Received: 23 April 2021 | Revised: 3 February 2022 | Accepted: 26 February 2022

DOI: 10.1002/jrsm.1557

SOFTWARE FOCUS

Research Synthesis Methods WILEY

Graphical Representation of Overlap for OVErviews: GROOVE tool

Javier Pérez-Bracchiglione[1,2,3] | **Nicolás Meza**[1] | **Shrikant I. Bangdiwala**[4] | **Ena Niño de Guzmán**[2] | **Gerard Urrútia**[2,5] | **Xavier Bonfill**[2,5] | **Eva Madrid**[1]

[1]Interdisciplinary Centre for Health Studies (CIESAL), Universidad de Valparaíso, Viña del Mar, Chile

[2]Iberoamerican Cochrane Centre, Sant Pau Biomedical Research Institute (IIB-Sant Pau), Barcelona, Spain

[3]Departament of Pediatrics, Obstetrics and Gynecology, Preventive Medicine and Public Health, Universitat Autònoma de Barcelona, Barcelona, Spain

[4]Department of Health Research Methods, Evidence, and Impact, McMaster University, Hamilton, Ontario, Canada

[5]Clinical Epidemiology Service, Hospital de Sant Pau, CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain

Correspondence
Javier Pérez-Bracchiglione, Angamos 655, Viña del Mar, Chile.
Email: javier.perez.b@gmail.com

Funding information
JP-B was funded by a FONDECYT Grant 1212037 from the Chilean National Agency of Research and Development (ANID). ENDG was funded by a Rio Hortega contract from the Instituto de Salud Carlos III [CM17/00199]. GU contribution to this paper was supported by a CONICYT grant (MEC80170060), government of Chile.

Abstract

Overlap of primary studies among systematic reviews (SRs) is one of the main methodological challenges when conducting overviews. If not assessed properly, overlapped primary studies may mislead findings, since they may have a major influence either in qualitative analyses or in statistical weight. Moreover, overlapping SRs may represent the existence of duplicated efforts. Matrices of evidence and the calculation of the overall corrected covered area (CCA) are appropriate methods to address this issue, but they seem to be not comprehensive enough. In this article we present Graphical Representation of Overlap for OVErviews (GROOVE), an easy-to-use tool for overview authors. Starting from a matrix of evidence, GROOVE provides the number of included primary studies and SRs included in the matrix; the absolute number of overlapped and non-overlapped primary studies; and an overall CCA assessment. The tool also provides a detailed CCA assessment for each possible pair of SRs (or "nodes"), with a graphical and easy-to-read representation of these results. Additionally, it includes an advanced optional usage, incorporating structural missingness in the matrix. In this article, we show the details about how to use GROOVE, what results it achieves and how the tool obtains these results. GROOVE is intended to improve the overlap assessment by making it easier, faster, and more friendly for both authors and readers. The tool is freely available at http://doi.org/10.17605/OSF.IO/U2MS4 and https://es.cochrane.org/es/groovetool

KEYWORDS

corrected covered area, overlap, overviews of systematic reviews, systematic reviews as topic

Highlights

- The development of overviews of reviews has brought new methodological challenges, such as the assessment of overlap of primary studies among systematic reviews.
- Current methods and guidance for addressing overlap still have important limitations, especially when assessing a large body of evidence.
- This new and freely-available tool named GROOVE provides a simpler and more comprehensive way for assessing the overlap of primary studies among systematic reviews included in an overview.

1 | INTRODUCTION

The increasing number of systematic reviews (SRs) published during the last years has led to the development of new methods for broader evidence synthesis, such as overviews.[1–4] An overview can be defined as a SR of SRs instead of primary studies, and constitutes a relatively new approach for broad evidence synthesis.[4,5] Nevertheless, some methodological challenges have arisen with the development of this research design, with one of the most important being the assessment of overlap of primary studies among SRs.

The overlap of primary studies among SRs (also named as overlapping SRs) refers to the double counting of the same primary study included in at least two (or more) SRs. Overviews including overlapping SRs are complex and, if not assessed properly, overlapped primary studies could have a major influence either in qualitative analyses or in statistical weight,[5] which could lead to misleading findings due to the undue influence of the results of the studies with greater overlap in the global assessment of the effect of the intervention of interest. For example, if an overview does not correctly assess the overlap of primary studies, it could wrongly obtain overly precise estimates of the effect of certain interventions.[6] Moreover, neglecting the analysis of overlap among SRs may disregard the opportunity of identifying duplicated efforts that may constitute a research waste phenomenon, with implications ranging from the existence of redundant findings, to the misuse of funds and resources.[7]

2 | METHODS AND ISSUES WHEN ASSESSING OVERLAP

There are several ways to deal with overlap at different stages during the development of the overview.[8–11] Overview authors may decide about eligibility, data extraction, risk of bias assessment and synthesis/presentation of the results, based on the overlap of primary studies among the included SRs. Indeed, a variety of tools has been proposed for guiding these decisions.[5,12–14] Nevertheless, currently, most authors of overviews do not report any method for handling overlap.[15] Although some methods for assessing overlap have been proposed, these are not widely used, and there is considerable heterogeneity among guidelines considering this issue.[11,16,17]

Matrices of evidence and the calculation of the corrected covered area (CCA) are probably among the most exhaustive methods for measuring overlap.[10,17,18] Matrices of evidence are grids that link SRs with their included primary studies. This method is very useful when the analysed body of evidence is relatively small since it displays a visual image that allows to capture (sensory impression) the overlap of studies between the different SRs that are being analysed within the overview. On the other hand, CCA is a formula that quantitatively assesses the overlap degree, gathering its variables from a matrix of evidence (Figure 1). According to the original publication, a CCA of 0%–5% represents a slight overlap, 6%–10% a moderate overlap, 11%–15% a high overlap, and above 15% a very high overlap.[18]

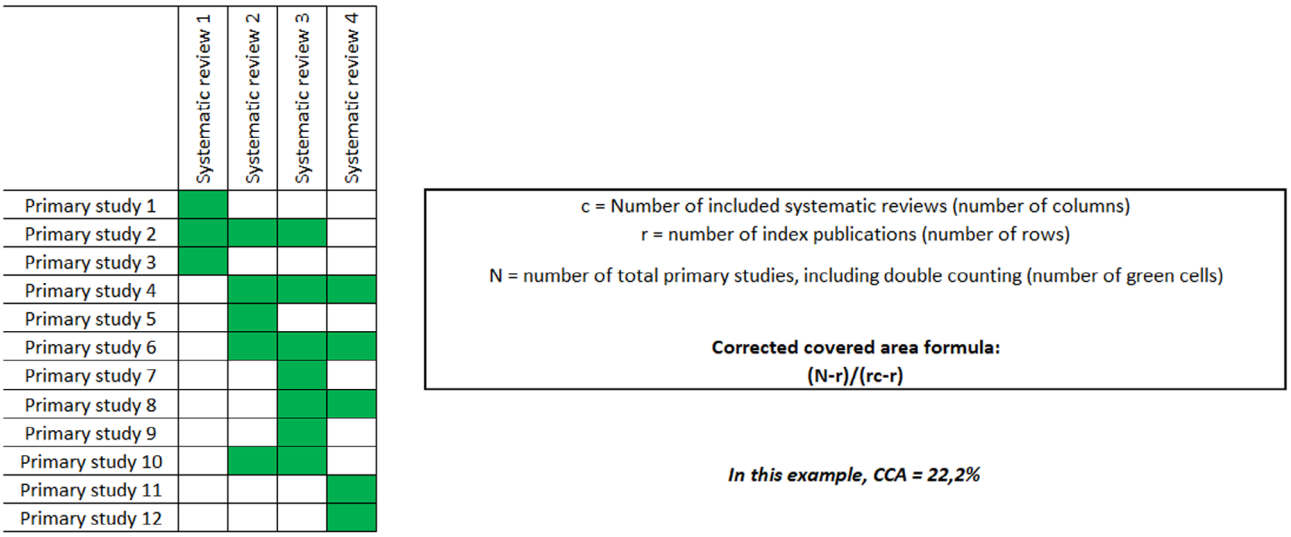

FIGURE 1 Matrix of evidence and calculation of corrected covered area (CCA) formula.[18] Ticked cells represent a primary study included in the respective SR [Colour figure can be viewed at wileyonlinelibrary.com]

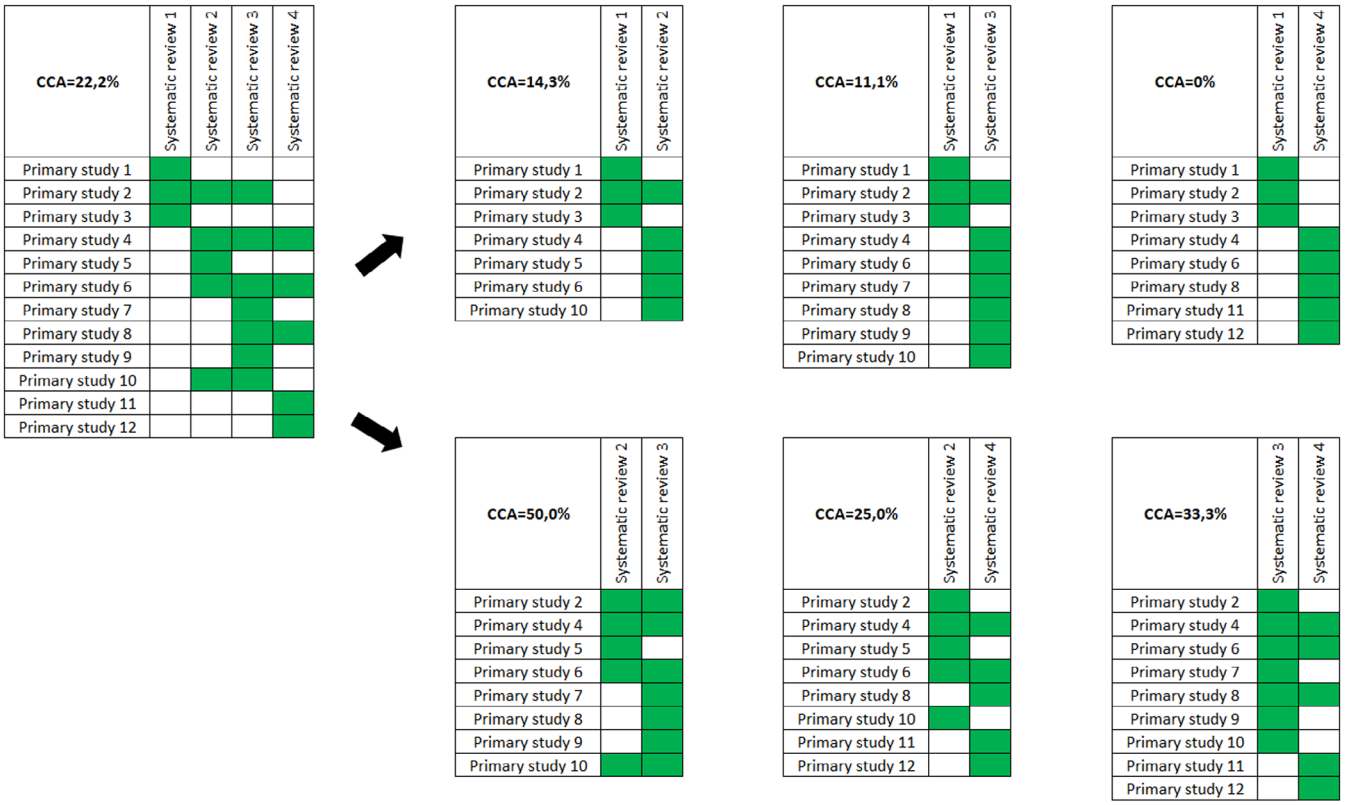

FIGURE 2 Rationale of GROOVE. The tool calculates the corrected covered area (CCA) for the overall matrix, and it also calculates the CCA for each possible pair of reviews. In this example, it is possible to find a specific pair of reviews (1 and 4) that have no overlap (CCA = 0.0%), in a context of very high overall overlap (overall CCA = 22.2%). The tool provides the result of the CCA for each possible pair of reviews, but does not visually display the specific matrices [Colour figure can be viewed at wileyonlinelibrary.com]

Despite being appropriate, both of the described methods have limitations. First, a matrix of evidence becomes harder to interpret as the included body of evidence increases,[11] since it depends on a visual impression that becomes more difficult to capture when the sheet of studies and reviews is very extensive. On the other hand, CCA provides an assessment for a whole matrix of evidence. It is possible for two or more specific SRs to be highly overlapped among each other in a low overall CCA scenario, as well as not being overlapped in a high overall CCA scenario. In this article, we present a new tool to address these limitations.

3 | INTRODUCING GROOVE: GRAPHICAL REPRESENTATION OF OVERLAP FOR OVERVIEWS

In order to assess in a simpler and more comprehensive way the overlap of primary studies among SRs included in an overview, we developed the GROOVE (Graphical Representation of Overlap for OVErviews) tool. This tool is an Excel-based file which automatically calculates the overall CCA for a whole matrix of evidence, and, at the same time, for each possible pair of SRs included in the overview. In other words, GROOVE calculates the CCA that a matrix would have if only two SRs were included into it, and repeats this process for every possible pair of SRs (Figure 2). This approach allows detecting highly overlapped pairs of SRs in a context of low-overall overlap, as well as non-overlapped pairs of SRs in a context of high-overall overlap, displaying these results into an easy-to-read figure.

GROOVE also provides an advanced optional new feature: the consideration of structural missingness (or structural zeros) when calculating the CCA. Structural missingness is operationally defined as an intersection in the matrix of evidence that cannot acquire a value other than "0," For example, a SR published in 2015 cannot include a primary study published in 2018 (i.e., the value of this intersection cannot be other than "0"), therefore, this is a chronological structural missingness. Structural missingness is a topic not yet described in the assessment of overlap of primary studies among SRs, but we think this new feature could provide a complementary approach to overlap assessment. The GROOVE tool supports the inclusion of structural missingness at the moment of building

MATRIX OF EVIDENCE

TOPIC: CALCIUM-BASED CARIES PREVENTIVE AGENTS

Primary Studies		Systematic Reviews								
Study ID	Reference	Azarpazhooh 2008	Yengopal 2009	Tellez 2013	Chen 2013	Li 2014	Raphael 2015	Li 2015	Abdullah 2016	Astvaldsdottir 2016	Paula 2017
1	1. Iijima Y, Cai F, Shen P, Walker G, Reynolds C, Reynolds EC. Acid resistance of enamel subsurface lesions remineralized by a sugar-free chewing gum containing casein	1	1								
2	2. Shen P, Cai F, Nowicki A, Vincent J, Reynolds EC. Remineralization of enamel subsurface lesions by sugar-free chewing gum containing casein phosphopeptide-amorphous calcium	1	1								
3	3. Cai F, Shen P, Morgan MV, Reynolds EC. Remineralization of enamel subsurface lesions in situ by sugar-free lozenges containing casein phosphopeptide-amorphous calcium	1	1								
4	4. Hay KD, Thomson WM. A clinical trial of the anticaries efficacy of casein derivatives complexed with calcium phosphate in patients with salivary gland dysfunction. Oral Surg	1									
5	5. Itthagarun A, King NM, Yiu C, Dawes C. The effect of chewing gums containing calcium phosphates on the remineralization of artificial caries-like lesions in situ. Caries Res. 2005	1	1								
6	6. Reynolds EC, Cai F, Shen P, Walker GD. Retention in plaque and remineralization of enamel lesions by various forms of calcium in a mouthrinse or sugar-free chewing gum. J	1	1								
7	7. Walker G, Cai F, Shen P, Reynolds C, Ward B, Fone C, et al. Increased remineralization of tooth enamel by milk containing added casein phosphopeptide-amorphous calcium	1	1								
8	8. Schirrmeister JF, Seger RK, Altenburger MJ, Lussi A, Hellwig E. Effects of various forms of calcium added to chewing gum on initial enamel carious lesions in situ. Caries Res.	1									
9	9. Cai F, Manton DJ, Shen P, Walker GD, Cross KJ, Yuan Y, et al. Effect of addition of citric acid and casein phosphopeptide-amorphous calcium phosphate to a sugar-free chewing gum on	1	1								
10	10. Morgan MV, Adams GG, Bailey DL, Tsao CE, Fischman SL, Reynolds EC. The anticariogenic effect of sugar-free gum containing CPP-ACP nanocomplexes on approximal caries		1	1		1					
11	11. Manton DJ, Walker GD, Cai F, Cochrane NJ, Shen P, Reynolds EC. Remineralization of enamel subsurface lesions in situ by the use of three commercially available sugar-free		1								
12	12. Reynolds EC, Cai F, Cochrane NJ, Shen P, Walker GD, Morgan MV, et al. Fluoride and casein phosphopeptide-amorphous calcium phosphate. J Dent Res. 2008 Apr;87(4):344–8.		1								
13	13. Andersson A, Sköld-Larsson K, Hallgren A, Petersson LG, Twetman S. Effect of a dental cream containing amorphous cream phosphate complexes on white spot lesion regression		1	1	1	1					1
14	14. Du M, Cheng N, Tai B, Jiang H, Li J, Bian Z. Randomized controlled trial on fluoride varnish application for treatment of white spot lesion after fixed orthodontic treatment.	X	X	1	1				1		1
15	15. Zantner C, Martus P, Kielbassa AM. Clinical monitoring of the effect of fluorides on long-existing white spot lesions. Acta Odontol Scand. 2006 Apr;64(2):115–22.			1							1
16	16. Biesbrock AR, Faller RV, Bartizek RD, Court LK, McClanahan SF. Reversal of incipient and radiographic caries through the use of sodium and stannous fluoride dentifrices in a			1							

FIGURE 3 Example of GROOVE's matrix of evidence filled for a previously published overview.[19] Green cells marked with a "1" represent a primary study included in a SR, while the black cells marked with an "X" represent a structural zero. The image has been cropped [Colour figure can be viewed at wileyonlinelibrary.com]

the matrix and when calculating the results, although this is an optional feature intended to calculate the proportion over the real denominator.

3.1 | How to use GROOVE?

GROOVE is a downloadable tool developed in Excel. It has four sheets:

- "0. Start here": It explains briefly what GROOVE is, how to use the tool and the optional advanced usage considering structural missingness.
- "1. Matrix": This is the only sheet that the user directly manipulates when entering data. It provides an empty matrix of evidence, supporting up to 70 SRs and 1000 unique primary studies. The user must fill the SRs ID in the columns (light blue cells starting from C5), and the primary study ID in the rows (light red cells starting from A6). Afterwards, the user must mark with a "1" each intersection in the matrix representing a primary study included in its respective SR. There is also space for annotating the topic of the matrix and the reference of the primary studies, although this does not have any influence on the final results. If the user wants to consider structural missingness, an "X" must be annotated in all the intersections that are considered structural zeros. Figure 3 shows an example of GROOVE's matrix of evidence fulfilled for a previously published overview.[19]
- "2.1 GROOVE - colour version": Once the user enters all the information in the "1. Matrix" sheet, the tool will provide the results of the overlap analysis in this sheet. The results provided in this sheet are colour-blind friendly.[20]
- "2.2 GROOVE - greyscale version": This tool is identical to the "2.1 GROOVE - colour version", except it provides the results in greyscale.

3.2 | What results does GROOVE achieve?

All the results will be provided in the "2.1 GROOVE - colour version" and the "2.2 GROOVE - greyscale version" sheets. The results are calculated automatically as the matrix is filled, and are included in three sections within these sheets:

Overall results

Number of columns (number of reviews)	c	10
Number of rows (number of index publications)	r	72
Number of included primary studies (including double counting)	N	115
Covered area	N/(rc)	15,97%
Corrected covered area	(N-r)/(rc-r)	6,64%
Interpretation of overlap	Moderate overlap	
Structural Zeros	X	84
Corrected covered area (adjusting by structural zeros)	(N-r)/(rc-r-X)	7,62%
N° of non-overlapped primary studies	In 1 SR	46
Number of overlapped primary studies	In 2 SRs	19
	In 3 SRs	2
	In 4 SRs	2
	In 5 SRs	1
	In 6 SRs	2
	In 7 SRs	0
	In 8 SRs	0
	In 9 SRs	0

FIGURE 4 Overall results as displayed by the GROOVE tool. These results include the components of the CCA formula, the calculation of the CCA, the calculation of CCA adjusted by structural zeros, and the absolute number of overlapped and non-overlapped primary studies. This example was elaborated using the data from a previously published overview.[19] The image has been cropped [Colour figure can be viewed at wileyonlinelibrary.com]

- "Overall results": This section provides the overall overlap assessment for the whole matrix of evidence. The tool summarises the number of reviews, index publications and primary studies (including double counting) included in the matrix. With this data, it calculates the covered area, the CCA, and provides the interpretation of the overall overlap assessment, being slight if the CCA is <5%, moderate if it is ≥5% and < 10%, high if it is ≥10% and < 15%, and very high if CCA is ≥15%. If structural missingness was considered when filling the matrix, the tool will also provide a CCA adjusted by structural zeros. If structural missingness was not considered when filling the matrix, these results will be equal to the CCA not adjusted by structural missingness. The tool also indicates the number of unique primary studies (i.e., included in only one SR), as well as the absolute number of primary studies included in two or more SRs (Figure 4).

- "Graphical Representation of Overlap for OVErviews (GROOVE)": This graphical representation gives the name to our tool. The tool provides a calculation of a CCA for each possible pair of SRs or "nodes", displaying these results in a figure resembling a leaning triangle (Figure 5). Each node shows the CCA for two specific SRs. In other words, it shows what the result of the CCA would be if, instead of the whole matrix, we considered a matrix including only those two specific SRs. The figure also highlights with different colours each node according to their interpretation: In the "2.1 GROOVE - colour version", the nodes are white if CCA is low, bluish green if it is moderate, yellow if it is high, and vermillion if it is very high. All these colours are colour-blind friendly.[21] The "2.2 GROOVE - greyscale version" displays the same results, with white being used for nodes with low CCA, light grey for nodes with moderate CCA, dark grey for nodes with high CCA, and black for nodes with very high CCA. The thresholds for this interpretation are the same as the ones mentioned previously. This figure also displays the total number of nodes that have low, moderate, high or very high overlap.

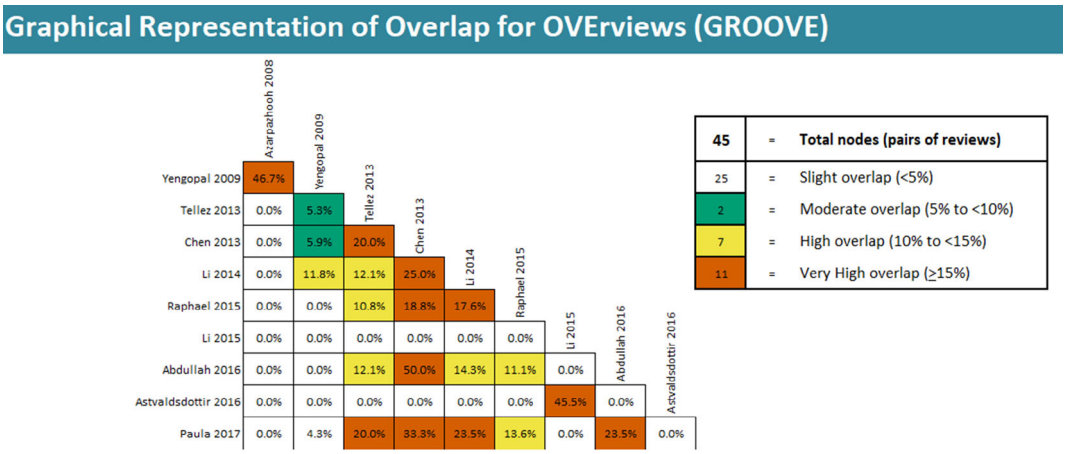

FIGURE 5 Graphical representation of the results as presented by the GROOVE tool (colour version). The intersections or nodes in this figure represent every possible pair of SRs. For each node, the tool calculates the CCA for that specific pair of SRs. The results are highlighted in colours. The tool also provides the total number of nodes with slight, moderate, high and very high overlap. This example was elaborated using the data from a previously published overview[19] [Colour figure can be viewed at wileyonlinelibrary.com]

- "Graphical Representation of Overlap for OVErviews (GROOVE) - Considering Structural Missingness": If the user considered structural missingness when making the matrix (that is, if he/she annotated any "X" in the matrix), this figure will show the results of the assessments of CCA for each node, but with the CCA formula adjusted by structural missingness. This figure has the same visual interface as the one mentioned above. If no "X" were annotated in the matrix, the results will be the same as those shown in the GROOVE not considering structural missingness.

3.3 | How does GROOVE calculate these results?

The results are calculated based on numerous but simple formulas in hidden columns and rows. In the "2.X GROOVE" sheets, there are four figures with the same leaning triangle structure as the GROOVE. For each possible node, these figures calculate the following:

- Total number of studies (including duplicates, "N"): The first of the hidden leaning triangle figures calculates the total number of studies for each node. To do this, the "1. Matrix" sheet sums all the "1" included in each column. The result for each intersection represents the sum of the results of the two corresponding columns.
- Total number of overlapped primary studies: In this hidden leaning triangle, the tool calculates the number of overlapped primary studies for each node. To do this, the "1. Matrix" sheet sums all the "1" included in each row for each possible pair of SRs. If the result of the sum is "2" for any pair of SRs, this means that the primary study is overlapped. Then, the tool counts all the "2" in the respective columns. This count represents the total number of overlapped primary studies for a specific node.
- Total number of rows (index publications, "r"): In this hidden leaning triangle, the tool calculates the number of rows which there would be in a matrix with two specific SRs. This is directly done by subtracting the total number of overlapped primary studies to the total number of studies ("N").
- Total number of structural missingness ("X"): In this hidden leaning triangle, the tool calculates the number of structural zeros or "X" in the matrix for each node. To do this, the "1. Matrix" sheet counts, for each possible pair of reviews, all the rows where one SR includes the study (that is, an intersection with a "1") and the other states a structural zero (that is, an intersection with an "X"). The leaning triangle copies the count of cases where this happens.

With this information, GROOVE (and GROOVE adjusted by structural missingness) has all the necessary data to calculate the detailed CCA. There is no need to calculate the number of rows ("r"), as the assessment is presented for each pair of SRs, therefore, "r" is equal to 2.

4 | DISCUSSION

In this article, we present a new tool for assessing overlap of primary studies among SRs. GROOVE is a simple and

easy-to-use tool which might be valuable for authors of overviews, allowing them to perform a comprehensive analysis of the overlap. Besides the calculation of overall CCA, GROOVE provides a new graphical representation of the overlap among each pair of possible SRs. Other graphical and visual approaches have been reviewed in detail by Bougioukas et al.[17] However, due to the complex and heterogeneous nature of possible findings when an overview is conducted, static figures, tables or graphs would not be enough. In this context, GROOVE provides dynamic and customizable features to apply the tool to different scenarios, allowing data exploration and management. For instance, GROOVE enables the analysis of overlap for specific outcomes by creating matrices containing only the SRs and their primary studies focusing on those outcomes,[13] and it could certainly help for discussing the results. Indeed, adjusting a given matrix to a specific clinical question within an overview by including only primary studies and SRs meeting that specific criteria (which involves deleting certain rows and columns in the matrix), could be useful to avoid underestimation of overlap in certain scenarios.

We also propose a modification to the CCA formula by incorporating structural missingness. The consideration of structural missingness in the generation of a matrix of evidence may provide a complementary approach to the overlap assessment. Structural missing data refers to data that is missing for a logical reason and that should not exist. For example, if authors incorporate chronological structural missingness in their matrices (i.e., considering as structural zeros all primary studies published after the conduction of a specific SR), they could logically and explicitly explain the reason why some primary studies are not included in certain SRs. Also, if the CCA for a certain pair of SRs is 100% when considering chronological structural zeros, but below 100% when not considering it, authors could choose to analyse only the most recent SR for that node, since it probably provides all the useful data by itself. Structural missingness based on a chronological criteria is probably the most useful example of this feature, but overview authors may eventually consider other types of structural missingness. For example, if a SR considers only studies published in English, and a primary study written in Spanish is incorporated into the matrix, it could be considered as a language structural missingness for that specific SR. The use of this feature is optional in the tool and still needs to be studied, but it might be advantageous for many reviewers and authors.

The development of GROOVE raises some other future challenges. First, there is guidance regarding which steps to take in the development of an overview once the CCA is calculated, but none about how to explicitly build the matrix of evidence from which the CCA is calculated.[13] For example, authors could consider each row as a particular reference or as a publication thread (i.e., a group of references related to the same study or findings). This lack of clear guidance could lead to an inconsistent assessment of overlap among different authors. Second, the thresholds for considering the CCA as slight, moderate, high or very high are based on the original author recommendations, but the impact of this classification has not yet been assessed.[18] We are confident that GROOVE will contribute to address these future challenges, as well as to improve the development of overviews.

ACKNOWLEDGMENTS

Javier Pérez-Bracchiglione is a PhD candidate at the Doctorate Program on Biomedical Research and Public Health, Universitat Autònoma de Barcelona, Barcelona, Spain

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The tool presented in this paper is freely available at http://doi.org/10.17605/OSF.IO/U2MS4 and https://es.cochrane.org/es/groovetool21

ORCID

Javier Pérez-Bracchiglione https://orcid.org/0000-0001-8738-2184

REFERENCES

1. Bastian H, Glasziou P, Chalmers I. Seventy-five trials and eleven systematic reviews a day: how will we ever keep up? *PLoS Med*. 2010;7(9):e1000326. doi:10.1371/journal.pmed.1000326
2. Thomson D, Russell K, Becker L, Klassen T, Hartling L. The evolution of a new publication type: steps and challenges of producing overviews of reviews. *Res Synth Methods*. 2010;1(3-4):198-211. doi:10.1002/jrsm.30
3. Smith V, Devane D, Begley CM, Clarke M. Methodology in conducting a systematic review of systematic reviews of healthcare interventions. *BMC Med Res Methodol*. 2011;11(1):15. doi:10.1186/1471-2288-11-15
4. Hartling L, Chisholm A, Thomson D, Dryden DM. A descriptive analysis of overviews of reviews published between 2000 and 2011. *PLoS One*. 2012;7(11):e49667. doi:10.1371/journal.pone.0049667
5. Pollock M, Fernandes RM, Becker LA, Pieper D, Hartling L. Chapter V: overviews of reviews. In: JPT H, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for Systematic Reviews of Interventions Version 6.1*. John Wiley & Sons; 2020.
6. Chen S-Y, Zhang X-R, Chen J, et al. An overview of meta-analyses of endovascular bridging therapies for acute ischemic stroke. *Biomed Res Int*. 2018;2018:9831210. doi:10.1155/2018/9831210

7. Ioannidis JPA. The mass production of redundant, misleading, and conflicted systematic reviews and meta-analyses. *Milbank Q*. 2016;94(3):485-514. doi:10.1111/1468-0009.12210
8. Lunny C, Pieper D, Thabet P, Kanji S. Managing Overlap of Primary Studies Results Across Systematic Reviews: Practical Considerations for Authors of Overviews of Reviews 2021. doi:10.21203/rs.3.rs-145573/v1
9. Lunny C, Brennan SE, McDonald S, McKenzie JE. Toward a comprehensive evidence map of overview of systematic review methods: paper 1-purpose, eligibility, search and data extraction. *Syst Rev*. 2017;6(1):231. doi:10.1186/s13643-017-0617-1
10. Lunny C, Brennan SE, McDonald S, McKenzie JE. Toward a comprehensive evidence map of overview of systematic review methods: paper 2-risk of bias assessment; synthesis, presentation and summary of the findings; and assessment of the certainty of the evidence. *Syst Rev*. 2018;7(1):159. doi:10.1186/s13643-018-0784-8
11. Gates M, Gates A, Guitard S, Pollock M, Hartling L. Guidance for overviews of reviews continues to accumulate, but important challenges remain: a scoping review. *Syst Rev*. 2020;9(1):254. doi:10.1186/s13643-020-01509-0
12. Pollock M, Fernandes RM, Newton AS, Scott SD, Hartling L. A decision tool to help researchers make decisions about including systematic reviews in overviews of reviews of healthcare interventions. *Syst Rev*. 2019;8(1):29. doi:10.1186/s13643-018-0768-8
13. Hennessy EA, Johnson BT. Examining overlap of included studies in meta-reviews: guidance for using the corrected covered area index. *Res Synth Methods*. 2020;11(1):134-145. doi:10.1002/jrsm.1390
14. Cooper H, Koenka AC. The overview of reviews: unique challenges and opportunities when research syntheses are the principal elements of new integrative scholarship. *Am Psychol*. 2012;67(6):446-462. doi:10.1037/a0027119
15. Lunny C, Brennan SE, Reid J, McDonald S, McKenzie JE. Overviews of reviews incompletely report methods for handling overlapping, discordant, and problematic data. *J Clin Epidemiol*. 2020;118:69-85. doi:10.1016/j.jclinepi.2019.09.025
16. Pollock M, Fernandes RM, Pieper D, Tricco AC, Gates M, Gates A, Hartling L Preferred reporting items for overviews of reviews (PRIOR): a protocol for development of a reporting guideline for overviews of reviews of healthcare interventions. *Syst Rev*. 2019;8(1):335. doi:10.1186/s13643-019-1252-9
17. Bougioukas KI, Vounzoulaki E, Mantsiou CD, Savvides ED, Karakosta C, Diakonidis T, Tsapas A, Haidich AB Methods for depicting overlap in overviews of systematic reviews: an introduction to static tabular and graphical displays. *J Clin Epidemiol*. 2021;132:34-45. doi:10.1016/j.jclinepi.2020.12.004
18. Pieper D, Antoine S-L, Mathes T, Neugebauer EAM, Eikermann M. Systematic review finds overlapping reviews were not mentioned in every other overview. *J Clin Epidemiol*. 2014;67(4):368-375. doi:10.1016/j.jclinepi.2013.11.007
19. Bijle MNA, Yiu CKY, Ekambaram M. Calcium-based caries preventive agents: a meta-evaluation of systematic reviews and meta-analysis. *J Evid Based Dent Pract*. 2018;18(3):203-217.e4. doi:10.1016/j.jebdp.2017.09.003
20. Wong B. Color blindness. *Nat Methods*. 2011;8(6):441. doi:10.1038/nmeth.1618
21. Pérez-Bracchiglione J, Meza N, Bangdiwala SI, et al. GROOVE - Graphical Representation of Overlap for OVErviews. doi:10.17605/OSF.IO/U2MS4

How to cite this article: Pérez-Bracchiglione J, Meza N, Bangdiwala SI, et al. Graphical Representation of Overlap for OVErviews: GROOVE tool. *Res Syn Meth*. 2022;13(3):381-388. doi:10.1002/jrsm.1557