution once more and shift the cards one final time. Prior to distribution, the survey was pilot-tested with a convenience sample of 20 epidemiologists to determine whether the process and cards were understandable. We performed the survey using FlashQ Software 1.0, the Flash application for performing Q-sorting online[43].

Details, with screenshots of the online survey, are available in the appendix.

Analysis

Means and standard deviations were used to describe quantitative variables and frequencies and percentages to describe categorical variables. Spin was classified and ranked in descending order by the mean score given by participants. Statistical analysis involved use of SAS v9.3 (SAS Inst. Inc., Cary, NC).

RESULTS

Classification scheme of spin in systematic reviews and meta-analyses

Identification of types of spin in systematic reviews

From our literature review and consensus process, we identified 39 different types of spin: 28 relevant to the main text of a report and 21 in the report's abstract and title. From the 39 types of spin, 13 (33%) were specific to systematic reviews (Table 1) and 26 (67%) could occur in other study designs. For example, the extrapolation of study findings from a surrogate marker to the global improvement of the disease could occur in systematic reviews as well as in RCTs, but the inadequate focus on primary study results instead of meta-analysis results is specific to systematic reviews that include meta-analysis.

Classification of spin

We classified the types of spin into 3 main categories: (1) misleading reporting, (2) misleading interpretation and (3) inappropriate extrapolation (Table 1).

1) Misleading reporting was defined as incomplete or inadequate reporting of the methods, study analysis, study results or any important information that could be misleading to the reader. The misleading reporting of systematic reviews included 10 items in the main text and 8 items in the abstract (Table 1), such as the selective reporting of efficacy outcome favoring the beneficial effect of the experimental intervention or the lack of clarity over the amount of information summarized across outcomes in a review. For example, in a systematic review published in 2014 [44], the abstract failed to mention that among the 36 trials included in the systematic review, only 8 studies (22%) contributed to the meta-analysis of the primary outcome.

2) **Misleading interpretation** was defined as an interpretation of the study results that could be misleading to the reader. This category contained 13 types of spin for the main text and 10 for the abstract. This category included the interpretation by authors of a non-statistically significant result with a wide confidence interval for harm outcomes as being safe. This category also included the inadequate claim of efficacy of an intervention, despite the high risk of publication bias or heterogeneity. For example, in the systematic review[45] comparing albumin and crystalloids in seriously ill patients, the authors concluded that "albumin is a safe treatment," but the pooled relative risk for death was 1.11 with a confidence interval from 0.95 to 1.28) for all patients receiving albumin, 1.12 (95% CI, 0.85 to 1.46) for surgery or trauma patients and 1.76 (95% CI, 0.91 to 2.78) for patients with burns. The authors claimed the safety of albumin based on non-statistically significant results with a wide confidence interval.

3) **Inappropriate extrapolation** was defined as an inappropriate generalization of study results. This category contained 5 types of spin for the main text and 3 for the abstract, including, for example, the extrapolation of the results for a surrogate outcome, such as a biological outcome, to the global improvement of the disease or extrapolating the review's findings to a different intervention (i.e., claiming efficacy of one specific intervention although the review covers a class of several interventions). For example, in the systematic review assessing the efficacy of biologics versus placebo for treatment of moderate-to-severe plaque psoriasis, the authors conclude on the efficacy of one specific drug instead of a class of intervention – biologic treatments[46].

Ranking of spin in abstracts of systematic reviews and meta-analysis according to their severity

Participants

Among the 476 people invited to take part in the survey, 169 (35%) clicked the link at least once and 123 (73%) of these participated in the Q-sort survey. We excluded one participant who acknowledged a lack of expertise or particular knowledge about systematic reviews and their interpretation. Half of the participants were located in Europe; 89 (73%) were affiliated with a review group of the Cochrane Collaboration and 51 (42%) with a methods group. The participants had a high level of expertise in systematic reviews; most (n=107, 90%) had been involved at least once in a systematic review as an author (Table 2).

The most severe types of spin

Among the 21 types of spin that could occur in the abstract of the systematic reviews (Table 3), the 7 types rated as the most severe were 1) the conclusion formulates recommendations for clinical practice not supported by the findings, 2) the title claims or suggests a beneficial effect of the experimental intervention not supported by the findings, 3) selective reporting of or overemphasis on efficacy outcomes or analysis favoring the beneficial effect of the experimental intervention, 4) the conclusion claims safety based on non-statistically significant results with a wide confidence interval, 5) the conclusion claims the beneficial effect of the experimental treatment despite a high risk of bias in primary studies, 6) selective reporting of or overemphasis on harm outcomes or analysis favoring the safety of the experimental intervention and 7) the conclusion extrapolates the review findings to a different intervention (e.g., claiming efficacy of one specific intervention although the review covered a class of several interventions). The distribution of responses for the Q-sort survey for each type of spin is available in the appendix.

DISCUSSION

To our knowledge, our study is the first to provide a classification scheme of spin in systematic reviews. We identified 28 types of spin in the main text and 21 in the abstract that were classified in 3 categories: (1) misleading reporting, (2) misleading interpretation and (3) inappropriate extrapolation. The ranking of spin in abstract according to their severity highlighted that the most severe were 1) recommendations for clinical practice not supported by findings in the conclusion, 2) misleading title and 3) selective reporting.

In recent years, the biomedical research community has widely focused on transparency and reporting quality. The development of reporting guidelines such as the CONSORT [47] Statement for randomized trials and PRISMA Statement [31,48] for systematic reviews has been a major step forward in the improvement of scientific reporting. Implementation of these guidelines by journals should have an important impact on the quality of reporting, although evidence for this remains slight[49]. These guidelines are evidence-based and provide a minimum set of recommendations to facilitate clarity, completeness, and transparency of reports of systematic reviews. However, the PRISMA Statement provides limited guidance on interpreting results. Most systematic reviews include many analyses. The authors must select which outcomes and analyses to emphasize in the text and summarize in the abstract. When those outcomes have been prioritized post-protocol, their use to support the conclusions could bias readers' interpretation of the results. Reviewers and editors may not be sufficiently aware or trained to identify spin.

Moreover, review findings are difficult to interpret[50–52]. Systematic reviews are supposed to overcome personal opinions inherent to narrative reviews by setting out the ground rules for the study and then following them, but in fact they leave much room for opinion and misleading presentation or interpretation of findings. Previous studies showed that generating

a conclusion is difficult, whatever the expertise of the authors. For example, in the study by Lai et al.[52], participants (hospital practitioners attending an Evidence-based Medicine course and final-year medical students) were asked to choose an appropriate conclusion for the abstracts of four Cochrane reviews. Most participants were unable to generate the appropriate conclusion in terms of the direction of the effect and strength of evidence. The interpretation of review findings is even more difficult for a consumer audience. Glenton et al. described the difficulties in generating a plain-language summary understandable by the public[53]. Therefore systematic review findings are particularly subject to misinterpretation.

Previous studies have developed classifications for spin and showed that the prevalence is troubling[4,9]. However, we are not aware of previous research on the mechanism of spin. Spin in scientific publications may arise from 1) ignorance of scientific standards, 2) young researchers' imitation of previous practice, 3) unconscious prejudice or 4) willful intent to influence readers[3]. This type of practice can be further enhanced by the current reward system, which unfortunately focuses on the number of publications ("publish or perish")[54] rather than their quality. We need research to understand why and how authors use spin in scientific reporting (i.e., the mechanism of spin) and to assess its impact on readers' interpretation.

Our study has limitations. First, the ranking of spin in the report abstract reflects the severity perceived by individuals with expertise in the field of systematic reviews; we did not evaluate the real impact of spin on the interpretation of findings by readers. However, the participants, all editors of the Cochrane Collaboration, were experts. Second, the participants ranked the spin according to their severity in theory but not in the context of a real systematic review. Thus, this ranking did not include the fact that the severity of a spin depends on not just the strategy used by the authors but also how far they depart from a fair presentation of the study as well as the consequences to patients. For example, concealing the cardiovascular adverse

effects of a drug seems more severe than omitting a side effect such as nausea or constipation. Third, we focused on spin in systematic reviews of therapeutic interventions. Spin may differ in other systematic reviews such as reviews of diagnostic or prognostic studies. Fourth, the ranking of spin is not the fruit of consensus and there is some disagreement among participants on how severe spin is. Fifth, the response rate to the survey (26%) was low. Finally, our classification is not exhaustive. We may not have identified all types of spin.

Our classification of spin may have a role in preventing and detecting spin that could occur in systematic reviews. This classification of spin could raise awareness among authors and help journal editors and peer reviewers focus attention on identifying spin in key parts of systematic reviews and therefore reduce the potential to misrepresent research findings. Future research is needed to assess the frequency of spin in systematic reviews and meta-analyses and its impact on readers' interpretation of results.

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Contributions

Conceived, designed and experiments: AY, IB, DM, DA, TL, AH, PR, Wrote the first draft: AY IB, Contributed to the writing of the manuscript: AY, IB, DM, DA, TL, AH, PR

On-line survey design and data management: Isabelle Pane, senior computer engineer Centre de recherche Épidémiologies et Biostatistiques, INSERM U1153, Paris, France

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Transparency declaration

AY affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained[55].

AY and IB had access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Conflicts of interest

None of the authors have conflicts of interest to declare.

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Table legends

Table 1: Classification of spin in the main text and abstracts of systematic reviews and meta-analyses

Table 2: General characteristics of the expert participants in the survey

Table 3: Spin in abstracts ranked by severity, Q-sort results

Figure legend

Figure 1: Example of sorting

Table 1: Classification of spin in the main text and abstracts of systematic reviews and meta-analyses. Spin highlighted in grey is specific to systematic review and meta-analysis designs.

Main category	Description of spin in the main text	Description of spin in abstract
Misleading reporting	1) Failure to acknowledge a departure from protocol that could modify the interpretation of results 2) Selective reporting of or overemphasis on efficacy outcomes favoring the beneficial effect of the experimental intervention (e.g., secondary outcomes, subgroup analyses) 3) Selective reporting of or overemphasis on harm outcomes favoring the safety of the experimental intervention 4) No or inadequate reporting of the limitations of the systematic review 5) Selective citation of articles in favor of the beneficial effect of the experimental intervention 6) Authors hide or do not present any conflict of interest 7) Conclusion focusing selectively on statistically significant efficacy outcome 8) Selective reporting of analysis favoring the beneficial effect of the experimental intervention (e.g., selective analysis using random or fixed effect according the results) 9) Inadequate focus on the results of primary studies favoring the beneficial effect of the experimental intervention instead of the meta-analysis results 10) Changing the scale of the forest plot to magnify the results (diamond size)	1) Selective reporting of or overemphasis on efficacy outcomes favoring the beneficial effect of the experimental intervention 2) Selective reporting of or overemphasis on harm outcomes favoring the safety of the experimental intervention 3) Failure to report a wide confidence interval of estimates 4) Authors hide or do not present any conflict of interest 5) Inadequate focus on the results of primary studies favoring the beneficial effect of the experimental intervention instead of the meta-analysis results 6) Conclusion focusing selectively on statistically significant efficacy outcome 7) Failure to report the number of studies/patients actually contributing to the analysis for main outcomes 8) Failure to specify the direction of the effect when it favors the control intervention
Misleading interpretation	11) Title claims or suggests a beneficial effect of the experimental intervention not supported by the findings 12) Inadequate interpretation of non-	9) Title claims or suggests a beneficial effect of the experimental intervention not supported by the findings 10) Inadequate focus on *p* value instead of magnitude of the effect estimates for

	statistically significant results (with a wide confidence interval) as a lack of effect or an equivalent effect for efficacy outcomes 13) Inadequate interpretation of non-statistically significant results (with a wide confidence interval) as demonstrating safety for harm outcome 14) Inadequate focus on *p* value instead of magnitude of the effect estimates for harm or efficacy outcome 15) Focus on relative effect when the absolute effect is small 16) Misleading interpretation of cited articles, favoring the beneficial effect of the experimental intervention 17) Conclusion claiming equivalence or comparable effectiveness for non-statistically significant results with a wide confidence interval 18) Conclusion formulating recommendations for clinical practice not supported by the findings 19) Conclusion claiming safety based on non-statistically significant results with a wide confidence interval 20) Conclusion ignoring the high risk of bias of the studies, the heterogeneity or the reporting bias (i.e., a low level of evidence) in the interpretation of the results 21) No or inadequate consideration of heterogeneity in results interpretation (i.e., no assessment of heterogeneity reported, claiming the absence of heterogeneity not supported by the data, claiming the beneficial effect of the treatment despite high heterogeneity, no downgrading the evidence in cases of high heterogeneity, interpreting non-statistical significant results for the test of heterogeneity as an evidence of no heterogeneity etc.) 22) No or inadequate consideration of	harm or efficacy outcome 11) Focus on relative effect when the absolute effect is small 12) Conclusion claiming equivalence or comparable effectiveness for non-statistically significant results with a wide confidence interval 13) Conclusion formulating recommendations for clinical practice not supported by the findings 14) Conclusion claiming safety based on non-statistically significant results with a wide confidence interval 15) Conclusion claiming the beneficial effect of the experimental treatment despite high risk of bias in primary studies 16) Conclusion claiming the beneficial effect of the experimental treatment despite reporting bias 17) Conclusion claiming the beneficial effect of the experimental treatment despite high heterogeneity 18) Ignoring that the review included different study design (e.g., controlled trial or observational studies

	the risk of bias of primary studies included in results interpretation (i.e., no reporting of the risk of bias of the primary studies, claiming the low risk of bias of studies included not supported by the data, no downgrading the evidence despite several high risk of bias studies) 23) No or inadequate consideration of reporting bias in results interpretation (i.e., no reporting of an assessment of reporting bias, claiming efficacy despite an evidence of reporting bias, claiming the absence of reporting bias not supported by the data, negative test result interpreted as absence of publication bias, use of the test without the condition of validity, inadequate interpretation of a funnel plot, etc.)	
Inappropriate Extrapolation	24) Inadequate extrapolation of the results from surrogate markers or specific outcome to the global improvement of the disease 25) Inadequate extrapolation of the results to a larger population, a larger setting or a wider set of interventions (e.g., from a specific rehabilitation program to all rehabilitation programs, to a specialized unit to a non-specialized medical unit etc.) 26) Conclusion extrapolating the review's findings to a different population or setting 27) Conclusion extrapolating the review's findings to a different intervention (i.e., claiming efficacy of one specific intervention although the review covers a class of several interventions) 28) Conclusion extrapolating the review's findings from a surrogate marker or a specific outcome to the global improvement of the disease	19) Conclusion extrapolating the review's findings to a different population or setting 20) Conclusion extrapolating the review's findings to a different intervention (i.e., claiming efficacy of one specific intervention although the review covers a class of several interventions) 21) Conclusion extrapolating the review's findings from a surrogate marker or a specific outcome to the global improvement of the disease

Table 2: General characteristics of the expert participants in the survey

Characteristics		**Total N=122**
Location	Europe	58 (49)
	Canada	24 (20)
	Oceania	15 (13)
	USA	12 (10)
	Asia	7 (6)
	South America	2(2)
Cochrane group member	Primary review group	69 (56)
	Methods group	51 (42)
	Both	20 (16)
	No answer	2 (2)
No. of systematic reviews involved in	0	12 (10)
	1-3	54 (45)
	4-6	97 (31)
	7-10	5 (4)
	>10	11(9)
No. of systematic reviews peer reviewed	0	16 (13)
	1-3	46 (39)
	4-6	29 (24)
	7-10	12 (10)
	>10	16 (13)

Data are no. (%).

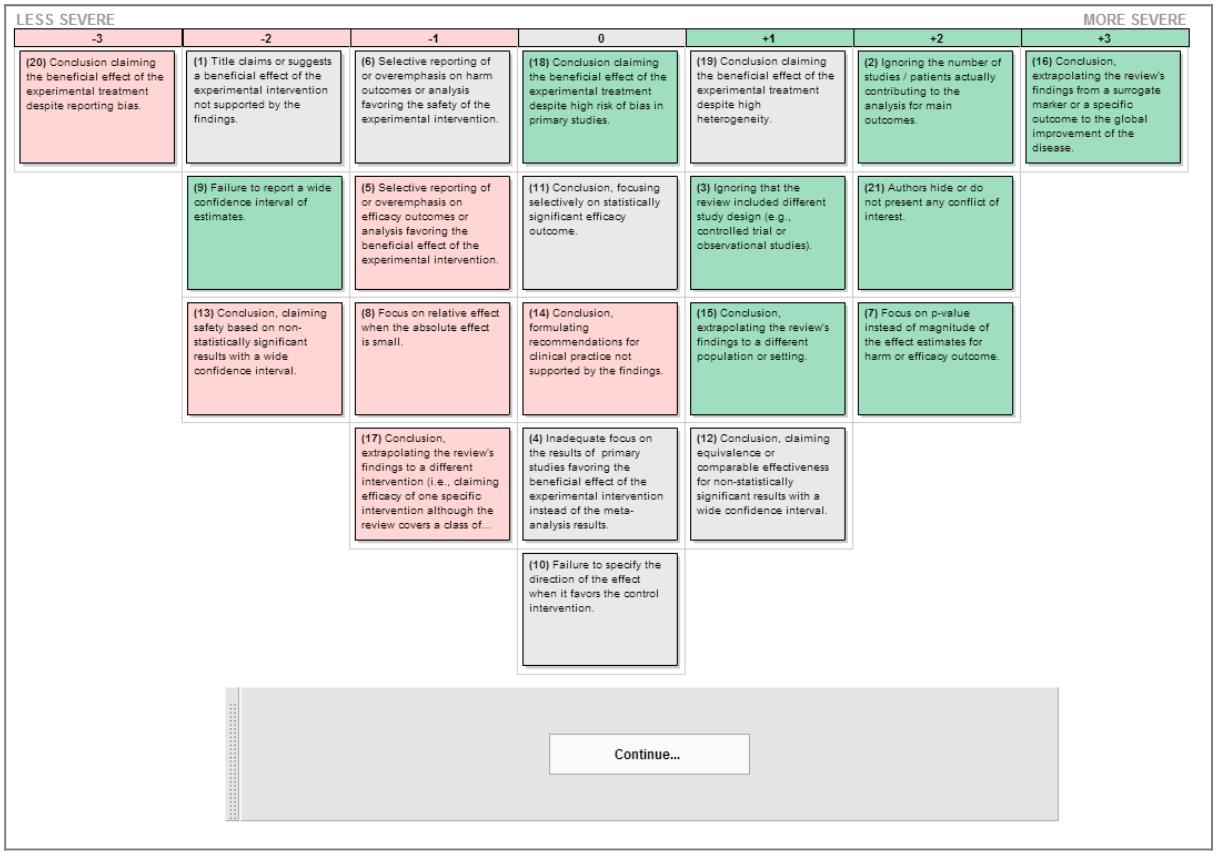
Table 3: Spin in abstracts ranked by severity, Q-sort results

Label	Mean rating of severity	Rank
Conclusion contains recommendations for clinical practice not supported by the findings	1.83 (1.18)	1
Title claims or suggests a beneficial effect of the experimental intervention not supported by the findings	1.43 (1.49)	2
Selective reporting of or overemphasis on efficacy outcomes or analysis favoring the beneficial effect of the experimental intervention	0.75 (1.20)	3
Conclusion claims safety based on non-statistically significant results with a wide confidence interval	0.46 (1.18)	4
Conclusion claims the beneficial effect of the experimental treatment despite high risk of bias in primary studies	0.43 (1.32)	5
Selective reporting of or overemphasis on harm outcomes or analysis favoring the safety of the experimental intervention	0.31 (1.45)	6
Conclusion extrapolates the review's findings to a different intervention (i.e., claiming efficacy of one specific intervention although the review covers a class of several interventions)	0.19 (1.27)	7
Conclusion extrapolates the review's findings from a surrogate marker or a specific outcome to the global improvement of the disease	0.16 (1.42)	8
Conclusion claims the beneficial effect of the experimental treatment despite reporting bias	-0.12 (1.33)	9
Authors hide or do not present any conflict of interest	-0.16 (1.78)	10
Conclusion focuses selectively on statistically significant efficacy outcome	-0.17 (1.54)	11
Conclusion claims equivalence or comparable effectiveness for non-statistically significant results with a wide confidence interval	-0.19 (1.40)	12
Failure to specify the direction of the effect when it favors the control intervention	-0.2 (1.62)	13
Failure to report a wide confidence interval of estimates	-0.29 (1.28)	14
Conclusion extrapolates the review's findings to a different population or setting	-0.43 (1.43)	15
Ignores that the review included different study design (e.g., controlled trial or observational studies)	-0.44 (1.40)	16
Conclusion claims the beneficial effect of the experimental treatment despite high heterogeneity	-0.51 (1.24)	17
Inadequate focus on the results of primary studies favoring the beneficial effect of the experimental intervention instead of the meta-analysis results	-0.63 (1.55)	18
Ignores the number of studies/patients actually contributing to the analysis for main outcomes	-0.69 (1.39)	19
Focus on *p* value instead of magnitude of the effect estimates for harm or efficacy outcome	-0.78 (1.20)	20

Focus on relative effect when the absolute effect is small	-0.96 (1.34)	21

Data are mean (SD) rating, ranging from -3, less severe, to +3, more severe.

Figure 1: Example of sorting



Pink, -3 to -1 severity; grey, 0 severity; green, +1 to +3 severity.