SYSTEMATIC APPROACHES TO A SUCCESSFUL LITERATURE REVIEW

Andrew Booth, Anthea Sutton
Mark Clowes, Marrissa Martyn-St James

THIRD EDITION

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PREFACE

When we produce a literature review we use clear, step-by-step ways that others could follow to find the information they need and to look at its strengths and weaknesses. We then try to spot patterns that link different items together, to summarise what the research does and does not say, and what that means for our target reader.

These 'step-by-step ways' require a 'system' so that a literature review is conducted rigorously and efficiently. We seek to avoid **bias** and duplicated or wasted research effort, especially given that much research is paid for from the public purse. By following a 'system', those who work alongside us know what we have done and what remains to be done. Those who come after us can build upon what we have produced. Although details of the system differ between reviews these steps collectively ensure that a review is 'systematic'.

Although one high-profile review type is labelled the 'systematic review' we do not mean that all literature reviews need to be systematic reviews. The systematic review is an ultimate version of literature review that seeks to take all steps possible to minimise bias. In this book we cover many types of literature review that may be suited to your particular question. Our original classification identified 14 common types of literature review (Grant & Booth, 2009) and our recent update expanded the list to 48 different types (Sutton et al., 2019). However, our full unpublished list has identified over 120 labels for different types of literature review, all systematic, to some degree or other. We use the phrase 'systematic approaches' to capture this wider variety. The good news is that a limited number of review types, our 'survival kit', cover most of your likely needs. So, our title phrase '*a* successful literature review' misleadingly covers 'one from many types of successful literature review'!

Finally, while no one can guarantee a 'successful literature review', we sincerely believe that your chances of achieving this are optimised by close attention to methods documented by others, and affirmed by ourselves. You will also benefit from the practical tips we four authors have gained in collectively completing more than 250 different reviews. Importantly, 'success' in producing literature reviews does not split into win/lose terms. Even our best-received literature reviews offer valuable learning points, while any that are comparatively less 'successful' have confirmed the importance of the seven elements that we elsewhere refer to by the acronym RETREAT. These elements are a well-articulated Research question; an understanding of the knowledge (Epistemology) on which each review is based and the Time, Resources and Expertise required; the need for a clear sense of Audience and purpose, and the Type (quantity and quality) of data within eligible studies.

CHAPTER OVERVIEW

Having introduced the idea of applying systematic approaches to any type of literature review, we now outline the contents of each chapter (Box 0.1). We offer a guide to the learning features found throughout the book, and ideas on how to get started with your own review. The chapter ends with 'frequently asked questions' to answer common queries at the beginning of your review process.

Below you will find an outline of each of the chapters in this book.

box 0.1

Overview of the structure of this book

Chapter 1: Meeting the Review Family: An Overview

Chapter 2: Getting Started on Your Literature Review

Chapter 3: Choosing Your Review Methods

Chapter 4: Defining Your Scope

Chapter 5: Searching the Literature

Chapter 6: Assessing the Evidence Base

Chapter 7: Synthesising and Analysing Quantitative Studies

Chapter 8: Synthesising and Analysing Qualitative Studies

Chapter 9: Synthesising and Analysing Mixed Methods Data

Chapter 10: Writing Up, Presenting and Disseminating Your Review

Chapter 1: Meeting the Review Family: An Overview

Chapter 1 introduces our approach to making sense of a bewildering variety of review types. We find it helpful to think of review types as different 'family' groups. Some families are defined by the type of data they include, others by their purpose and yet others by their type of synthesis. Understanding these review family groups helps you to steer your own review.

Chapter 2: Getting Started on Your Literature Review

Chapter 2 looks at the role of the literature review in research, examines common types of review and provides a brief history of research synthesis. We analyse each systematic approach for key elements of the review process: searching, appraisal, synthesis, analysis and presentation.

Chapter 3: Choosing Your Review Methods

Chapter 3 examines how to choose an appropriate review method for your research topic, focusing on factors to consider, and presenting a practical decision tool, RETREAT, to help you to choose your review method. Chapter 3 also includes some review scenarios to assist your learning.

Chapter 4: Defining Your Scope

Chapter 4 demonstrates how to focus your research question, using a framework to define the scope. It examines the review protocol, presenting tips and guidance to complete your own protocol. The chapter also explores challenges and pitfalls you may encounter when defining your scope.

Chapter 5: Searching the Literature

Chapter 5 enables you to translate your research question from Chapter 4 into a search strategy. It follows the stages in the literature searching process, examining the components of a systematic search and allowing you to identify appropriate sources for your own review. The chapter covers conducting a scoping search, and reviewing and refining your search as necessary. The chapter includes sample research questions, search strategies and an exercise to plan your own literature search.

Chapter 6: Assessing the Evidence Base

Chapter 6 covers how to assess the quality and relevance of studies found to address your research question, presenting how to undertake **study screening** and to use **reference management software** and other tools to track this procedure. The chapter then explores how to assess your included studies, including the challenges you may face and considering the **quality assessment** of included studies required for your review type.

Chapters 7, 8 and 9: Synthesising and Analysing Quantitative, Qualitative and Mixed Methods Studies

Chapters 7, 8 and 9 allow you to select an appropriate strategy for synthesis to match the type of data found for your review. These chapters provide an overview of synthesis for quantitative and qualitative literature and for mixed methods studies. Data extraction is covered for each different type of data, together with different approaches to displaying your data. Each chapter then moves on to analysing your findings, allowing you to produce a plan for your own review. Each chapter includes the important review elements of discussing limitations and recognising the likelihood of bias.

Chapter 10: Writing Up, Presenting and Disseminating Your Review

The final chapter describes the main elements required when writing up and presenting your review, including identifying recommendations for action and future research. It presents the key factors to consider, such as audience, and presents a sample review structure.

Working your way through this book

The purpose of this book is to examine review methods and how you can apply systematic approaches to your own review, making it robust, transparent and, ultimately, a successful literature review. While the book does not insist that you undertake a conventional systematic review, it will help you to apply a systematic approach to your own literature reviews.

This book offers a step-by step guide to planning, conducting and writing up your literature review. If you are new to literature reviews, or systematic review methodology, you may find it useful to work through the book in sequence. If you have identified a particular skills gap, or if you need to refresh your familiarity with particular processes, you can read a single chapter as a stand-alone contribution or work through a selection of chapters.

After three chapters that introduce review types and methods, we follow the step-by-step process of a literature review so that you can apply a systematic approach to your own literature reviews. Each chapter follows the same structure and includes:

- **'In a Nutshell'** – summarises the chapter in 4–6 bullet points. What are the key messages of the chapter?
- **Exercises** with sample answers (to be found on the companion website).
- **Toolbox** – highlights specific resources that we have found useful.
- **Rapid Review Tips** – techniques to consider when required to produce a review within a rapid timeframe. These tips are based on the recommendations of Garritty et al. (2021) and appear throughout the book alongside the processes to which they relate; however, we caution against implementing them without first discussing whether the resulting review product will meet the needs and expectations of your client (e.g. your academic supervisor or whoever has commissioned you to conduct your review).
- At the end of the chapter, a **summary** (1–2 paragraphs summarising the chapter) and **key learning points** (4–6 bullet points on the 'Take home messages' of the chapter. What should the reader have learnt from reading the chapter?)
- Frequently asked questions (**FAQs)** with answers.
- Suggestions for further information (with annotations).

The 'In a Nutshell' feature at the beginning of each chapter offers an overview of learning objectives to be covered in each chapter. Once you have read the chapter, refer back to this feature and reflect on what you have learnt. If you feel that you have not met one of the learning objectives, simply revisit the relevant parts of the chapter.

Two new features distributed throughout the book are the 'SALSA profile' and the 'At a glance' feature. We profile common types of literature review against our four-part SALSA (Search AppraisaL Synthesis and Analysis) schema. You will see how these four processes are interpreted and implemented for each review type, so that you clearly understand what each process involves. An example SALSA profile is given in 0.1.

Table 0.1 SALSA profile for the rapid review (Tricco et al., 2017)

SALSA stages	Steps required by the method	Explanation
	1. Needs assessment, topic selection, and topic refinement	A critical first step, in seeking to determine the scope of the request and the intended purpose for the completed review, and obtaining a commitment for collaboration for the duration of the project
	2. Protocol development	A research protocol clearly lays out scope of the review, including research questions and approaches to be used to conduct the review

SALSA stages	Steps required by the method	Explanation
Search	3. Literature search	Often, a layered approach, identifying existing systematic reviews updated with a summary of recent eligible primary studies
	4. Screening and study selection	Often streamlined by using a single reviewer; some reviews verify a sample of selections using a second reviewer
Appraisal	5. Data extraction	Usually single-reviewer extraction, sometimes checked by a second reviewer, or double independent extraction. Data extraction generally includes sections for the population, the intervention and the types of measures (outcomes)
	6. Risk-of-bias assessment	Sometimes called critical appraisal, or methodological quality appraisal, examines how well each included study has been carried out
Synthesis Analysis	7. Knowledge synthesis	Ranges from a basic descriptive narrative summary of studies to a meta-analysis. When possible, a narrative synthesis should report results of included studies and discuss reasons for differences among studies
	8. Report production and dissemination	Standard templates for each stage of the review that specify minimum methods, reporting requirements, and/or standard report sections, help to streamline production of the report making the process more transparent

Our 'At a glance' feature offers a 'takeaway' summary of common types of literature review as a ready reference. Each feature follows the same structure (see Box 0.2):

box 0.2

At a glance – review type

Definition

Requirements

Research Question
Expertise
Constraints (Time and Resources)
Purpose
Sources

(Continued)

Overview of Process

SALSA

- Search
- AppraisaL
- Synthesis
- Analysis

Example

Strengths and Limitations

At a Glance

Reviewer expertise	🤔🤔
Information expertise	ⓘⓘⓘ
Time	🕘🕘
Resources	££

References

Table 0.2 summarises the available 'SALSA profiles' and 'At a glance' features and points you to the chapter where each can be found.

Table 0.2 SALSA profiles and 'At a glance' features

Review type	SALSA profile	'At a glance' feature
Bayesian meta-analysis	NA	Chapter 9
Concept analysis	Chapter 4	Chapter 4
Critical interpretive synthesis	Chapter 9	Chapter 9
Framework synthesis	Chapter 8	Chapter 8
Integrative review	NA	Chapter 9
Mapping review	Chapter 3	Chapter 3
Mega-aggregation	NA	Chapter 8
Mega-ethnography	NA	Chapter 8
Meta-analysis	NA	Chapter 7
Meta-ethnography	Chapter 8	Chapter 8
Meta-narrative	Chapter 9	Chapter 9
Mixed methods reviews	NA	Chapter 9
Narrative synthesis	NA	Chapter 7
Network meta-analysis	NA	Chapter 7
Overview (review of reviews)	Chapter 3	Chapter 3
Rapid QES	NA	Chapter 8
Rapid realist review	See realist review (Chapter 9)	

Review type	SALSA profile	'At a glance' feature
Realist review	Chapter 9	Chapter 9
Review update	Chapter 2	Chapter 2
Scoping meta-review	Chapter 3	Chapter 3
Scoping review	Chapter 3	Chapter 3
Systematic review	Chapter 3	Chapter 3
Thematic synthesis	Chapter 8	Chapter 8

Note: Rapid review features with handy hints are distributed throughout the book.

For each stage of the literature review, we provide appropriate resources (such as tools, checklists, templates, etc.). The 'Toolbox' section of each chapter lists these practical resources, with information on how to use them in your own literature review.

You may find it helpful to complete the exercises as you work through the book, applying them to your own review as appropriate. If you have queries on any of the topics, please see the FAQs at the end of each chapter.

Each chapter recaps on 'Key learning points'. We also provide an annotated list of further information for each chapter topic, allowing you to follow up a particular systematic approach if you wish to know more.

Key glossary terms with definitions appear at the start of each chapter and we provide a comprehensive glossary in the online resources. Glossary terms are highlighted in bold throughout the book so that you can check the definition of a particular term as you work through the book.

EXAMPLES OF REVIEW CHALLENGES AND HOW THIS BOOK CAN HELP

Here are the challenges that you may encounter for your own review, with suggested solutions.

'I have a general review topic in mind, but I don't know where to focus'

Look at Chapter 4 to help you to focus your research question. The chapter outlines various frameworks to use to define the scope of your question.

'I have no idea how much literature exists on my review topic'

Consider conducting a scoping search on a key database to get an idea of the size of your topic. The scoping search is described in Chapter 5. Examine how many results you find and estimate how many results you are likely to find by searching multiple databases. As a rule of thumb we recommend that you identify the single best database for your topic and then multiply the number of results found in that single database by between 2.5 and 5.0 depending upon how multidisciplinary your topic is. This rule of thumb accounts for duplicates across multiple databases and recognises that each successive database yields fewer unique hits. You may then want to examine the titles and abstracts of a sample of the results to see how many includable studies are found in each extra 100 references.

'I am confident I can find and select studies for my review; however, I am not sure how to assess the quality of the evidence base'

Visit Chapter 6. Here we provide an overview of **quality assessment**, and all the tips and tools you need to assess quality in your own review. To practise your quality assessment skills, complete the exercises within this chapter and refer to the feedback on the companion website to check your understanding.

'I am not sure how to select an appropriate method of synthesis for my review'

Read Chapters 7, 8 or 9 depending on whether your question is best answered by quantitative or qualitative data or a mixture of both. Also revisit the types of review presented in Chapter 2 for consideration when selecting a method of synthesis. You may find that the type of review you have chosen accommodates a limited number of recommended synthesis approaches.

'I realise that I will need to clearly report my methodology when I write up my review. Should I make notes as I go along to aid with this?'

Yes, we find it easier to write up a review if we make notes as we go. The chapter on completing a review protocol (Chapter 4) helps you to do this. A good review protocol outlining your review methodology, typically written in the future tense, can later be changed to the past tense when writing up your review to produce a comprehensive account of what you have done.

SUMMARY

This overview has introduced the main features of the book, how they are organised and how you can make the most of what is on offer. It helps you to navigate your way around the book, matching the advice to the stage at which you most need it. Above all, it emphasises that you should be systematic not only in how you conduct your review but also in how you describe each review type.

frequently asked questions (FAQs)

FAQ 0.1 Is this book for me?

This book is designed for students and researchers undertaking any type of review. It offers a step-by-step guide. Each chapter offers a stand-alone resource for each particular step and a 'refresher' and further 'pointers' for each step.

FAQ 0.2 I may not want to undertake a full systematic review but I want to make my review more systematic. How can I do this?

This book is designed for you. It highlights critical steps to take to make your review more systematic. The book draws on established systematic review methodology, expertise developed by the scientific and academic community in reviewing the literature in its field, and good practice for research. Start by looking at Chapter 3 to help you decide which type of review is appropriate for your question. Each type of review has its own methodology so you can follow the methodology that you will use as you work your way through the book.

FAQ 0.3 How do I find out the meaning of unfamiliar terms used in the book?

Throughout the book there are terms highlighted in bold. Refer to the online Glossary for definitions of these terms.

FAQ 0.4 How can I view images used in this book?

The companion website provides access to higher resolution versions of any images and screenshots reproduced in this book.

FAQ 0.5 I've completed one of the exercises in the book. Where can I find the answers?

All answers to exercises in this book are hosted on the companion website.

suggestions for further information

Collaboration for Environmental Evidence (2018) *Guidelines and Standards for Evidence Synthesis in Environmental Management*. Version 5.0 (AS Pullin, GK Frampton, B Livoreil and G Petrokofsky, eds). Available from: www.environmentalevidence.org/information-for-authors

A useful structured online text walking through the stages of the systematic review in a readable format.

Sambunjak D, Cumpston M & Watts C (2017) Module 1: Introduction to conducting systematic reviews. In: *Cochrane Interactive Learning: Conducting an intervention review*. Available from: https://training.cochrane.org/interactivelearning/module-1-introduction-conducting-systematic-reviews

Part of the Cochrane Interactive Learning Course on Conducting an Intervention Review, this module introduces systematic reviews and why they are useful. This module describes the various types and preferred format of review questions, and outlines how to conduct a systematic review.

Sutton A, Clowes M, Preston L & Booth A (2019) Meeting the review family: exploring review types and associated information retrieval requirements. *Health Information & Libraries Journal*, 36(3): 202–22. Available from: http://dx.doi.org/10.1111/hir.12276

Overview of over 40 literature review types by the authors of this book, grouping types within seven 'families' and particularly focusing on how to identify studies.

ONLINE RESOURCES

DISCOVER THIS TEXTBOOK'S ONLINE RESOURCES!

Systematic Approaches to a Successful Literature Review is supported by a wealth of online resources for both students and lecturers to aid study and support teaching, which are available at https://study.sagepub.com/booth3e

For students and researchers

A **literature review starter template** to demonstrate the sections you need to include for a successful written review.

A **source credibility checklist** to help you assess and think critically about the sources you choose.

A **source tracker** template to help you keep track of your sources and know what you need to include in your audit trail.

A downloadable **exercise workbook** and **suggested answers** so you can interact with the book's activities and questions and save your answers for future reference.

A **collated list of tried-and-tested tools**, including freely available technologies to help you search databases efficiently, plan your work, and keep track of references.

A **project diary** template and example so you can start your project with an organized approach and track your insights along the way.

A complete **glossary of terms** to help you understand and revise key concepts.

For lecturers

PowerPoint slide templates including approximately 10-15 slides per chapter, which can be downloaded and customized for use in your own presentations.

1

MEETING THE REVIEW FAMILY: AN OVERVIEW

in a nutshell

Meeting the review family

- You will likely need to produce a literature review at one or more important stages of your career.
- A literature review is not a single definable product; it serves multiple purposes and takes diverse forms, not all of them systematic.
- You need to know when to choose a particular type of literature review to match your intended purpose.
- You can think of the numerous types of literature review as different 'families' which share common characteristics.

key terms explained

critical review: a form of research synthesis that aims to demonstrate extensive research and critical evaluation of quality. It goes beyond mere description to include a degree of analysis and conceptual innovation and typically results in a hypothesis or model.

integrative review: a form of research synthesis that utilises broad methods to include both experimental and non-experimental research in order to understand more fully a focus of interest. Integrative reviews may also combine data from theoretical and empirical literature.

(Continued)

rapid review: a form of research synthesis that accelerates the process of conducting a conventional systematic review through streamlining or omitting specific methods to produce evidence for stakeholders in a resource-efficient manner.

systematic review: a form of research synthesis that seeks to systematically search for, appraise and synthesize research evidence, using strategies to limit bias often adhering to guidelines on the conduct of a review.

umbrella review: a type of overview (review of reviews) that only includes other systematic reviews and meta-analyses. Distinguished in this book from other overviews by only including reviews from the same organisation or those using a common manual.

INTRODUCTION

Whether you are an undergraduate or postgraduate student, an established academic or a professional practitioner, you will, no doubt, have had to write a 'literature review' at some point in your career. Early in our student lives, typically while still at school, we learn to identify a single printed source, perhaps a book or newspaper article, and to critically evaluate that source. However, a more important step is when we start to look not just at individual items but at whole sets of items, to evaluate them as a whole and to identify how they contradict or confirm one another. Our search for an overall summary of findings, a whole picture, forces us to assemble different sources within a single line of argument. We cannot simply rely on 'islands' of individual knowledge without considering the 'continents' that link those islands together.

WHAT IS A LITERATURE REVIEW?

Fink (2019) neatly defines a literature review as a 'systematic, explicit, and reproducible method for identifying, evaluating, and synthesising the existing body of completed and recorded work produced by researchers, scholars, and practitioners'. This definition is not the easiest to understand but, as with most good definitions, every word matters. Put simply, it means that we use clear, step-by-step ways that others too could follow:

- to find the textual information we need;
- to look at its collective strengths and weaknesses;
- to spot patterns that link the different items together; and
- to summarise what it does/does not say and what that means for our target reader.

In the next chapter we show you that you can remember these steps as 'SALSA' (Search, AppraisaL, Synthesis, Analysis). Each SALSA step is so important that we spend at least one chapter on each (Chapters 5, 6 and 7–9). Other important steps either come before SALSA – stating what question you are trying to answer (including defining your scope) (Chapter 4) – or follow SALSA, when choosing how to ensure that your findings reach their target audience(s) (Chapter 10).

Why be systematic?

We have already referred several times to 'systematic' and the need to follow a 'step-by-step approach'. 'Systematic' not only features within our title but also captures the most important idea in the whole book. Although there is a specific type of literature review called a '*systematic review*', as the most extreme form of being systematic, what *is* important for you as reader is our first 'Take home message': all literature reviews can and should be systematic – that is, conducted using a 'system', planned from the start and clearly reported when you write up your review.

Why should we always aim to be systematic? Some good reasons are scientific and others practical. Importantly, the more systematic we are, the less likely we are to introduce *bias*. If you introduce bias then people do not know whether they can believe what you have found or not. More importantly, they cannot even tell which parts, if any, they can trust. At least if you conduct your review systematically, even though the methods you use and the studies you include are not perfect, a reader can decide for themselves which findings are largely certain and which remain uncertain. In fact, a helpful review author should tell readers the limitations of the review and the limitations of the included studies. All research, by definition, follows some 'system', although some systems are more formalised and pre-planned than others. Being systematic moves you from 'creative writing' to genuine research:

> Who would want reviews to be unsystematic, if by 'systematic' we mean no more than 'properly carried out, taking account of all the relevant evidence, and making reliable judgements about its validity and implications'? On this definition, to produce a systematic review is simply to do the job of reviewing well. (Hammersley, 2013)

Working systematically also helps you, and others in your team, to be efficient. You all know what the team has completed, what you are currently working on and what remains to be done. You always have a good idea of how much progress you have made with your review.

What does it mean for a review to be systematic?

Our work over many years for different governmental agencies and organisations reveals five different ways that a review may be considered systematic. While not all review types tick all five boxes, because methods develop at different rates with different levels of popularity, we can safely say that the more boxes that they tick, the more likely they are to be truly systematic.

First, *an accepted step-by-step methodology*. In some cases this is outlined in a procedures manual, in other cases a definitive textbook acts as a source book for the orthodox methodology. Additional authors add different variations and adaptations for their own purposes, but anchored to the original source. Finally, a definitive paper may offer guidance on a specific review type, drawing on the authors' extensive experience. So, for example, the review manuals of the Cochrane Collaboration, the Campbell Collaboration, and the Centre for Environmental Evidence offer 'recipes' for systematic reviews. The Joanna Briggs Institute and the Centre for Environmental Evidence cover diverse review types. Those interested, specifically, in realist synthesis (Pawson, 2006a) or meta-ethnography (Noblit & Hare, 1988) could consult seminal texts. Papers on scoping reviews (Arksey & O'Malley, 2005) and on the integrative review (Whittemore &

Knafl, 2005) offer a place to start for those methodologies. While illustrative, at this point, we shall return to most of these texts in more detail.

Second, a systematic approach is more likely to follow a **pre-established review protocol**. A review protocol serves multiple purposes, including protecting against conscious or unintentional changes of scope during the course of the review itself. A review team (or supervisor and student) usually communicate plans for the review in a review protocol so that they share a common view of the intended product. The review protocol also helps other scholars and funding agencies to avoid duplication of effort and/or waste of money. Having a systematic plan or protocol also makes project management easier, either in managing the whole review team, or for you and your supervisor to keep you to your planned timescales. Protocols should *always* exist for a systematic review. However, increasingly protocols are seen for **rapid reviews**, **mapping reviews** and **scoping reviews** as well as for most **qualitative reviews**. While you might consider a protocol a time-intensive luxury within the context of a rapid review, perversely it becomes more important. You need to employ exemplary communication on what you have, or have not done, and any shortcuts that you have taken to save time. A **review protocol** may be registered in a formal registry, in an institutional repository, on a funder's website or an open access sharing site (Tawfik et al., 2020). Protocols for potentially impactful or strategically important reviews may even be accepted by some journals as a publishable output in their own right.

The third characteristic of a systematic approach is a consensual **reporting guideline**. Reporting guidelines were previously published opportunistically by interested researchers but now involve a comprehensive literature search, expert input and formal deliberation and consensus (Moher et al., 2010). Published guidelines exist for most types of review and are gathered together in a specialist repository labelled EQUATOR (www.equator-network.org see Resource Break 10.5). Even where a complete reporting guideline does not yet exist, guidelines exist for specific review components (e.g. the literature search or figures and tables). The time and effort required to produce these itemised lists usually signals that a review type is now substantive enough to merit its own reporting guidelines.

A fourth characteristic of a review type that uses a systematic approach is that someone is likely to have developed a **quality assessment checklist** by which to gauge its quality. Frequently these are confused with reporting guidelines (above). However, the difference is best illustrated with reference to the intended user. A reporting guideline targets the *producer* of a literature review, a quality assessment checklist is aimed at the *consumer/reader* of that review. As we shall see in Chapter 6, quality assessment checklists have a key role to play when we review multiple studies of the same type, side by side. However, at this point, we highlight how a checklist helps a reader to answer the basic question – is this a good example or a poor example of this type of review? A review type with its own checklist has usually acquired a measure of popularity – increasingly, people argue that checklists should be developed in the same structured way required for reporting guidelines (Whiting et al., 2017).

A final characteristic of a systematic approach is *a published survey or audit of examples of a review type, to analyse the review methods used*. These surveys may be conducted before a methodology manual or reporting guideline is published, flagging up that a review type has become popular. Both are signalling that it is now timely to pin down the characteristics of that review type. So, for example, qualitative evidence synthesis is examined in periodic published audits (e.g. Hannes & Macaitis, 2012; France et al., 2014; Dalton et al., 2017). Similarly, realist synthesis

is explored in general (Berg & Nanavati, 2016) and, specifically, in connection with the 'realist search' (Booth et al., 2020). These audits help to agree cumulative good practice, to identify examples of innovative methods or, more controversially, to arbitrate which variations are legitimate and which should be curtailed or discouraged. Where published studies are analysed specifically for their methodology you may see the report published as a meta-epidemiological study (Marshall et al., 2019).

As we repeat throughout this book, these characteristics do not require all literature reviews to be 'systematic reviews' – we are opening up a menu of options from which to choose. You are not a very good chef if you serve French fries with every dish! Perhaps you have tried cooking something having only seen someone else prepare it – omitting one or more steps, following the steps in the wrong order, using the wrong ingredients or using the wrong equipment results in an inferior product. An experienced chef knows all the steps and what the dish should look like and can adapt a standard recipe to specific requirements – for example, dietary preferences or intolerances. Upon completing this book you will not only have gained a good knowledge of how best to produce 'a systematic literature review' but also share our tips, tricks and methods choices.

WHEN DO I DO A LITERATURE REVIEW?

As already mentioned, literature reviews are versatile and are used for diverse purposes (Tricco et al., 2018b). Table 1.1 lists some of those purposes. Read through the table and complete Exercise 1.1.

exercise 1.1

Why am I doing a literature review?

Look through Table 1.1 and see if you recognise any reasons why you might want to conduct a literature review. Can you identify any added or spin-off benefits that you might gain from your review that you had not previously considered?

Table 1.1 Familiar purposes and functions for conducting a literature review

Purpose	Function
Do I want to know how much literature and what types of literature exist in a specific topic area?	Mapping the landscape
Do I want to get a feel for the current state of knowledge in an unfamiliar topic area?	Sensitisation to new areas
Do I want to know the major studies and main authors in a specific topic area?	Spotting the landmarks
Do I want to locate my own research within the context of what has already gone before?	Positioning one's research

(Continued)

Table 1.1 (Continued)

Purpose	Function
Do I want to see how different disciplines or professions have taken forward the same ideas or concepts?	Comparing ideas
Do I want to identify the main theories that authors have applied to a particular topic area?	Exploring theory
Do I want to explore different approaches to tackling the same methodology or problem?	Brainstorming approaches
Do I want to learn lessons from current practice?	Taking stock
Do I want to identify unexplored areas or gaps in research?	Seizing opportunities

MEET THE REVIEW FAMILY

We have already identified that literature reviews are versatile, that they take diverse forms and that they can be used for different purposes (Tricco et al., 2018b). As a team we picture different review types as the branches of a review 'family tree'. Some branches share closer similarities than others. This chapter will identify the seven main families and list some high-profile review types. However, a full listing is available elsewhere (Sutton et al., 2019) and we return to other review types throughout the remainder of this book.

Traditional review family

Reviews have existed in the academic and policy worlds for many years. Increasing recognition of the limitations of the 'traditional review' has led methodologists to develop alternatives. This does not mean that these historic forms are no longer useful for the specific purpose that they were originally designed. Table 1.2 summarises some prominent members of the traditional family.

Table 1.2 Common traditional review types with definitions

Label	Definition	Source
Critical review	Aims to demonstrate writer has extensively researched literature and critically evaluated its quality. Goes beyond mere description to include analysis and conceptual innovation. Typically results in hypothesis or model	Grant & Booth (2009)
Integrative review	Approach (primarily within nursing research) that allows for inclusion of diverse methodologies (i.e. experimental and non-experimental research)	Whittemore & Knafl (2005)
Narrative review	Summarises the literature in a way which is not explicitly systematic, particularly when contrasted with a systematic review	Baethge et al. (2019)
State of the Art Review	Tends to address current matters in contrast to combined retrospective/current approaches. May offer new perspectives on issue or point out area for further research	Grant & Booth (2009)

One traditional type of review, the critical review, seeks to offer extensive coverage of a specific topic together with critical insight into the quality of its supporting literature (De Klerk & Pretorius, 2019). Where the emphasis is more summative (i.e. where are we now?), rather than looking back at how a particular field has developed (where have we come from?), a review may be labelled as a 'state-of-the-art review'. Of more recent pedigree, the integrative review/integrative synthesis, particularly common within nursing, seeks to make collective sense of the quantitative and qualitative literature. Perhaps most common within the traditional review family is the narrative review, particularly contrasted with the systematic review (Baethge et al., 2019). Interestingly, guidelines for narrative reviews are becoming increasingly systematic, reflecting pressures within the academic domain to accommodate systematic approaches (Baethge et al., 2019).

Systematic review family

Systematic reviews (Table 1.3) follow a formal review method, following methodological guidelines for conduct, quality assessment and reporting, typically as documented in a manual or handbook. For example, Cochrane reviews 'adhere to a structured format that is described in the Cochrane Handbook for Systematic Reviews of Interventions' (Higgins et al., 2021). Systematic reviews within healthcare now extend beyond treatments to other types of intervention (e.g. diagnostic techniques), to other types of question (e.g. causation or harm) and to other types of evidence, such as economic evaluations and qualitative research (qualitative evidence syntheses) (Munn et al., 2018b). The last two decades have seen systematic methods extend beyond healthcare to education (Zawacki-Richter et al., 2020), environmental science (Collaboration for Environmental Evidence (CEE), 2018), information science (Xie et al., 2020), information systems (Okoli & Schabram, 2010), social sciences (Petticrew & Roberts, 2006) and social care (Macdonald, 2010) and software engineering (Kitchenham, 2004) among others. International collaborations for systematic reviews exist in Environmental Evidence (https://www.environmentalevidence.org/), Healthcare (https://www.cochrane.org/), Nursing (https://joannabriggs.org/), International Development (https://www.3ieimpact.org/) and Social Science (https://campbellcollaboration.org/).

Table 1.3 Common systematic review types with definitions

Label	Definition	Source
Campbell Review	Academic research paper that uses 'evidence synthesis', which can include meta-analysis, to look for answers to a pre-defined question [in the social sciences]. Its purpose is to sum up the best available research on that specific question. Reviews can also show when not enough research has been carried out, and where more research is needed	www.campbellcollaboration.org/
Cochrane Review	A systematic review of research in healthcare and health policy that is published in the *Cochrane Database of Systematic Reviews*	www.cochranelibrary.com/about/about-cochrane-reviews

(Continued)

Table 1.3 (Continued)

Label	Definition	Source
Joanna Briggs Institute (JBI) Review	Aims to provide a comprehensive, unbiased synthesis of many relevant studies in a single document using rigorous and transparent methods. Aims to synthesise and summarise existing knowledge and to uncover 'all' evidence relevant to a question	https://wiki.jbi.global/display/MANUAL/1.1+Introduction+to+JBI+Systematic+reviews
Meta-analysis	Can be combined with systematic reviews to assess the magnitude of the outcome across relevant primary studies and to analyse the causes of variation among study outcomes (effect sizes)	Gurevitch et al. (2018)
Network meta-analysis	Starts with network of evidence (e.g. relevant studies that have compared those interventions directly) within … a diagram in which each node represents an intervention (or perhaps a group of interventions), and each link or edge connects interventions that are directly compared within one or more studies	Hoaglin et al. (2011)
Systematic review	Application of strategies that limit bias in the assembly, critical appraisal, and synthesis of all relevant studies on a specific topic	Hong & Pluye (2018)
Other members of the review family	Systematic reviews of diagnostic test accuracy; systematic review of epidemiology studies (also known as: prevalence and/or incidence review; etiology and/or risk review); prognostic review; psychometric review; review of economic evaluations	e.g. Munn et al. (2018b)

Review of reviews family

With the growth of review production an increasing number of topics are already covered by reviews, or commissioners require larger topic areas covered by multiple existing reviews. Increasingly, commissioners ask for a review of existing review evidence on their topic or question. These syntheses are known as reviews of reviews or overviews of reviews (Table 1.4). You can use existing reviews in multiple ways. Reviews produced according to common standards (e.g. multiple Cochrane Intervention reviews or Joanna Briggs Institute reviews) may be combined within an umbrella review (Pollock et al., 2016). You can combine reviews that follow different standards, often produced serendipitously, within a review of reviews or overview. Finally, you can 'recycle' existing reviews to combine the studies they contain within a *de novo* review. In all of these circumstances the publication dates of the contributing reviews and, subsequently, of the review of reviews are critical and therefore closely related to assessments of review quality and issues relating to review updates (Robinson et al., 2014). Recently, these issues have extended to qualitative reviews (syntheses of qualitative research) with the

emergence of **mega-ethnography** (Toye et al., 2017) and **mega-aggregation** (Hendricks et al., 2021).

Table 1.4 Common types of reviews of reviews with definitions

Label	Definition	Source
Cochrane Overviews of Reviews (Cochrane Overviews)	Use explicit and systematic methods to search for and identify multiple systematic reviews on related research questions in the same topic area for the purpose of extracting and analysing their results across important outcomes. Thus, the unit of searching, inclusion and data analysis is the systematic review	Pollock et al. (2021b)
Overview (Review of reviews)	Aim to provide 'user-friendly' summaries of the breadth of research relevant to a decision without decision-makers needing to assimilate the results of multiple systematic reviews themselves. Often broader in scope than an individual systematic review, so that they can examine broad…options in ways that can be aligned with the choices that decision-makers often make. In comparison to a synthesis of primary studies, overviews can be conducted more quickly	Pollock et al. (2016; 2019)
Mega-aggregation	Method for synthesis of multiple qualitative evidence syntheses 'developed and utilised to identify evidence gaps and to inform future research from the evidence collated within included systematic reviews'. The mega-aggregative approach includes 5 phases containing 10 steps including categorisation and aggregation of evidence into a predefined framework	Hendricks (2019); Hendricks et al. (2021)
Mega-ethnography	Synthesis of multiple QES using the methods of meta-ethnography to create a conceptual output, with a focus on theory development	Toye et al. (2017)
Umbrella review	Specific type of review of reviews (overview) that combines and synthesises reviews produced according to common standards, e.g. Cochrane reviews, Campbell reviews or Joanna Briggs Institute reviews	Aromataris et al. (2015)

Rapid review family

Rapid reviews have grown in popularity partly in recognition that decision-making cannot always tolerate the lead-in time that a full systematic review might require and partly because a good enough just-in-time review offers a practical way to be evidence based. Rapid reviews are designed to either accelerate or abbreviate the review process. Within the rapid review family are variants that represent rapid versions of mainstream review products (Table 1.5). So, for example, the rapid evidence synthesis typically represents a form of rapid effectiveness systematic review, the rapid qualitative evidence synthesis seeks to conduct a qualitative synthesis within an abbreviated timeframe and a rapid realist synthesis represents a rapid form of realist synthesis. More specifically, a **rapid evidence assessment** is a systematised review of evidence designed to meet the needs of policy-makers.

Unfortunately, and perhaps inevitably, the adjective rapid is often used as an apology or excuse for poorly conducted versions of the full version – to stave off potential criticism of methods and to excuse not having conducted a review that follows the full review methods. For this reason, it is preferable to define an abbreviated review in terms of its focus or ambition, rather than its speed. Within the medical education domain the 'focused systematic review' has gained some traction (Gordon et al., 2018).

Table 1.5 Common rapid review types with definitions

Label	Definition	Source
Rapid review	A form of knowledge synthesis that accelerates the process of conducting a [conventional] systematic review through streamlining or omitting specific methods to produce evidence for stakeholders in a resource-efficient manner	Hamel et al. (2020)
Focused review	A form of knowledge synthesis in which the components of the systematic process are applied to facilitate the analysis of a focused research question	Gordon et al. (2018)
Rapid evidence synthesis	[T]ype of knowledge synthesis in which components of the systematic review process are simplified or omitted to produce information in a short period of time	Tricco et al. (2015)
Rapid qualitative evidence synthesis	A rapid synthesis of qualitative evidence that employs methods which are 'accelerated and streamlined' so that completion is earlier than with typical QES review methods	Biesty et al. (2020)
Rapid realist synthesis (also known as: rapid realist review)	Applies a realist approach to knowledge synthesis ('What works for whom under what circumstances?') to produce a product that is useful to policy-makers in responding to time-sensitive and/or emerging issues within limited time and resources	Booth (2016)
Rapid evidence assessment	[A] process that is faster and less rigorous than a full systematic review but more rigorous than ad hoc searching, it uses a combination of key informant interviews and targeted literature searches to produce a report in a few days or weeks	betterevaluation.org

Qualitative review family

Although not as well established as quantitative systematic reviews, qualitative reviews have existed for over three decades. Qualitative evidence synthesis is the overall term agreed within the Cochrane Collaboration to cover a diverse family of approaches (Noyes et al., 2021). By synthesising qualitative research it offers a potential voice for patients and for disenfranchised or seldom heard groups (Booth, 2017). Most long-established among the family of qualitative review approaches is **meta-ethnography** with origins in the synthesis of school inspection reports (Noblit, 2019). Other qualitative review methods have developed in parallel to their primary qualitative data equivalents (Table 1.6) (Carroll, 2017). So, for example, **thematic synthesis** mirrors thematic analysis and **framework synthesis** parallels framework analysis (Snilstveit et al., 2012). The Joanna Briggs collaboration has standardised a method called **meta-aggregation** (Florczak, 2019). In some cases, different labels are used to characterise similar qualitative evidence synthesis methods within different disciplines: **qualitative interpretive meta-synthesis** has developed within social work (Aguirre & Bolton, 2014) and **qualitative research synthesis** within education (Major & Savin-Baden, 2010). Differences between methodologies are less significant; education argues that different types of qualitative research should not be synthesised together, whereas health research tends pragmatically to accept different study designs and epistemologies. The European Union INTEGRATE project identified 15 different types of qualitative evidence synthesis (Booth et al., 2018b).

Table 1.6 Common types of qualitative synthesis with definitions

Label	Definition	Source
Qualitative evidence synthesis	Broad term, popularised within the Cochrane Collaboration, for group of methods used to undertake systematic reviews of qualitative research evidence	Noyes et al. (2021)
Qualitative interpretive meta-synthesis	Way of synthesising a group of studies, usually on a social work topic, into an enhanced understanding of the topic of study wherein the position of each individual study is changed from an individual pocket of knowledge of a phenomenon such that a synergy among the studies creates a new, deeper and broader understanding	Aguirre & Bolton (2014)
Qualitative research synthesis	Term typically used within education to describe a diverse set of methods for combining the data or the results of multiple studies on a topic to generate new knowledge, theory and applications	Drisko (2020)
Framework synthesis	Synthesis method, originating from framework analysis, whereby the review research question and the background theoretical and empirical literature shape an understanding of the issue under study into an initial conceptual framework, which develops iteratively as new data are incorporated and themes are derived from the data	Brunton et al. (2020)

(Continued)

Table 1.6 (Continued)

Label	Definition	Source
Meta-ethnography	Thorough qualitative synthesis method in which researchers select, analyse and interpret qualitative studies to answer focused questions on a specific topic (e.g. people's experiences of having and being treated for a particular condition) to come up with new insights and conclusions	Cunningham et al. (2019)
Thematic synthesis	Builds upon the techniques of grounded-theory and meta-ethnography. It involves coding of text 'line by line'; development of descriptive themes; and generation of 'analytical themes'.	Kavanagh et al. (2012)

Mixed methods review family

Recent attention has focused on the added contribution of qualitative synthesis when harnessed together with quantitative reviews, within mixed methods reviews (Table 1.7). This trend parallels developments in mixing methods within primary research. Methodological challenges relate both to the practical (how do you combine, synthesise and integrate empirical data in both quantitative and qualitative forms?) and to the conceptual (how do you interpret research findings that have been investigated in different ways and which are based on very different views of knowledge (epistemologies)?).

Within mixed methods reviews some approaches are **convergent** (they integrate different data and methods of analysis together at the same time). Often these have either broad inclusion criteria or multiple sets of criteria so that they can identify and then synthesise the resultant diversity of data. **Sequential** reviews may involve a quantitative sub-review being followed by an explanatory qualitative sub-review. Conversely, a qualitative synthesis may unearth what is important and meaningful followed by a quantitative review that explores whether desired features are effective.

The EPPI Centre's model of mixed methods review typically sees a sub-review on effectiveness of interventions being combined with a sub-review on people's understanding and views about the same group of interventions. Bringing together these two strands of evidence allows the team to explore where interventions that are closely aligned to user views are also effective.

In contrast a realist synthesis handles the two bodies of research simultaneously, exploring how the way that a programme or policy is believed to work can be tested from both types of data. Having generated a set of potential causal explanations (or programme theories) the team searches for empirical evidence that confirms or refutes the theory being evaluated.

Within these overall review designs other differences exist. So, critical interpretive synthesis and meta-narrative reviews (see Chapter 9) both target the body of literature – in the former case by exploring how the literature has problematised or explained a recurrent concept such as access to services and, in the latter, by looking at cross-disciplinary differences in how a concept has developed (Booth et al., 2018b). This contrasts with most other types of mixed methods reviews where the individual study, whether reported in a single paper or multiple related papers, is the focus of attention.

Table 1.7 Common types of mixed methods review with definitions

Label	Definition	Source
Mixed methods review	Reviews combining the findings of qualitative and quantitative studies within a single systematic review to address the same overlapping or complementary review questions	Harden (2010)
Critical interpretive synthesis (CIS)	Method developed from meta-ethnography which integrates systematic review methodology with a qualitative tradition of enquiry. Can be used specifically to synthesise quantitative and qualitative literature	Flemming (2010)
EPPI-review	Stylised form of mixed methods review developed by the EPPI-Centre at the University of London. First, a conventional systematic review of effectiveness (with or without meta-analysis) is undertaken. Second a synthesis of qualitative research is performed to address questions of intervention need, implementation, acceptability and appropriateness. Finally, a cross-study synthesis brings the findings of both earlier syntheses together. This final comparative analysis juxtaposes findings of both syntheses	Kavanagh et al. (2012)
Meta-narrative review	Relatively new method designed for topics that have been differently conceptualised and studied by different groups of researchers. Involves consciously and reflexively stepping out of the reviewer's own world-view to try to view the topic through multiple different sets of researcher eyes	Wong et al. (2013a)
Realist synthesis (or realist review – terms are synonymous)	Applies realist philosophy to synthesis of findings from primary studies that have a bearing on a single research question or set of questions. Methodologically, reviewers begin by eliciting from the literature the main ideas that went into the making of a class of interventions (the programme theory)	Wong et al. (2013b)

Purpose-specific review family

The purpose-specific review family (Table 1.8) is probably the most problematic, partly because all reviews are purpose-specific to some degree. However, we reserve this term for review types that have a narrow self-defining scope where the review method is clearly the most appropriate tool for the task and where few, if any, alternative methods exist for achieving the same task. So, for example, a health technology assessment is typically used to evaluate a technology for introduction or discontinuation within a health system. Although different technology agencies may differ on the specifics of the review method, they all share a common objective which typically revolves around assessing effectiveness, cost-effectiveness and acceptability, and, less commonly, other considerations such as equity. Other purpose-specific reviews focus on a

narrow task such as, for example, the **concept analysis** (using one of a limited number of slightly different methods) to arrive at a definition of a particular concept (e.g. 'loneliness'). Another example is **content analysis**, which characterises a body of evidence (e.g. policy documents) according to the volume and/or emphasis of material on a specific topic. For example, you might examine how policy documents characterise 'equity' over the life of a particular government administration.

Other purpose-specific review products are labelled for their synthesis process. So, for example, a **mapping review** may survey a topic or subject field to identify where research is concentrated and where research gaps and opportunities exist. Specifically, a **scoping review** may determine the boundaries and coverage for a subsequent review. Inevitably, given that mapping and scoping are activities undertaken for many reviews and yet mapping and scoping reviews are review outputs in their own right, much confusion exists around terminology. However, most review types follow a three-stage mapping–scoping–systematic synthesis trajectory (Rebelo Da Silva et al., 2017), but differ in the scale and significance of this activity, and whether a formal deliverable accompanies each stage.

Table 1.8 Common types of purpose-specific review with definitions

Label	Definition	Source
Concept synthesis. Also known as: Concept analysis Conceptual analysis	Synthesis method for the development and explanation of concepts following eight steps which are: subject familiarity, classification of construct and sub constructs, rearrangement of clusters, cluster nomination, cluster verification, develop conceptual definition, conform the synthesised concepts to existing theory. Walker and Avant assert that conceptual synthesis can be conducted iteratively with no need to follow step by step	Walker & Avant (2010)
Mapping review	Similar to a scoping review, but instead of aiming to determine the scope of knowledge on a topic, the goal of a mapping review is to describe and categorise knowledge within a topic of known scope in order to identify gaps in the literature	Grant & Booth (2009)
Methodology review (sometimes reports as a meta-epidemiological study)	'To examine and investigate current research methods and potentially their impact on research quality'	Munn et al. (2018b)
Scoping review	Aims to 'map the literature on a particular topic or research area and provide an opportunity to identify key concepts; gaps in the research; and types and sources of evidence to inform practice, policymaking, and research'	Daudt et al. (2013)

WHY NOT A LITERATURE REVIEW?

As we have seen, a literature review has so many different purposes and functions that it is unusual to find a situation where one is not possible or useful. Nevertheless, reviews also have limitations. Table 1.9 outlines circumstances where you might consider alternative methods of data collection.

Table 1.9 Circumstances where alternatives to a literature review may be required

Issue	Data collection alternatives
When information is too current to have been published (e.g. less than six months since event)	Newspaper sources, bulletin boards, correspondence and editorials, newsletters, press releases and press statements
When current practice is not formally documented	Web searching (of organisational domains), surveys of practitioners, interviews with key informants
When certain views are unpopular or undocumented	Confidential interviews, contact with minority groups/associations
When a recent literature review addressing your exact question and/or purpose already exists	Critique of existing literature review plus supplementary searches for recent papers/ citations to the review itself
When you are seeking to collect references to the literature in a topic area but not (yet) to address a specific question or purpose	Annotated bibliography (literature search with abstracts)

WHAT IS NOT A LITERATURE REVIEW?

All too often students assume that they know what a literature review is and that they recognise its essential features. However, as markers of theses and dissertations and peer reviewers of submitted manuscripts we have identified common flaws for you to avoid. We have organised these warning signs of an unsuccessful review according to the SALSA stages of the literature review mentioned above (Table 1.10). We will return to these common flaws throughout the remainder of the book.

Table 1.10 Warning signs of an unsuccessful review

Problem	Warning signs
Review question	
Unclear review question	You have not shown why some studies were included and why others are excluded. Your decisions seem arbitrary
Imprecise review question	You have framed your problem statement as a topic, not a review question
Search	
Lack of quality sources	You have not identified/included sufficient peer-reviewed sources (journals, books, etc.). You have included a high proportion of Web sources (e.g. blogs and Wikipedia pages)

(Continued)

Table 1.10 (Continued)

Problem	Warning signs
Glaring omissions	Key items on the topic are omitted. You have not searched widely enough, including reading of reviews and follow-up of references
Appraisal	
Too descriptive	You have not evaluated the quality of your sources but have taken them on face value
Over-reliant on the work of others	Your ideas or wording are taken unprocessed from the work of others. This may reflect plagiarism or a lack of critical thought about what the original sources are saying
Synthesis	
Listing included studies	You have described each included study one by one (Study A says this … Study B then says this …) instead of looking for patterns and commonalities across studies (Studies A, B and E explore an urban setting while Studies C and D are rural)
Random presentation	You have presented studies as you have found or processed them without assigning a meaningful order (e.g. chronological, general to specific or by category)
Analysis	
Unsupported statements	You have not established a clear link between the statements you make and the literature that supports them
Over-generalisation	You have not identified exceptions to the overall rules. You have rushed your analysis
Discussion and conclusion	
Not answering the 'So what?' question	You have not made it clear how the literature you included has answered your review question or what the implications are for research/practice
Rambling and non-logical order	You have lost sight of the review question you were trying to answer. You are presenting everything you now know on the topic. Your tables are not presented in a logical sort order

HOW DO I PREPARE TO DO A LITERATURE REVIEW?

Much important thinking takes place before you even start your literature review. Below we outline five important practical steps to take, singly, with your research team or with your supervisor(s) before starting the stages outlined in Chapters 2–10.

Practical step 1 – choose your topic

So, where to start? First, choose your topic. This is more difficult than it initially sounds. So many literature reviews now exist that it can, at first, prove challenging to identify a suitable topic. Chapter 2 provides helpful guidance on embarking on this key initial step.

Practical step 2 – think about your intended purpose

What are you trying to achieve? Are you trying to establish the current state of the art in your topic? Are you looking to support an alternative view that is only partly explored? If you find the best type of evidence for your question, how will you use it? Will it be a platform for a future research proposal or project, or an output in its own right?

Practical step 3 – think about your intended audience

Each review topic can include numerous particular questions. Take a pandemic virus, for example. Consider how the needs of a research scientist, a health professional, the relative of a patient, a member of the public and a local government decision-maker differ. Even different health professionals have different interests, different backgrounds or different levels of experience or knowledge. Why is this? The virus is the same. However, the needs of each potential reader differ according to what they already know, what they need to know, how they need it to be presented and what they plan to do with that information. Does the intended audience occupy a specific professional group or discipline or does it extend across multiple disciplines? Even if your audience comprises only your supervisors and your examiners, you need to think about what they already know, what they will expect to see and what will interest them.

Practical step 4 – where will the literature be found?

In science and medicine a 'literature review' immediately evokes a search of the journal literature. While much relevant material will be found through listings of journal articles (known as bibliographic databases) these will not necessarily be either the only source or the most useful source. Increasingly, preprints fill a need for rapid publication. Government reports and policy documents can provide an official version which may contrast with a view from the professional scientific literature. Academic theses and dissertations may offer cutting-edge views of developments. In arts and humanities the literature may primarily comprise books and book chapters. Increasingly, information is found in textual sources that are not considered traditional publishing: patient fora, bulletin boards, Twitter threads, etc. You will need to think about the question that you plan to address, where information on your topic is typically found and, critically, how you will rate such information for 'signal versus noise'. You can verify the 'signal' by using filtering or quality assurance procedures (such as peer review, external examiners, etc.) or 'triangulation' across multiple sources.

Practical step 5 – what will the literature, and the data, look like?

Once you have thought what the literature sources look like you can consider how information within each source is typically presented. Some sources have their own standards

for content and presentation of data so, for example, both journal articles and examined academic works provide instructions or regulations to determine the length of the work, what information you should include or disclose and how to handle that information. Typically, reviews take different formats of data and convert them into a common or standardised format. You may need to calculate, or even obtain, missing numerical data. Data may be quantitative or qualitative or a mixture of both. What you can do with the data will largely depend upon the format in which the data is supplied in the first place. You will have to eliminate some methods of analysis right from the very beginning while, for others, it only becomes clear whether the method is feasible or useful as you start to handle the data.

Finally, think about systematic literature reviews, what you know in theory and your experience in practice. Can you identify particular knowledge and skills gaps? Or do you need to learn about the review method from the very start? Do you already have a topic in mind? Do you know what type of review you plan to conduct?

GOING FORWARD

For 'Getting started on your literature review', see Chapter 2. Whatever your knowledge and experience, you will find it helpful to work through the suggested steps for planning your review also outlined in that chapter. If you have identified particular knowledge and skills gaps you could visit the appropriate chapters first.

By the end of this book, you should be able to:

- Identify different types of reviews, their approaches and assess their applicability to your own review topics.
- Plan the methodology, presentation and dissemination of your review.
- Define the scope of your research by applying techniques such as formulating your question and conducting a scoping search.
- Conduct a systematic search of the literature for your research question.
- Undertake **quality assessment** on different literature types.
- Synthesise and analyse quantitative and qualitative studies.

SUMMARY

Faced with a bewildering variety of review types that have evolved from different disciplines and paradigms, a reviewer needs tools and guidance in order to select their review method appropriately. The good news is that many such tools exist, both to guide your selection and then to prescribe the methods, once chosen. In most cases, these review types have not been developed arbitrarily but reflect different underlying processes and purposes. Once you have made an appropriate choice the path to completing a successful literature review – already well-trodden – will prove immeasurably easier.

TOOLBOX – PUBLISHED GUIDELINES/GUIDANCE FOR DIFFERENT REVIEW TYPES

Table 1.11 Illustrative characteristics of common review types

	Procedure manuals/ papers	Protocols	Reporting guideline	Quality assessment checklists	Published audits
Systematic review	Higgins et al. (2021)	Shamseer et al. (2015)	Page et al. (2021)	Shea et al. (2017)	Borges Migliavaca et al. (2020)
Mapping review	James et al. (2016)	CEE (2018)	Tricco et al. (2018)	See Chapter 6	Not known
Scoping review	Arksey & O'Malley (2005)	Peters et al. (2020a)	Tricco et al. (2018)	See Chapter 6	Tricco et al. (2016b)
Review of reviews	Smith et al. (2011)	Aromataris et al. (2020)	Pollock et al. (2019)	Ballard & Montgomery (2017)	Lunny et al. (2017; 2018)
Meta-analysis	Higgins et al. (2021)	Shamseer et al. (2015)	Page et al. (2021)	Shamseer et al. (2015)	Multiple, e.g. Plana et al. (2021)
Meta-ethnography	Campbell et al. (2011)	Not known	France et al. (2019)	SBU (2019)	France et al. (2014)
Qualitative evidence synthesis	Noyes et al. (2021)	Glenton et al. (2020)	Tong et al. (2012)	SBU (2019)	Hannes & Macaitis (2012)
Rapid review	Garritty et al. (2020)	Not known	Under development[1]	Not known	Marshall et al. (2019)
Rapid qualitative evidence synthesis	Guide to conducting rapid QES for HTA	Glenton et al. (2020)	Tong et al. (2012)	SBU (2019)	Campbell F et al. (2019)
Realist synthesis	RAMESES – training materials	Not known	RAMESES – realist synthesis	Quality standards	Berg & Nanavati (2016)

Note: HTA = Health Technology Assessment; QES = Qualitative Evidence Synthesis

1.See: https://www.equator-network.org/library/reporting-guidelines-under-development/reporting-guidelines-under-development-for-systematic-reviews/

frequently asked questions (FAQs)

FAQ 1.1 What if I haven't identified a review topic yet?

Think about your area of interest. You may find it helpful to find recent reviews in your general topic area – can you identify any research gaps? Once you have an idea of a potential review topic make sure no one else has recently undertaken a review in this topic, by searching review and protocol databases, and then work through Chapter 4 to define your scope.

FAQ 1.2 What if I don't know which type of review is most appropriate for my topic?

Chapter 3 assists with this. We present different review types and their associated methodologies, grouping them helpfully together in related 'families'. We also suggest which review type to use for which purpose.

FAQ 1.3 Where can I find additional resources?

The website that accompanies this book includes additional resources to support each chapter. Each chapter is accompanied by extensive references and further information to allow you to immerse yourself in methodological issues or nuances that we have had to mention in passing.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Aveyard H (2019) *Doing a Literature Review in Health and Social Care: A Practical Guide*, 4th edn. Maidenhead: Open University Press.

Now in its fourth edition, this book provides a step-by-step guide to doing a literature review. This is a practical textbook with each chapter focusing on a specific stage of the review, following an introductory chapter on 'why do a literature review?'.

Callahan JL (2014) Writing literature reviews: a reprise and update. *Human Resource Development Review*, 13(3): 271–5.

An editorial, describing the characteristics of 'rigorous' literature reviews. Defines types of literature review, such as 'integrative', 'historic' and 'rapid structured' reviews. You may find 'Table 1' particularly helpful as it presents the six 'W's which should form the components of a literature review method section – Who, When, Where, hoW, What and Why.

Daigneault PM, Jacob S & Ouimet M (2014) Using systematic review methods within a PhD dissertation in political science: challenges and lessons learned from practice. *International Journal of Social Research Methodology*, 17(3): 267–83.

A reflective article reporting on the experiences of a PhD student. You may find the 'lessons learned and recommendations' section particularly helpful if you are considering doing a systematic review for your thesis or dissertation.

Haddaway NR & Pullin AS (2014) The policy role of systematic reviews: past, present and future. *Springer Science Reviews*, 2(1–2): 179–83.
An invited expert review on how systematic reviews can inform policy and practice decisions. Includes a history of the systematic review in environmental management, and the future of systematic reviews.

Petticrew M (2015) Time to rethink the systematic review catechism? Moving from 'what works' to 'what happens'. *Systematic Reviews*, 4(1): 36.
Examines a pragmatic approach to systematic reviews, and presents examples where alternative approaches to the 'traditional' systematic review model may be more appropriate.

Pickering C, Grignon J, Steven R, Guitart D & Byrne J (2014) Publishing not perishing: how research students transition from novice to knowledgeable using systematic quantitative literature reviews. *Studies in Higher Education*, 40(10): 1756–69.
Presents the pedagogical benefits of different types of literature review. Particularly interesting are the student case studies on undertaking a systematic quantitative literature review.

Sutton A, Clowes M, Preston L & Booth A (2019) Meeting the review family: exploring review types and associated information retrieval requirements. *Health Information & Libraries Journal*, 36(3): 202–22. Available from: http://dx.doi.org/10.1111/hir.12276
Overview of over 40 literature review types by the authors of this book, grouping types within seven 'families' and particularly focusing on methods for study identification.

2

GETTING STARTED ON YOUR LITERATURE REVIEW

in a nutshell

Getting started on your literature review

- The 'literature review' builds upon a long history within academic and research scholarship to meet ever more varied purposes and answer more diverse question types.
- If you review the literature in a systematic way you can communicate clearly, build confidence in your work and demonstrate the rigour of your methods. Systematic approaches reduce potential bias within a review.
- Recent years have seen significant developments in research synthesis, starting from within healthcare and migrating across diverse disciplines and fields.
- All research should be 'systematic'; there is no reason why a literature review should be any different.
- Systematic approaches to a literature review harness the SALSA framework (Search, AppraisaL, Synthesis and Analysis) to different proportions.

key terms explained

decision support: approach that seeks to go beyond research synthesis by taking on some of the decision-making process, for example incorporating values or judgements. Compare knowledge support: an approach that seeks to contribute to knowledge without necessarily impacting directly upon everyday decision-making.

incident knowledge: the rate by which new knowledge is added to the knowledge base of a specific topic. Compare prevalent knowledge: the amount of knowledge already known to exist on that topic.

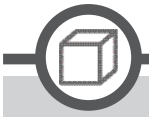
research synthesis: process of combining the results of multiple primary research studies that address the same research question. It may apply equally to quantitative or qualitative research in seeking to make findings applicable or transferable. Aims to generate new knowledge by combining and comparing the results of multiple studies, often using a systematic approach.

SALSA (Search AppraisaL Synthesis Analysis): four generic steps, typically in this order, used in undertaking systematic approaches to the literature to produce a research synthesis.

scoping search: preliminary search designed to (i) identify existing reviews in your topic area and (ii) estimate the existing quantity and quality of relevant primary studies. Typically, scoping searches do not aim to be fully comprehensive.

INTRODUCTION

Recall from Chapter 1 how a literature review was defined as a 'systematic, explicit, and reproducible method for identifying, evaluating and synthesising the existing body of completed and recorded work produced by researchers, scholars, and practitioners' (Fink, 2019). Particularly noticeable is the word 'systematic', key to the title and content of this book. As for all original empirical research, reviews must be systematic. Different types of review (Box 2.1) differ only in the degree to which they are systematic – according to each review's role and function – and each type should tell you what exactly they have and have not done.



box 2.1

Some common types of review

- Critical review
- Integrative review
- Literature review
- Mapping review/systematic map
- Meta-analysis
- Mixed studies review/mixed methods review
- Overview
- Qualitative systematic review/qualitative evidence synthesis
- Rapid review

(Continued)

Realist synthesis

Scoping review

State-of-the-art review

Systematic review

Systematised review

Systematic search and review

Umbrella review

Note: These different types of review are defined and explained later in this chapter. For the present we acknowledge a plethora of terms for systematic approaches to a literature review.

Producing a high-quality review requires a delicate balancing act:

> Quality in reviewing literature means an appropriate balance between depth and breadth, rigour and consistency, clarity and brevity, and effective analysis and synthesis. (Frank & Hatak, 2014)

To perform this *effectively* you need to complete this task in an *efficient* manner and to the right *quality*. Good data management, project management and quality assurance mechanisms (Lasserson et al., 2021) are essential for the completion of a successful review.

WHY IS THE LITERATURE REVIEW SO IMPORTANT?

Bem (1995) notes that 'authors of literature reviews are at risk of producing mind-numbing lists of citations and findings that resemble a phone book – impressive case, lots of numbers, but not much plot'. Decisions based on evidence require the best information that is available. By and large the best evidence for many decisions comes from a **systematic review** of *all* the evidence. Mulrow (1995) argues that reviewing in this way is a search for the whole truth, rather than just one part of it, and is thus a 'fundamentally scientific activity'. The reviewer uses a specific and reproducible method to identify, select and appraise studies of a previously agreed level of quality (including either all studies or only those that pass a minimum quality threshold) that are relevant to a particular question. The results of the studies are then analysed and summarised. Synthesising evidence helps us to find out what we know and do not know about what works and what does not work. A good **research synthesis** can generally give us the most trustworthy answer to a specific review question, and it can identify gaps in our knowledge that require further research. It also communicates the strength of the available evidence and the quality of included studies, thereby indicating how much confidence practitioners, service users, managers, policy-makers and the popular media should have in the results.

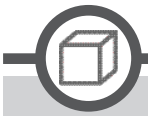
A research synthesis can also help us to find out how well a policy, programme, technique or intervention works in different subgroups of users and inform us about its potential to cause harm. Some research syntheses shed light on the pros and cons of different ways of organising or delivering services or policies. A research synthesis that includes considerations of cost can help shape our judgements about whether a chosen policy or course of action provides good value for money.

Yet another reason to synthesise the results of different studies of a given intervention is to learn whether findings are consistent across multiple studies. Always remember that 'disagreements among findings are valuable … [and that] conflicts can teach us a lot' (Light & Pillemer, 1984). Thus we can identify settings in which a particular social policy might succeed, circumstances under which an educational programme might work best, or which dose of a drug is most effective.

A good research synthesis frequently highlights weaknesses in the evidence and argues for further research. What should service users, policy-makers and others decide in the absence of evidence? Even when a research synthesis shows strong, unambiguous evidence to support one course of action, 'politics', whether local, national or professional, may make a review's findings less influential than well-coordinated lobbying. Research synthesis is not always welcomed as it may pose a challenge to 'strongly held opinions and other vested interests' (Chalmers et al., 2002). Yet even if the recommendations from a research synthesis are disregarded, its very existence encourages more transparency about the role of other factors in decision-making. No matter how well they are done, research syntheses do not solve all research problems. However, they do offer a valuable aid to decision-making.

WHERE DO I START?

In Chapter 1 we introduced five issues to consider before starting your literature review. For convenience we reproduce this checklist below (Box 2.2).



box 2.2

Issues to consider before starting your literature review

1. Choose your topic
2. Think about your intended purpose
3. Think about your intended audience
4. Where will I find the literature?
5. What will the literature, and the data, look like?

WHERE DOES THE LITERATURE REVIEW FIT WITHIN THE CONTEXT OF RESEARCH?

Literature reviews are pervasive in academia and policy development. However, there are three particular contexts in which a literature review is typically showcased:

1. As a major component of a dissertation, thesis or other academic deliverable.
2. As a peer-reviewed publication, typically in a journal or, depending upon the discipline, as a book chapter.
3. As a report resulting from a funded research project or other commissioned research or consultancy.

Each of these contexts shapes the final review product. For example, literature reviews for a dissertation or thesis should identify something innovative. You should be reflexive about your methods (Suri, 2020) and demonstrate your personal growth through the methodology (Daigneault et al., 2014). You will be expected to demonstrate your 'knowledge about a particular field of study, including vocabulary, theories, key variables and phenomena, and its methods and history' (Randolph, 2009). Furthermore, you must show that you are sensitised to the 'influential researchers and research groups in the field'.

In producing a peer-reviewed publication the reviewer faces the challenge of squeezing a wealth of data into the tight constraints of a journal's house style and word limits, occasionally overflowing into online supplementary materials. Journals, and their parent disciplines, demonstrate very different approaches to handling reviews. Some journals will not even consider review articles. In contrast, other journals celebrate annual review-type commissioned overviews and literature surveys.

Finally, if you are reviewing the literature for a funded research project or for consultancy you may face tight time constraints, a demand for answers rather than issues, and readers who want to sidestep the methodology and cut straight to the results or findings:

> Systematic reviews can be considered relevant to policy (and policy makers) when they present findings clearly for policy audiences to: illuminate policy problems; challenge or develop policy assumptions; or offer evidence about the impact or implementation of policy options; and take into account diversity of people and contexts. (Oliver & Dickson, 2016)

Chapter 10 acknowledges that different types of presentation suit different audiences and purposes. For the moment, we distinguish between reviews for knowledge support and those for decision support (Mays et al., 2005a). Reviews for knowledge support summarise and synthesise research evidence (focusing on what currently exists and is known about a topic). Reviews may highlight gaps in the evidence base as a target for future research, just as a thesis might do. Reviews for decision support go further in using the existing evidence to tackle a specific issue or problem. Gaps in the evidence base lead to the supplementary question 'and what shall we do about this issue or problem in the meantime?'. Decision-makers want reviews to help them to decide whether to start, stop or change a programme, how to accommodate new programmes or services, tried elsewhere, within their own organisation and how to bring about change (Lavis et al., 2005).

This choice between knowledge support and decision support does not necessarily reflect two extremes; knowledge support tools (exemplified by the **Cochrane review)** also aim to impact upon decision-making, and decision support reviews (such as the **health technology assessment)** also look beyond the immediate problem to recommend future commissioned primary research.

What types of research question are suitable for the literature review?

Literature reviews are essentially *question* led. Your question, along with your audience and the purpose of the review, determine how you will identify, collect and present your data. Some conclude that a literature review is only useful where a significant body of literature is already

known to exist. However, even if a researcher believes that they are the first to examine a particular intervention, policy or programme they should confirm this from the previously published literature. Thus the researcher avoids presenting 'islands without continents' (that is to say, falsely claiming innovation) (Clarke & Chalmers, 1998). Cross-fertilisation of methods from a related field may similarly save a researcher from having to develop a solution from scratch.

Although you could be the first to consider a particular issue, most literature reviews assume that at least one other researcher has considered, if not addressed, your question. Your question is shaped and influenced by the goal and focus of the review:

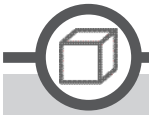
> *Effectiveness questions:* What effect does intervention X, compared with intervention Y, have on outcome Z in a real world setting? What are the relative cost-benefits of X versus Y?
>
> *Methodology questions:* What research methods are used to investigate focus of interest X? What are the respective strengths and weaknesses of such methods?
>
> *Conceptual questions:* How has focus of interest X been identified and defined? Which theories are used to explain focus of interest X? Which theory provides the best fit to findings from research studies? What are the main unresolved controversies? What assumptions about knowledge and evidence underpin the topic/discipline? (Randolph, 2009)

WHY REVIEW THE LITERATURE?

The Internet age has witnessed the so-called **information explosion** (Major & Savin-Baden, 2010a). With increasing numbers of articles being published and with improved open access to many of these articles, it is almost impossible to navigate even the more specialised subject domains. At an individual level we face **information overload**. We are overwhelmed by the volume of information that we encounter and are unable to retrieve the information we need. Is there a solution to this situation? One possible approach is to become **information literate** – put simply, this means acquiring the skills covered in Chapters 5–10 in this book in being able to locate, evaluate and use information effectively.

Although technologies are always changing, database interfaces and search engines are continually being upgraded, and new topics emerge with regularity, the skills of information literacy you acquire during your literature review will equip you beyond the duration of your project or dissertation and throughout your career and working life.

The general purposes of a literature review are to describe, summarise, evaluate, clarify and synthesise (Cooper, 1988). These general purposes are expanded in Box 2.3.



box 2.3

Purposes for a literature review

- to place each work in the context of how it contributes to an understanding of the subject under review;
- to describe how each work relates to the others under consideration;

(Continued)

- to identify new ways to interpret, and shed light on gaps in, previous research;
- to identify and resolve conflicts across seemingly contradictory previous studies;
- to integrate what others have done and said;
- to criticise previous studies;
- to make connections with related topics;
- to identify research gaps;
- to identify what has been covered by previous scholars to prevent you needlessly duplicating their effort;
- to signpost the way forward for further research; and
- to locate your original work within the existing literature.

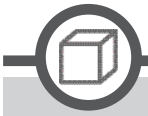
Which of the above points most accurately capture your reason(s) for conducting a literature review?

Your reasons may include 'taking stock' of what has gone before and identifying a niche for your own research. The literature may help you to design your own research. You may identify a theory against which you will explore a specified hypothesis. You may need to select tools, instruments or scales to help you conduct your research. You may identify gaps that offer opportunities as future research questions.

Is my review really necessary?

With the growth of systematic reviews and other review types it is increasingly uncommon to find a topic area that is completely untouched by review activity. An early scoping search may reveal that your review question seems to have been addressed already. Do not despair! As we shall see in Chapter 4, just because you have found a review on your topic does not mean that the authors have addressed the exact same question. Perhaps they have only examined a specific narrow population or context? Or perhaps they have restricted the interventions that they have included or focused on a limited number of outcomes? Perhaps they have covered a topic area broadly, with one or two studies from many countries when you know that, for your chosen country, many more studies exist?

Box 2.4 examines options that you can pursue where a review already exists.



box 2.4

Options when a review already exists on your topic

- Check when *searches were completed* for the existing review. How many studies are likely to have appeared since the review was conducted?
- Examine a different population.
- Broaden the interventions that you include.
- Check whether the **comparison intervention(s)** in the existing review are still current and meaningful.
- Examine the outcomes covered in the review. Are any important and obvious outcomes excluded?

- Could you examine studies from a different geographical setting or a more specific context?
- Consider the value of a complementary review (e.g. process evaluations alongside a review of trials or a qualitative evidence synthesis to help explain findings from an effects review).
- Consider different perspectives (e.g. a synthesis of practitioner views – health personnel, teachers, police, etc. - to complement a synthesis of public views).

You should not start upon a review update as if it is automatically an easier option:

> Updating a systematic review can be as costly and time-consuming as conducting the original review or developing the original guideline. Therefore, it is of paramount importance to know whether or not a systematic review needs to be updated.

If you are planning a systematic review update (see section later in this chapter on 'Updates to Existing Reviews') then you and your supervisor should consider the issues in Box 2.8. Each time you answer 'Yes' to one of the featured questions you have a stronger case for conducting an update.

A BRIEF HISTORY OF RESEARCH SYNTHESIS

Research synthesis can have no absolute start date. Those who chronicle research synthesis typically identify specific landmarks (Table 2.1). Histories exist for those who are interested (Chalmers et al., 2002; Clarke, 2016; Gurevitch et al., 2018; Hong & Pluye, 2018). Of particular interest is how research synthesis has migrated from a select number of disciplines to almost every area of academic activity (O'Rourke, 2007). Despite this extensive pedigree it was not until the 1970s that formal procedures for synthesising studies were labelled **meta-analysis** (Glass, 1976).

Table 2.1 Milestones in the history of research synthesis

Date	Milestones
1753	James Lind published first 'systematic review'
1904	Pearson published landmark review on effects of vaccines against typhoid
1976	Glass coined term 'meta-analysis'
1984	Light and Pillemer *Summing Up*
1987	Mulrow 'The Medical Review Article: State of the Science'
1989	Enkin and colleagues *Effective Care in Pregnancy and Childbirth*
1992	Antman and colleagues illustrated value of cumulation of findings
1993	Launch of Cochrane Collaboration
1994	Establishment of the UK NHS Centre for Reviews and Dissemination
2000	Founding of Campbell Collaboration

Over the years the principal motivation for research synthesis has enjoyed subtle shifts being variously allied with the cumulative nature of science (Light & Pillemer, 1984), the 'subjective, scientifically unsound, and inefficient' characteristics of traditional medical reviews (Mulrow, 1987), the rise of **evidence-based policy** and **evidence-based practice** and the need to eliminate duplication and research waste (Clark & Horton, 2010).

Subsequent years have seen the increasing popularity of different types of literature review, often conducted within time constraints and requiring a flexible toolkit of systematic approaches. More than anything the large numbers of review types illustrate how the extent to which a review is systematic lies on a continuum running from brief evidence summary to gold standard systematic review (Sutton et al., 2019).

WHAT IS THE PLACE OF THEORY IN THE LITERATURE REVIEW?

A successful literature review 'creates a firm foundation for advancing knowledge. *It facilitates theory development*, closes areas where a plethora of research exists, and uncovers areas where research is needed' (Webster & Watson, 2002). Initially, theory was considered an unwelcome distraction from the fundamentally pragmatic intent of the science of research synthesis. Pragmatic disciplines such as health services research are largely atheoretical – at least in the sense of not acknowledging a specific theoretical contribution. As you move outwards to contiguous disciplines such as public health, health promotion and nursing, theory is more plentiful. This is similarly true for the disciplines of social care, education, management and even information systems. **Complex interventions** (see Chapter 4) may require complex review questions and complex methods (De Silva et al., 2014). Think GET: Generating, Exploring or Testing theory (Oliver et al., 2018). Reviews range from the hypothesis testing of **meta-analysis** through to use of interpretive techniques such as **meta-ethnography** and **critical interpretive synthesis**. Other techniques such as **realist synthesis** explore the application of **programme theory** to a mix of quantitative and qualitative data before linking this to **mid-range theory**. Furthermore, **concept analysis** explicitly seeks to define, expand and extend the theoretical underpinnings of a target concept. You may find concept analysis a useful starting point when definitions are contested.

Literature reviews offer multiple opportunities to engage and interact with theory (Table 2.2) (Noyes et al., 2016a). Methods for searching for theory in a systematic way have been proposed (Booth et al., 2013b; Booth & Carroll, 2015a). An evidence synthesis may scope out theories relating to a particular issue (Campbell et al., 2014) or consolidate current theory, creating a **meta-model**. Alternatively, you can use a literature review to generate new, overarching theories and interpretations (Campbell et al., 2014; Oliver et al., 2018). Subsequently, you may use a data set from the literature to explore and test existing theories (Oliver et al., 2018). Finally, where a literature review does not fully explain differences that exist between apparently similar mechanisms or contexts, you may introduce (mid-range) theory to analyse such differences.

Table 2.2 Examples of the interplay of literature review and theory

Type of review	Reference	Interplay of literature review and theory
Concept analysis	Cyberbullying: a concept analysis of defining attributes and additional influencing factors (Sun & Zhang, 2020)	Systematic literature search resulted in 24 definitions for qualitative synthesis; 15 characteristics were determined to describe cyberbullying. Proposes a definition and additional influencing factors. Future research requires more qualitative studies with adolescents to validate these attributes

Type of review	Reference	Interplay of literature review and theory
Creation of meta-model	Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science (Damschroder et al., 2009)	Used **snowball sampling** to identify published theories and component constructs. Combined constructs and removed redundancy/overlap. Created Consolidated Framework for Implementation Research (CFIR) as overarching typology for implementation theory development
Meta-ethnography	Understanding collaborative interactions in relation to research impact in social sciences and humanities: a meta-ethnography (Dewaele et al., 2021)	Gathered relevant knowledge from eight carefully selected qualitative studies. Results address the lack of understanding of collaborative processes, fine-tune existing concepts and integrate them into a comprehensive theoretical model of successful knowledge diffusion
Realist review (to complement an effectiveness review)	Realist review of carer led oral hygiene interventions for people with intellectual disabilities (Waldron et al., 2020)	Sought to undertake a realist review to run parallel with a Cochrane Review. Parallel use of Cochrane/realist methods enriches hypothesis of what works, for whom, when and how
Review of theories	A review of theories and models applied in studies of social media addiction and implications for future research (Sun & Zhang, 2021)	Reviewed 25 distinct theories/ models that guided design of 55 empirical studies of social media addiction to identify theoretical perspectives and constructs to explain the development of social media addiction
Review of use of theory	Use of theory to plan or evaluate guideline implementation among physicians: a scoping review (Liang et al., 2017)	Aimed to describe if and how theory is used to plan or evaluate guideline implementation. Searched MEDLINE, Embase and Cochrane Library. Nearly 50% of studies were based on theory. Theory of Planned Behaviour and Theoretical Domains Framework used most frequently
Scoping review	What is the evidence on the role of the arts in improving health and well-being? A scoping review. (Fancourt & Finn, 2019)	Synthesises global evidence, with a specific focus on the WHO European Region, from over 3000 studies. Identified major role for arts in the prevention of ill-health, promotion of health, and management and treatment of illness. Evidence included uncontrolled pilot studies, case studies, cross-sectional surveys, national longitudinal cohort studies, community-wide ethnographies and randomised controlled trials
As precursor to conceptual work	The place of the literature review in grounded theory research (Dunne, 2011)	Explored the role literature review can play in grounded theory methodology

The traditional narrative review, the systematic review and 'systematic approaches'

All research, literature reviews included, should be 'systematic' in its conduct, analysis and/or presentation (Hammersley, 2013). However, reviewers have not always recognised this fact, as illustrated by our hypothetical recipe for a traditional literature review:

> Take a simmering topic, extract the juice of an argument, add the essence of one filing cabinet, sprinkle liberally with your own publications and sift out the work of noted detractors or adversaries.

Greenhalgh (2019) describes journalistic reviews of college students where, if research did not fit with their proposed theory, material is simply left out. Bias, or systematic error, may exist during the identification, selection, synthesis, analysis and interpretation stages of the review, which may demonstrate 'implicit, idiosyncratic methods' (Mulrow et al., 1997). Frequently, the much maligned **narrative review (**Mulrow et al., 1997; Greenhalgh et al., 2019), is referred to as a 'traditional review', 'conventional review' or, even more damningly, as a 'non-systematic review'. However, some non-systematic reviews openly ally themselves to different traditions of reviewing literature. Consequently, a review can be poorly conducted, poorly reported or both.

Why be systematic?

We have identified three main arguments for why reviews should be systematic, namely clarity, validity and auditability.

Many systematic approaches target the *clarity* of scholarly communication. The structure of a systematic review makes it easier to navigate and interpret. Clear methodology makes it easier to judge what the reviewers have and have not done. A focused question and explicit search strategies help to clarify scope and terminology. Stated inclusion and exclusion criteria allow readers to recognise why particular articles known to them were not included. Graphical, textual and tabular features combine to reveal rather than to conceal.

A second consideration addresses **internal validity** (i.e. that a study's design truly reflects what is observed). The review product must be defensible against potential bias (see Chapter 7). Potential biases include **selection bias** where a reviewer selects primary research studies that support their prior beliefs. Biases include **publication bias** (where investigators, reviewers or editors differentially submit or accept manuscripts based on the direction or strength of the study findings) (Ayorinde et al., 2020). Systematic approaches require that items are selected for inclusion on the basis of their relevance and rigour, not on whether they report a favourable outcome or whether their results are intrinsically 'interesting'.

Finally, an emphasis on transparency leads to concerns with *auditability* – how do we know that the reviewer's conclusions are grounded in the data from included studies and not an argument fabricated to support a prior conclusion? Systematic research syntheses offer a mechanism for quality control post-peer review, scrutinising the data, not just the published report (Rousseau et al., 2008).

The science of research synthesis is thus populated by flowcharts of numbers of included studies, supplementary documents, and appendices relating to search strategies, sample data extraction forms, and increasing numbers of reporting guidelines (Moher et al., 2014).

exercise 2.1

Features that make a review systematic/unsystematic

Disciplines differ in the extent to which they have adopted systematic approaches to research synthesis. Identify a review article within your own subject area or discipline. (For example, search for 'review', 'overview', 'meta-analysis' or 'evidence synthesis' in the title or abstract.) To what extent is your chosen review 'systematic'?

Exercise 2.1 suggests that you construct a grid and complete it with your own observations:

Features that make this review appear SYSTEMATIC	**Features that make this review appear NON-SYSTEMATIC**

Briefly reflect on what the term 'systematic' means to you. Do you consider being systematic a positive or a negative attribute? Table 2.3 suggests some words associated with being systematic or unsystematic.

Table 2.3 Words associated with being 'systematic'

Systematic	**Either**	**Unsystematic**
Explicit	Creative	Implicit
Transparent	Comprehensive	Opaque
Methodical	Imaginative	Whimsical
Objective	Publishable	Subjective
Standardised	Stimulating	Variable
Structured	Topical	Chaotic
Reproducible	Well-written	Idiosyncratic

The availability of time, personnel and money may further constrain the quality of the final review product. You should select a model of review that is most appropriate to the purpose required (Tricco et al., 2011; Whittemore et al., 2014; Sutton et al., 2019). You should state explicitly any limitations of your chosen approach. For example, a **scoping review** that offers a snapshot of a particular topic area (Arksey & O'Malley, 2005) does not usually attempt **quality assessment**. In contrast, systematic reviews (or overviews of reviews) should always assess quality or the risk of bias (Pollock et al., 2021b).

The results of systematic reviews are rarely unequivocal and require careful reading and interpretation (Sylvester et al., 2017). Narrative reviews often offer a 'snapshot' of **prevalent knowledge** at a particular point in time (Bodolica & Spraggon, 2018). Many systematic reviews explicitly aim to monitor and capture **incident** (i.e. emerging) **knowledge**. Systematic reviews may be designed for periodic update to accommodate the emergence of new evidence.

Reviews are often characterised by their **exhaustivity** (Suri, 2020), used synonymously with 'systematic review', a more helpful concept than 'comprehensiveness', because the former implies

finite (i.e. review-dependent) resources. Early systematic reviews specified that reviewers should retrieve *all* studies on a clearly defined topic. Failing to include relevant information in an evidence synthesis may lead to inaccurate or skewed conclusions (Livoreil et al., 2017). Subsequent addition of omitted information may lead to changed direction and/or changes in conclusions.

More recently there is increasing recognition that even the most exhaustive (and exhausting!) search cannot hope to identify the entire universe of studies on the most specific of topics. Diverse sampling approaches are increasingly recognised as a more appropriate response than a 'one size fits all' comprehensive approach (Suri, 2011). 'Fitness for purpose' is the appropriate aspiration, underpinned by the trade-off of rigour versus relevance (Hartling et al., 2017). Selective citation persists as a key threat of bias (Song et al., 2010). Exercise 2.2 asks you to compare a systematic review with a traditional review.

exercise 2.2

Identify a systematic review

Identify a systematic review in an area of interest to you and also identify a traditional review in a similar or related topic. Place the two reviews side by side and briefly list the differences between the two reviews.

Traditional review	Systematic review

CLARIFICATION OF TERMINOLOGY

Up to now we have used the umbrella term 'research synthesis' unless specifically referring to a particular type of review. Many authors have attempted taxonomies of literature review types (Tricco et al., 2016c; Samnani et al., 2017; Littell, 2018; Sutton et al., 2019). Categorising review types is challenging because a review may be characterised by purpose (as with a **mapping review**), by types of included study (as with a systematic review of **randomised controlled trials**), by the nature of included data (as with the qualitative systematic review), by the type of question being addressed (as with the effectiveness review), by the focus of interest being investigated (as in **meta-theory** or **meta-method**), or by the underlying intent (**meta-ethnography** for theory generation or **realist synthesis** for theory verification). Other characteristics relate to the context of the review (as for the **rapid evidence assessment**) or to the underpinning 'philosophy' regarding subsequent use of the review (as with **best evidence synthesis**). This book attempts to define the characteristics of each type of review wherever possible. However, 'only a handful of review types possess prescribed and explicit methodologies and many of the labels used fall short of being mutually exclusive' (Grant & Booth, 2009).

Researchers have a considerable incentive to invent a new label or new form of review that differs slightly from its predecessors rather than seek standardisation. In Chapters 4–10 we focus on generic stages of the review ('systematic approaches') to counteract methodological 'pigeon-holing'.

Approaches to the synthesis of literature, quantitative or qualitative, are characterised as either **aggregative** or **interpretive/configurative** (Gough et al., 2012) (see Table 2.4). Aggregative reviews bring together studies on a similar topic such that each additional study adds 'weight' to a shared finding. Bringing studies together in this way necessitates assumptions about how similar studies are to one another (**homogeneity**). In practice all studies are different (i.e. **heterogeneous**; with regard to the population studied, in how a procedure is implemented, in how an outcome is measured, etc.). The reviewer, and indeed the reader, has to judge whether studies are more alike than different.

By implication aggregative approaches can reach a point at which sufficient studies have established a finding beyond statistical doubt. Cumulative meta-analyses can demonstrate a point beyond which subsequent studies are no longer required (Bolland et al., 2018). Nevertheless, in theory at least, additional studies hold the potential to overturn a previous finding. Aggregative reviews continue to require ongoing attempts to identify studies that were previously missed, particularly if their absence might reveal a previously neglected bias.

In contrast, interpretive/configurative reviews seek to broaden our understanding of a particular intervention or focus of interest. Each study holds the potential to contribute additional insights and to contribute to the overall picture. Of course, the potential for new insights is more limited where a broad consensus exists and authors report similar observations. The point where no further insights are revealed is analogous to **theoretical saturation** within primary research (Booth, 2016).

Occasionally '**integrative review**' is used synonymously with the interpretive review. While this terminology was appropriate for as long as quantitative and qualitative reviews were separate endeavours, the **mixed methods review** now seeks to 'harness the power of stories alongside the power of numbers' (Pluye & Hong, 2014). We reserve 'integrative review' for cases where both types of data are brought together (Hopia et al., 2016), typically to produce a 'whole that is greater than the sum of its parts'.

Table 2.4 Configurative/interpretive or aggregative?

Consider whether the overall intent of your intended review is interpretive or aggregative	
Configurative/interpretive	**Aggregative**
Will my question develop and change as new insights emerge from the literature?	Is my question fixed and focused, allowing me to decide authoritatively whether studies are relevant or not?
If new papers fail to contribute new insights will I purposively move on to different types of sources?	Will I keep searching until I have exhausted all likely sources?
Does each new study add additional insights to what I am investigating?	Does each new study add weight to, or confirm, what was previously found?
Is my principal focus on the 'exception to the rule'?	Is my principal focus on the mean or 'average' overall result?
Will I present my data primarily as themes or models with accompanying commentary?	Will I present my data primarily as tables and graphs with accompanying commentary?

INTRODUCING THE SALSA FRAMEWORK

We characterise all review types against four critical steps embodied within the mnemonic, **SALSA** (Search, AppraisaL, Synthesis and Analysis) (Grant & Booth, 2009). The strength and quality of each step contributes to the overall 'signal' emitted by the review, whereas biases increase the distracting 'noise' (Edwards et al., 1998). Thus a **scoping review** is characterised as a broad-brush approach to finding the most notable studies in the field, minimal attempts to evaluate them for quality, a rudimentary attempt at synthesis (perhaps through listing, tabulation or mapping) and an analysis that caricatures the quantity and distribution of the literature (Pollock et al., 2021a). In contrast a **gold standard** systematic review, as endorsed by the **Cochrane Collaboration**, prescribes an exhaustive search of the literature, checklist-driven quality assessment, complex synthesis using textual, numerical, graphical and tabular methods, and sophisticated analysis (e.g. for differences between subgroups, the differential effects of study groups and the likelihood of missing studies). Between these two extremes lie numerous variants with different levels of input at the four key stages (see Table 2.5).

The SALSA approach is anticipated by other authors: for example, Major and Savin-Baden (2010a) highlight the importance of synthesis, analysis and interpretation. For us 'analysis' fuses the technical aspects of juxtaposing studies with the more imaginative and explorative aspects signified by interpretation.

SYSTEMATIC APPROACHES

By 'systematic approaches' we reference those elements of a literature review that, either individually or collectively, contribute to the methods being both explicit and reproducible (Box 2.5). Systematic approaches are evidenced in the conduct and presentation of the literature review and are epitomised in the formal method of 'systematic review'. Exercise 2.3 asks you to examine how systematic a review is. Specifically, systematic approaches include:

- systematic approaches to **searching** of the literature, as seen in the **scoping review** and the **mapping review** (see Chapter 5);
- systematic approaches to **quality assessment** (appraisal) of the literature, as seen in an integrative review (see Chapter 6);
- systematic approaches to synthesis of the literature, seen in such techniques as **meta-analysis**, **meta-ethnography**, **realist synthesis** and **thematic synthesis** (see Chapters 7–9);
- systematic approaches to **analysis** of the robustness and validity of review findings such as subgroup analysis, either qualitative or quantitative, or **sensitivity analysis** (see Chapters 7–9);
- systematic approaches to **presentation** of review findings using narrative, tabular, numerical and graphical approaches (see Chapters 8–10).

Table 2.5 Types of review

Type of review	Description	Search	Appraisal	Synthesis	Analysis
Critical review	Aims to demonstrate extensive research and critical evaluation of quality. Goes beyond mere description. To include degree of analysis and conceptual innovation. Typically results in hypothesis or model	Seeks to identify most significant items in field	No. Evaluates by contribution	Narrative, conceptual, chronological	Significant component: seeks to identify conceptual contribution to embody existing or derive new theory
Integrative review	Utilises broadest type of research review methods to include both experimental and non-experimental research in order to understand more fully a focus of interest. Integrative reviews combine data from theoretical and empirical literature	Exhaustive search to identify maximum number of eligible primary sources, using two or more strategies. Purposive sampling may be combined with exhaustive search if appropriate	Reports coded according to quality but not necessarily excluded	Tabular (matrices, graphs, charts or networks) usually according to a framework	Creativity, critical analysis of data and data displays key to comparison and identification of important patterns and themes
Literature review	Examines recent or current literature. Can cover wide range of subjects at various levels of completeness and exhaustivity. May include research findings	Possibly exhaustive	Possibly	Narrative	Chronological, conceptual, thematic, etc.
Mapping review/ systematic map	Maps out and categorises existing literature from which to commission further reviews and/or primary research by identifying gaps in research literature	As time allows	No	Graphical Tabular	Characterises quantity and quality of literature, perhaps by study design and other key features. May identify need for primary/secondary research

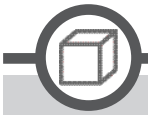
(Continued)

Table 2.5 (Continued)

Type of review	Description	Search	Appraisal	Synthesis	Analysis
Meta-analysis	Statistically combines results of quantitative studies to provide precise effect of results	Exhaustive. May use funnel plot to assess completeness	May determine inclusion/exclusion and/or sensitivity analyses	Graphical Tabular Narrative	Numerical analysis
Mixed studies review/mixed methods review	Combines methods that include review component (usually systematic). Specifically combines review approaches such as quantitative with qualitative research or outcome with process studies	Sensitive search or separate quantitative and qualitative strategies	Generic appraisal instrument or separate appraisal processes with corresponding checklists	Narrative Tabular Graphical (to integrate quantitative and qualitative studies)	May look for correlations between characteristics or use gap analysis to identify aspects absent in one literature but missing in other
Overview	Surveys literature and describes its characteristics	Depends on how systematic methods are	Depends on how systematic methods are	Depends on how systematic methods are. Narrative Tabular	Chronological, conceptual, thematic, etc.
Qualitative systematic review/ qualitative evidence synthesis	Integrates or compares findings from qualitative studies. Looks for 'themes' or 'constructs' in or across individual studies	Selective or purposive	Typically to mediate messages not for inclusion/exclusion	Qualitative, narrative synthesis	Thematic may include conceptual models
Rapid review	Assesses what is already known about policy or practice issue	As time allows, uses systematic review methods to search existing research	As time allows, uses systematic review methods to critically appraise existing research	Narrative Tabular	Quantities of literature and overall quality/ direction of effect of literature

Type of review	Description	Search	Appraisal	Synthesis	Analysis
Realist synthesis	Synthesises large and diverse selection of literature to inform policy revision, design effective interventions and identify potentially effective and innovative interventions	Mainly iterative and purposive	Privileges relevance over rigour	Narrative, causal chains and graphical	Key output is programme theory/ies of target intervention, specifying how and why programme/service is thought to cause intended outcomes (theory building) and then testing assumptions against further evidence, to strengthen and refine it (theory testing)
Scoping review	Identifies nature and extent of research evidence (including ongoing research)	As time allows, may include research in progress	No	Narrative Tabular	Quantity and quality of literature, perhaps by study design and other features. Attempt to specify viable review
State-of-the-art review	Addresses current matters. May offer new perspectives on issue or point out area for further research	Exhaustive coverage of current literature	No	Narrative Tabular	Current state of knowledge, priorities for future investigation; research limitations
Systematic search and review	Combines strengths of critical review with exhaustive search process. Addresses broad questions to produce 'best evidence synthesis'	Exhaustive	Possibly	Narrative Tabular	What is known; recommendations for practice
Umbrella review	Summarises results from systematic reviews on a topic	Exhaustive search for reviews only	Possibly using a review specific appraisal tool (e.g. AMSTAR)	Graphical and tabular	What is known and research gaps for primary research or further reviews

Source: Adapted from Grant & Booth (2009)



box 2.5

What does 'systematic' look like?

- A priori specification of planned review methods/protocol.
- A clearly focused question.
- Clear explicit criteria for inclusion and exclusion.
- Documentation of search process: sources and strategies.
- Use of tables and boxes to make methods explicit.
- Use of tables to summarise study characteristics.
- An explicit mechanism to handle quality assessment.
- Exploration of assumptions, limitations and areas of uncertainty.
- Use of tables and graphics to support interpretation of data.
- Appendices including search strategies, data extraction and quality assessment tools.
- Explicit declarations of interest.

exercise 2.3

How systematic is that review?

Look through this fictional abstract describing 'a structured review of the literature' in the light of what you have already learnt regarding the search, appraisal, synthesis, analysis (SALSA) framework. Which elements of this abstract make you think that this used a systematic approach?

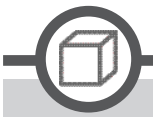
Performing X in Y: a structured review of the literature
Abstract

{Two brief sentences of background.} A literature search was conducted across {list of databases and Internet sources} of studies that evaluated X. Information on the type of activity, sample and setting, endpoints, and study design were extracted. Studies were classified based on a modified {name of model} model. Four categories of activity were identified: actor, decision-support, involvement and systems. The search strategy and selection criteria yielded 21 articles. Eleven studies used an actor activity, two studies used a decision support activity, seven used an involvement activity, and one used a systems intervention. The overall quality of research was uneven: research design – nine studies were quasi-experimental in nature, endpoint measures were not consistent, three did not perform statistical analysis. Sample characteristics varied dramatically. In conclusion, the number of high-quality studies of X remains limited. **Methodological limitations** include measuring an inappropriate **surrogate measure** when measurement of an **endpoint** is more valid. Further research is needed to understand how each type of activity improves the quality of performing X in a Y setting.

HOW DO I PLAN AND CONDUCT MY LITERATURE REVIEW?

You should plan a literature review just like any other research project (Granger, 2020). In fact, formal methods for conducting literature reviews should make project planning noticeably easier.

However, you still need considerable skill to tailor a generic plan to the specific needs of a particular review. As for any project, the reviewer, or review team, should consider the elements of time, quality and money (TQM) (Box 2.6). Balancing time, quality and money within an agreed timescale for delivery, whether one year for a dissertation or thesis or a longer (or indeed shorter) period of time for a commissioned project, is key to the success of a literature review. Experience from multiple review projects is distilled under five themes of learning and experience, interpersonal (networking), teamwork, outcomes and barriers (Boden et al., 2018).



box 2.6

Three key questions (TQM) for planning a review

- How much *time* must I allocate to critical activities that must be done (and that cannot be abbreviated)?
- What *quality* is required for the key stages of the review and what scope do these offer for flexibility or possible negotiation?
- Where can I save time (and, by implication, *money*) by efficiencies, either by one reviewer multitasking or by members of a review team dividing up the workload?

Time

With regard to *time*, every literature review embodies a critical path that represents a minimum time for completion. For example, you will need to identify, acquire and read all materials for the review before you can complete it, unless agreed otherwise with the commissioner or supervisor. In addition to this minimum time you must allow extra time for quality assurance to increase reader confidence in the review method. How comprehensive will the search be? Will I use formal data extraction and quality assessment? How thorough will the synthesis and analysis be? Typically, reviewers and students struggle with:

- Knowing when to stop reading for the literature review (Wellington et al., 2005).
- Allowing enough time at the end for editing (Harris, 2019).

For these reasons, you should set clear deadlines. Allow time for reading and documenting the literature review. You can always come back to it later if you have any time to spare. Try to allow time for your work to 'rest' so that you can come back to it with fresh eyes. To avoid 'wasting time' use this downtime to ask a critical friend to check your review for spelling, grammar and style. Alternatively, you could be sharing your review with your supervisor, a mentor or external advisors – while you get on with other tasks such as tabulating data or checking the format, consistency and completeness of your references.

A key concern at your analysis stage will relate to the adequacy of your literature sample: have you identified all studies (comprehensive sampling)? You may find your relief as you start to experience information saturation mingled with anxiety as you worry whether every possible key source has been located (Combs et al., 2010). Preparation of a review is an ongoing and continuous process. New studies are appearing continuously; chasing cited references may

repeatedly extend the review task and reading in adjacent literatures may imperceptibly cause **scope creep** (see Chapter 4). For these reasons, it is important for the reviewer, perhaps in conjunction with a supervisor or mentor, to agree when to cease further study identification. Models of conducting systematic reviews and meta-analysis, fuelled by the idea of identifying all the literature a priori before synthesis and analysis commences (the so-called 'big bang approach') (Sutton et al., 2019), might suggest that agreement of when to stop should appear at the search stage of the SALSA model. However, considering this at the analysis stage recognises that some reviews are iterative as some analytical processes suggest further lines for enquiry.

In our workshops on preparing successful literature review proposals, we contrast processes that lie within the reviewer's own control (and that are 'flexible') with those that depend on external agencies (conceived as 'fixed'). Fixed processes include obtaining interlibrary loans or photocopies of journal articles from other libraries (see Chapter 3) and subsequent dependencies such as following up citations, quality assessment and extraction of data. Depending on how review tasks are allocated, fixed external constraints may include searching bibliographic databases via an information specialist or librarian and access to a specialist in meta-analysis. Once you have all the included articles to hand, you can work through the remainder of the process at your own pace, working all hours where necessary. However, a rushed, last-minute approach will typically impact negatively on the quality of the review, particularly the analysis. When attempting to calculate the time required for a meta-analysis, you should realise that additional studies (i.e. more of the same) may not contribute too greatly to an increased workload as much preparatory work has already been completed. However, if additional studies require additional subgroup analysis or include additional groups of outcomes, this analysis can add significantly to the overall time taken.

Students often ask 'what are the minimum/maximum numbers of articles required for a review?'. Again, our response is 'it depends'. Numbers vary according to type of review, type of analysis and the extent to which your review is intended as an educational or personal development process. Reviewer competencies for our Master's programme require a mini-review assignment where students assess, synthesise and interpret an arbitrary five or six studies. Other institutions set 'systematic search and review' assignments that require students to formulate a review question and identify relevant studies but then conduct less rigorous synthesis and summary of results. Our take home message is that the approaches to the literature described in this book are flexible and varied enough to meet most educational requirements. Indeed, you could reanalyse a data set from an existing review to learn meta-analysis rather than completing the entire meta-analytic process. The field of qualitative evidence synthesis is particularly grappling with the optimal number of studies to be included. Considerations relate to the overall synthesis approach and the accompanying analysis (see Chapter 8 FAQ 8.4 How many studies do I need for my qualitative evidence synthesis?).

If this guidance seems evasive we could add (off the record, of course) that an ideal review, in an educational context and from our personal perspective, would include somewhere between 8 and 12 studies. This is large enough to provide rich data (either quantitative or qualitative) and significant variation between studies. It also offers the possibility of multiple meta-analysis displays if relevant and yet is small enough to be completed within a typical academic timescale. However, we certainly do not advocate reverse engineering: shaping the review question to fit the intended number of studies. Indeed, many students have tried to arrive at a 'magic number' of included studies, either underestimating the number of hits (and having thousands of references to sift through) or misjudging the effect of inclusion criteria (and pruning down to too few included studies). Staying honest to the review question, rather than worrying about the

volume of the literature, remains the best single marker of systematic approaches to a successful literature review.

Quality

How much time you spend on specific processes impacts on the *quality* of your review. If you have pre-specified your methods, for example in a review plan or protocol (see Chapter 5), you have relatively little room to renegotiate. However, if you have retained some flexibility then a decision, for example to switch from formal checklist-based quality assessment to a holistic judgement of quality based upon general prompts, will allow you to reduce considerably the time taken by your review. The literature on rapid reviews suggests tips by which you might accelerate or abbreviate your planned review (see e.g. National Collaborating Centre for Methods and Tools, n.d.).

Money

While *money* appears relevant only to externally commissioned reviews, this concern remains present, even if implicitly, in all types of review. Two critical factors impact on the time and cost of a review. The first is how many references/abstracts that the review team needs to sift through to result in one relevant potentially includable study (what we call the 'conversion ratio'). Different types of review have different conversion rates. So, for example, public health, management and education topics have lower conversion ratios than drug interventions or surgical procedures. Qualitative topics have lower conversion ratios than those addressing quantitative questions. The conversion ratio depends upon the sensitivity or specificity of the search strategy, the 'tightness' of review terminology, the diffuseness of the literature and the experience and expertise of the review team. The second critical factor relates to the absolute number of included studies. Each included study involves extra workload in terms of quality assessment, data extraction and synthesis. In comparison, the overall planning, conduct and management of the review will remain fairly fixed regardless of numbers of studies. While calculations remain approximate you should distinguish fixed from variable costs. Consider the 'opportunity cost' ('If I wasn't doing this what else might I be doing?') in both the absolute time and resource that you allocate to the entire review and the relative time you spend on each phase. A PhD where you spend too much time on the literature review will delay your subsequent primary research (Randolph, 2009). Similarly, if you postpone reading any literature until you have exhausted all avenues for finding relevant studies, your review may end up with underdeveloped, stunted or truncated analysis. A third consideration, relating to review resources, determines 'Can I do certain processes together or in parallel?', 'Could I be doing something during "downtime" for another process?' and 'Can I divide up this process and assign it to different members of a review team?'.

MANAGING YOUR LITERATURE REVIEW

Managing a literature review is similar to managing any research project. You need to identify necessary skills and resources. You should consider major milestones and deliverables throughout the four phases of project management (Baker et al., 2010):

1. concept;
2. planning and definition;
3. implementation; and
4. finalisation.

These generic stages apply to any review project. The concept phase includes assembling the team (this chapter). The planning and definition phase of the review includes protocol development (Chapter 5) to cover specific allocation of roles and responsibilities and identifying training and resource requirements. The implementation phase covers operational aspects discussed in Chapters 5–9 of this book. Finalisation involves the write-up and publication of the review and making plans for future updates (Chapter 10).

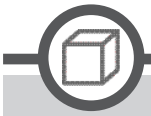
Many Master's students lack a knowledge of the purpose of the literature review (Shahsavar & Kourepaz, 2020). They fear that examiners respond badly to students who identify conflicting views from included studies. Other students fail to take into account the quality of the studies that they included. Lack of time represents another important barrier. Some students see the literature review as something to get through quickly in proceeding to the other parts of the thesis. Perhaps this is how you see the task? Other students do not feel that their supervisors spend much time assessing their literature reviews.

Time and financial support are particularly critical for Cochrane Reviews, which enjoy neither protected time nor funding. Nevertheless, all these reported barriers are important for all reviews, whether systematic or not. Later in this chapter we consider some barriers and how you can tackle them. However, as with most research projects, 'prevention is better than a cure'. You will find it best to anticipate where you may experience difficulties and develop strategies to avoid them. For example, those experienced in review projects attest to the importance of project management:

> One reviewer needs to lead (or project manage) the entire review and consult regularly with others, set deadlines and deliverables. That person needs to be the conduit for the editorial team and manage review submissions and revisions. Communication with the review team is essential. (Turner et al., 2017)

No review can expect entirely trouble-free progress from initiation to completion. However, you can anticipate most types of difficulty that you will likely encounter within the controlled environment of a literature-based project. Project management seeks to foresee or predict risks, and to plan, organise and manage activities so that projects are successfully completed in spite of the risks (Baker et al., 2010). Review methodology provides a ready-made phased structure for planning and conducting a review. It also supplies a repository of approaches with which to counter the more common types of problem. For this reason, some teams find it helpful to conduct their review using established project management methodologies. We do not recommend particular project management methods. However, generic structures for quality assurance (Lasserson et al., 2021) and stakeholder engagement (Haddaway et al., 2017) translate well to the needs of a review project.

When thinking about your own review you should consider what risks threaten completion of a successful literature review. Ask yourself, 'What is the worst thing that could possibly happen? How likely is it?' Create a mental picture of risks to your project and how likely they are to occur. How would you tackle them?



box 2.7

The rapid review

What is it?

Rapid reviews 'use accelerated or abbreviated (streamlined) methods as compared to traditional systematic reviews' (National Collaborating Centre for Methods and Tools, n.d.). Although the terminology draws attention to the speed with which a rapid review is conducted, commentators observe that the reason why an accelerated process is possible, namely close interaction between those producing the review and those commissioning it, is equally key to the definition. Those conducting rapid reviews seek a clear unequivocal brief from the customer. In return they communicate the options available for an accelerated or abbreviated process and the implications of these for the uncertainty surrounding the results. There is no agreed duration for a rapid review but, as a general rule, a 'rapid review typically takes 3 weeks to 6 months to complete (versus minimum 6–12 months for systematic reviews)' (National Collaborating Centre for Methods and Tools, n.d.).

What can I use it for?

Rapid reviews may be commissioned when a topic is urgent (e.g. Ebola) (Garritty et al., 2017) or when there is a narrow policy window. Rapid reviews (RRs) are considered 'an efficient tool to get evidence to decision makers more quickly and are now considered part of the knowledge synthesis family' (Garritty et al., 2020). While many assume that a rapid review necessarily means that time is tight, some reviews cut corners while others achieve rapidity by increasing their person power and so are fully resourced. More research is required on how different shortcuts impact on the methodological quality of the resultant review (Polisena et al., 2015; Schünemann & Moja, 2015).

The time constraints associated with rapid reviews may require you to extract data from each study directly into tables in the word-processed report rather than extracting into a purpose-designed data extraction form. Automated data extraction is now an option and methods are improving rapidly (Kadic et al., 2016; Tricco et al., 2017). However, extracting direct may also mean that you have to spend time formatting and standardising table contents.

How has it been used?

The UK Home Office commissioned a rapid evidence assessment (Booth et al., 2011), within a tight timeframe, looking at the effect of alcohol pricing and taxation on crime and violence. Methodological shortcuts included collective quality assessment by study type rather than critical appraisal of individual studies. Other approaches to fast-track quality assessment have included using limitations reported by different authors to compile a critique of data registry sources collectively used by multiple studies (Preston et al., 2015).

Project management challenges

Two specific project management challenges merit brief consideration. These are:

1. Updates to existing reviews.
2. Conversion of reviews to a different format.

In theory, both tasks sound relatively easy when compared with undertaking a full-blown systematic review. This may explain why reviewers and commissioners of reviews commonly underestimate the time and resources required to deliver review updates and conversions.

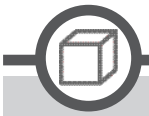
UPDATES TO EXISTING REVIEWS

We learnt about review updates the hard way! We were invited to update a systematic review previously conducted by a Spanish organisation. Five years had elapsed between completion of that review and our planned review update. We agreed a cost that was about a sixth of our standard price for a full systematic review. We mistakenly reasoned that we would only have to identify and synthesise a limited number of recent eligible studies. Although the original review was of good quality, we found that we had to check, validate and, essentially, repeat all stages of the review process. We had to update our search strategies. We also had to revisit the inclusion criteria to ensure consistency between original and newly added studies. Our review update cost at least three times more than its budget, equivalent to half the cost of a standard review, and probably significantly more! Our organisation absorbed the extra costs of our valuable lesson. Any team thinking of updating a review should start from the standard price of a review and works downwards. You must only credit actual, not imagined, savings to the pre-existing review. So, for example, if the team can access studies originally included in the review, this represents a real saving. If not, you will need to budget for the cost of both original and newly added studies. Others confirm that updating a systematic review can be as costly and time consuming as conducting the original review (Moher & Tsertsvadze, 2006). Updating an existing review is not an easy option!

Your supervisor/mentor will want to discuss whether a proposed update is 'worthwhile'. Being 'worthwhile' depends upon the extent to which your objectives are to gain new skills, to generate new knowledge, or a combination of both. Clearly you will gain little from simply replicating an existing high-quality review. However, if your objectives are to acquire skills in systematic review and meta-analysis, then identifying a few additional studies, extracting data, critically appraising the studies and possibly incorporating them within a Forest plot will prove valuable. On the other hand, given that methods of systematic review require that you stick to agreed standards rather than innovate, even completing standard review tasks may contribute little if your objective is to create new knowledge. You should, instead, look for controversy, disambiguation or reversal of previous effects.

To decide whether or not to update a review requires a detailed knowledge of the characteristics of a field and its associated literature (Mendes et al., 2020). The appropriate timeframe depends 'on the rate of development of a particular … field' (Moher & Tsertsvadze, 2006); frequent updating of systematic reviews in slowly developing areas may waste resources, whereas systematic reviews in rapidly developing areas quickly become outdated. Arbitrarily updating a

systematic review every two or three years, as suggested by some authors, is overly simplistic. Box 2.8 suggests grounds for updating a literature review. However, these are indicators, not rules, and are informed by evidence on review update characteristics (Garner et al., 2016).



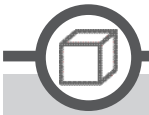
box 2.8

Justifications for updating an existing review

Each time you answer 'Yes' to one of the questions below you have a stronger case for conducting an update.

1. Has a single large study (i.e. more participants than all previously included studies combined or larger than the previously largest included study) recently been published?
2. Have multiple small studies (i.e. total number of participants greater than all previously included studies) been published since the original review?
3. Have interventions improved considerably (e.g. progression up learning curve, a volume-outcome relationship, etc.) since they were last evaluated?
4. Have validated outcome measures been produced and agreed (where previous review relies on subjective or unvalidated measures) since the previous review?
5. Have the interventions become more popular in policy and practice (i.e. more activity and more evaluation) since the time of the previous review?
6. Have four years elapsed (or, by exception, two or less years for volatile topics), since completion of the previous review?
7. Has new conceptual thinking/theory appeared to offer an alternative framework for analysis?
8. Do similar reviews, drawing upon common included studies, provide conflicting interpretations or results?

If you are considering updating an existing review, you should be clear with your academic supervisor/mentor what exactly you intend to do. You should consider together the issues covered in Box 2.9.



box 2.9

Agreeing expectations for an updated review

1. Will you extract, appraise and reanalyse both new and existing studies? Will you simply compare the overall result from the previous review with the new overall result that includes all the new studies?
2. Will you repeat searches for the period covered by the previous review or only search for studies published since that review (allowing for up to two years' overlap in recognition of publication delays)?
3. Will you extend the search process to cover additional sources, identify additional types of materials, or additional study designs?

(Continued)

4. Will you enhance the interpretation of the review by including complementary qualitative/quantitative data (e.g. relating to effectiveness or acceptability)?
5. Will you conduct sensitivity analyses looking at whether certain study characteristics, or possible publication bias, might explain the results of the review?
6. Will you unpick and isolate factors relating to the implementation of interventions, their fidelity and their external validity?
7. Will you enhance the scope and extent of qualitative discussions of review limitations, implications for practice and implications for further research?
8. Will you re-examine applicability of review findings in the light of a different context, culture or political environment?

At a glance – review update

Definition

As defined by Garner et al. (2016) a review update is: 'A new edition of a published systematic review with changes that can include new data, new methods, or new analyses to the previous edition.'

Brief history

To support decision-making, authors should keep their systematic reviews up to date to ensure that they include the most recent evidence. Reviews that are out of date or do not incorporate all available evidence risk providing misleading information. For example, Cochrane Reviews are assessed periodically to determine whether an update is needed. Reviews differ in the speed with which their focal topic of interest evolves and some research questions stop being relevant to decision-makers. For 100 systematic reviews (published 1995–2005) the median time to require an update was 5.5 years: 23% of reviews were out of date within two years, 15% within one year, and 7% were out of date as soon as they were published (Shojania et al., 2007).

Requirements

Research Question: An update asks a similar PICO (Participants, Intervention, Comparisons, and Outcomes) question and shares similar objectives, and thus similar inclusion criteria, with the original review. You can modify inclusion criteria to reflect developments within your topic (e.g. new interventions, new standards and new approaches).

Expertise: You can access experts in your topic or methodologists to provide an informed view of whether a review update can substantially improve the original (e.g. by applying new methods).

Constraints (Time/Resources): Updating an existing systematic review is generally performed manually and is time consuming. However, generally it is less time consuming than undertaking the original review. You can use technology to streamline the updating process and improve efficiency.

Iteration/Integration Issues: Key decisions involve whether the existing review will act as a template for the methods and format of the update or simply as a source for the historic included studies. Will the update review integrate old and new studies within a new publication

or will the update supplement the original review, modifying its key message and expanding its coverage?

Purpose: Adding new studies/new data can substantively change review findings (Cumpston & Chandler, 2021). Even where the update reports similar results, increasing the number of studies can improve the precision of effect estimates, demonstrate wider applicability or yield additional subgroup analyses.

Sources: 'New' studies may include 'ongoing studies' from the existing review. Citations to included studies, and to the original review, may also be relevant. Experience from the original search may shape your list of sources to search or search terms to use (Garner et al., 2016).

Overview of process

SALSA

Search: Typically, a search strategy can be rerun as specified in the existing review, limited to date limits that include an overlap period of up to a year from the original search to the current date. However, you should consult an information specialist to ensure the strategy remains appropriate. Changes to electronic databases or their indexing may require that the search is amended.

Appraisal: Methods of appraisal typically replicate those from the original review, assuming no major intervening methodological developments. Otherwise studies may need to be assessed again specifically for the update.

Synthesis: Synthesis methods for the update tend to stick closely to the original methods; new data may allow further subgroup analyses.

Analysis: Although analysis focuses on the integrated results of old and new studies, the existence of different versions allows additional comparison between versions and methodological observations on the value of the update.

Strengths and limitations

Little consensus exists on when to update a review, although several methods for triggering updates are proposed (e.g. Ahmadzai et al., 2013; Takwoingi et al., 2013).

The quality of the update is very dependent upon the quality of the previous review. A poor-quality review may have to be repeated or key stages (e.g. the literature search) re-executed.

Updates are also possible for qualitative syntheses (France et al., 2016; Rodriguez-Prat et al., 2017); these may use a framework generated from the original studies to analyse newly added data.

At a glance

Reviewer expertise	
Information expertise	
Time	
Resources	££

CONVERTING YOUR REVIEW TO A DIFFERENT FORMAT

Another task you should not underestimate involves converting a review to a different format. Reviewers frequently consider 'importing' or 'exporting' reviews for the Cochrane Collaboration: that is, either converting reviews for adoption by the Cochrane Collaboration (importing) or in building on Cochrane Reviews as a starting point for extensive reviews commissioned by other funding agencies (exporting). Some authors question whether reviews or technology assessments are transferable across agencies and countries.

Becoming familiar with an external organisation's procedures and documentation definitely requires orientation and probably requires training. You will need to read and comprehend documentation for an overall view of how the process works. You may then need to revisit operational details as you approach each state of the review. Converting a review to Cochrane format requires dedicated time – time that typically lies outside the original project, and which may compete with new and existing priorities. You should not underestimate the challenges of navigating a synthesis organisation's peer review system and procedures. While some organisations may offer 'conversion grants' these will typically require you to produce a research proposal. You may encounter further delays in processing the application that may impact on the original window of opportunity. The attraction of converting your review to the Cochrane format may dissolve under the need to validate the entire process and to reanalyse new and existing data side by side.

Combining a systematic review for a Master's dissertation or a PhD with offering the resultant review to a synthesis organisation such as the Cochrane Collaboration may initially look like an attractive option for meeting demands for coverage by new reviews (Sambunjak & Puljak, 2010). Nevertheless, we consistently recommend that students do not combine an academic assignment with a longer review commitment. Undertaking a 'dual-purpose review' is like being torn between two supervisors, except greatly magnified. The deliverables typically have different timescales, different peer review processes and different quality checks. How will you manage starting on a review approved by your academic supervisor only to find that external review comments from the synthesis organisation later recommend modifications and amendments? The dual-purpose model works best where the academic organisation can accommodate the final synthesis product as a deliverable, for example in a PhD by publications. Nevertheless, the way forward is for dual-purpose reviews to increase in the future, perhaps requiring that supervisors or mentors occupy dual roles and that review guidelines are adopted 'off the shelf' by academic organisations. Synthesis organisations will also want to make the supervisor, not the student, the nominated review contact, allowing for updates and 'succession planning'.

Skills and resources

A successful review does not simply require technical skills. If you have never managed a review before, or you are being advised by someone with limited experience, you will need a rigorous project management structure. You should document your methodology, review an explicit timetable with frequent deliverables and internal and external deadlines, and access regular input on methodology.

Most reviews are multidisciplinary, requiring methodology and subject experts. Consequently, most reviews are conducted by collaborative review teams. Review teams should engage with representatives of stakeholders using appropriate project management structures. Many reviews have a steering group that meets at least monthly. Larger reviews require an administrator to support the project on a day-to-day basis, and to arrange meetings, handle correspondence and

support document delivery, database administration or tabulation of data. The steering group may choose to create small, ad hoc groups to address specific issues as they arise. For example, they may bring in meta-analysis expertise when required. A wider advisory group, comprising methodology or subject experts and, most importantly, practitioners from the field, may meet quarterly or every six months to provide advice to the steering group or secretariat on clinical, technical or other issues impacting on the review.

rapid review tip 1

Stakeholder engagement

Working interactively (knowledge brokering) on your protocol with stakeholders helps policy-makers better understand your review proposal. You will understand why they have commissioned the rapid review and the relevant context for the questions, scope, methods and report conclusions. Sharing your protocol will make you more confident that you are meeting policy-maker needs (Garritty et al., 2021).

Study skills and techniques

As a novice reviewer, or a review team that has never worked together on a review before, you cannot assume that you already have the skills you need to plan and conduct a literature review. Most researchers consider themselves familiar with 'reviewing the literature'. They may fall into the trap of thinking that methods for conducting reviews appear straightforward. To illustrate, many experienced librarians consider that they already have excellent information retrieval skills. However, typically, their strength lies in identifying key references for a research paper or proposal. This is a considerably different scale of endeavour from conducting sensitive searches designed to minimise the chances of missing something relevant. Similarly, if you are previously familiar with critiquing research papers (the 'science of trashing papers' (Greenhalgh, 2019)) you have a useful starting point for quality assessment. However, again critical appraisal of an individual study is nothing like as demanding and intense as the level of skills required for systematic approaches to reviewing. Notwithstanding increased availability of systematic review courses, a skills deficit still exists in fields where systematic approaches to literature review are still in their infancy. Review expertise is distributed differentially across disciplines. Most trained reviewers work in health with pockets of expertise in management, education and social care among others. Suggestions for building capacity in reviewing include mentorship and skills exchange programmes to enhance the quality of evidence synthesis. Capacity building might also involve evidence synthesis organisations collaborating to deliver training and capacity development in countries where evidence synthesis is emerging (Gough et al., 2020).

What generic study skills will I require for my review?

Planning and conducting a literature review requires a methodical approach and good discipline in documenting your methods and progress. Individual review tasks, such as planning and executing a search strategy, may extend over many days. Each time you must document how far

you have got, what else you still need to do, and false starts or blind alleys to avoid repeating in the future. You may need to re-execute an identical search strategy as an update search at the end of a project. You may even need to re-examine search strategies to try to establish why an included study, subsequently identified, was missed by your original searches.

Keeping a bench book or project diary for the life of each review helps considerably at later stages of the writing-up process. It is also helpful to create a dedicated project folder with subfolders clearly labelled as follows:

New SR

0 – Admin

1 – Protocols

2 – Searches

3 – Study Selection

4 – Full Texts

5 – Data Extractions & QA

6 – Final Report

7 – Draft Publications

You can paste in this 'dummy' file structure for each new review. The numbering ensures that folders remain in the sequence of the review process. Preferably you will be able to store software and services in the cloud, instead of locally on your computer, and share these among the review team. If this is not possible, then you should take regular 'snapshots' of the folder contents and save them to external storage media such as portable hard drives or USB flash drives/memory sticks. A content management system for web-based project management and document submission may help in version control and in managing access to submitted drafts (Shapiro et al., 2018).

If your review is an interpretive work, then your project diary doubles as a reflective document of major insights or decisions made along the way. In this way, you can document your review process and, subsequently, justify your decisions to a peer reviewer or examiner.

Conducting a review combines a disciplined scientific process with a creative artistic one. Review methods offer a frame or structure within which you can be imaginative. You need to structure and order your data to help you to recognise patterns and to carry out subsequent analysis. Picture how an artist assembles materials, organises their palette and selects their viewing point before getting started with the creative process. It is almost impossible to possess all the needed skills required, which is why reviews are typically best undertaken as a team. If you are a postgraduate student then your team includes your supervisor, fellow students conducting their own reviews and university resource staff such as librarians.

How do I gain needed skills in systematic approaches?

Each stage of the review process requires that you either gain new skills or extend the skills that you have already used at some time in your academic career. Consider how you rate personally against the requirements outlined in Table 2.6.

Table 2.6 Training requirements for systematic approaches

SALSA stage	Training requirements
Search	• Do I have skills to conduct sensitive searches that are unlikely to miss relevant studies? • Do I have access to a librarian or information specialist who can advise on search terms and demonstrate advanced search functions? • Does my library run training sessions in databases or reference management software? • Am I aware of available YouTube or other training videos on using databases or reference management? References: McGowan & Sampson, 2005; Hausner et al., 2012; Cooper et al., 2018; Spencer & Eldredge, 2018
AppraisaL	• Am I familiar with the optimal quality features of the main study designs (e.g. RCTs or qualitative research) for my topic? • Are journal clubs or critical appraisal sessions run within my institution? • Can I identify published examples of critiques of research studies published in my discipline or specialty?
Synthesis	• Do I possess necessary skills in tabulation, sorting and organising data in word processing packages and spreadsheets? • Am I able to use features of word processing packages (e.g. Headings, Captions, Sort and Cite-while-you-write?) • Have I acquired a good overview of knowledge of available synthesis techniques? • Having identified a synthesis method of choice, have I established how I will acquire knowledge and skills of that particular method, e.g. meta-analysis or meta-ethnography? • Am I a member of relevant discussion lists (e.g. RAMESES for realist syntheses; ASQUS for qualitative synthesis) so that I can ask questions or learn vicariously from others' exchanges? • Do I plan to join relevant webinars and seminars where researchers have used particular methods of synthesis and have I identified questions I need to ask them? References: Booth et al., 2018b
Analysis	• Have I planned opportunities to discuss, debate and challenge my findings with my supervisors and other researchers within my institution (whether formal supervision or through opportunistic student presentations etc.)? • Have I explored the need for additional supervisors, whether internal or external, for my specific methodology? • Have I cultivated exchanges for ad hoc advice and suggestions from academic and research staff at other institutions?
Writing and presentation	• Have I acquired experience of a range of skills in textual, tabular, graphic and numeric modes of presentation? • How will I ensure opportunities for formal research training programmes, lunchtime sessions, and technical or software-specific training courses?

A good way of judging what techniques you are likely to use is to see how frequently they appear within published examples of reviews on the same topic. For example, once you decide that your data is suited to meta-analysis you will note, from other published meta-analyses, that meta-analysis is frequently accompanied by such analytical techniques as the funnel plot (to detect possible publication bias) or sensitivity analysis (to establish whether results would be changed by including or excluding particular studies).

Many techniques help formatively while you conduct interim analyses. A handful of these techniques will shape the summative phase of presentation and reporting. In particular you will need to expand your writing style from itemisation (e.g. 'Study A was conducted in a population of X') to narrative summary (e.g. 'Five of the eight studies were conducted in secondary schools with the remainder in training colleges. Six were from the United States with one from Canada and one from New Zealand'). Such techniques help you to identify similarities, differences and subgroups that are the exceptions to a rule.

exercise 2.4

Personal skills audit

Having briefly reviewed the skills needed to conduct a successful literature review, reflect on the following: Which skills do I already possess? Which do I need to acquire? How will I acquire such skills?

Personal Skills Audit			
Skill	**Already Possessed**	**Training Needed**	**Source of Training**
Project Management			
Literature Searching			
Quality Assessment (Generic)			
Quality Assessment (Study Specific)			
Synthesis (Generic)			
Synthesis (Review Specific)			
Analysis (Generic)			
Meta-analysis			
Writing for Publication			

Communication

Communication is key to the success of a review. You should plan effective communication strategies from the outset of the project, whether as a documented communications plan or a less formal approach. For large-scale international reviews, a communications plan will help to meet the challenges of having review authors in different time zones, distant locations and even different languages. Personal communication between collaborators, typically via email, can speed a review process beyond a regular cycle of face-to-face or virtual meetings. Nevertheless, where issues require rapid resolution it may be more effective to set up a video conference. Resources that harness voice over Internet protocols and video services, such as Skype or Zoom, offer an attractively cheap alternative for communication (Baker et al., 2010).

Stages of the literature review

Systematic reviews take variable time according to the topic but usually take between nine months to a year to complete. The duration is gradually reducing as expertise and systems develop. Typical timescales are provided for six-month, nine-month and one-year versions of a literature review (Table 2.7).

A **six-month** timescale is most appropriate for a literature review that does not require significant appraisal, synthesis and analysis (e.g. for a scoping review, a mapping review of a well-defined and focused area, or for a **rapid evidence assessment**). Mapping/scoping reviews are primarily descriptive (What does the literature look like? Where are the gaps?) rather than analytical (What does the literature tell us?). A rapid evidence assessment makes little claim to in-depth quality assessment. Similarly, a tightly defined **concept analysis**, perhaps to inform a subsequent framework, may be achieved within six months.

Table 2.7 Sample project timetables for 6-, 9- and 12-month literature review projects

Task	Timescale (6 months)	Timescale (9 months)	Timescale (12 months)
First project team/supervisor meeting	Months 0–1	Months 0–1	Months 0–1
Search			
Finalise scope	Months 0–1	Months 0–1	Month 1
Preliminary literature searches	Months 0–1	Months 1–2	Months 1–2
Identify and contact key organisations	Months 0–1	Months 1–2	Month 2
Second project team meeting/ discussion	Months 1–2	Months 1–2	Months 2–3
Full literature searches and reference management	Months 1–2	Months 2–3	Months 2–3
Selection of articles	Month 2	Months 2–3	Months 3–4
Obtain articles	Months 2–3	Months 3–4	Months 4–5
Follow-up cited references	Month 3	Month 4	Month 6
Third project team meeting/discussion	Month 3	Month 4	Months 6–7
Appraisal			
Quality assessment	Months 3–4	Month 5	Months 6–7
Data extraction	Months 3–4	Months 5–6	Months 7–8
Fourth project team meeting/discussion	Month 4	Month 6	Month 8
Synthesis			
Data synthesis	Month 5	Month 7	Months 8–9
Analysis			
Data analysis	Month 5	Months 7–8	Months 9–10

(Continued)

Table 2.7 (Continued)

Task	Timescale (6 months)	Timescale (9 months)	Timescale (12 months)
Fifth project team meeting/discussion	Month 5	Month 8	Month 10
Report writing	Month 6	Months 8–9	Months 11–12
Draft report	Month 6	Month 9	Month 11
Sixth project team meeting/discussion	Month 6	Month 9	Month 12
Final report	Month 6	Month 9	Month 12

A **nine-month** timescale is most appropriate as a component of a large-scale (e.g. two or more years) project where findings from the literature review feed into subsequent primary research. Similarly nine months may be suitable if you are planning to use the literature review component of a thesis to inform the design of primary data collection and as a deliverable in an upgrade report. This timescale assumes that you are conducting other tasks (e.g. applying for ethical approval) during the concluding phases of the literature review.

Twelve months is a typical timescale for a stand-alone literature review such as a systematic review with meta-analysis or a qualitative evidence synthesis (whether aggregative with many included studies or interpretive with in-depth analysis of 10–12 studies). In the latter case the aim is to complete search, appraisal and data extraction as early as possible to maximise time spent on synthesis and analysis.

Within these generic templates there is considerable scope for variability according to:

1. the quantity of the literature that you have to review;
2. the scope of your literature review;
3. the number of team members, and proportions of their time, available to your review;
4. the format and quality of the review deliverables.

Nevertheless, these templates are a useful starting point. You may also use these as a starting point for negotiations with a review commissioner or a supervisor.

Tools

You may find it helpful to produce a SMART plan to identify the specific, measurable, agreed, realistic and timed objectives of your review project. The person managing the review should plan each phase carefully, identify each strand of work and set realistic completion dates. A sample SMART plan is provided in Table 2.8.

Table 2.8 Extract from a SMART plan for a review

What	By whom	By when	Cost	Status (not started/in progress/completed)
Conduct scoping searches	Information specialist	01/09/2023	£250 (per day)	Completed
Completion of pilot searches	Information specialist	15/09/2023	£250 (per day)	In progress

What	By whom	By when	Cost	Status (not started/in progress/completed)
Completion of full searches	Information specialist			Not started
Study Selection	Reviewers 1 and 2			Not started
Data Extraction	Reviewers 1 and 2			Not started
Quality Assessment etc. ...	Reviewer 1			Not started
Draft report	Reviewer 1			Not started
Final report				Not started

exercise 2.5

Producing a draft timetable for your review

Produce a draft timetable for your own review. Include the phases of scoping and planning; searching and obtaining references; data extraction and quality assessment; synthesis and analysis; and writing up and disseminating.

Now identify milestones (i.e. time deadlines) or deliverables (specific outputs from each phase of the review process) and where they lie in your review timetable. Deliverables include, but are not necessarily restricted to, a review protocol or review plan (scoping and planning); a search strategy for a principal database with sample search results (searching and obtaining references); a draft data extraction form with completed quality assessment for an included article (data extraction and quality assessment); tables of included study characteristics (synthesis and analysis); and a draft report or article (writing up and disseminating). If you are undertaking a dissertation or thesis, meet with your supervisor each time you produce any of these deliverables. If you are conducting a commissioned review or working with a review team, use review milestones as critical points for either internal or external team meetings. You may find it helpful to use the format for a SMART plan (Table 2.8).

Having given attention to the 'TQM (Time–Quality–Money) of Review Management' you are ready to consider the detailed logistics of your project. Aspects frequently overlooked include the following.

Access to databases

Your academic institution will typically offer diverse database resources that extend beyond your own discipline (e.g. health, management, education, social science). However, you cannot assume that you have access to all databases required for your topic. You may need to negotiate ad hoc access to particular sources, identified from the Methods sections of related reviews. You may need to think about whether you will need to pay for any fees or subscriptions or for staff orientation and training. Alternatively, you might choose to arrange for an intermediary, paid database access, and information specialist time for preparing, planning and executing the search strategy.

Reference management software

Reference management software enables you to collect, store and organise references and notes and then format references in a required referencing style to create a bibliography. Some packages allow you to insert in-text citations into a document as you type. All packages generate a reference list or bibliography at the end of your document, based on included citations. The number of references in a typical review makes use of reference management software virtually essential. You may already have access to reference management software, either via your institution or via free software on the Internet. However, institutional agreements often relate to 'cut-down' versions of software geared to general student use. Cut-down software versions may be unable to manage the heavier demands of a major literature review.

Furthermore, some reference management software licences may restrict how many users can use the database at the same time, whether you are permitted to run office and home versions, and whether external collaborators may also access the system. For free-to-use versions available via the Internet, you will need to explore the functions available, whether it is worth paying an additional premium for added functionality, and issues such as backup and security of data. Ultimately the bottom line involves asking questions such as, 'What is the worst case scenario if the system malfunctions?' and 'What would failure mean for my review?'. Faced with such questions you will frequently choose to spend money on robust and secure systems to improve risk management and achieve peace of mind.

Obtaining literature

The open access movement has increased the availability of journal articles in addition to any institutional subscriptions you may have access to. Most institutional libraries hold a collection of key journal and book resources to support core subject areas. However, where you move beyond this coverage, you will typically need to access other journal articles through interlibrary loan and document delivery services. Few information units, aside from those specifically created to support systematic reviews, are geared up for processing large numbers of journal article requests. You therefore need to seek out those who manage local libraries to alert them of your likely needs and to negotiate preferential arrangements to handle bulk quantities of requests if required. For large-scale projects this may necessitate that either you or a member of your team pre-checks the holdings of other libraries. You may even need to employ a temporary member of staff specifically for this purpose. You should also consider whether you should arrange trips to specialist libraries (e.g. national libraries or specialist collections) to access materials in person. You will need to research opening hours, access arrangements and eligibility, photocopying facilities and transport times and costs.

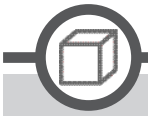
Analysis software

While you will not yet know what your final analysis of data will look like, you will usually know earlier on whether quantitative (i.e. **meta-analysis**) or qualitative (e.g. **thematic synthesis**) analysis will be possible. Meta-analysis will require that you budget for meta-analysis software and possibly statistical support. For qualitative synthesis you might consider qualitative data analysis software. Again, your decision on whether to use commercial proprietary

or free software depends upon how central the analysis is to your final deliverable, the available resources and whether such software is already used within your organisation.

You will find it helpful to estimate the likely size and scale of the literature. You can do this in several ways. Bibliographic databases with data mining or analytical facilities (Scopus, Scirus, PubMed PubReMiner, Web of Knowledge) supply statistics regarding the frequency of certain terms or phrases. For example, Pubmed PubReMiner (https://hgserver2.amc.nl/cgi-bin/miner/miner2.cgi) helps you to identify key authors, key journals and countries of publication as well as terms used most frequently by authors and/or indexers.

Projections of the size of the literature have two main purposes. First, they help you to create your initial review plan or protocol together with associated milestones and deliverables. Second, they help you to think about 'rescue' techniques to help you bring your review back on track (Box 2.10). This is particularly critical if time, quality or money aspects of a literature review are deflecting you from your original plan.



box 2.10

Some areas of review efficiency

- Could I use a methodological filter to reduce the numbers of studies to screen?
- Can I identify a point at which searching additional databases adds more work without extra useful yield?
- Could someone eliminate duplicate citations retrieved from different bibliographic databases instead of the team having to repeat decisions on inclusion/exclusion for the same research study?
- Could I start selecting studies from abstracts from core databases while continuing to search peripheral additional databases?
- Could I request and obtain potentially relevant articles as soon as I identify each new study?
- Could I read and/or check initial articles received for relevant citations as soon as I receive them rather than wait for the full set of retrieved studies?
- Could I start data extraction and quality assessment in advance of obtaining all studies?
- Could I conduct data extraction and quality assessment as a combined single operation?
- Will I extract data via data extraction forms or direct into summary tables?
- Do I need more than one reviewer for study screening (or could I use a second reviewer to screen a random sample of records or until we reach an acceptable level of agreement)?

Problem solving and troubleshooting

Consider the realistic scenarios in Exercise 2.6, relating to problems typically encountered while undertaking a literature review. Choose a scenario of interest. Where does the problem lie? How might you overcome this problem? Having proposed your own solutions, look at what we suggest (suggested solutions available on the companion website).

exercise 2.6

Problem-solving scenarios

Scenario A: Adebola

Adebola is starting a literature review as part of a funded pilot project on the social determinants of ill-health in Sub-Saharan Africa. She is interested in the causes of mortality for mothers and infants and she feels she must definitely look at leading causes of disability among adults. Then there is the increasing high profile of illness in the ageing population. In her country, there is a particular concern around HIV and AIDS. As she starts to build a list of all possible population–illness combinations she realises that her topic has started to get out of hand.

What are the root causes of this particular problem?

What strategies might you suggest to help Adebola overcome this problem?

Scenario B: Brenda

Brenda is a member of a small team working on a funded review in a management topic. After spending considerable time devising comprehensive search strategies for the specific review question, using the **PICOS** formulation, she has completed an initial screen of retrieved titles and abstracts. She applies the rigorous inclusion criteria devised by the team. Not a single article would make it through to the full article stage. She is concerned that the team has made its review topic too exclusive and may have only an 'empty review' to offer to the research funders.

What are the root causes of this particular problem?

What strategies might you suggest to help Brenda overcome this problem?

Scenario C: Sanjay

Sanjay is a part-time student conducting a literature review for his academic thesis. He has devised a comprehensive search plan for his literature review and meets with his supervisor to discuss his next steps. His supervisor suggests that, in addition to the topics he has already identified, he needs to access key concepts from the psychological literature. Then a work colleague, who has recently completed a Master of Business Administration degree, suggests that the management literature may also have something to contribute. Revisiting his search plan, he now finds that these suggested revisions have tripled the extent of the literature to be screened.

What are the root causes of this particular problem?

What strategies might you suggest to help Sanjay overcome this problem?

Scenario D: Eloise

It is month 10 of a 12-month funded project and Eloise is worried. She has completed data extraction and quality assessment for about half of the 80 articles to be included in her literature

review. She has no idea what findings will emerge from her review, let alone how she will complete the literature review on time.

What are the root causes of this particular problem?

What strategies might you suggest to help Eloise overcome this problem?

Scenario E: Sandra

Sandra has just received the monthly budget report for her first ever 18-month literature review. It is month 7 and she has spent well over half the budget allocation for the project. The project is proceeding on schedule but she is concerned that she is going to have to report a likely end-of-project overspend to her line manager at her next three-monthly review meeting. She is concerned that she has underestimated the project budget for the literature review.

What are the root causes of this particular problem?

What strategies might you suggest to help Sandra overcome this problem?

Scenario F: Tomasz

Tomasz is at a crucial stage of his systematic review on attitudes to citizenship of first-generation East European migrants. He has identified all the studies for likely inclusion in his review. However, he is not sure which method of synthesis to use to summarise these qualitative research reports. His supervisor has extensive experience of supervising systematic reviews, but all have involved meta-analyses and he has never supervised a qualitative evidence synthesis.

What are the root causes of this particular problem?

What strategies might you suggest to help Tomasz overcome this problem?

Scenario G: James

James is feeling frustrated. He has been sending multiple emails to topic experts on the review team asking for their input. Although they are only located 40 miles (64 km) away, in the nearest adjacent city, they seem uncontactable. James is concerned that, without their cooperation and input, the literature review will fall behind its time schedule and lack credibility with practitioners.

What are the root causes of this particular problem?

What strategies might you suggest to help James overcome this problem?

Such decisions constitute a toolkit of 'rescue' techniques for bringing a review back on track if time, quality, money or even methodological aspects of a literature review are deviating from the original plan.

Tools to support the review process

Few articles identify tools to support the review process. Those that do typically focus on literature searching, study selection, reference management and analysing quantitative or qualitative data (Bandara et al., 2015). Tools also facilitate communication and project management (Table 2.9). Many resources are covered in detail throughout this book. You can use this section as a checklist when planning requirements to support your own review. For details on these and other tools, see the SR toolbox (http://systematicreviewtools.com/) In additon, we have highlighted tools that we have found useful on the companion website..

Table 2.9 Tools to support the review process

Stage of review process	Types of tool	Examples
Communication (Baker et al., 2010)	Meeting planning tools	Doodle, Google Calendar, Microsoft Outlook
	Voice and video communication	Google Meet, Skype, Zoom
	File sharing	Dropbox, Google Drive
Project management	Project management software	Microsoft Project
Review management	Integrated review management software	CADIMA; DistillerSR, JBI SUMARI, RevMan; EPPI-Reviewer
Concept development	Mindmapping	Freemind
Data mining		EPPI-Reviewer
Search strategy development	Title and abstract analysis software	PubMed PubReMiner
Citation retrieval	Citation tracking software	Google Scholar; Publish or Perish
Literature searching	Bibliographic databases	ERIC, PubMed
Reference management	Reference storage	Endnote, Refworks
	Reference sharing	Endnote, Citeulike, Mendeley
	Duplicate checking	Systematic Review Accelerator
	Abstract screening	Abstrackr, Colandr, Covidence, DRAGON, EPPI-Reviewer and Rayyan, Excel
Data visualisation	(a) Flow diagrams (e.g. PRISMA reporting standard)	
	(b) Descriptive plots/tables	
	(c) Databases/sytematic mapping	
	(d) Heat maps (pivot tables – Google sheets and Excel; EviAtlas)	
	(e) Evidence atlases (EviAtlas)	
	(f) Conceptual models/logic models	
	(g) Forest plots	
	Reporting standards	ROSES: RepOrting standards for Systematic Evidence Syntheses

Stage of review process	Types of tool	Examples
Data extraction	Extraction forms	RobotReviewer, Google Forms, Access, Excel
Data analysis	Quantitative data analysis	SPSS, STATA
	Meta-analysis	Comprehensive Meta-Analysis (CMA)
	Qualitative data analysis	NVivo
Word processing	WP software	Word; OpenOffice Write
Revisions	Commenting software	DocTools
Dissemination	Presentation software	Powerpoint; OpenOffice Impress
Distribution	Report conversion/distribution software	Acrobat, Winzip

Avoiding common pitfalls

Seven mistakes are commonly made when reviewing the literature (Gall et al., 1996). These mistakes map to our SALSA framework (see Table 2.6).

You will find it helpful to review these common pitfalls at various stages throughout the planning and conduct of your own review.

Table 2.10 Common reviewer errors

Stage	Reviewer error
Search	Does not take sufficient time to define the best search terms and identify the best sources to use in review literature related to the topic
	Does not report the search procedures used in the literature review
AppraisaL	Relies on secondary sources rather than on primary sources in reviewing the literature
	Uncritically accepts another researcher's findings and interpretations as valid, rather than examining critically all aspects of the research design and analysis
Synthesis	Reports isolated statistical results rather than synthesising them using meta-analytic methods/*reports isolated themes or categories rather than examining the relationships between them*
	Does not consider contrary findings and alternative interpretations in synthesising quantitative *or qualitative* literature
Analysis	Does not clearly relate the findings of the literature review to the researcher's own study or the original review question

Items in italics are added to make this checklist applicable to diverse review types beyond the original context of meta-analysis.

SUMMARY

This chapter focuses on how to plan your review, frequently omitted from published guidelines for the review process. It offers useful frameworks for planning and tackling your own review. Far from shackling your creativity, paying attention to logistics early in your review offers you freedom to engage effectively with your data. Having removed anxieties and uncertainties about your direction of travel you will feel more able to liberate your imagination for synthesis and analysis.

Like all science, research synthesis is evolving and uncertain. For example, statistical methods for pooling and synthesising the quantitative results of different studies – **meta-analysis** – are steadily improving, though considerable challenges remain (Gurevitch et al., 2018). While early development focused on systematic reviews of evidence about healthcare interventions – drugs, treatments, technologies – the principles of **research synthesis** remain the same regardless of subject matter. This chapter has examined the relative advantages of systematic over more traditional approaches to reviewing the literature. It has identified the main stages in the review process. Systematic approaches to the literature can improve the clarity, validity and auditability of an otherwise well-conducted conventional review. The key steps of **search, appraisal, synthesis and analysis** (**SALSA**) help to characterise differences between types of review. Systematic approaches to the literature address three problems: the *underuse* or *misuse* of existing research and the *overuse* of limited or inconclusive findings (Rousseau et al., 2008).

Managing any review that follows systematic principles is complex and time consuming. As a reviewer you must pay close attention to initial planning. Established project management principles provide a good basis for both planning and managing the production of the review (Baker et al., 2010). You must consider planning, management, effective communication and stakeholder engagement. All these elements, if handled appropriately, will improve your potential to deliver a successful review in time and within budget, as well as enhancing the experience of the review team and the capacity of the hosting organisation. Of course, a lack of planning and management, poor mechanisms for communication and inappropriate engagement of stakeholders could ruin your review project. Project management is therefore a key element of systematic approaches to a successful literature review.

key learning points

- Systematic approaches to the literature attempt to offer greater clarity, internal validity and auditability.
- You can identify different types of review from how they undertake the four steps of search, appraisal, synthesis and analysis (SALSA).
- Planning a systematic review requires good project management skills.
- You should construct a project timetable around milestones and deliverables.
- It takes as much to plan for a review update as it does for a full systematic review and an update may prove equally demanding on resources.
- Software is available to help you with most stages of the review process.

frequently asked questions (FAQs)

FAQ 2.1 Should I always aim to be 'systematic' when conducting my literature review?

- Yes. We contend that all types of literature review should be systematic, to some degree. Any type of research should access an underpinning 'system'. The flexibility of the review method allows for different degrees of being systematic. An associated challenge relates to how you describe what you have done, especially where your methods are iterative and recursive. Describing what you looked for, what you found, what you did with what you found and what you conclude from this are shared characteristics of any review. Text, tables and diagrams are different ways to make your review appear more systematic – and your reader will benefit if you can communicate what you have done as explicitly as possible.

FAQ 2.2 If all reviews are 'systematic' should I call my review a 'systematic review'?

- By all means call your review a 'systematic review' if you have clearly followed a systematic review methodology, such as outlined by the Cochrane Handbook or Campbell Collaboration guidelines. Systematic reviews justifiably carry extra academic weight and are highly cited. However, this label must be earned and is not to be awarded carelessly. If you wrongly label your review a systematic review and it is not then it will receive a rough ride from editors, peer reviewers, supervisors and examiners. Choosing the most accurate label for your review ensures that it is viewed appropriately.

FAQ 2.3 Do I need a minimum amount of literature to conduct a literature review?

- The amount of literature you need to review depends upon why you are doing your literature review and what your intended audience is expecting. If your review is trying to establish whether *any* study has previously addressed your specific question then you have to demonstrate that you have conscientiously combed all likely sources and yet have not found any eligible study. Alternatively, you may need to show that you have looked in the right places by itemising studies that are almost, but not quite, what you were looking for. If your review is to support a particular decision then you may need to broaden your search beyond particular types of study or literature and look to include any relevant source of evidence.

FAQ 2.4 Must I only include high-quality literature or particular study types within my literature review?

- Again this depends upon why you are doing your literature review and what your intended audience is expecting. If your review is trying to establish definitively whether or not a particular intervention works, then simply adding inferior study designs or poor-quality papers is not going to advance this issue. Only good-quality studies will confirm or deny whether the intervention has an effect. In essence you are 'sieving out' inferior studies so that only good enough studies remain. However, if you are seeking an overall ('all-round')

(Continued)

picture of your focus of interest then even a poor-quality study may contain a 'nugget' of a valuable insight (see Chapter 7).

FAQ 2.5 Should I update an existing review?

- Updating a systematic review can be inefficient and introduce bias (Tsertsvadze et al., 2011; Takwoingi et al., 2013; Mayhew et al., 2015). However, a delayed update may delay introduction of an effective intervention or disinvestment from a policy or programme suspected as ineffective. Research teams have worked to identify when a review update is most likely to prove useful (Bashir et al., 2018). The appearance of a new includable study with more participants than previously analysed, or where the new study is larger than the largest previously included study, are clear markers. Less obviously a review update may prove useful where the confidence intervals are wide (indicating uncertainty) or where they cross the line of no effect, thus indicating genuine equipoise (i.e. an intervention and its alternative are equally likely to be effective and so neither represents a compelling choice).

FAQ 2.6 Will updating a review be cheaper than the original review?

- Updating a review is not significantly less resource intensive than a full systematic review. A review update is always dependent on the previously included studies and may also draw on the previous review methods. A review team may consider it necessary to re-execute the previous analysis. Where the quality of the previous review is uncertain, a review team may re-execute the entire review process, effectively conducting a more extensive systematic review covering the previous review period and all intervening years since completion. Your decision will be influenced by the criticality of the topic, the volatility of the discipline and uncertainties surrounding the previous verdict. Repeating a review to cover both former and current review periods, although expensive, does increase the confidence that the evidence is being handled consistently. Update searches should cover the time period from the date of last search, not from the date of publication of the review, preferably with an added margin to allow for database or indexing irregularities. You should examine search strategies for any changes or additions to search terminology. You can use included studies from the older review to validate new search strategies. A new search strategy should retrieve all the original included studies in addition to more recently published articles.

FAQ 2.7 What are the main things that could go wrong when conducting a review?

- Frequently topic experts underestimate how much literature is available or they may seek to expand the scope of the original review question. Finalising the review question and conducting the literature search often take longer than anticipated. Often a team may only work to external deadlines and omit the setting of internal deadlines. Production and formatting of the final report and assembling and checking of references often take longer than planned. You will find it useful to maintain standard review templates for reviews that are undertaken for a regular publication series.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Baker PR, Francis DP, Hall BJ, Doyle J & Armstrong R (2010) Managing the production of a Cochrane systematic review. *Journal of Public Health*, 32(3): 448–50.
One of the few items to focus on the project management of the review process.

Boote DN & Beile P (2005) Scholars before researchers: on the centrality of the dissertation literature review in research preparation. *Educational Researcher*, 34(6): 3–15.
Interesting perspective on the academic literature review and its role within a dissertation.

Petticrew M (2001) Systematic reviews from astronomy to zoology: myths and misconceptions. *British Medical Journal*, 322(13): 98–101.
An accessible introductory overview to the idea of systematic reviews and what they aim to do.

Pickering C & Byrne J (2014) The benefits of publishing systematic quantitative literature reviews for PhD candidates and other early-career researchers. *Higher Education Research & Development*, 33(3): 534–48.
A good starting point if you are yet to be convinced about the value of systematic reviews for your own research.

Randolph J (2009) A guide to writing the dissertation literature review. *Practical Assessment, Research and Evaluation*, 14: 13.
Useful tutorial paper on writing an academic literature review outlining pitfalls to avoid and offering a framework for self-evaluation.

Sayers A (2007) Tips and tricks in performing a systematic review. *British Journal of General Practice*, 57(545): 999.
An accessible 'How to' guide that includes some valuable know-how.

3

CHOOSING YOUR REVIEW METHODS

in a nutshell

How to choose your review methods

- Choosing the most appropriate review method to answer your question is a key task in the progress towards reviewing the literature.
- The activities of mapping, scoping and reviewing the literature are more than simple review labels. More usefully, they describe generic processes that contribute to many review methods, irrespective of their label, and it can be helpful to consider a combination of all three when contemplating your specific review topic.
- Five review methods comprise the stock tools (the survival kit) in your systematic approaches toolbox: the scoping review, the systematic review, the scoping meta-review, the review of reviews (overview); and the mapping review.
- Within the RETREAT mnemonic, your choice of synthesis method requires you to reconcile the topic (research question, type of data), the logistics (time, resources, expertise) and the context (epistemology, audience and purpose).

key terms explained

epistemology: the branch of philosophy concerned with knowledge; epistemologists study the nature, origin and scope of knowledge. Within the context of reviews it requires recognition of the assumptions about knowledge and what it is for that underpin different review types.

mapping review: maps out and categorises existing literature across a broadly defined topic from which to commission further reviews and/or primary research by identifying gaps in research literature.

RETREAT (Review question–Epistemology–Time–Resources–Expertise–Audience and purpose–Type of data): mnemonic for the seven factors that help you to choose a literature review method and thus determine the scale and complexity of your literature review.

scoping meta-review: seeks to fast-track the scoping review process by synthesising reviews rather than primary research studies. It shares many objectives of a scoping review in taking stock of the literature, looking for opportunities and identifying gaps, and by describing the literature rather than synthesising it.

scoping review: seeks to examine the extent, range and nature of research activity and the extent to which a topic is already addressed by research/systematic reviews; in order to determine the value of undertaking a full systematic review; to summarise and disseminate research findings; to identify uncertainties; and to identify research gaps.

INTRODUCTION

Your choice of review methods is determined by seven main considerations captured by the acronym, RETREAT:

1. Your **R**eview question
2. Your **E**pistemology (i.e. your view of knowledge and what it looks like)
3. The available **T**ime for conducting your review
4. Any **R**esource constraints within which you must deliver your review
5. Any requirements for specialist **E**xpertise in order to complete the review
6. The requirements of the **A**udience for your review and its intended purpose
7. The richness, thickness and availability of **T**ype of data within included studies.

Throughout this chapter we encourage you to advance with RETREAT!

If you had been conducting your review in the early days of evidence synthesis you would have viewed the process as a logical sequential series of steps. Each stage in the review process is completed in turn and each stage, in turn, determines subsequent steps of the process (Thomas et al., 2004). The review process resembled a production assembly line where each factory operative performs a specific function with little flexibility on how to deliver the product (PLOS Medicine Editors, 2007). Viewing the review process as a production line risks 'dumbing down' the reviewers' expertise and contribution. In contrast, 'systematic approaches' evoke the toolbox of the skilled craftworker where you, as reviewer, respond to certain cues that shape your review methods. These cues and choices derive from the review question, the available literature and what the 'customer' wants. They also reflect decisions made within the external environment. As a reviewer you choose from a toolbox of methodologies, methods and review types to deliver against the review's intended purpose. As a consequence, the review process is iterative and flexible, both in what is done and in the order in which certain procedures are carried out.

When we use the word 'system' we refer to an overall plan for how to deliver your review rather than a minute specification of individual procedures. This presents both an opportunity and a threat. You have a wider choice of available methods but you also run the risk of choosing

a method inappropriately. You must hold true to the overall aim of minimising the likelihood of bias (Kitchenham, 2004). Getting the balance right between rigour and relevance is the modern-day challenge faced when reviewing the literature (Laupacis & Straus, 2007). This chapter seeks to open up a choice of review methods while, at the same time, encouraging you to concentrate on those methods that are most common and most versatile.

ACKNOWLEDGING YOUR REVIEW CONSTRAINTS

We use our RETREAT mnemonic to remember the seven factors that help you choose a literature review method and thus determine the scale and complexity of your literature review (Booth et al., 2016; 2018b):

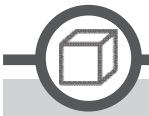
Review question – probably the most important determinant of your chosen literature review method. The literature review method must be appropriate to the type of question (Munn et al., 2018b). First, this requires that you establish whether your review is going to be descriptive (or aggregative) or interpretative (or configurative). Then, you need to decide whether the data required to answer the question need to be quantitative or qualitative or a mixture of both (also see **T**ype of data below). Finally, you must match the specific type of question to the most appropriate type of literature review method. Table 3.1 includes five common types of literature review and gives a typical question for each. (You may want to cover the right-hand column of the table with a sheet of paper and see if you can choose the right type of review for each.)

Table 3.1 Typical question types matched to review type

Typical question		Review type
1.	What are the main types of papers on <a specific focus of interest/event/happening> and where are the main research gaps?	Mapping review
2.	What is the extent, range and nature of <interventions> to achieve <one or more outcomes>?	Scoping review
3a.	How does <intervention/happening> compare with <alternative intervention/happening> in <a particular group> when measured by <outcome>?	Systematic review of effects
3b.	What are the attitudes/values/preferences of <a particular group> towards <a specific focus of interest/event/happening>?	Systematic review of qualitative research (qualitative evidence synthesis)
4.	What does the review-level literature tell us about the state of knowledge in this topic?	Scoping meta-review
5.	What do reviews report regarding the main results or findings relating to <a specific focus of interest/event/happening>?	Review of reviews (overview)

Epistemology (view of knowledge) – there are different ways to think about knowledge as captured in literature reviews. You can think of who owns that knowledge and therefore what is valued by that group; for example, the Social Care Institute of Excellence distinguishes between organisational knowledge, practitioner knowledge, policy community knowledge, research knowledge and user knowledge (Pawson et al., 2003). To value user knowledge alongside research

knowledge you might choose to undertake a participatory systematic review with multiple stakeholder iterations. Alternatively, you could choose a genuinely participatory review method such as **realist synthesis** (see Chapter 9). Different methods of literature review occupy different positions on an idealist–realist continuum (Gough et al., 2012). In practical terms we prefer to think about the type of knowledge as it specifically informs the literature review method. Therefore, we distinguish between the knowledge purposes identified in Box 3.1 (Schryen et al., 2015; 2017):



box 3.1

How will I use knowledge in my review?

- Will I be looking for shared patterns across a set of studies (Synthesis)?
- Am I seeking to use a set of studies to construct a different view of a focus of common interest (Adoption of a new perspective)?
- Will I construct a new explanatory theory from a set of studies (Theory building)?
- Will I apply an existing theory to a set of studies to see the extent to which it holds true (Theory testing)?
- Will I explore a focused set of studies to identify an opportunity for a specific research project (Identification of research gaps)?
- Shall I look at a broad set of literature to see where multiple opportunities for further research currently lie (Provision of research agenda)?

Time/Timeframe – 'How long does a literature review take?' is a 'how long is a piece of string?' type of question. This chapter presents timescales that range between 6 and 12 months for systematic approaches to the literature. Time/Timeframe refers to both the total time available to spend on your review and the timeframe within which you concentrate your activity. For example, three months' work may be performed by one researcher spending 25% of their time over one year or by six reviewers over a two-week period. When choosing an appropriate type of review you will need to consider your available time. Will you make your review manageable by reducing its scope or by fast-tracking some of the review stages? An acceptable dissertation literature review takes an estimated three to six months to complete (Gall et al., 1996; Hei & David, 2015). However, this estimate predates higher expectations of review conduct and reporting (potentially lengthening) and increased expertise and use of technology (potentially shortening the review period). Many review types now carry their own rapid variant (e.g. rapid realist synthesis, rapid qualitative evidence synthesis, rapid evidence assessment). Rapid evidence assessments, which abbreviate time spent on quality assessment and synthesis, may take as little as 8–12 weeks. One of us was involved in the first ever rapid Cochrane Qualitative Evidence Synthesis which took just 25 days from commissioning to publication (Houghton et al., 2020).

Resources – When time and other resources are restricted then you might undertake a rapid review where you limit some aspect of the review; for example, breadth of review question, sources searched, data coded, quality and relevance assurance measures, and depth of analysis (Government Social Research Unit, 2008; Abrami et al., 2010). However, if you make too many concessions and compromises you undermine the rigour of the resulting review (Gough et al.,

2012). Under resource-constrained circumstances you should make absolutely clear which elements of your review process remain 'systematic', and which have to drop any such pretence, as well as describing clearly any resultant limitations:

> If rigor of execution and reporting are reduced too far then it may be more appropriate to characterize the work as non systematic scoping rather than as a systematic review. (Gough et al., 2012)

As we shall demonstrate, even if resources are limited you can demonstrate that your scoping review is systematic. Indeed, the extra time and effort that a systematic (as opposed to non-systematic) scoping search and scoping review require can yield dividends (Levac et al., 2010). Not only might it prove easier to communicate what it covers, but also it will strengthen the certainty of its findings, offering a potential launch pad for a subsequent systematic review, if required.

Expertise – Most stages of a systematic review may be carried out by a researcher with a basic education in research skills. However, other processes may require specialist input. Those that immediately come to mind include information specialist expertise to support literature searching, statistics for meta-analysis and skills in data analysis for a qualitative review. Once these needs are identified, the reviewer faces several choices: to add a specialist to the team, to access the expertise on a selective 'need to know' basis, to acquire the skills themselves or to 'bypass' problematic parts of the process. All these strategies carry implications for resources or for the quality of the review. For example, selective access to specialists presumes that a reviewer knows exactly when and why to draw on this additional experience. Accessing a specialist too early may mean that you cannot articulate the information that they require to provide advice. On the other hand, accessing expertise too late may miss a window of opportunity or require repeating of tasks. Circumventing problematic parts of the process may simply be deferring criticism and storing up subsequent problems for either external review or for the peer review stage of the publication process.

Audience and purpose – Increasingly, we have identified a need to start from what the intended audience for the literature review requires and then to 'reverse engineer' the subsequent shape of the review. Time and resource constraints can therefore be managed by planning your available resources backwards from this starting point. At first sight the requirements of the audience may appear simply to restate the purpose of the review. However, these are two fundamentally different considerations.

To illustrate, if you are selecting a particular review topic for a PhD your choice may be determined by personal interest, supervisor support or available funding – preferably a combination of all three factors. However, your supervisors are not the primary audience for your review. Your examiners are! Of course, you can use your supervisors to help you understand what your examiners are looking for. So, what do your examiners expect from your review, and indeed, more generally, from your thesis as a whole? Your thesis should showcase work of publishable quality. Your review should adhere to appropriate **reporting guidelines** (see Chapter 10). A thesis should also contribute new insights or understandings to your chosen area of investigation. While these new insights will not necessarily originate exclusively from the literature component of the thesis, as any primary research or data analysis will also contribute, your literature review should identify what is already known about the topic and which questions remain to be answered. Your examiners will want to see an auditable link between the work of

others and your own contribution. They will not simply expect a descriptive map of what has gone before but will require some analysis with the potential to reveal new insights. After all, you may be the first person who has ever brought this particular set of studies together side by side in juxtaposition! What patterns can you identify from the literature that you have so carefully assembled?

Similarly, when we conduct a review for an external commissioner we find ourselves going beyond the actual review question to try to understand what decision problem the review is expected to resolve. For example, if a funder is trying to decide whether to introduce a new policy or programme they are often not interested in *all possible solutions* to the problem being addressed. Typically, they want to know how their proposed policy or programme performs compared with other alternatives. Evidence that compares their candidate policy with other options is most useful for their decision problem. Evidence comparing two different alternatives, or evaluating an alternative policy in isolation, is of less interest to them. We can therefore plan our review resources and effort accordingly. Of course, if the commissioners genuinely do not have a preferred policy or programme then we might conduct a broad scoping search to identify alternatives that have been tried and then work with them to agree criteria (e.g. local feasibility or acceptability) by which to narrow down these alternatives to a shortlist of interventions for detailed review.

Type of data – This relates to the quality, quantity, thickness, and richness (Popay et al., 1998) of the data – systematic approaches to reviewing the evidence are collectively flexible enough to accommodate all types of data. However, the actual choice of method is determined by the characteristics of the literature, whether quantitative or qualitative, to be included. Quantitative reviews carry an overall requirement that the retrieved literature presents a finite number of important outcomes, measured using common measurements or scales, across a sufficient number of studies that have investigated the same research question using a similar enough research design (Tseng et al., 2008).

Where studies demonstrate variation rather than similarity a reviewer may seek to explore reasons for this variation, rather than exploring the results of the studies themselves. So, for example, if identified studies have all measured educational attainment using a common scale then statistical pooling using meta-analysis becomes possible. If the studies have measured educational attainment using different scales that are sufficiently similar and that reveal a common overall pattern of effect, then you will be able to conduct mapping across studies. If, however, the scales used differ in their underpinning rationale or the results of such measurements are so disparate that they provide conflicting conclusions then the review must be more descriptive (e.g. a narrative synthesis). A review containing such contradictions may well focus on possible methodological explanations for such differences.

Sometimes no clear evidence exists simply because primary studies did not include the outcomes of interest (Petticrew, 2003). In public health, in particular, the problem often seems to be an absence of evidence rather than evidence of absence of effect. This is partly because few studies have evaluated the outcomes of social interventions, including policies, and even fewer measure health outcomes.

Qualitative reviews require that the data contained within retrieved literature is *contextually* thick (i.e. in terms of helping us to understand what is happening). Furthermore, the data itself will optimally be *conceptually* rich to help us suggest why the particular focus of interest is occurring (Booth et al., 2013b). If the literature is characterised by thin levels of detail

we may be able to describe how frequently a particular focus of interest, or specific themes, occur and describe this via narrative synthesis (e.g. text and tables) but we may not be able to explain any variation. If the literature lacks detailed theorising then we may have to look further afield to separate wider bodies of literature in order to provide explanation or simply describe what we have observed and leave detailed explanation to those who actually use the review's findings.

From the above we see that narrative synthesis, which essentially describes or displays the characteristics of the literature, is a versatile tool that provides an 'entry'-level approach for most types of evidence synthesis. Typically, you identify patterns from the data or generate hypotheses by using simple forms of synthesis, such as tabulation in quantitative reviews or thematic synthesis in qualitative reviews. However, to go beyond this, in seeking conclusive results or explanations, you need data to be rich, plentiful and of high quality.

A GENERIC PROCESS FOR PLANNING YOUR REVIEW

We have already identified that mapping, scoping and systematic reviewing are distinct processes for analysing the literature. Confusingly, 'mapping' and 'scoping' are labels attached to review outputs: the '**mapping review**' and the '**scoping review'**. However, mapping, scoping and systematic reviewing are not mutually exclusive – they may be combined within the same review. For example, a **review of reviews** (**overview**) includes elements of mapping (in charting what existing reviews are already out there) and systematic reviewing (in taking stock of the results of each of those reviews). An optimal review process includes mapping, scoping and systematic reviewing: mapping to make sense of the field, scoping to set boundaries for the review question and systematic review to explore the results of studies meeting the predetermined criteria (Rebelo Da Silva et al., 2017).

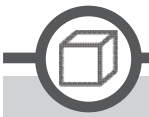
Briefly, we characterise these three generic processes below:

Mapping – making sense of the field – involves engaging with the literature at a broad level. The expression 'helicopter view' captures the fact that we want our overview of the literature to see what is there and what is not there. You want to 'land' where the literature is not overly populated by landmarks (other reviews) but where the ground is sufficiently supported by primary research studies. In short, we are interested in both 'synthesis gaps', where few if any reviews exist, and 'research gaps', where future research might be commissioned (including your own PhD!) (Hempel et al., 2019). Mapping of a topic may be equally useful to others. A topic map may be published alongside a subsequent systematic review or as a separate mapping review (Saran & White, 2018).

Scoping – setting boundaries for the review question – involves optimising the focus of your enquiry so it is both meaningful and feasible. You could liken your role in scoping to the architect who lays out the outline of a planned building to see how it is orientated and to demonstrate that it will fit within the available space. Difficult decisions may be involved when choosing what will be included within, or excluded outside, the boundaries of your final role. The scoping process is not trying to supplant or subvert the final review. Scoping does not typically quality assess the included studies (except perhaps when building on the quality of an existing systematic review) but describes the quantities and study designs of potential 'includes'. Scoping does not attempt to 'model' the subsequent systematic review on a small scale although it does allow you to estimate logistics for the task ahead. Neither

does scoping focus on the results of the studies – being more interested in their existence and their coverage. When performed well a scoping review may save descriptive data extraction for any studies identified during scoping. However, scoping is best regarded as a separate activity in its own right, perhaps even generating a scoping review publication.

Reviewing – exploring the characteristics of included studies – involves taking stock of the literature that falls within the scope of your review and meets the eligibility criteria. Reviewing can be descriptive – perhaps categorising studies by study type, country of origin, demographic characteristics of the population, the specific nature of the intervention and the outcome measures and tools used. These descriptive characteristics frequently recur across reviews. Alternatively, reviewing can be analytical – characterising the included studies according to some feature that may be variable and therefore partly explain some of the variation across studies. So, for example, a review might extract data on the context and general state of health of the population, the dosage or mode of administration of interventions or the components of programmes, the exact outcome results or the accurately worded verbatim accounts from the participants. In practice, reviewing will include both descriptive and analytical elements, meaning that part of your data extraction form will be standardised and part will be tailored to each review. Any issue not addressed or answered by the review becomes a specific recommendation for further research.



box 3.2

What do we mean by scoping?

Scoping is an exploratory process of assessing the literature for its likely quantity and quality. It has four principal functions: methodologically it helps in determining appropriate review methods (Chapter 3); logistically it allows you to estimate how much time, money and reviewer effort is needed for a specific review (Chapter 2); conceptually it facilitates decisions on what type of topics are to be included/excluded from a subsequent review (Chapter 4); and practically it helps in identifying terms and synonyms to be used in the literature searching phase (Chapter 5). Scoping may be carried out at several stages in the review process: for example, when preparing the funding application or in finalising the review protocol and commencing the full systematic review process. A particular type of review, the **scoping review**, embodies the scoping process as the main deliverable.

OUR 'SURVIVAL KIT' OF REVIEW OPTIONS

At this point you may feel overwhelmed by all the options at your disposal. The good news is that we can reduce an almost bottomless toolbox to five main options that cover most of your reviewing needs – our 'survival kit'. The relationship between these options is captured in Figure 3.1. These five options can be applied to the quantitative literature, the qualitative literature or both. We can review primary studies or secondary reviews/syntheses. A further variation of review methods, the mixed methods review, is discussed in detail in Chapter 9.

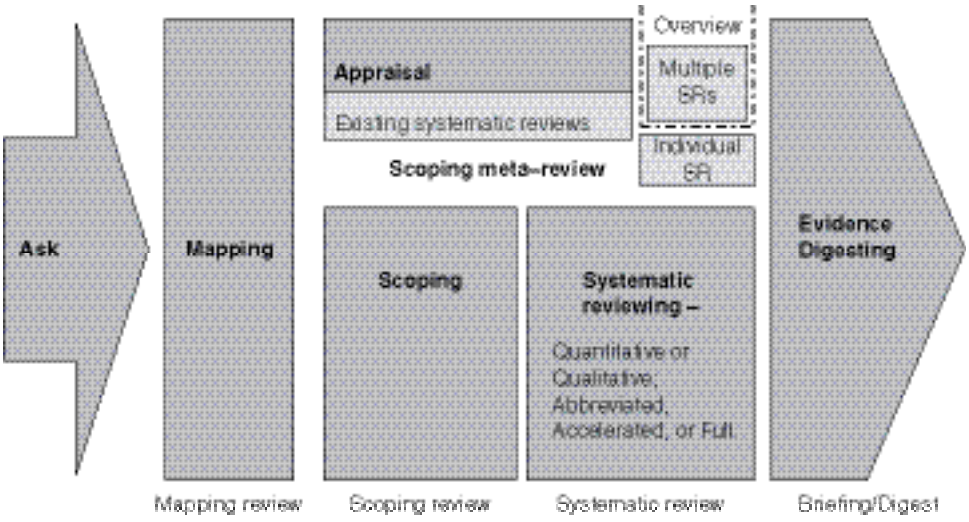


Figure 3.1 AMASSED schema for summary and synthesis

The five key options are labelled in Figure 3.1:

Mapping review

Scoping review

Systematic review

Scoping meta-review

Review of reviews (overview)

Of these five options, the scoping meta-review is a hybrid review type being a scoping review of reviews, not employing distinctive review methods as such, but simply applying scoping review methods to reviews rather than to the primary literature. Table 3.2. not only briefly describes each review type but characterises the requirements of each (from 1 to 3) in terms of reviewer expertise, information expertise, time and resources. We then review each option in turn in more detail.

Mapping review

When approaching a topic for the first time it is helpful to start with a mapping review. The purpose of a mapping review is to map out existing literature with a view to planning a more detailed review. Typically, a mapping review has three principal objectives:

- to provide an overview of a research area to assess the existing evidence;
- to identify gaps in sets of primary studies, where new or better primary studies are required;
- to pinpoint specific knowledge gaps where more complete systematic literature reviews might be required.

Table 3.2 'Survival Kit' of five review options

Review type	Definition	At a glance		Key Reference
1. Mapping review	Maps out and categorises existing literature from which to commission further reviews and/or primary research by identifying gaps in research literature	Reviewer expertise		James KL, Randall NP & Haddaway NR (2016) A methodology for systematic mapping in environmental sciences. *Environmental evidence*, 5(1): 7.
		Information expertise	ⓘⓘ	
		Time		
		Resources	£	
2. Scoping review	Conducts preliminary assessment of potential size and scope of available research literature. Aims to identify nature and extent of research evidence (usually including ongoing research)	Reviewer expertise		Peters MDJ, Godfrey C, McInerney P, Munn Z, Tricco AC & Khalil H (2020) Chapter 11: Scoping Reviews. In: Aromataris E & Munn Z (eds), *JBI Manual for Evidence Synthesis*. Available from https://synthesismanual.jbi.global. https://doi.org/10.46658/JBIMES-20-12
		Information expertise	ⓘⓘ	
		Time		
		Resources	£	
3. Systematic review	Seeks to search systematically for, appraise and synthesise research evidence, *using strategies to limit bias* often adhering to guidelines on the conduct of a review	Reviewer expertise		Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ & Welch VA (eds), *Cochrane Handbook for Systematic Reviews of Interventions*, version 6.2 (updated February 2021). Available from www.training.cochrane.org/handbook.
		Information expertise	ⓘⓘⓘ	
		Time		
		Resources	££	
4. Scoping meta-review (SMR)	Combines a scoping review with a meta-review to establish an evidence-based map. As with a scoping review, an SMR offers a practical and flexible methodology but it only includes systematic reviews	Reviewer expertise		Sarrami-Foroushani P, Travaglia J, Debono D, Clay-Williams R & Braithwaite J (2015) Scoping meta-review: introducing a new methodology. *Clinical and Translational Science*, 8(1): 77–81.
		Information expertise	ⓘ	
		Time		
		Resources	£	
5. Review of reviews (overview)	Undertakes summary and synthesis (meta-review) of multiple reviews (systematic or otherwise) that attempt to survey the literature and describe its characteristics	Reviewer expertise		Pollock M, Fernandes RM, Becker LA, Pieper D & Hartling L (2021). Chapter V: Overviews of reviews. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, & Welch VA (eds), *Cochrane Handbook for Systematic Reviews of Interventions*, version 6.2 (updated February 2021). Available from www.training.cochrane.org/handbook.
		Information expertise	ⓘⓘ	
		Time		
		Resources	£	

Table 3.3 SALSA profile for a mapping review

SALSA stages	Steps required by the method	Explanation
Preliminaries	Establishing review team and engaging stakeholders	Extensive preparatory work assembling right expertise and appropriate scope
	Setting scope and question	
	Setting inclusion criteria for studies	*[Publication of a protocol is good practice, not mandatory, for a mapping review]*
	Scoping studies	
	Protocol development and publication	
Search	Searching for evidence	Extensive searching, screening and coding comprises principal stage of review process
	Screening evidence	
	Coding	
	Production of systematic map database	Systematic map database first of two key deliverables of mapping process
AppraisaL	Critical appraisal (optional)	Findings from included studies not usually used to inform action
Synthesis Analysis	Describing and visualising the findings	Synthesis and analysis intertwined and depend on functionality of map database
	Report production and supporting information	Second key deliverable is report

For map as primary product often labelled 'evidence map' or 'systematic map'; where review is primary output labelled as 'mapping review'

Source: Based on James et al. (2016)

A **mapping review** for a PhD can identify sub-topics that are already well covered by the literature (to minimise duplication and research waste), help you to summarise what is already known and enable you to identify gaps that you might target with your own literature review, systematic review or primary research.

> A mapping review is like using a magnetic compass – you drop it down in the centre of your topic and assess the lie of the land in each direction. Which directions look to be most productive and which look like a possible dead end?

For a funding agency or a charity, a mapping review can help in planning a research agenda and in taking stock of an evidence base. So, for example, we conducted a systematic mapping review for the charity Epilepsy Action on the role of the Epilepsy Specialist Nurse (ESN). We mapped different publications on the ESN role against a framework of 14 sub-roles. Epilepsy Action could therefore identify how much evidence underpinned each of the sub-roles and where gaps in the research need to be filled. You can use a mapping review to prepare for a future **scoping review/systematic review** (see Figure 3.1) or as an output in its own right. Methods of a mapping review have been described thoroughly within the context of environmental science (James et al., 2016).

Scoping review

Having identified where opportunities lie, in terms of reviewing the literature of a particular topic, you will find it helpful to explore where the boundaries of your topic lie. Cast your net too wide and you will drown in the available literature, keep your focus too narrow and you may find little to inform your topic and may overlook important lines of enquiry. A scoping review is a type of literature review to help inform these decisions (Peters, 2020a; 2020b). Typically, a scoping review fulfils multiple purposes:

- **conceptually**, a scoping review helps you to decide on which elements of your topic to focus your energies and which you can acknowledge briefly or even ignore entirely;
- **methodologically**, it helps you to get a feel for the quantity and quality of literature that is available in your topic and to narrow down your review options to appropriate methods;
- **logistically,** it helps you to decide whether you will be able to manage the quantity of literature within your available time and resources or whether you need to revise your plans;
- **topically**, a scoping review helps sensitise you to the literature in the field so that you recognise the main patterns and landmarks in your topic.

The SALSA profile for a scoping review is found in the Preface (Table 0.1). A scoping review for a PhD can help you to mark boundaries around your chosen topic so that you know where to focus your efforts over the course of your programme of study. A small yet perfectly formed and completed topic is so much more valuable than a sprawling half-completed one. Guidance exists to help you to choose between a systematic review and a scoping review (Munn et al., 2018a; 2018b).

> A scoping review is like using a geometric compass – you pinpoint the central focus of your topic and then you look at the implications of changing the radius of your compass. Will I end up with too much literature or will I miss potentially relevant and useful data? Should I go narrower or should I go broader?

For a funding agency or a charity, a scoping review can help to plan a follow-up systematic review with a degree of confidence that you know what the literature looks like and what is feasible in the given time. So, for example, we conducted a systematic scoping review for the British Association of Counselling and Psychotherapy on how patients view the 'therapeutic relationship'. We identified as many qualitative research studies on the topic as we could. We characterised these by type of therapy, type of population and descriptive qualities, such as country of publication and type of qualitative research. The charity could therefore be confident that the topic is viable for systematic review and could decide which countries and populations to include and over what time period. You can use a scoping review to prepare a future systematic review (see Figure 3.1) or as an output in its own right. We describe the methods of a scoping review in detail in Chapter 4. For the moment you should read the article by Arksey and O'Malley (2005).

Systematic review

Recommendations for practice or future research are best underpinned by the most reliable and rigorous data and review methods that you can achieve in the available time. Such rigour comes at a cost. Systematic reviews are time intensive so you have to concentrate your systematic

reviewing efforts on that area where you are most likely to make an impact. Ideally, you have used a mapping process (or, even, **mapping review**) to identify where this 'tipping point' lies. You have then used a scoping process (or, even, **scoping review**) to fix the boundaries of your systematic review to something that is manageable and meaningful. Now you are ready to start thinking about a systematic review. Chapters 4–10 take you in detail through this process. For the moment it will suffice to emphasise that the main point of conducting a systematic review is to minimise potential bias. A systematic review is defined as: 'The application of strategies that limit bias in the assembly, critical appraisal, and synthesis of all relevant studies on a specific topic. Meta-analysis may be, but is not necessarily, used as part of this process' (Porta, 2014). Strategies used to limit bias within a systematic review help to build the confidence of those who have to use the results of the review and to deflect potential criticism that the results are not trustworthy.

A systematic review for a PhD offers a major platform for the remainder of your programme of study. However, the amount of time that conducting a systematic review requires means that you will have to use literature review strategies that are less robust to cover all the other productive strands of literature that your doctorate requires. So, for example, if you are going to systematically review the methodology literature this will be at the expense of the topic-focused literature.

> A systematic review can serve as a platform for future research or action. Unlike mapping reviews and scoping reviews which describe the literature, a systematic review can help resolve uncertainties. Can we implement a course of action based on a review of the evidence or is more research required?

For a funding agency or a charity, a systematic review can help to drive forward a programme or to avoid further expenditure in areas that are ineffective. However, the organisation has to decide how good an answer it wants in the available time. The organisation may negotiate a rapid review, which takes methodological shortcuts from the systematic review method, to provide an answer earlier than would otherwise be possible. So, for example, we conducted a **rapid evidence assessment** for the Home Office on the effect of alcohol prices on crime (Booth et al., 2011). Instead of undertaking a detailed quality assessment of each included study we reported the generic limitations of the two main methods of researching the topic. The Home Office could therefore form an overall judgement about the quality of the included evidence in the knowledge that some included studies are weaker than others. A systematic review is expensive and labour intensive so it would be rare not to publish the final outputs as a formal publication, whether a journal article or within a report series.

Scoping meta-review

Up to now we have focused on situations where there is sufficient published research to undertake a review but where the topic is not already well covered by an existing review. Increasingly, however, plentiful reviews exist within a topic area. Under such circumstances it makes sense to start by reviewing existing reviews rather than plunging straight into the primary research literature. (In fact, many commentators suggest that you should *always* start any topic by looking at the existing review literature.) A scoping meta-review seeks to fast-track the scoping review process by synthesising reviews rather than primary research studies. The scoping meta-review

therefore shares many objectives of a scoping review in taking stock of the literature, looking for opportunities and identifying gaps (Perry et al., 2018). The important element of 'scoping' seen in the label 'scoping meta-review' focuses on describing the literature rather than synthesising it. So, a scoping meta-review is more about getting a picture of the overall literature than what that literature means. Of course, it may act as a prequel to engaging with the findings of the literature as indicated in Figure 3.1 (in moving to conduct an overview) but it usually represents an interim stage after which the reviewer takes stock of the evidence they have found.

A scoping meta-review for a PhD offers a fast-track route into the literature on a topic. Essentially, it resembles a speeded-up guided tour of the literature. You run the risk of missing an isolated study that has essentially achieved what your own PhD seeks to do. Conversely, if many studies exist then you find this out quickly and can then shift your programme of work speedily to complement them, build on them or systematically improve them.

> A scoping meta-review is like a speeded-up guided tour of a topic area. You will be able to form a picture of a topic area, particularly if it is well covered by the literature, in a fraction of the time that a full review would take. However, you may miss important detail because of this speed. Ideally, you should complement a scoping meta-review with a more forensic look at the precise sub-topic that you plan to explore, optimising breadth *and* detail.

For a funding agency or a charity, the benefits of a scoping meta-review mirror those of a mapping review and scoping review of the primary literature. Scoping meta-reviews are attractive because their added breadth is particularly appropriate if a funder is moving into a new area. They offer added value in that you can repurpose reviews included within the scoping meta-review to identify relevant studies for a rapid review, thus accelerating the review process. However, when you conduct a scoping meta-review you are dependent on how well previous reviewers have undertaken their reviews. If these reviews were conducted poorly then any 'head start' is lost. We conducted a scoping meta-review for a National Institute of Health Research review on group clinics. We were able to map the included studies from the identified reviews to see to what extent the same set of studies appeared again and again within the different reviews. There are no formal standards for conducting a scoping meta-review. However, the procedures are similar to those for an overview (see following) except the emphasis is on *describing* the included reviews, *not interpreting* them. Furthermore, formal quality assessment of the reviews is not usually required within the scoping process although you may decide to undertake this, subsequently.

Review of reviews (overview)

Just as a scoping review helps in preparing for a systematic review a scoping meta-review (above) is often preparatory for a review of reviews (overview). Again, what you can achieve through a scoping meta-review depends on the quality and characteristics of the contributing reviews. Although the terminology of 'reviews of reviews' (overview, umbrella review, etc.) is largely interchangeable we try to distinguish between some important characteristics. In some instances, the same organisation may produce a set of reviews to a common standard and set of procedures (e.g. the Cochrane Collaboration, the Campbell Collaboration, the Joanna Briggs Institute (JBI) nursing collaboration, etc.). We typically label these 'umbrella reviews'

(Fusar-Poli & Radua, 2018) – to evoke the standardised spokes ('stretchers') that make up a literal umbrella. More typically, however you are faced by diverse reviews of different degrees of systematicity for which you need to summarise their coverage and findings. This would be a 'review of reviews'. If all the included reviews are sufficiently systematic then you can describe your output as a 'review of systematic reviews'. If your own approach to these systematic reviews is sufficiently systematic (in terms of search methods, appraisal processes and synthesis techniques) then your own output becomes a 'systematic review of systematic reviews'. Put simply, however, the overall term is the 'review of reviews' and the other terms mentioned above are specific labels to tell you more about the contents of this review.

Reviews of reviews (overviews) are often conducted within a rapid review (see scoping meta-review above) – but in topics with good reason to believe that many reviews already exist in the topic (Hunt et al., 2018). So, for example, a comprehensive search of 12 health-related databases identified more than 30 reviews evaluating how nurse and midwife-led interventions impacted upon clinical outcomes, within an ongoing study of the impact of advanced nurse practitioners in Ireland. Put simply, a review of such reviews aims to summarise evidence from multiple systematic reviews at diverse levels, including the combination of different interventions, different outcomes, different conditions, problems or populations, or the provision of a summary of evidence on the adverse effects of an intervention (Smith et al., 2011).

REVIEW CHOICE SCENARIOS

Below we present realistic scenarios, based on real-life reviews but fictionalised for instructional purposes, so that you can practise choosing appropriate review methodologies. In each case read the section 'What are you aiming to do?' and see if you can isolate clues to potential review types. Then review the factors that we have isolated as informing your choice ('What factors influence your choice?'). Finally consider our suggested choice(s) ('What choice(s) might you make?'), particularly trying to understand why we have rejected alternative labels or choices for this particular scenario. We have provided references on which each scenario is based should you wish to follow up a particular example.

Scenario A – Coding and categorising a sample from the literature

What are you aiming to do?

You want to understand how flooding impacts upon mental health. Evidence will come from quantitative and qualitative studies of diverse study designs. Your readers will want you to demonstrate that you have gathered together a representative sample of how the topic has been researched and that you have identified the main themes to emerge from the research. However, you do not need to perform a comprehensive and exhaustive search of every instance of their use. Optimally, you want to create a framework that depicts the main types of impact of flooding on mental health. The main output from your review requires that you categorise the main types of impact together with how these have been evaluated using quantitative and/or qualitative methods. The resulting framework may help future researchers to plan how they will analyse future research studies and may even apply to other natural disasters. This is an extensive piece of research and the timespan (publication dates) covered will depend on what you are able to manage in the available time.

Table 3.4 SALSA stages for the five reviews included in the 'Survival Kit'

Review type	Preparation	Search	Appraisal	Synthesis	Analysis	Conclusion
1. Mapping review	Establishing review team and engaging stakeholders Setting scope and question Setting inclusion criteria for studies Scoping studies Protocol development and publication	Searching for evidence Screening evidence Coding Production of systematic map database	Not usually required	Describing and visualising the findings		Report production and supporting information Reporting according to modified PRISMA-ScR (tentative)?
2. Scoping review	Clarifying and linking the purpose and research question	Balancing feasibility with breadth and comprehensiveness of the scoping process Using an iterative team approach to selecting studies and extracting data	Not usually required	Incorporating a numerical summary and qualitative thematic analysis	Identifying the implications of the study findings for policy, practice or research	Adopting consultation as a required component of scoping methodology Presentation of results Summarising evidence in relation to purpose of review, making conclusions and noting any implications of the findings Reporting according to PRISMA-ScR
3. Systematic review	**Planning review:** Identify need for review Prepare proposal Develop review protocol Reporting according to PRISMA-P	Comprehensive search for relevant primary studies Select studies: include all primary studies that fulfil eligibility criteria	Assess risk of bias of included primary studies Extract data and monitor progress	Synthesise results across included primary studies for each important outcome using meta-analyses, network meta-analyses and/or narrative summaries.	Conduct meta-analysis or construct theories, frameworks or models, as appropriate	Report and disseminate Reporting according to PRISMA reporting guideline Get evidence into practice

(Continued)

Table 3.4 (Continued)

Review type	Preparation	Search	Appraisal	Synthesis	Analysis	Conclusion
4. Scoping meta-review	Undertaking a preliminary non-systematic review	Building a search strategy Interrogating academic literature databases Classifying and excluding studies based on titles and abstracts Saving the refined database of references Revising the search strategy	Not usually required	Selecting and reviewing the full text papers	Thematically analysing (coding and mapping) the selected texts	Writing the report Reporting according to modified PRISMA-ScR (tentative)?
5. Review of reviews (overview)	Describe topical and methodological inclusion and exclusion criteria Study design of interest is the systematic review (SR)	Comprehensive search for relevant systematic reviews Include all systematic reviews that fulfil eligibility criteria	Assess methodological quality/risk of bias of included systematic reviews Also report risk of bias assessments for primary studies contained within included systematic reviews	Summarise and/or reanalyse outcome data that are contained within included systematic reviews		Report the assessments presented in SRs, if possible. Otherwise, consider assessing certainty of evidence using data from SRs Reporting according to PRIOR (Preferred Reporting Items for Overviews of Reviews [in development]

What factors influence your choice?

Your review is primarily descriptive. Your team is more interested in what has been done and how it has been done, rather than in what the findings are. You intend to create a typology or interpretive framework but not to sample the literature comprehensively – essentially to create a time-limited snapshot of activity. You will code and classify the literature, allowing you to conduct further analysis at a subsequent stage if desired. Your team does not seek an in-depth synthesis of the contents of each included article. Indeed if the sample of literature is to be adequately representative then the team is unlikely to have time to examine all sampled studies in depth.

Suggested answer: Scenario A – Mapping review

What choice(s) might you make?

Clearly you do not require a sophisticated interpretive method to undertake this review. Analysis will likely be superficial, except for problematic examples where the review team might need to reach consensus on how they are labelled and whether they require a new category. Once a category exists, however, it is a fairly rapid process to slot articles into existing categories. You are not examining the actual results of included studies so this is not a **rapid evidence assessment**. Neither are you reviewing the literature with a view to defining the scope of a planned future review – so this is not a **scoping review**. Essentially you are mapping out the field within a predefined scope and sample. Mapping includes characterising the sample (hence the use of categories) and then depicting the frequency or percentages of the categories in either tabular or graphical form (e.g. via a pie chart). This approach does not rule out the chance of in-depth review of either the entire dataset or a subset of particular interest but, unlike a scoping review, this is not a primary focus. This is therefore a (systematic) **mapping review.**

Scenario adapted from: Fernandez et al. (2015).

Scenario B – Examining whether a potential review topic is feasible

What are you aiming to do?

Your research team wants to decide whether it is feasible to perform a systematic review of randomised controlled trials of personal health records. What does the evidence base look like? Do sufficient randomised controlled trials exist in this area? What specific aspects of personal health record systems do they address? You need to search the key databases to estimate what is available. However, as any subsequent systematic review would attempt to identify all relevant studies it is not critical to identify every study at this stage. You simply want to find out if eligible studies are relatively plentiful (e.g. are there at least 6–10 candidate studies?) and, if not, what are the implications of reviewing the evidence from low quality comparative studies (e.g. **cohort studies** or **case–control studies**)? Your review will not necessarily result in a peer-reviewed publication in its own right. You might make it made available as grey literature or use it as a basis for a grant application.

What factors influence your choice?

You are seeking to gauge the quantity and quality of studies in a particular topic area. Initial information from this process may help you to decide which settings, populations, interventions, comparators, outcomes and study designs will be included or excluded. Inclusion and exclusion may also be determined by what time and resources you have available. You may have to tailor your plans to fit your resources. Your investigation may or may not be subsequently written up and/or published. It will likely inform a subsequent review.

Suggested answer: Scenario B – Scoping review

What choice(s) might you make?

Although there is an element of 'mapping' about this review, your main purpose is to establish feasibility rather than to characterise the literature conceptually. Essentially your scoping searches may or may not become a formal publishable **scoping review**. Increasingly, however, researchers publish their scoping reviews and, indeed, may publish their intended methods for a subsequent systematic review within a **review protocol**. This is therefore a scoping review.

Scenario adapted from: Archer et al. (2011).

Scenario C – Arriving at a bottom line of 'effect'

What are you aiming to do?

Your educational research team wants to establish whether providing breakfast to schoolchildren impacts on attendance at school and subsequent academic performance. Your preliminary look at the literature has identified randomised controlled trials and observational studies that have examined these outcomes. The few studies you have found to date share a limited number of outcome measures (e.g. attendance rates and improvement in academic performance). You want to integrate the results of such studies and arrive at an overall bottom line of whether providing breakfast 'works'.

What factors influence your choice?

This review offers possible quantitative outcome measures which appear broadly comparable. At least some randomised controlled trials are known to exist. Although the included studies may examine different populations and different contexts, the outcomes and the measures used appear broadly comparable. Essentially this is an effectiveness question requiring an overall summation or bottom line of effectiveness.

Suggested answer: Scenario C – Systematic review with meta-analysis

What choice(s) might you make?

Clearly if you are to provide an unbiased estimate of effect you will want to take systematic steps to ensure that you identify all relevant studies, that you take into account any differences in

study quality and that you communicate explicitly to your potential audience what you have and have not done and which studies are included or not included. Clearly too, an incomplete or imperfect answer might lead to flawed decision-making and unwarranted expenditure. All of these factors confirm the need for a conventional **systematic review**. However, this particular data set seems to offer additional potential. The apparent **homogeneity** of the outcome measures and their presence as quantitative measures that might be standardised and pooled offer the potential for meta-analysis. At this early stage of the project we can plan for a systematic review with meta-analysis. If, subsequently, the study outcome measures are sufficiently different to make combining them problematic or not meaningful then we can backtrack and produce a systematic review with a narrative summary and tabulation of results. This is therefore a systematic review with meta-analysis**.**

Scenario adapted from: Rampersaud et al. (2005) and Murphy (2007).

Scenario D – Bringing together qualitative data into a classification or taxonomy

What are you aiming to do?

Your research team is examining reasons that women give for having an abortion. You plan to use a predefined 'secure' definition of abortion to avoid issues around different perspectives on abortion and how abortion is defined. At this stage you will only include studies containing qualitative data. However, you want to keep the option open to integrate data from quantitative studies at a later date if required. You will use a qualitative approach to categorise reasons, methodologically according to how they were generated (e.g. by survey, focus group, personal interview, etc.). You will summarise data about research aims, samples and methods of each included study. Then you wish to summarise included data according to 'clusters' of shared associations (e.g. a cluster of factors relating to the individual, a cluster of factors relating to the environment, and so on). Where factors use different wording to convey the same meaning or similar wording for different concepts you will refine the taxonomy or classification to keep the categories and sub-categories exhaustive and yet parsimonious. The team will discuss and resolve debates over how to classify studies and create concepts. You will use the completed review to develop instruments to collect routine data and generate a standard data collection template.

What factors influence your choice?

Your planned review will use data from qualitative research studies and possibly surveys. The concept you plan to explore is relatively 'secure' (i.e. not subject to continual reinterpretation and change). Indeed, your team has taken steps to ensure that this is the case – for example, by using a standard definition of 'abortion'. Your team is planning to construct an exhaustive framework. However, your primary interest is not on nuances of interpretation but on creating categories that are well defined and mutually exclusive. The review procedures privilege consensus over dissonance. In a sense you are using an approach typically used to bring together quantitative studies but in the context of qualitative studies. This will allow you to bring quantitative and qualitative studies together at a later date although not as a primary objective of this review. Your planned review is clearly a qualitative evidence synthesis.

Suggested answer: Scenario D – A qualitative evidence synthesis

What choice(s) might you make?

At first sight this review looks similar to the **mapping review** described in Scenario A above. However, closer inspection reveals that we have moved beyond examining the study as the unit of analysis to a focus on study themes. We are bringing themes from different studies together and attempting to organise them side by side. Aggregative approaches: (i) focus on summarising data and (ii) assume that included concepts (or variables) 'under which those data are to be summarised are largely secure and well specified' (Dixon-Woods et al., 2006b). In contrast to an interpretative or configurative approach, 'the primary focus of an aggregative synthesis is not on the development of concepts, or their specification' (Dixon-Woods et al., 2006b). Of course, this does not mean that an **aggregative review** does not fulfil any theoretical or interpretive function. However, interpretation is likely to be limited and to focus on easily discernible types of relationship such as cause and effect. For example, we might use an **aggregative qualitative synthesis** to identify that religious reasons for having an abortion are more likely to occur in certain geographical regions of the world or in older populations. This top-level summary, or **meta-summary**, is useful for hypothesis testing. The earlier stage of Scenario D that looks at how different types of research method affect the data is known as **meta-method**. So, this is an aggregative qualitative evidence synthesis, specifically including meta-method.

Scenario adapted from: Kirkman et al. (2009).

SUMMARY

This chapter demonstrates how the review type that you choose depends largely upon the purpose of the review and how stakeholders intend to use the review deliverable. Other considerations relate to available time, expertise and the expectations of the intended audience. In all cases, regardless of whether a review has been commissioned or reflects the interests of the reviewers, what is eventually delivered must be informed by careful scoping – a topic to which we return in Chapter 4.

key learning points

- Numerous methods exist for reviewing the literature; however, most common needs are met by the mapping review, the scoping review, the systematic review (whether quantitative or qualitative), the scoping meta-review or the review of reviews (overview).
- Multiple considerations (RETREAT) shape the choice of review method but the review question is probably the single most important factor.
- Another choice-limiting factor for review methods is the available type of data, whether interpreted as study design, quantitative, qualitative or mixed, rich or poor, or thick or thin.
- Scoping is an exploratory process of assessing the likely quantity and quality of the literature; its four principal functions are methodological, logistic, conceptual and practical.

frequently asked questions (FAQs)

FAQ 3.1 How can I use other people's reviews in my own research?

With so many reviews being conducted and published it is becoming unusual for topics not to be occupied, if only partially, by the 'footprint' of a pre-existing review. While finding that your chosen topic is entirely inhabited by a recent and well-conducted systematic review can be incredibly frustrating, it is fortunately a relatively uncommon occurrence. More common are situations where one or more existing reviews can contribute positively to your own research topic. At the most obvious level there is the opportunity to *update* an existing review, particularly if **incident knowledge** is plentiful or the methods described have been superseded. An existing review can be the direct source of early studies or, less directly, it may have been cited subsequently by eligible studies. It may yield methods that you can use in your own review, it may include a framework or theory that you can use for your own analysis or, at the very least, it may provide useful background. In the context of specific review types, a review may yield **programme theory** for a **realist review** (e.g. **Cochrane reviews** all have a section on 'How the Intervention is thought to Work') or it may help in defining a concept for a **concept analysis**. All of the above explains why most reviews start by seeking pre-existing reviews and why some review types (such as scoping meta-reviews and reviews of reviews) focus exclusively on collecting and analysing reviews.

FAQ 3.2 Is a scoping review or mapping review automatically a rapid review?

Students often assume that, because of the exploratory nature of 'scoping' or 'mapping', a scoping review or a mapping review *must* be a rapid review. It is true that, because of the descriptive purposes of both reviews, quality assessment is typically omitted. It is also true that omission of quality assessment is often suggested as a potential time-saving option when seeking to undertake an accelerated rapid review. However, this 'all swans are white' fallacy fails to recognise that efforts in scoping and mapping reviews are frequently diverted towards other activities, such as coding the literature, creating mapping databases and producing graphical maps. So, a scoping review or a mapping review of a broad or complex topic need not be rapid. In similar vein we often see research proposals that involve both synthesis and primary research referring to reviews using terms such as 'scoping', 'mapping' and 'rapid' when the applicants mean that they want to 'get the review out of the way and get on with the primary study which interests them more'. While not labouring the point that a well-designed synthesis can be just as interesting as primary research(!), we encourage all readers to use 'scoping review' and 'mapping review' in the precise technical context of what they seek to accomplish. 'Rapid review' has no place within a normative research proposal (i.e. one without a critical timeframe). If you want to convey the limited ambition or limited resources that you will harness in your review then we suggest the term 'focused review'. Even here this should preferably be a 'focused *systematic* review' so that it contributes to the advancement of knowledge and minimises the likelihood of research waste.

FAQ 3.3 What if scoping reveals studies are poor in quality?

Where studies are poor in quality you face three options. First, you can exclude all studies that fail to meet agreed quality criteria. This may dramatically reduce the number of studies for inclusion in your review. This approach is frequently used in reviews that privilege

(Continued)

rigour over the need for a pragmatic answer for day-to-day working practice. A compromise between rigour and pragmatism comes in a second option where a review team specifies in advance minimum quality criteria (often related to methodological 'fatal flaws') for a study to be included. This prevents a policy or practice recommendation being based on flawed studies. A third option is to include studies of any quality, as long as they meet the review question and the list of required study designs. You then conduct a *sensitivity analysis* (Carroll et al., 2012; Thabane et al., 2013) which, essentially, looks at the results of included studies all together and then with poor-quality studies taken out. Bear in mind that descriptive review methods such as scoping reviews, mapping reviews and concept analyses do not typically require quality assessment procedures. However, for some purposes revealing poor-quality studies is a review finding in itself.

FAQ 3.4 What if eligible studies lack detail?

Primary studies for inclusion in reviews that seek to understand the context or components of an intervention or programme, or how it works, may lack the detail that you require. Contextual detail (to understand which external factors impact on the success of the intervention) may be incompletely described, or even completely absent. Conceptual detail of underpinning theory may be lacking. Primary papers may not detail the components of an intervention resulting in a so-called **black box effect** (Trompette et al., 2020). What can you do? Typically, you have four options:

1. **Seek supplementary data, published alongside the included intervention studies**, so-called *sibling studies* such as study protocols, pilot studies, feasibility studies, process evaluations, accompanying qualitative studies or surveys and audits, etc., to add detail to the investigation (Booth et al., 2013b). You can use the **TIDieR checklist** and guide (Hoffmann et al., 2014) as a framework for specifying details of any intervention.
2. **Identify related, but not directly linked, papers** exploring how and under what circumstances an intervention or programme might work. Editorials or theoretical contributions, not in themselves eligible for inclusion in the review, may be referenced and drawn upon in the Discussion and Conclusions of your review.
3. **Supplement available published data by engaging with stakeholders, such as those using or those delivering the service.** Additional qualitative data obtained may help to explain how an intervention might work or which components stakeholders feel are critical to a successful intervention. Of course, consultation may extend the time you need to deliver your review.
4. Do not attempt to explain how and why a programme or intervention works. Simply **concentrate on whether it works**. In limiting the ambition of your review you may conclude that a newly commissioned primary study is required.

FAQ 3.5 What if I am short of time?

If you are short of time a 'telescoped review' is infinitely preferable to a 'truncated review'. You should establish how much time you have available and then plan your tasks and review milestones accordingly. Throughout the book our SALSA framework breaks a review into four important stages – namely, **S**earch, **A**ppraisa**L**, **S**ynthesis and **A**nalysis (Grant & Booth, 2009). You can achieve time savings at each of these stages. Frequently, analysis suffers most from time shortages. Major time savings often impact on the rigour of the overall review. Where you depart from accepted systematic review methods you need to communicate what exactly you have, and have not, been able to accomplish within your review timeframe.

FAQ 3.6 Should I perform a rapid review?

Rapid reviews are typically used when decision-makers face a time-critical decision (Langlois et al., 2019). Rapid reviews are characterised by the time window within which a decision is required and by close interaction with the commissioner – the Audience and Purpose of our RETREAT mnemonic (discussed above). Where time is not an issue you should conduct a systematic review – primarily because it takes elaborate precautions to avoid bias. Reviews typically target either **decision support** or **knowledge support** (see Chapter 2) (Mays et al., 2005a). Reviews for knowledge support typically take time to build a foundation for practice and/or research. Reviews for decision support provide a contingent and context-specific answer within a time-limited expiry date. Rapid reviews are typically abbreviated (cut short), conceding rigour to deliver on time, or accelerated (sped up), by preserving rigour but requiring more resources. Reviewers should initiate a frank, open discussion to clarify how potential readers/users of the review plan to use the review, limitations of the method and how streamlining will impact on the uncertainty of conclusion. In a risk-averse context a robust, yet delayed systematic review may offer a more effective policy lever than a superficial rapid review where its contribution is devalued following close scrutiny.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Hanneke R, Asada Y, Lieberman L, Neubauer L & Fagen M (2017) The scoping review method: mapping the literature in 'structural change' public health interventions. *SAGE Research Methods Cases*. doi:10.4135/9781473999008

In-depth case study of a scoping review, including a discussion of its advantages and disadvantages and a description of the challenges encountered along the way.

James KL, Randall NP & Haddaway NR (2016) A methodology for systematic mapping in environmental sciences. *Environment Evidence*, 5(7). https://doi.org/10.1186/s13750-016-0059-6

Highly cited methodology paper that outlines the process for a mapping review.

Munn Z, Peters MDJ, Stern C, Tufanaru C, McArthur A & Aromataris E (2018) Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, 18: 143. https://doi.org/10.1186/s12874-018-0611-x

Offers clear guidance regarding whether to conduct a scoping review or a systematic review, so that fewer scoping reviews are performed for inappropriate indications better served by a systematic review, and vice versa.

(Continued)

Pollock M, Fernandes RM, Becker LA, Pieper D & Hartling L (2021) Chapter V: Overviews of reviews. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ & Welch VA (eds), *Cochrane Handbook for Systematic Reviews of Interventions* version 6.2 (updated February 2021). Available from www.training.cochrane.org/handbook

Definitive chapter on overviews from the Cochrane Handbook.

Rebelo Da Silva N, Zaranyika H, Langer L, Randall N, Muchiri E & Stewart R (2017) Making the most of what we already know: a three-stage approach to systematic reviewing. *Evaluation Review*, 41(2): 155–72.

Argues that a three-stage approach (mapping-scoping-systematic review) to systematic reviewing proved useful in helping to understand the evidence base, identify and fill knowledge gaps, build on work that had already been done, and avoid wasting resources on work with no useful outcome.

Sarrami-Foroushani P, Travaglia J, Debono D, Clay-Williams R & Braithwaite J (2015) Scoping meta-review: introducing a new methodology. *Clinical and Translational Science*, 8(1): 77–81. doi: 10.1111/cts.12188

Introduces the 'scoping meta-review' as addition to review methodologies based on authors' experiences in mapping the field of consumer engagement in healthcare.

4

DEFINING YOUR SCOPE

in a nutshell

How to define your review scope

- A good review begins with an answerable research question. Consider using a framework to structure and define the key concepts of your research.
- When you set out the aims of your research at the outset, you improve your chances of being successful.
- When you are clear about what is (and what is not!) within your scope you will find it easier to search the literature and to select appropriate studies.
- Completing a review protocol when defining your scope makes it easier to plan your review.
- If you use processes such as descriptive mapping, data mining, concept mapping and logic models to characterise the available literature you are able to refine your review scope and to choose an appropriate review method.
- When defining your scope you can anticipate and avoid common pitfalls, which could otherwise slow down or derail your review.

key terms explained

complex intervention: intervention with multiple components and/or mediators and moderators of effect. Complex interventions may target multiple participants, groups or organisational levels; require multifaceted adoption, uptake or integration strategies; or work in a dynamic multi-dimensional environment.

(Continued)

concept mapping: visual organisation and representation of knowledge that shows concepts and ideas and the relationships among them. You create a concept map by writing keywords (sometimes within shapes, e.g. circles, boxes, triangles, etc.) and then drawing arrows between related ideas.

logic model: diagram or flowchart that conveys relationships between contextual factors, inputs, processes and outcomes. Logic models are considered valuable in illustrating influential relationships and components from inputs to outcomes.

PICO(S): mnemonic used to describe the four elements of well-formulated question for a review of effectiveness: Population/Person/Patient/Problem–Intervention–Comparison–Outcome-Study type(s). Compare **SPICE** for qualitative review questions.

review protocol: document that formally lays out in advance how you will approach each step of your review process. The review protocol serves to protect against bias, set the rules for the conduct of the review and stake your claim to the topic.

INTRODUCTION

So, you have an idea for a topic you would like to review. You have an intended audience and purpose in mind. But where do you start?

You need to make three decisions, all of which are related:

1. On what specific aspect of the topic will you focus your review?
2. What topics and/or types of evidence should you include and exclude?
3. What type of review are you going to conduct?

Key factors when deciding your scope are how much resource (time, person power, financial resources, expertise) you have available (Pullin et al., 2018). Are you working alone or in a team? How much time do you have to complete the review? How much evidence can you reasonably manage?

This chapter helps you to make informed choices as you plan your review.

Why is defining your scope important?

Developing your review question is critical to the research process (Thomas et al., 2019) and is as important for you as author as it is for future readers of your review.

As for any research, when planning a review we benefit from setting objectives that are specific; measurable; achievable; realistic and time-limited (SMART) (as opposed to being vague and aspirational) (Alves, 2018). For your review to be useful, your audience must be confident that you have answered the question you set out to address and be clear on what you have covered as well as what you chose to omit (and why).

When you define your scope you set clear boundaries around your topic. You reduce the risk of making subjective decisions in deciding what is relevant. Defining your scope also helps you

to be consistent throughout your review and to ensure that you deliver what you have promised to your audience.

Typically, you define your scope after an initial estimate of the size and nature of the relevant literature, based on a scoping search (see Chapter 5). A scoping search is less exhaustive than a full, systematic search but helps to estimate how many papers you will have to manage within your review.

If you do not undertake a scoping search you may encounter problems later in the review, for example:

- You might over-promise by committing yourself to a review for which you do not have sufficient resources to manage all eligible studies.
- You might commit to reviewing a topic for which no evidence exists (or set yourself inclusion criteria which are so restrictive that no studies remain eligible for review) – an 'empty review'.
- You might commit to reviewing a topic in which a high-quality, comprehensive, recent review already exists – making all your hard work redundant.

By scoping your topic properly before writing your protocol, you should have an approximate idea of how much literature and what previous reviews exist on similar topics, so that you can target a unique 'niche' for your own review.

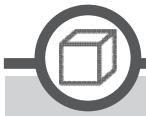
Can you realistically answer your research question within a single review? How will you know for sure that you have identified all the relevant evidence? Following the example in Exercise 4.1 below, try to develop a SMART question for your own review.

exercise 4.1

From starter questions to smarter questions

Starter question	**SMART question**
Example: How can schools reduce their carbon footprint?	What initiatives have UK schools successfully used to tackle waste reduction? Or Do sustainability awareness initiatives targeted at schoolchildren influence parental behaviours? Or Do 'walk to school' campaigns reduce obesity and traffic congestion?
Enter your question:	*Enter one or more SMART questions below:*

If you are struggling to make your question SMART, consider Box 4.1 (below).



box 4.1

The three elements of defining the scope

WHO = who is the research question about?

WHAT = what must I find out to answer the research question?

HOW = how will the study impact on the 'who'? (what is the outcome?)

Adapted from Ibrahim (2008).

In short, defining your scope takes you from:

'I'd quite like to do some research on under-age drinking ...'

to:

'I'm going to review the literature on

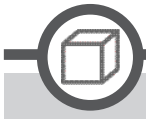
the economic and social implications [HOW]

of school age [WHO]

drinking [WHAT].'

By clearly setting out the aims of your review from the outset, you plan a route for the journey that you will follow for the rest of the process. For example, a good **review question** can inform your **literature search**, as you will find it easier to identify the key concepts of the question and therefore your key search terms (we explore this fully in Chapter 5). A clear review question shapes your **inclusion criteria** (in helping you to select studies) as you will know precisely what type of study you are looking for (Stern et al., 2014) – explored within Chapter 6.

For now, we offer a brief worked example (Box 4.2).



box 4.2

Example of a review question informing inclusion criteria

Review question: What are the economic and social implications of school-age drinking?

Inclusion criteria

Study must include:

1. Subjects of school age (5–16 years) [WHO].
2. Drinking of any alcohol in any quantity [WHAT].
3. Economic and/or social implications [HOW].

When you know approximately how many records your searches are likely to retrieve (and perhaps, by screening a sample, can even estimate how many studies you are actually likely to include) you can realistically predict how many days your review will take. This helps you to decide whether you need to enlist the help of colleagues; to obtain items not available through your library or through electronic collections; and to take account of other factors with associated costs. It is much better to plan ahead and budget for such costs than to encounter them as a surprise.

You should also check for existing reviews on the topic. Do not just look at published reviews – check PROSPERO (https://www.crd.york.ac.uk/prospero/) or other study registers for protocols of ongoing reviews, to make sure that you are not duplicating effort. If your research team identifies another group who are planning a review in a closely related topic, you could contact them with a view to possible collaboration. If you are a student you may decide to move on to a unique, but related, topic.

rapid review tip 2

Existing reviews

Consider a stepwise approach when including evidence in a rapid review. Start by assessing how far you can get using existing systematic reviews, either using their results or using any studies they have already found. Then move on to higher quality designs for primary studies. Try searching specialist databases of reviews or use search filters and publication type limits for reviews to identify the highest level evidence first.

Garritty et al. (2021)

Defining your scope with your audience in mind

You need to consider your review audience when defining the scope for your review. Is your review question the one that your audience most wants answering? To check, you could consult key people with an interest in, or affected by, your review to confirm that your review question is appropriate. If your review findings are likely to inform professional practice or to enable decision-makers to change policy, contact experts for their input.

Where you identify strong commercial, community or professional interest in your review findings, you will find it wise to involve key opinion leaders or stakeholders from the outset and jointly devise the review question (Harris et al., 2016; Greenhalgh et al., 2019). Numerous examples demonstrate how users can contribute to systematic reviews (Bayliss et al., 2016; Pollock et al., 2018). This does not mean that individuals dictate your review findings but does allow you to define a review question that is useful for your target audience.

Frameworks for defining your scope

In deciding your scope, you will find it helpful to identify the key concepts using a question framework. One of the most popular question frameworks is 'PICOS' (Population; Intervention; Comparator; Outcome; Study type).

The PICOS framework

The PICOS framework (Table 4.1) was developed within evidence-based medicine to explore questions that explore the effectiveness of an intervention, whether related to health or not.

Table 4.1 The elements of PICOS

Population	Who is facing the problem or situation that needs to be addressed? In a human population, for example, which age, sex, socioeconomic or ethnic groups are involved? In which countries?
Intervention (or Exposure)	How might the problem or situation be tackled? What interventions might be used and how are those options best described using technical terms, lay terms, synonyms and related terms? If your topic does not relate to an intervention (i.e. a planned response), you may find it helpful to replace **Intervention** with **Exposure** (an unintentional occurrence or happening); for example, exposure to air pollution.
Comparison	What is the alternative? You may wish to compare two or more possible options or exposures to explore which is either most likely to have an intended effect or most likely to happen. This facet is optional when your question does not involve comparing options. Remember that comparing a new option to what is currently done (usual practice) or doing nothing is equally valid. So, you may seek information on the relative merits of: • buses versus trams for urban congestion; • natural versus chemical methods of agricultural pest control; • surgery versus drug treatments for an illness.
Outcome(s)	Another optional facet – what are you trying to achieve or accomplish (outcomes) and how would you measure or demonstrate that they have been achieved (outcome measures)? You may find these challenging to identify. You should make sure that you do not introduce potential bias to your review by only searching for anticipated or welcome outcomes. Unexpected or negative outcomes can be equally useful in informing decision-making.
Study type(s)	What types of study are likely to explore your question? Are some study types more useful than others because they are more rigorous (**hierarchy of evidence**) or more realistic ('pragmatic')? If certain study types are more useful have your scoping searches demonstrated that sufficient rigorously designed studies exist so that you will not need to include less reliable study types?

Table 4.2 offers two worked examples using the PICOS framework. While you will find it helpful to work through the five PICOS facets in relation to these topics, you are unlikely to include all five facets within your search strategy. Your search strategy aims to retrieve the *essential* facets (those which – were they absent – would lead you to reject a study) in order to reduce the literature to a manageable size. You can then examine the results you retrieve more closely at the screening stage, either skimming or searching within them for additional terms. We will focus more on study selection in Chapter 6.

Table 4.2 Worked examples of PICOS

Population	Intervention	Comparator	Outcome	Study type(s)
Example 1: How does integration within mainstream schools impact upon children with learning disabilities?				
Children with learning disabilities	Integrated education in mainstream schools	Special education	Educational success; psychological well-being	Qualitative or quantitative studies
Example 2: Do free bus passes reduce social isolation in people aged 65 and over?				
People aged 65 and over	Free public transport	None	Reduced social isolation	Qualitative or quantitative studies

Other frameworks for defining your scope

Many frameworks were developed to answer specific types of question. As noted above, PICOS (originally PICO: Population–Intervention–Comparison–Outcome(s)), was developed to answer medical queries (Richardson et al., 1995; Munn et al., 2018b). For qualitative questions, you may prefer to use SPIDER (Sample–Phenomenon of Interest–Design–Evaluation–Research type – Cooke et al., 2012) or SPICE (Setting–Perspective–Intervention/Interest–Comparison–Evaluation – Booth, 2004; Butler et al., 2017). An alternative version of PICO, known as Context–Intervention–Mechanisms–Outcomes (CIMO) (Box 4.3) may be useful for management or realist synthesis questions (Denyer & Tranfield, 2009). A comprehensive list of 38 such frameworks is included in a supplement on framing questions for complex interventions (Booth et al., 2019b). Further advice on framing questions is available in Chapters 8 and 9 on qualitative and mixed methods reviews, respectively.

However, when conceptual frameworks are translated into practical search strategies they may not lead to optimal retrieval. They may retrieve too many (**sensitivity/recall)** or too few (**specificity)** results (Frandsen et al., 2020). Not all frameworks are suitable for fully comprehensive reviews (Methley et al., 2014; Frandsen et al., 2020). Often, you may find it sufficient to search for 2–3 of the most important concepts or facets.

box 4.3

Context–intervention–mechanisms–outcomes (CIMO) framework

Context – Which individuals, relationships, institutional settings or wider systems am I studying?

Intervention – For what event, action or activity am I studying the effects? (As with PICOS, you may be exploring an 'exposure' resulting from a change in circumstances rather than a deliberate intervention.)

Mechanisms – What responses explain how the event, action or activity leads to an effect? Under what circumstances are these responses activated or not activated?

Outcomes – In what effects of the intervention (planned or unintentional) are you interested? How are such effects measured?

Example of a focused question using CIMO:

> 'Under what conditions (C) does leadership style (I) influence how project teams perform (O), and by what mechanisms does leadership style (I) impact on project team performance (O)?' (Denyer & Tranfield, 2009)

Now practise using a framework to focus your research question by completing Exercise 4.2.

exercise 4.2

Using a framework to focus your question

Choose a framework that best fits your research topic and formulate your own research question. So, if you are using the PICOS model, consider:

Population

Intervention or Exposure

Comparison

Outcome(s)

Study type(s)

Complex interventions

The examples given so far are straightforward and involve simple 'does this work?' type questions. Review questions are more difficult to define when they involve interventions which are complex (Petticrew et al., 2013b) – for example, involving multiple different components or populations.

When many variables and forces act upon a situation, it is impossible to be certain that an outcome is a direct result of a single intervention or exposure; you may need to adopt a systems-based approach to fully understand the context (Moore et al., 2019; Petticrew et al., 2019). Complex interventions can also be investigated using realist methods (involving looking not only at what works but also for whom, in what circumstances, and why) (Petticrew, 2015) (see Chapter 9).

Interventions are described as 'complex' (Guise et al., 2017) if they have:

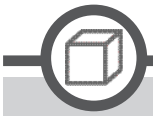
- multiple components (intervention complexity)
- complicated/multiple causal pathways, feedback loops, synergies and/or mediators and moderators of effect (pathway complexity).

In addition, they may also:

- target multiple participants/groups/organisational levels (population complexity)
- require multifaceted adoption, uptake or integration strategies (implementation complexity)
- work in a dynamic multi-dimensional environment (contextual complexity). (Based on Guise et al., 2017)

With so much written on how to design and how to evaluate complex interventions, this chapter can only go into brief detail and we recommend that you refer to 'Suggestions for further information' at the end of this chapter.

Consider the example intervention below (Box 4.4). We have listed just some of the ways in which it could be considered complex.



box 4.4

Example of a complex intervention

Education programmes to teach type 1 diabetic patients how to self-manage their condition effectively:

- Number of interacting components: lecture-type sessions, small-group role play, diary keeping, discussion of problems/successes amongst group.
- Delivery of the intervention: intense week-long course, weekly sessions, online packages.
- Change of behaviour in participants, enabling them to increase control of their own condition and integrate effective self-management into their daily lives.
- Change in behaviour in health professionals: less 'do as I say', more about patient empowerment.
- Programme can be tailored to an individual: one-to-one sessions available to discuss specific goals and targets.
- Therapist effect: delivered by diabetic nurses or dietitians or peer volunteers trained in delivery of the education programme, personality types.
- Outcomes: control of their diabetes, long-term health outcomes (such as heart disease), patient-rated quality of life, time off work, admissions to hospital, health care resource use.

This example illustrates the diverse review questions that you could ask around this topic. So how do you begin to define the scope of your review question for this type of complex intervention? The **PerSPE(c)TiF** (Perspective-Setting Phenomenon of interest–Environment–comparison–Timing–Findings) question structure has been suggested to elicit relevant elements of complex interventions (Booth et al., 2019c).

Three issues that relate to complexity might guide how you define your review question (Squires et al., 2013), as follows.

What type of question am I asking?

As with simpler interventions, you should allow your review question to be guided by what you or your target audience need to know. Discuss your question widely with colleagues or stakeholders to ensure that it addresses their needs (Squires et al., 2013).

Just because an intervention is complex, it does not mean your review question necessarily has to adopt a complex perspective or lens (Petticrew et al., 2013a; 2019) – you can choose to conduct a straightforward effectiveness review looking at one or more specific outcomes, while acknowledging the complexity of the intervention and its context.

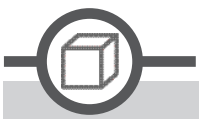
rapid review tip 3

Focusing on important outcomes

If the findings of your rapid review are to influence practice and policy, then you need to select outcomes that are relevant to professionals, policy-makers and the public. Although you would usually try to explore a wide diversity of outcomes in a full systematic review you will need to telescope this list given the time and resource limitations of a rapid review. You should involve your stakeholders in prioritising outcomes.

Garritty et al. (2021)

However, you may decide that you need to know more than whether an intervention is effective or not. Perhaps you want to consider *why* an intervention works (mechanisms of action); identify factors which impact upon its effectiveness; ask whether the intervention is implementable in 'real life' (see Chapter 9); or explore the theory underpinning the intervention (Petticrew et al., 2013a; Squires et al., 2013). Let us consider our exemplar complex intervention again and identify some review questions that we might ask (Box 4.5).



box 4.5

Questions that you could ask in a complex intervention review

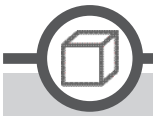
- Does it work? What is the average effect?
- For whom does it work?
  - For the individual with type 1 diabetes?
  - For particular subgroups within a type 1 diabetic population?
  - For family members?
  - For wider society?
- How does the intervention work?
- Does any theory underpin the education interventions? What is it based on?
- What are the barriers and facilitators of education programmes?
- What are the mechanisms of action and how do they interact with each other?

What issues are manageable within the scope of the review? Should I lump or split?

As seen from our complex intervention example, you may not find it feasible to ask all the pertinent questions in a single review. So, you also need to consider what is manageable within the time and resources available. It is likely that much of the evidence will be **heterogeneous**, explored within many different study types. To determine how broad the scope of your review should be, you need to decide whether to 'lump' or 'split' (Squires et al., 2013) your review questions in order to present the evidence.

'Lumpers' maintain that, unless two interventions act in very different ways, they should be included within the same review. Review findings can thus be applied across the widest possible range of settings. 'Splitters', however, only combine studies that they consider very similar in terms of design, setting or intervention characteristics. Splitters either exclude a large number of studies or analyse them in multiple separate categories. No single study type or methodological approach can provide all the answers required to model a complex system (Higgins et al., 2019; Noyes et al., 2019; Petticrew et al., 2019). Therefore, a mixed methods approach combining quantitative and qualitative data may offer the optimal solution (Petticrew et al., 2019) (see Chapter 9).

Considering our example again (Box 4.6):



box 4.6

Lumping or splitting in our example complex intervention review?

- Could studies looking at an intense five-day education programme be lumped together with studies of a programme which delivers five weekly one-day sessions?
- Could studies of programmes delivered by trained diabetes nurses and dietitians be compared with studies reporting a peer-delivered programme?
- Could studies reporting the effects of education programmes on patient quality of life be compared with other studies investigating family quality of life?

Thinking about your own review, consider which approach best matches your research topic, remembering to take into account the resource implications (Weir et al., 2012).

How will I specify the complex intervention?

When defining your review question it is important to describe the intervention of interest as precisely as possible so that you know which studies to include in your review. You will find it helpful to carry out specific scoping searches to investigate how the intervention is described in the literature (unfortunately, you will often find insufficient detail is included in the studies, especially for complex interventions). Often we use a 12-item tool named TIDieR (Template for Intervention Description and Replication) to describe the components of an intervention (Hoffmann et al., 2014) or our own abridged five-item version, labelled 'TIDieR-Lite' (by whom, what, where, to what intensity and how often) (Chambers et al., 2020).

One way to overcome a lack of information about the intervention is to focus your scoping searches on secondary study types such as **process evaluations**, which may provide more detail, or to contact authors directly for further information.

box 4.7

Exemplar review of complex interventions

Crime, fear of crime, environment, and mental health and well-being: mapping review of theories and causal pathways (Lorenc et al., 2012a).

Scope of review: The primary aim of the review was to develop an holistic framework on the theoretical links between crime, fear of crime, the environment and health and well-being. Findings outline the broader context in which interventions take place and therefore identify factors which may affect intervention success rate.

Because reviews of complex interventions can involve extra background or investigative work when defining your scope, we suggest several tools to assist with the scoping process, the first being **logic models**.

Logic models

A logic model (also known as an impact model or theory of change model) is a type of concept map, originating from programme evaluation. Logic models are widely used in public health as summary diagrams of complex interventions, identifying the key components and relationships between inputs, outputs and outcomes (Anderson et al., 2011; Baxter et al., 2014; Rehfuess et al., 2018).

You can use logic models like the one in Figure 4.1 to clarify and prioritise your review questions when defining your scope. They will help you to understand the complexity of the intervention and ensure that you will explore all contributing elements (Squires et al., 2013).

FURTHER DEFINING YOUR SCOPE

Once you have broken down your review question into concepts, you need to consider what type of review you will undertake; some review methodologies are a better fit than others for certain types of question.

It is not always realistic to conduct a full 'Systematic Review' but you may choose to systematise some stages of the process where resources allow and where it strengthens the credibility of your review to do so. (For example, when mapping the literature around your topic, you will want to show that you have conducted a wide-ranging and thorough literature search, but you may choose not to spend time on formal quality assessment of the studies you identify.) (See Chapter 6.)

An ever-expanding literature has labelled different types of review, categorising them by purpose or methodology (often against the benchmark of the conventional systematic review) (Munn et al., 2018b; Tricco et al., 2018b). A recent typology of review 'families' (traditional reviews, rapid reviews, qualitative evidence syntheses, etc.) (Sutton et al., 2019) offers a helpful primer. Meanwhile, Chapter 3 of this book offers guidance on choosing a review method appropriate to your topic.

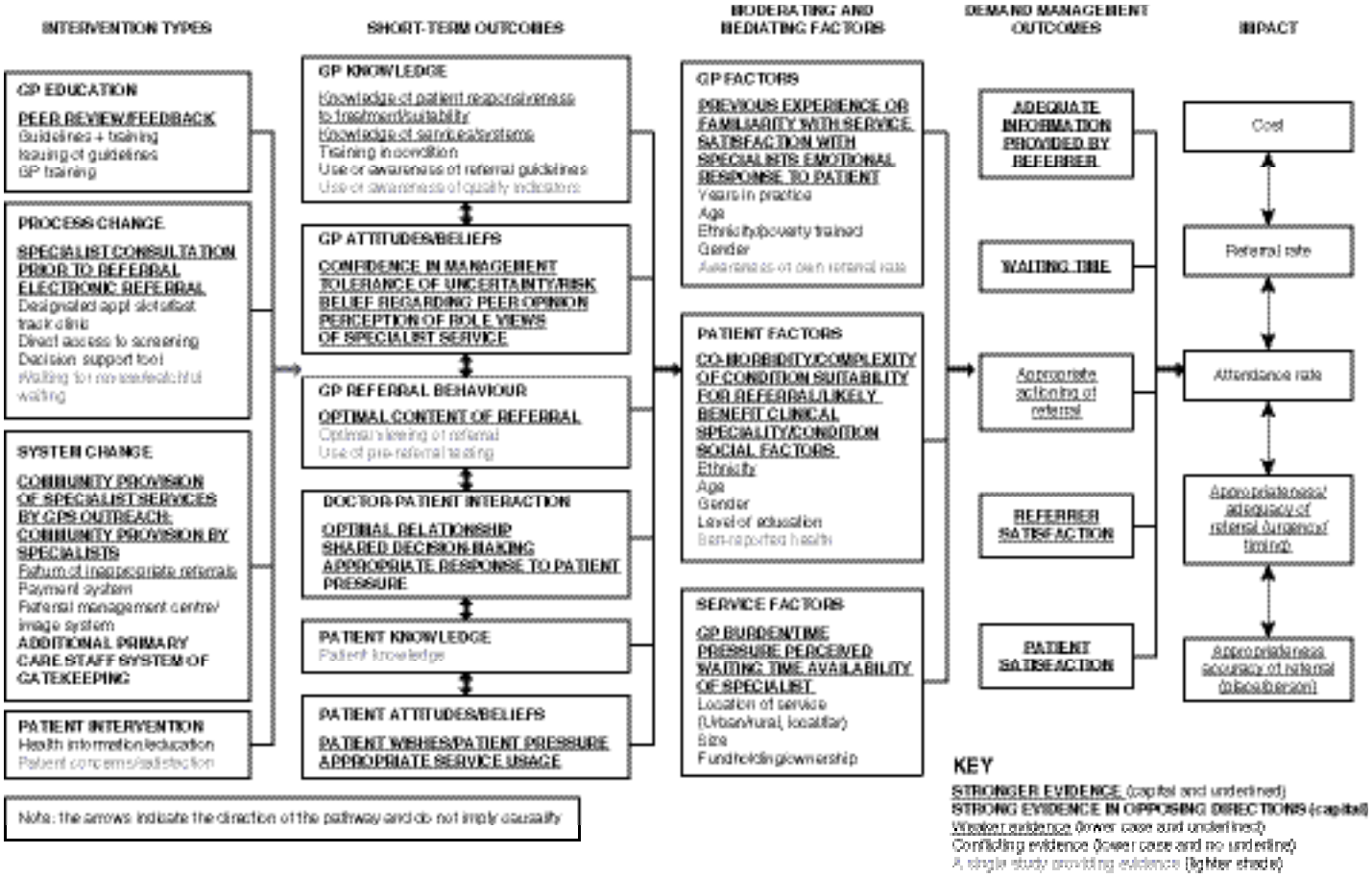


Figure 4.1 Example of a logic model

Source: Baxter et al. (2014)

The methodology you choose is also influenced by how much literature exists on your topic. Typically, you refine and focus your research question through a **scoping search**. Scoping searches are useful 'to attain a preliminary assessment of the size and scope of research literature and to help assess the feasibility of conducting research, including determining whether … questions have previously been evaluated, or are up-to-date, and for estimating time frames and budgetary considerations' (Rathbone et al., 2017). You may start with a relatively clear idea of the topic that you want to research, and then find that someone else has already comprehensively reviewed it! Be sure to consider the advice we provide in Chapter 2 on the option of conducting a review update. Alternatively, you might have a fresh idea for a new topic for your review but find insufficient primary research available to answer your review question.

By carrying out initial searches of **bibliographic databases** you can identify where the research gaps lie and where a new review is needed. Chapter 5 details how to conduct a scoping search.

At this stage, once you have some results from a scoping search, you can use other mapping techniques to further define the scope of your review question. We have already discussed logic models, which although time consuming and resource intensive are nevertheless useful, particularly for complex reviews. Other mapping processes such as **descriptive mapping**, **data mining** or **text mining** and **concept mapping** help to make sense of the quantity and characteristics of the literature. In this section we outline these tools with examples and links to resources, where available, that you could use to scope or to map the literature.

Descriptive mapping

Descriptive mapping is used to define a body of literature on a given topic, by allocating keywords to the studies found. Classifying the literature in this way can help to determine what research has been previously carried out as well as to identify research gaps. Organisations such as the EPPI-Centre have devised purpose-specific sets of keywords (EPPI-Centre, 2003) but you may prefer to devise your own keywords tailored to the purposes of your own review.

Having assigned **keywords** describing the main intervention for each included study, you present your results as a **descriptive map** or table.

We will revisit the exemplar systematic **mapping review** below (Table 4.3) several times throughout this book. The review aimed to identify and map the effectiveness of interventions to promote physical activity with children in specialist schools (Emonson et al., 2019). The authors categorised interventions by:

- type (e.g. dance/drama, games/play, motor activities, running, stretching, swimming and 'other')
- duration, where and by whom they are delivered, and
- outcomes measured (e.g. academic, behavioural, cognitive, physical, psychological, social or 'other').

Free text fields added detail where required (e.g. a brief description of the interventions). As this was a **mapping review**, the map becomes an output in its own right – but for whatever type of review you are planning, descriptive mapping can help you to finalise the criteria that locate certain studies within or outside your review scope.

Table 4.3 Extract from a descriptive map categorising physical activity interventions used in schools

Author (Year)	Program Category	Program Description	Program Duration	Program Delivered by	Program Location	Outcome Category(ies)
Bothma, Dunn & Kokot (2014)	Motor activities	The Wired to Learn program consists of 10 main activities. Children learn and continue to practise the first movement activity until they can do it with ease then proceed through the movement activities in order.	15–25 min session once per day (5 times per week) for 14 weeks	Researchers	School room (school clinic)	Other; Physical; Social; Cognitive
Bruce, Fasy, Gulick, Jones and Pike (2006)	Stretching	Among many components, stretching and yoga have been included in Morning Circle meetings. The stretching component involved imitating the teacher. The yoga component consisted of students taking turns to select a yoga position and everyone imitating the position depicted.	Yoga components lasted no longer than 10 min. Other stretching activities were less than 10 min.	The classroom teacher	The classroom	No outcomes evaluated
Carnahan, Musti-Rao and Bailey (2009)	Dance/drama	A 30 min class group activity which consists of peer greetings, a calendar activity, a picture book activity and a movement/ dancing activity. The movement or dancing time included activities such as the Hokey Pokey and YMCA.	Every school day for 8 weeks. The duration of the movement component specifically is unclear.	The classroom teacher	The classroom	Not applicable

(Continued)

Table 4.3 (Continued)

Author (Year)	Program Category	Program Description	Program Duration	Program Delivered by	Program Location	Outcome Category(ies)
Davis, Zhang and Hodson (2011)	Motor activities Games/play	The Motivate, Adapt, and Play program. Each 30min session consisted of a warm up, cardiovascular activities, strength activities and a flexibility/closure activity. Tasks were presented in a game-style format that is appropriate and motivating for students with intellectual disabilities.	A 30 min session every school day for 8 weeks.	Classroom teacher 3 times a week. Graduate students twice a week.	Not reported	Physical
Dickinson and Place (2016)	Games/play	Mario & Sonic at the Olympic Games on the Nintendo (Kyoto, Japan) Wii™. Children were able to choose to play athletics, aquatics, fencing or table tennis games electronically using the motion sensor of the Wii console remote.	A 15 min session, 3 times per week for 9 months.	Other (school staff)	School room (where PE would normally take place)	Social Other

Source: Based on extract from a map from Emonson C, McGillivray J, Kothe EJ, Rinehart N & Papadopoulos N (2019). Citations in the table above are to primary studies cited in this mapping review.

Data mining and automation

Data mining refers to analysing data to identify patterns and correlations. When the data being analysed is textual, it is referred to as **text mining.** Both terms are closely linked with the broader concept of **artificial intelligence**.

Data mining takes place behind many websites that we use each day; examples include personalised Google results based on your search history, or algorithms defining which advertisements or posts you see on social media sites.

In the above examples, the data (on our behaviour) is collected by third parties and we have little control over how it is used; however, we can actively employ similar technology in the review process.

For example, when defining your scope you may find that your scoping search returns large numbers of citations. We look at study selection in more depth in Chapter 6 but several software tools rank results according to likely relevance (Waffenschmidt et al., 2018; O'Mara-Eves et al., 2015). Result sets may be generated by text mining (recognising patterns in the results) (Thomas et al., 2011; Shemilt et al., 2014) and/or **machine learning** (recognising patterns in decisions made by a user). Once the software has 'learned' from sufficient examples, it predicts how many more results are worth screening manually. Tools include Rayyan (Ouzzani et al., 2016), Abstrackr and EPPI-Reviewer Web (Tsou et al., 2020).

An excellent White Paper summarises the applications of text mining within systematic reviews (Glanville & Wood, 2018).

Concept mapping

Concept mapping (sometimes known as **mind mapping** or occasionally **idea webbing**) involves visualising your research topic and observing the connections between its different aspects. You may find it helpful when defining your scope, especially if you are visually minded.

Benefits from using concept maps when planning a literature review include (Rowley & Slack, 2004):

- identifying key concepts on a research topic;
- identifying additional search terms;
- clarifying thinking about the structure of the literature review;
- understanding theory, concepts and the relationships between them.

Concept analysis

If your preliminary sensitisation to the literature in your topic reveals a lack of clarity around one or more key concepts, you could undertake a concept analysis to gain a better understanding. Concept analysis has been used in several disciplines but is best established in the field of nursing. Our guidance is based on the model developed by Walker and Avant (2010). Concept analysis seeks to define and clarify a concept through examples of its usage in the available literature, and works well for wide-ranging questions and terminology which may be used in a variety of ways. Concept analysis involves naming a concept of interest (and the purpose for which analysis is being conducted), before going on to identify all the situations in which it may be used – its defining attributes and its 'surrogate terms'. It establishes its antecedents and consequences (the context before and after it is used) and constructs a 'model case', before looking for

Figure 4.2 Example of a concept map

Source: Booth et al. (2008)

ways in which it might be measured. Concept analysis may be more feasible for new or emerging topics than those which already have an extensive and diverse literature. Where too many publications exist for you to review them all, beware of selection bias.

At a glance – concept analysis

Definition

A concept analysis can be defined as 'the dissection of a concept into simpler elements to promote clarity' (Foley & Davis, 2017). The aim is to 'unpack' an abstract idea into a tangible concept; a concept analysis may be a publishable output and an end in itself; or it might be a stage in preparing or scoping another type of review project.

At a glance

Reviewer expertise	
Information expertise	
Time	
Resources	£

Overview of process

Typically, a concept analysis requires eight steps broadly corresponding to the SALSA framework (Walker & Avant, 2010) (Table 4.4).

SALSA

Table 4.4 Eight steps of a concept analysis

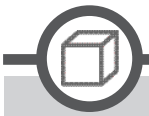
SALSA stages	Steps required by the method	Explanation
	1. Select a concept	Identify the concept that will be the focus of study
	2. Determine the purpose of the analysis	Answer the vital question 'Why am I doing this analysis?' (e.g. to clarify a concept, to identify boundaries or domains, to develop a definition)
Search	3. Identify all uses of the concept	Search different disciplines and sources to see how the concept has been used
Appraisal	4. Determine the defining attributes	Identify those essential individual and collective characteristics that uniquely define the concept
	5. Construct a model case	Demonstrate how an exemplar that possesses all the attributes would look in real life
	6. Construct a borderline and contrary case	Demonstrate what a real-life occurrence of a case that only marginally fulfils the attributes and an 'exception that proves the rule' look like

(Continued)

Table 4.4 (Continued)

SALSA stages	Steps required by the method	Explanation
Synthesis	7. Identify antecedents and consequences	Antecedents are events that must occur prior to the manifestation of a concept, and consequences are events that occur as a result of it
Analysis	8. Define empirical referents	Identify elements of a phenomenon that by their existence or presence demonstrate where a concept occurs and make it measurable

Source: Walker & Avant (2010)



box 4.8

Example of concept analysis

Using Walker and Avant's strategy, Sharifi et al. (2019) conducted a concept analysis of cultural competence in nursing. The authors reviewed 43 articles and identified six defining attributes of cultural competence: cultural awareness, cultural knowledge, cultural sensitivity, cultural skill, cultural proficiency and dynamicity. They identified the antecedents as cultural diversity, cultural encounter and interaction, cultural desire, cultural humility, general humanistic competencies, educational preparation and organisational support. They also identified the consequences of cultural competence for those giving and receiving nursing care. By exploring the scope of the concept and its broader context, the authors developed a theoretical definition and a conceptual model of cultural competence which could be used for the purpose of planning services, education and further research.

TOOLBOX – DEFINING YOUR SCOPE

Tools for data mining

PubReMiner provides an alternative, text-mining based interface to the PubMed database. Rather than simply presenting a list of results, it highlights prominent authors and publications, as well as frequently occurring terms for inclusion in your search strategy.

VOSViewer is a visualisation tool which uses text mining to identify common phrases occurring in a body of text (e.g. a set of search results). It can then display the frequency and proximity of these terms to each other as 'heat maps' allowing you to observe recurring themes within your results.

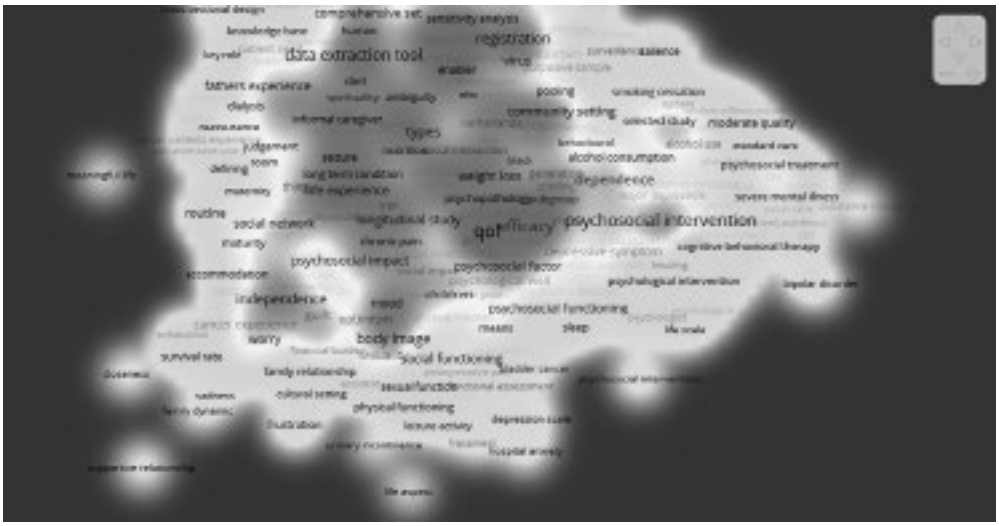


Figure 4.3 Example 'heat map' visualising themes in a collection of reviews of well-being. Produced using VOSViewer (vosviewer.com)

We selected the above examples as illustrative of scoping. The Systematic Review (SR) Toolbox (http://www.systematicreviewtools.com/) provides a searchable online catalogue of tools for use throughout the review process.

box 4.9

The Systematic Review (SR) Toolbox

Access the Systematic Review (SR) Toolbox (http://systematicreviewtools.com/). The SR Toolbox provides a searchable online catalogue of tools to support systematic reviews. Browse through the menu of stages of the systematic review and select one stage. Browse through the list of tools for your chosen stage. Which tools are free and which require a subscription or one-off payment? What appears to be the added value of one of the tools requiring payment over its open access alternatives?

Tools for concept mapping

You can use free mind-mapping software to construct a **concept map**, including:

- FreeMind/Freeplane
- Docear (formerly SciPlore) (note this software is compatible with reference management software, such as Mendeley)
- XMind.

DEFINING YOUR SCOPE: CHALLENGES AND PITFALLS

As with any stage of a literature review, certain challenges and pitfalls occur when defining your scope. These range from minor 'nuisance' complications, such as identifying duplicate and/or multiple citations, to substantive challenges such as deciding which types of studies to include or exclude and how to assess their quality (Kennedy, 2007). In this section, we identify common problems when defining the scope for your own projects.

How wide do I go? (Sampling approaches)

A common challenge when defining your scope relates to knowing 'when to stop'. Debate centres on whether you should aim for comprehensiveness (in quantitative terms), **theoretical saturation** (in qualitative terms) or a 'representative' approach. Alternatively, you might aim to cover key 'pivotal' works in your chosen topic (as for a **meta-narrative** review or a **concept analysis**). Whichever approach you choose, and your choice may be influenced by the time and resources available, you should be explicit in your methods so that the reader is fully aware of the scope of your review, and the criteria for selection and relevance (Bruce, 2001).

The type of review you choose will help you to define your scope, as reviews differ in the extent to which they use and report systematic methods. Table 4.5 outlines three review types (scoping, mapping, systematic) and their respective purposes. For each review type the table provides an illustrative example together with details of the scope covered.

Table 4.5 Types of review: scope

Type of review	Purpose	Example
Scoping review	To find out how much literature exists To find out the characteristics of the literature	Kelly et al. (2018) This scoping review aimed to identify and present evidence on the benefits of walking, to establish what is known and what remains unknown about the relationship to eight specific mental health outcomes
Mapping review	Aims to explore the characteristics of a body of literature within a topic area to identify which questions have already been addressed and where research or synthesis gaps remain	Emonson et al. (2019) This review aimed to identify and map class-time physical activity programmes as implemented in specialist schools and classes. Included programmes were identified through searches of grey and published literature and narratively synthesised by activity type. Identified a need for further research to extend the evidence base.
Systematic review	Aims to be comprehensive Scope should be well defined and clearly stated Systematic reviews tend to focus on the highest quality evidence available	(Fuller et al., 2019) Examined the impact of national parks and other conservation initiatives on leakages and spillovers into neighbouring areas. The authors followed discipline-specific guidance to produce their protocol

Table 4.6 SALSA stages of a mapping, scoping and systematic review

	Definition	Preliminary	Search	Appraisal	Synthesis	Analysis
Mapping review	A broad exploration of the characteristics of a body of literature within a topic area to identify which questions have already been addressed and where research or synthesis gaps remain	(1) Define overall question of interest, construct series of more refined questions for key aspects of the overall question, and then design search strategy	(2) Systematically search and screen for relevant evidence	(3) Assess scope of each item of evidence against questions defined in step 1; (4) *Optional:* critically appraise methods of each item of evidence review using a standardised tool	(5) Construct the evidence review map(s)	*Either performed by review team or simply presents descriptive data for interpretation by review customer*
Scoping review	A preliminary written assessment of the potential size and scope of available research literature on a specific topic with a view to identifying where exactly a future research or synthesis study should be targeted	(1) Identifying the research question	(2) Identifying relevant studies/ sources (3) Study selection	*Not usually included*	(4) Charting the data	(5) Collating, summarising and reporting results (6) Consultation
Systematic review	A type of research synthesis, typically conducted by review groups with specialised skills, who set out to identify and retrieve evidence relevant to a particular question or questions and to appraise and synthesise the results of this search to inform practice, policy and in some cases, further research	Produce a review protocol Assemble a review group Formulate the question(s)	Conduct a thorough search Select relevant studies	Appraise the quality of studies Extract information from individual studies	Synthesise studies	Report what is known and not known Inform research, policy and practice

Many researchers find the terms 'mapping' and 'scoping' confusing as they are often used interchangeably. To avoid ambiguity, we consider that **scoping** aims to establish the size of the literature and the boundaries of a review topic (whether to produce a scoping review as an output in its own right or in preparing a substantive review). In contrast, **mapping** provides an overview of a topic, typically classifying identified evidence, to identify opportunities and gaps. Some commentators propose a three-stage process for all systematic reviews involving mapping (to identify opportunities for a systematic review), scoping (to set the boundaries and limits of the review) and then, finally, the systematic review itself (Rebelo Da Silva et al., 2017; Chambers et al., 2020).

For comparison, Table 4.6 presents key stages of each of these review types.

How narrow can I stay? (Scope creep)

A major problem in the literature review process is **scope creep**: uncontrolled changes over time to your review aims, direction, scale and/or timescale and, more specifically, the gradual unchecked expansion of the review objectives. Scope creep can occur at any point during the review process, particularly when you are searching the literature. You should constantly refer to your original scope to ensure that your project does not go off track. A common tension exists between what is interesting and what is useful – references may catch your attention, but may not be directly relevant to your research question. Of course, you may face having to amend your original scope. You can manage this using a **changes clause** (Matchar et al., 2006), which is particularly important when working on official contracts and/or as part of a wider research team.

THE REVIEW PROTOCOL

Once you have defined your review scope, you can start writing the review protocol. As with any research project, you need to plan your literature review carefully (see Chapter 2). Your protocol should lay out in advance how you will approach each step of your review process.

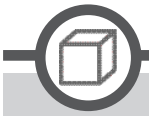
The review protocol has three main functions:

1. **Protection against bias** – by clearly describing your methods you are ensuring rigour and minimising the risk of being subjective or otherwise inconsistent in your judgement.
2. **Setting the rules for the conduct of the review** – this is particularly useful when working within a wider project team. Agreeing a protocol ensures that everyone follows the same procedure. If everyone sticks to what they said they would do, the protocol, with tense changed from the future to past tense, becomes the first time-saving contribution to your final report!
3. **Staking your claim to the topic** – this is particularly important if you plan to publish your review.

When review authors publish in advance a review protocol that they have written prior to examining in detail the available studies, this:

> reduces the impact of review authors' biases, promotes transparency of methods and processes, reduces the potential for duplication, allows peer review of the planned methods before they have been completed, and offers an opportunity for the review team to plan resources and logistics for undertaking the review itself. (Lasserson et al., 2021)

The main components of a protocol are shown in Box 4.10.



box 4.10

Components of a protocol

- Administrative information (review title, contacts, funding details)
- Introduction (rationale, objectives)
- Methods
  - for identifying evidence (including search strategy and inclusion criteria)
  - for selecting studies (e.g. two independent reviewers)
  - for data extraction (including any processes for checking accuracy)
  - for assessing risk of bias in individual studies
- Approach to data synthesis (including details of planned meta-analysis or subgroup analyses)
- Approach to evaluation of the strength of the body of evidence
- Timeline for completing your review

based on Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) (Moher et al., 2015).

Examples of review protocols

Examine and compare the examples in Table 4.7 (or search for review protocols from your own discipline) to see how different review protocols are presented.

Table 4.7 Review protocol examples

Example A – a systematic review protocol	Jackson J et al. (2020) Early childhood education and care-based healthy eating interventions for improving child diet: a systematic review protocol. *Systematic Reviews*, 9: 181. https://doi.org/10.1186/s13643-020-01440-4 (also registered at PROSPERO https://www.crd.york.ac.uk/prospero)
Example B – a scoping review protocol	Naidoo K & van Wyk J (2019) Protocol for a scoping review of age-related health conditions among geriatric populations in sub-Saharan Africa. *Systematic Reviews*, 8: 133. https://doi.org/10.1186/s13643-019-1055-z Protocol published in *Systematic Reviews*
Example C – a mapping review protocol	Reisch L. et al. (2019) Mitigating climate change in food consumption and food waste: a systematic map of behavioural interventions –a systematic map protocol. Protocol registered with the Center for Open Science: https://osf.io/3cje4/?view_only=7a3062f2b5c6400692112bbd139d08a8

Further advice on qualitative and mixed methods protocols is found in Chapters 8 and 9.

exercise 4.3

Examining a review protocol

Using the review protocols from Table 4.6, or an example that you have identified yourself, consider:

1. What sources will be searched; would any of these sources be relevant to my topic?
2. What methodological papers do the authors cite that I might use in my own review?
3. What other decisions specified in the review protocol do I still need to make for my review? (Some decisions relate to stages of the review covered later in this book.)

Now consider your own review and begin to fill in the review protocol template in Exercise 4.4.

exercise 4.4

The review protocol template

Start to fill in the blank version of the review protocol template (see Exercise 4.4 on the companion website)) for your own review. Table 4.8 provides further information on which sort of information to include within each section in the review protocol template. You may find that you are only able to complete the first few sections at this stage. As you work through the remaining chapters of this book, you can add to each section of the template, ultimately to create a complete protocol. You will find it helpful to follow the Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) (Moher et al., 2015).

Table 4.8 Instructions for completing the review protocol template

Background
Your background should set the context for your review, introducing the reader to your topic, without needing specialist knowledge to understand the topic of research. You may include relevant current statistics and previous research, highlighting the importance of your review
Objectives
Here you should outline the aims of your review and the research question(s) you are attempting to answer
Criteria for inclusion and exclusion of studies
In this section, you should record how you will decide which studies to include and which to exclude. You will find it helpful to define eligibility by key concepts such as study design, population, intervention, etc., as below

Types of studies

Which types of study design(s) are you going to include/exclude? For example, randomised controlled studies, cohort studies, qualitative studies? surveys?

Types of populations

Revisit your focused question and record the type(s) of population you are going to include/exclude

Types of interventions or exposure

Revisit your focused question and record the type(s) of intervention(s)/exposure(s) you are going to include/exclude

Types of outcome measures

Revisit your focused question and record the type(s) of outcome you are going to include/exclude. If you have a broad outcome such as whether an intervention is 'effective', you may want to define this further here. For example, in the question

'Is e-learning effective in teaching undergraduate students information literacy skills?' you may define effectiveness in terms of assignment marks and you would exclude any studies that did not measure this outcome. (Note that it is possible to look at more than one outcome here)

Setting/context (where applicable)

If your research question applies to a particular setting or context, record which you will include/exclude here. For example, if you are only interested in studies taking place in a particular country, you can exclude studies from other countries. However, please be aware that this may limit your review too much, so you may also have to look at any comparable settings – for example, Europe rather than the UK

Search strategy for identification of studies (see Chapter 5 for more details)

Record your methodology for finding studies:

- Electronic databases to be used – which sources will you search?
- Other search methods – such as browsing electronic tables of contents and websites, reference checking, citation searching, etc.
- Keywords and sample search strategy – here you should include initial ideas for search terms. You may also find it useful to provide an example search strategy from any scoping searches you have done

Study selection

Method of review (see Chapter 6)

- Remember to include who will select studies and how they will do so. For example, if you are working within a project team you should state which project team members will select the studies and how any disagreements will be resolved. If you are conducting all aspects of the review single-handedly, record that you will be selecting the studies. You may find it useful to record the process you will follow here – such as title sift, abstract sift, full-text sift, etc. (see Chapter 6 for further details)

Assessment of methodological quality (see Chapter 6)

- Here you record how you will assess the methodological quality of your included studies. Remember to include details of any specific checklists that you will use

Data extraction (see Chapters 7–9)

- What data will you extract (variables, themes, etc.)? If you plan to use/adapt an existing data extraction form you should record the details here. If you plan to design your own, state this intention here.

(Continued)

Table 4.8 (Continued)

Data synthesis (see Chapters 7–9)

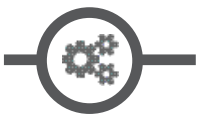
- What will your data look like – qualitative or quantitative or a combination?
- How will you synthesise it – will you use narrative synthesis, thematic synthesis or some other method? Tables, figures or as text?

Timeframe (see Chapter 2)

List the stages of the review and outline how long each stage will take. This will help you set milestones by which you can assess your progress

Task	Timescale
Literature search	
Study selection	
Data extraction	
Data synthesis	
Writing-up review	

You may find it helpful to construct a Gantt chart if several stages will take place concurrently, or depend on each other. Software such as Microsoft Project can help with this; other people use Excel. Free open source tools are also available (e.g. GanttProject)



rapid review tip 4

Documenting your protocol

You should precede all rapid reviews with a protocol submitted to, and agreed with, the commissioner of the review; this protocol should be published (e.g. PROSPERO or Open Science Framework). The protocol document becomes correspondingly more, rather than less, important, given the limited time to surface expectations and conduct the review. The protocol should accommodate and document all post hoc changes to the protocol (eligibility criteria etc.) within an efficient and iterative process.

Garritty et al. (2021)

SUMMARY

By defining your review scope you provide a solid foundation for your subsequent review. You may find it useful to use a published framework for formulating your research question. Conducting a scoping search can help you to assess if your review is feasible, both in terms of uniqueness (are there existing reviews in your topic?) and in terms of the size and characteristics of the evidence base.

Consider mapping the literature identified in your scoping search. Various tools and approaches can assist with this, including logic models, data mining and concept mapping.

Consider whether you aim to be comprehensive or selective – this will be informed by the literature and the type of review that you choose to undertake.

Beware of **scope creep**, where items of interest distract from the original aim of your review. You can avoid scope creep by drawing up a review protocol at the outset and following it during your decision-making, particularly when you implement inclusion and exclusion criteria. If you need to change the scope of your review you can manage this by including a **changes clause** in your protocol.

key learning points

- Formulate your research question using a published framework (such as PICOS) where possible.
- When defining the scope of your review think carefully about what your audience will expect and need.
- Conduct a scoping search on key databases to identify the literature available.
- Consider mapping the literature using a tool such as a logic model or similar.
- Beware of the challenges and pitfalls, such as scope creep.
- Complete a review protocol with planned milestones before you start on your review.

frequently asked questions (FAQs)

FAQ 4.1 None of the frameworks fit my question. How can I formulate my research idea?

Not every question suits the frameworks covered here. Even if your question does fit a framework, you may choose to omit one or more facets. The important thing is to break down your research question into discrete concepts which you can clearly define and translate into meaningful search terms.

FAQ 4.2 With so much literature in my review topic, how can I review it systematically?

If you find more literature than you can realistically review, you can either narrow your focus (e.g. look at a more specific type of intervention, or population) or place restrictions on the type of evidence you will include. For example, you may apply limits by date, by study type, geographical coverage, or similar. Make sure that you clearly record all your decisions and that you are aware of potential biases. Consider the time taken for each stage of the process (not just screening but also quality assessment and data extraction) to decide what is feasible. Consider whether text mining or data mining might assist you with the study screening process.

FAQ 4.3 My research question is actually four or five questions, is this a problem?

Given the variety of possible questions that you might like to ask when defining your review scope you need to limit these to what is manageable and answerable. You will otherwise

(Continued)

discover the hard way that it is not possible to answer all the questions. Consider using a logic model to prioritise your research question. Time spent planning at the beginning of your review is time well spent to avoid tackling an unanswerable question. You may also want to explore Chapter 9 on using a mixed methods review to answer related quantitative and qualitative questions (e.g. the effectiveness, acceptability and implementation of intervention X compared with intervention Y).

FAQ 4.4 I had identified a defined question but my scoping search identified nothing on this topic, what shall I do?

You may need to modify your topic by expanding one or more of your concepts (do this one step at a time, so you can assess the impact of expanding each concept), or consider relaxing your inclusion criteria. Defining your research question is iterative. It is not uncommon to have to adjust your scope. It is better to adjust your scope early on than to get too far into the review process before realising that your question is not answerable.

FAQ 4.5 Is it really necessary to formally complete the review protocol?

Yes, your review will benefit greatly from having a formal review protocol. It serves as a document to which you can constantly refer to keep your review on track. The review protocol is particularly useful when working within a larger review team as it ensures that you all follow the same review recipe. In addition, a well-written review protocol assists when writing the methodology section of your review – if you have achieved what you said you would do, you should simply be able to change the future tense into the past tense.

FAQ 4.6 When is it appropriate to change my review scope?

You may have multiple valid reasons for changing the scope during your review. Spending time planning and scoping before you start reduces the risk of having to change, but sometimes change is inevitable due to resourcing, funding or scheduling issues. By conducting a scoping search you should become familiar with the literature, reducing the likelihood that you will need to change direction further down the line. You should also ensure that no recent review exists on your topic (remember to check PROSPERO, and other systematic review registers, for similar reviews which are already underway).

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Johnson BT & Hennessy EA (2019) Systematic reviews and meta-analyses in the health sciences: best practice methods for research syntheses. *Social Science & Medicine*, 233: 237–51. Available from: http://dx.doi.org/10.1016/j.socscimed.2019.05.035

Expanding on the PRISMA standards, the authors recommend further methodological considerations to be taken into account at each stage of the review process summarised in the acronym TOPICS-M (Time–Outcomes–Population–Intervention–Context–Study design and Moderators).

Petticrew M, Anderson L, Elder R, Grimshaw J, Hopkins D, Hahn R, Krause L, Kristjansson E, Mercer S, Sipe T, Tugwell P, Ueffing E, Waters E & Welch V (2013) Complex interventions and their implications for systematic reviews: a pragmatic approach. *Journal of Clinical Epidemiology*, 66(11): 1209–14.

A practical approach to undertaking systematic reviews of complex interventions, including clarifying the review question, implications for inclusion criteria, and approaches to synthesis of multiple outcomes.

Petticrew M, Knai C, Thomas J, Rehfuess EA, Noyes J, Gerhardus A, Grimshaw JM, Rutter H & McGill E (2019) Implications of a complexity perspective for systematic reviews and guideline development in health decision making. *British Medical Journal Global Health*, 4 (Suppl. 1).

Paper, commissioned by the World Health Organization (WHO), which considers the benefits of, and challenges associated with, complex systems-based approaches to systematic reviews.

Rowley J & Slack F (2004) Conducting a literature review. *Management Research News*, 27(4): 31–9.

Definitive section on developing conceptual frameworks and mind mapping.

Stern C, Jordan Z & McArthur A (2014) Developing the review question and inclusion criteria. *AJN The American Journal of Nursing*, 114(4): 53–6.

Part of an introductory series from the Joanna Briggs Institute aimed at nurses, this article discusses how to develop a research question and define inclusion criteria for a systematic review.

5

SEARCHING THE LITERATURE

in a nutshell

How to conduct a literature search

- Identifying studies to include is a key stage of any literature review.
- A systematic literature search is an essential component of any systematic review.
- Having developed a structured review question, this chapter helps you to translate that question into an appropriate search strategy.
- Tools and exercises can assist you to devise a search strategy and identify appropriate sources of information to be searched.
- Several techniques exist to make your literature search more systematic, and to review and refine it as necessary.

key terms explained

adjacency/proximity operators: database-specific commands (such as NEAR or WITH or 'exact phrase') that allow you to search for two or more terms occurring in close proximity. These operators increase specificity by preventing the retrieval of terms when they occur at a distance from one another.

Boolean logic: syntax entered into a search engine or database (e.g. AND, OR) specifying the relationship between two or more concepts required for an item to be retrieved.

grey literature: any information not produced by commercial publishers. It includes research reports, working papers, conference proceedings, theses, preprints, **White Papers**, and reports produced by government departments, academics, business and industry. May be referred to as fugitive literature.

search filter: a combination of search terms designed to retrieve studies meeting particular criteria (e.g. a type of study design, population or geographic setting). Search filters are typically designed scientifically and then evaluated as to their effectiveness in retrieving studies eligible for inclusion.

search strategy: the process by which searches are conducted to retrieve relevant items. Generically, this includes which databases were searched and which search terms were used. Specifically, it relates to the exact configuration of search terms and search syntax used within a specific database (e.g. ERIC, PubMed, etc.) – also known as a search string.

INTRODUCTION

The purpose of your literature search is to identify information for your review topic.

If you are planning to conduct your own research, you may seek literature to provide background and context; to identify a gap in the existing evidence; to provide justification for your work; or to investigate potential methodologies that you might use.

Perhaps having read the previous chapters you have identified a single, focused question that you want your search to address. This is where a systematic approach is most useful to ensure you identify the best available evidence. You may have teased out other implicit questions about which you are curious. Be sure to distinguish between a foreground question (an explicit review question requiring a systematic search) and a background question (a contextual question to be addressed in the introduction or discussion sections, perhaps informed by review articles or targeted searches) (Booth, 2019b) – if you allow your review to become hijacked by background issues your scope will rapidly expand out of control.

All searches involve a trade-off between two opposing goals: (i) retrieving all relevant results and (ii) minimising the number of unwanted results that you need to screen to identify what you are looking for (sometimes known as the **number needed to read** or **NNR**). In this chapter we will consider how to balance these two extremes (labelled as **sensitivity** and **specificity** respectively), a balance that depends on the type of review you are conducting and how important it is for your coverage of the topic to be comprehensive.

This chapter starts by describing the eight key stages in the literature searching process, including an analysis of methods used by a published review. A practical section then demonstrates how to translate your review question (as identified in Chapter 4) into a search strategy. We will refer to examples from several different disciplines and review types (including tips to consider within the context of rapid reviews), but you will find it useful to consider each section in relation to your own review topic. Reviews of **complex interventions** are briefly considered, but these may require alternative approaches to both planning and conducting searches; in the previous chapter we signposted 'Suggestions for further information' for those whose review explores complex interventions.

STAGES IN THE LITERATURE SEARCHING PROCESS

To identify evidence systematically for the purposes of a literature review, you will need to follow eight 'key stages' of the search process, from initial decisions made at the planning stage to conducting and reporting your searches (Cooper et al., 2018a). These stages (presented in Table 5.1) are common to reviews across all disciplines and are taken from the best available published guidance.

Table 5.1 Key stages of the literature searching process

Stage	Description	Steps
1	**Who should do the literature search?**	Ideally, engage an experienced information specialist/librarian to conduct searches. Maintain ongoing communication between the person searching and the rest of the review team If you are a student or lone researcher, you will probably need to do the searches yourself, but may still be able to obtain advice from an expert such as a librarian
2	**Aims and purpose of literature searching**	Decide whether your aim is a comprehensive survey of the literature or a selective, sampling approach To minimise bias, state clearly from the outset what types of evidence you consider eligible for inclusion For more iterative review types (e.g. qualitative evidence synthesis (Chapter 8) or realist synthesis (Chapter 9)), state how you plan to deal with emerging sub-topics
3	**Preparation (scoping)**	Draw a concept map (see Chapter 4) and populate it with lists of possible search terms Conduct a scoping search to assess the size and nature of the literature and define the boundaries around your topic (the scope)
4	**The search strategy**	Decide and state in your review protocol: • which sources you will search • at what stage of the review you will conduct them (all at the beginning? Or over multiple iterations? Will you need to plan update searches (or set up alerts) to notify you of any relevant studies published while your review is in progress?) • which supplementary methods you will use
5	**Searching bibliographic databases**	Identify appropriate database sources for your topic area. A list of possible sources is provided in Table 5.2. Use advanced search features (where available) for maximum control over your results
6	**Supplementary searching**	Consider additional searching for known authors in the field to see what else they have published Check reference lists of included papers for studies you have missed Search for papers which have cited your included studies (particularly useful for following up older papers) Search websites or general search engines to identify grey literature (see Table 5.3)

Stage	Description	Steps
7	**Managing references**	Export your search results to reference management software to remove duplicates and facilitate study selection
8	**Reporting the search process**	Keep a search log of sources searched, terms used and how you have combined them. Aim to make how you have identified evidence as transparent as possible. Consider saving one or more search strings in full for your Appendix (for systematic reviews this is essential) Follow the PRISMA-S reporting guidance (Rethlefsen et al., 2021)

Source: Based on Cooper et al. (2018a)

1. Who should conduct the literature search?

Advice consistently recommends that the person who conducts the search should be an experienced information specialist who is familiar with the databases and other sources relevant to your discipline (Rethlefsen et al., 2015; Metzendorf, 2016). Involving someone with search expertise from the outset helps you to plan and scope your project and write a protocol. They may also help you to develop and run the searches. The information specialist may also advise you on how to write up the search methods in your final report.

rapid review tip 5

Harness information expertise

Involve an information specialist in planning, conducting and writing up your rapid review. Ask them what are the minimum core databases that cover your topic (e.g. CENTRAL, MEDLINE and Embase for clinical trials) and whether data exists on database coverage or potential overlap. Ask them whether they recommend searching of specialised databases (e.g. PsycInfo and CINAHL) for your review topic. Ask them which sources they choose if under time pressures and which they omit when time and resources are limited. (Garritty et al., 2021)

Information specialists work best when they are embedded in the review team or, at the very least, can work closely with subject experts – this helps to ensure that searches remain closely aligned with the review aims. We strongly recommend that you include your search expert as a named applicant on research grants and a co-author of any resulting publications.

If you will be running the searches yourself, consider seeking advice from a librarian/information professional. Although not always possible for student dissertations, information specialists increasingly recommend the use of the **PRESS** (Peer Review of Electronic Search Strategies) checklist (McGowan et al., 2016; Rethlefsen et al., 2021).

If you are working on a topic where you have limited prior subject knowledge, expert advisors can help to suggest papers to get you started (and to use for validating your searches). Such experts could also help to verify your **search terms** (perhaps distinguishing between similar

concepts, in order to clarify which are within scope). Expert input is particularly important in realist reviews (Abrams et al., 2020), where core papers and expert insight are used to generate theories which are subsequently tested and explored through targeted searches for evidence (Booth et al., 2018c; 2020). Realist reviews are covered in Chapter 9.

2. Aims and purpose of literature searching

Developing an optimal search strategy for your topic requires that you understand clearly the review methodology that you are using.

Systematic reviews of the effects of interventions are usually expected to cover every relevant study meeting their inclusion criteria. Therefore, literature searches to support effectiveness reviews tend to prioritise **sensitivity**. Decision-makers can have more confidence in review findings if they know that you have aimed for a comprehensive sample of the literature (Hiebl, 2021), reducing the influence of bias and 'the play of chance'. If you miss relevant studies from a meta-analysis this could distort the review findings (and, consequently, any decisions or guidelines informed by that review). However, the need to restrict the number of results to a manageable number (Aveyard, 2019b) often requires that effectiveness reviews adopt a narrow focus with strict rules on what should be included (eligibility criteria).

rapid review tip 6

Eligibility criteria

If you work with key stakeholders to define clearly the scope of your review (e.g. population, intervention, comparator and outcomes), and you also agree to limit the number of interventions and comparators, then you will ensure that your rapid review is manageable and timely.

Garritty et al. (2021)

By contrast, qualitative evidence syntheses (which often ask open, exploratory questions) are not so vulnerable to missing relevant studies. Although searching for qualitative health research does require multiple databases and alternative search strategies (Frandsen et al., 2019), commentators argue that if you reach **theoretical saturation**, where no additional insights are gained from reading further papers, you lose little by omitting papers that represent 'more of the same'. For this reason, you might best spend your remaining time for searching in undertaking additional purposive searches to identify disciplines or perspectives that are less well represented or in pursuing elusive types of publication such as grey literature (Hoffecker, 2020) or academic theses. More information on searching for qualitative evidence can be found in Chapter 8.

Rapid reviews – in truth, more a 'family' of review types that offer variations from a conventional systematic review process (Sutton et al., 2019) – often involve search shortcuts (agreed in advance with the client). For example, an information specialist may use simplified or 'abbreviated' search strings across a limited number of sources (Nussbaumer-Streit et al., 2018). Other rapid reviews may still require full, exhaustive searches but omit or abbreviate other stages of the review process.

There is a direct relationship between searching and screening (study selection). High **sensitivity** (finding as many eligible studies as possible) is generally preferred, but may result in large numbers of false positives (records which appear relevant, but are not). Some reviewers prefer to spend time optimising the search **specificity** while others are content to run a broad search even if this increases the screening burden. Spending more time screening is typically best for diffuse concepts or for 'open' review questions, when you cannot anticipate all relevant specific search terms and have to resort to 'trawling' with general concepts. Further guidance on search requirements is found in Sutton et al. (2019).

3. How to prepare for your review (the scoping search)

You may find it helpful to start with a **scoping search**. A scoping search is a preliminary search designed to (i) identify existing reviews in your topic area and (ii) estimate the existing quantity and quality of relevant **primary studies**. Typically, scoping searches do not aim to be fully comprehensive. Scoping searches have three main objectives:

1. Identify any existing reviews around the topic (to avoid duplicating work).
2. Assess the nature and scale of the literature (to ensure that you can complete the review you are planning within the time and resources available).
3. Identify key publications with which to familiarise yourself with the topic and inform your subsequent searches (sometimes described as **pearl growing**).

Ideally you should cover a selection of both core electronic databases and grey literature sources in your scoping search, as suggested in Tables 5.2 and 5.3.

Sources

Table 5.2 lists common electronic databases (by subject area) and Table 5.3 lists sources of grey literature. Most electronic databases provide online guidance including search tips and video tutorials demonstrating the individual features of the database.

Table 5.2 Electronic databases: subject specific

Database	Coverage
Health	
Allied and Complementary Medicine Database (AMED)	Professions allied to medicine Alternative and complementary medicine Palliative care
BIOSIS	Biology and biomedical sciences (including botany, zoology, microbiology, biomedical science, ecology, biotechnology, biophysics, biochemistry and agriculture)
British Nursing Index	Nursing and midwifery (UK focus)

(Continued)

Table 5.2 (Continued)

Database	Coverage
CINAHL	Nursing and allied health (international)
The Cochrane Library, including: Cochrane Database of Systematic Reviews (CDSR) Cochrane Central Register of Controlled Trials (CENTRAL)	Cochrane systematic reviews and protocols Reports of controlled trials
Embase	Biomedical and pharmacological sciences, as well as general medicine
HTA Database (hosted by INAHTA)	Health technology assessment reports from around the world
MEDLINE/PubMed (includes MEDLINE database plus additional citations: 'in process' and 'ahead of print')	General medical and biomedical sciences. Includes medicine, dentistry, nursing, allied health
PsycInfo	Psychology and related fields
Social sciences	
ASSIA	Social sciences, includes sociology, psychology and some anthropology, economics, medicine, law and politics
Campbell Library	Systematic reviews of effects of social interventions produced by Campbell Collaboration. Includes social welfare, crime and justice, education
International Bibliography of Social Sciences	Social sciences including economics, sociology, politics and anthropology
Sociological abstracts	Sociology and related disciplines
Social Sciences Citation Index	Social sciences
Social care	
Social care online	Social work and community care (UK focus)
Social services abstracts	Social work, human services and related areas
Social work abstracts	Social work and human services
Education	
Australian Education index	Education (Australia)
British Education Index	Education (UK focus)
Education Resources Information Centre (ERIC)	Education (international/US emphasis)
Information studies	
Library, Information Science Abstracts (LISA)	Library and information sciences
Library, Information Science and Technology Abstracts (LISTA)	Free research database for library and information science studies
Computer sciences	
Computer and information systems abstracts	Broad coverage of computer sciences

Database	Coverage
IEEE/IET Electronic Library (IEL)	Electrical engineering, computer science and related technologies
Business and management	
ABI-Inform	Contains full-text journals and some grey literature including dissertations, company reports and working papers
Business Source Premier	Business research including marketing, management, accounting, finance and economics. Contains trade journals, newswires, market research reports, company profiles
EconLit	Economics
Emerald Insight	Books and journals on diverse subjects including accounting and finance, management, marketing, education, information studies and engineering
Also consider:	General social sciences sources like Scopus and Social Sciences Citation Index
Multidisciplinary	
Web of Science core collection	Comprises: • Arts and Humanities Citation Index • Science Citation Index expanded • Social Sciences Citation Index • Conference Proceedings Citation Index – Science • Conference Proceedings Citation Index – Social Sciences And Humanities • Book Citation Index • Emerging Sources Index *Note: these indexes can be searched either individually or simultaneously*
Scopus	• Chemistry, physics, mathematics, engineering • Life and health sciences • Social sciences, psychology, and economics • Biological, agricultural, and environmental sciences
Google Scholar	Although not strictly speaking a database, this search tool dedicated to academic content can complement your searches and is particularly useful for citation searching

Table 5.3 Grey literature sources

Type of grey literature	Potential sources
All types	CADTH 'Grey Matters' (health) GreySource (GreyNet International)
Ongoing research	Research registers such as: • ISRCTN Register • WHO International Clinical Trials Registry Platform (ICTRP) • NIHR Funding and Awards

(Continued)

Table 5.3 (Continued)

Type of grey literature	Potential sources
Governmental or quasi-governmental reports and guidance	Organisational websites such as: • World Health Organization (WHO) • UNICEF • National Institutes of Health (USA) • Center for Disease Control (USA) • Department of Health and Social Care (UK) • National Institute for Health and Care Excellence (NICE - UK)
Conference abstracts for ongoing or unpublished literature	Conference Proceeding Indexes such as: • Conference Proceedings Citation Index – Science via Web of Science • Conference Proceedings Citation Index – Social Science & Humanities via Web of Science • COS Conference Papers Index via ProQuest • Embase (conference abstracts in health) For recent papers not listed in databases, check websites of conferences in your field, e.g. in cancer: ASCO, ESMO; or in library and information science: UMBRELLA/CILIP Conference
Dissertations and theses	Databases such as: • ProQuest Dissertations & Theses (Global) – also known as 'Index To Theses' • Networked Digital Library of Theses and Dissertations (NDLTD) – USA • EThOS e-theses online (via The British Library)
Information from key websites in the field of interest	For example, for environmental research: • Organisation for Economic Co-operation and Development (OECD) • United Nations (UN) • World Bank • UNESCO • World Health Organization (WHO)

If your topic is multidisciplinary, you may want your scoping search to **sample** purposively across diverse disciplines. To conduct the scoping search, revisit your review question and make a list of synonyms for each concept of your query.

For your scoping search, concentrate on terms which are **specific** (i.e. a paper is highly likely to be relevant if they are present) rather than on broader, sensitive terms. Aim for a search that is sufficiently sensitive to estimate the overall size of the literature but where you can quickly identify key papers to help you develop your main strategy.

By looking at the words used in titles, abstracts and other searchable fields (such as how they are indexed in bibliographic databases) you can identify the most useful search terms and find similar material. Check the reference lists for the names of key authors whose work you might want to explore further. Using a small number of key papers to develop your search strategy like this is known as **pearl growing** (see Figure 5.1).

PubReMiner (https://hgserver2.amc.nl/cgi-bin/miner/miner2.cgi) is another way to identify relevant subject headings and key authors.

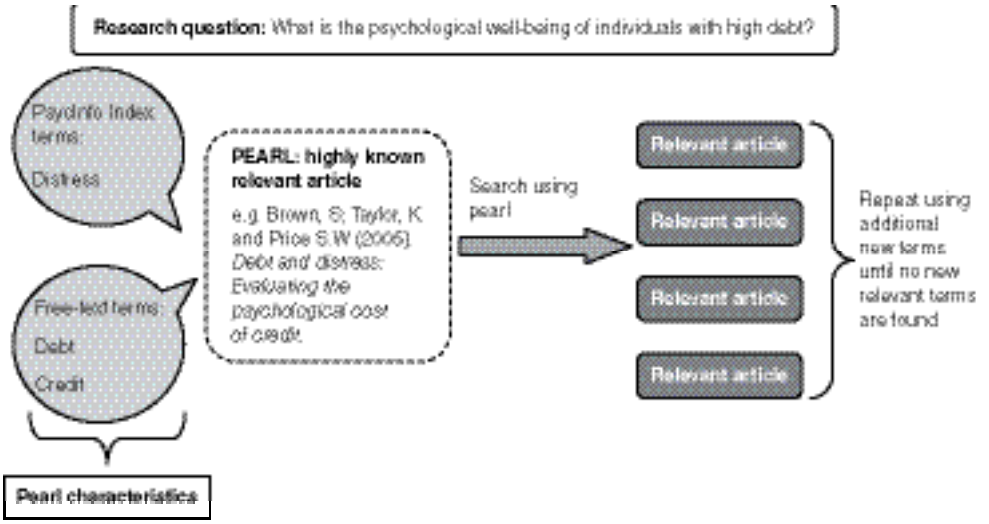


Figure 5.1 Illustration of citation pearl growing

4. How to construct your search strategy

Your **search strategy** is more than the string of terms and syntax that you enter in a specific database (although that is how some use the phrase). The search strategy includes conceptualisation of your question, which defines how your terms are grouped together; your choice of sources; and any supplementary methods you use (Aromataris & Riitano, 2014). When writing your review, you should devote a section of the text to explaining how you made these decisions as well as providing an example **search string**.

If you have used a question framework such as PICOS or SPICE (see Chapter 4), you will need to decide:

> Which concepts will I include in my search (typically population/perspective and intervention) and which will be easier to identify through the study screening process?

You will also need to consider:

> *Which terms will I handle either as synonyms or as related terms for the same concept?* For example, if you are interested in 'life expectancy' you might include terms like 'mortality' which are not synonyms but relate to the same concept. Sometimes you will have subgroups of synonyms, some of which will be sufficiently distinct in isolation while others are only of interest if paired with another term (or if found within certain disciplines).
>
> *Which sources will I search, and which supplementary search methods will I use* (especially when seeking information from beyond the mainstream published and indexed literature) (Cooper et al., 2018c)? Consider broad multidisciplinary databases, in addition to those directly related to your review topic.

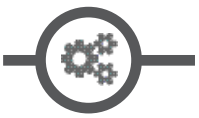
rapid review tip 7

Supplementary search sources

You will find grey literature and supplemental searching particularly valuable for some topics. However, always consider the extra time that such searching requires and prioritise either high-yield or 'high-risk' sources. If justified, search study registries and scan reference lists of other SRs, or included studies after screening abstracts and full texts.

Garritty et al. (2021)

What limits will I apply (if any)? If you are only interested in certain types of study, will you use a validated search filter to identify them? Further advice on searching to populate qualitative and mixed methods reviews is found in Chapters 8 and 9. If applying date limits to your search, choose a date with a methodological, practice or policy justification (e.g. the date of the searches for the last review on this topic; a change of government; the introduction of a new intervention; or the publication of a major report) rather than arbitrary date ranges such as 5 or 10 years. You can always apply a subsequent cut-off date during the study screening process if you need to, remembering to amend your review protocol to reflect this.



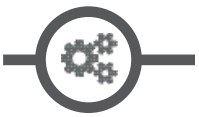
rapid review tip 8

Applying date restrictions

If you are considering limiting the inclusion criteria for your rapid review by study date of publication think carefully about the implications. Could loss of studies before a particular date change the bottom line of any meta-analyses? Conversely, could inclusion of older qualitative studies introduce contextual factors that no longer apply? Although date restrictions offer a pragmatic shortcut, they should be carefully considered for each topic.

Garritty et al. (2021)

For systematic reviews, you should record all decisions, taken at the scoping stage and stated in your protocol, a priori to minimise bias when conducting your comprehensive searches.



rapid review tip 9

Justify all limitations

Always consider search limits within the context of each rapid review. You may find it appropriate to limit your searches to literature that describes contexts similar to your own, particularly if different health systems, educational systems or political systems are likely

> to affect review results. Restricting to English-only studies is not appropriate for global or multi-country reviews but may be pragmatic if time and resources for translation are limited. Consider whether particular geographical regions are known for a particular problem or type of intervention. Above all, note down why you made the decision and document any limitations or shortcuts for use in the Discussion of your final report.
>
> Garritty et al. (2021)

For reviews using **iterative search** methods it is particularly useful to keep a journal, log or search summary table recording decisions you make as you conduct your searches and how many results you find via each method (Bethel et al., 2021).

5. How to search bibliographic databases

Although bibliographic databases will not identify everything you seek for your review, they typically form a substantial part of your search strategy. Evidence of robust, well-structured database searching will reassure your audience that your review has made every effort to identify all the relevant literature.

Bibliographic databases generally offer more advanced search features than other sources, allowing greater control over sensitivity and specificity. Search syntax varies from platform to platform (e.g. Ovid versus EBSCO for example), but we highlight common features to look for when checking 'search tips' or 'Help' pages in the respective sources. Sample search strings run across various database platforms are provided later in this chapter (Exercise 5.2).

Free text searching

All databases offer a basic 'free text' search, but the way this works varies considerably between platforms. Although some databases contain the full text of articles, you should not assume that this is the case; more often than not, full text is hosted elsewhere, meaning you will only be able to search article titles, abstracts and index fields. As you enter your search terms consider applying **truncation** to find singular/plural forms and other word endings (some databases automatically use a process called **lemmatisation**). Manual truncation typically involves placing an asterisk (*), or occasionally a dollar sign ($), at the end of the stem of a word. Be careful not to truncate too early (**nurs*** finds nurse, nurses and nursing, but also nursery). You can use wildcards where spellings vary in the middle of a word (e.g. on the Ovid platform **colo?r** will find both **colour** (UK) and **color** (US); in **wom#n** the # character substitutes for the **a** or **e** in **woman** or **women**).

If searching for phrases, rather than individual terms, be sure to check database help pages to confirm how these are interpreted; some platforms assume you are searching for an exact phrase, others simply look for terms occurring near to one another (you can sometimes counteract this by encasing the phrase within quotation marks, e.g. 'zero-based budgeting'). The interpretation of hyphenated words and phrases can vary between databases: some platforms will treat a hyphen as a space. Check the help pages of the database(s) you are searching, or if in doubt search for all variant forms (e.g. socioeconomic or socio-economic) and combine them with OR.

Thesaurus searching

Some databases, generally those which specialise in a particular discipline, offer a **controlled vocabulary** in the form of **subject headings** which are applied as indexing to records as they are added to the database. Subject headings aim to address the inconsistencies in terminology used by authors and make similar articles easier to discover. They do this by standardising the way studies are categorised using a common scheme – much as books on similar subjects would be shelved together in a library.

How useful these headings are will depend on how comfortably they match the facets of your review question, but where available they may suggest terms you would not otherwise have thought to include in your search. Moreover, thanks to the human judgement used in the indexing process, the presence of a term in the subject heading field often yields a higher degree of specificity than the same term in an abstract alone.

You will find that hierarchies of subject headings are helpful in suggesting how you might broaden your search (if required), or in identifying narrower terms beneath an umbrella concept in which you are interested.

Population interested in = Teenagers
ASSIA Thesaurus term = Adolescents
[+] indicates there are narrower terms below the term.

Adolescents [+] (Use For Teenagers)
Broader Terms = Children [+]
Narrower Terms =

- Autistic adolescents
- Behaviour disordered adolescents
- Blind adolescents
- Conduct-disordered adolescents
- Deaf adolescents
- Developmentally-disabled adolescents
- Disadvantaged adolescents
- Emotionally-disturbed adolescents
- Gifted adolescents [+]
- Hearing-impaired adolescents
- Hyperactive adolescents
- Learning-disabled adolescents
- Low-intelligence quotient adolescents
- Reading-disabled adolescents [+]
- Runaway adolescents [+]
- Sexually-abused adolescents
- Sick adolescents
- Special-needs adolescents
- Violent adolescents
- Visually impaired adolescents

Figure 5.2 Example of thesaurus searching

Note: Subject headings vary between databases, which is one of the reasons why, for systematic searching, it is recommended to search databases one at a time (even if they are on the same platform). It should also be noted that these schemes evolve over time – newer concepts (e.g. 'social distancing') may take some time to be recognised and appropriately indexed, and older headings may change their meaning – check the scope note if you are uncertain whether or not a heading is relevant to your topic.

Boolean, adjacency and proximity operators

Once you have identified the search terms you will use for each of your key concepts, you can combine them into a search string using **Boolean logic**.

In simple terms:

1. OR is used to combine synonyms, or terms which relate to the same concept. By combining terms with OR your search is broadened.
2. AND is used to combine different concepts which must both be present for an article to be retrieved. By combining terms with AND you are narrowing your search.
3. NOT is used to exclude unwanted terms so is another way of narrowing your search.

Using 'OR' and 'AND' will be sufficient for many searches. 'NOT' should be used with caution since it can have unintended 'double negative' effects (e.g. if you exclude a term which is mentioned in an article only in the context of a sentence saying the authors have excluded it). If you do decide to use NOT, it is always worth examining at least a sample of the records you have excluded to check that the effect is as you intended.

Since databases are primed to recognise and act upon Boolean commands, you should be careful around everyday phrases which contain one of these terms, for example:

> low- and middle-income countries would be interpreted as a Boolean search for the word 'low' AND the phrase 'middle-income countries' (not necessarily occurring together). To avoid this, enclose the entire phrase in quotation marks.

If one of your search concepts could be expressed in a number of different phrases, you might prefer to use a **proximity search** (sometimes known as 'adjacency searching'). This looks for two or more terms occurring close to each other, within a specified number of words, in any order.

For example, using the **syntax** on Ovid databases:

> (education* or academic*) adj3 (achievement* or attainment*)
>
> would find phrases such as
>
> 'educational attainment'
>
> 'attainment in educational settings'
>
> 'academic or scholarly achievements'
>
> (or any other phrase containing at least one word from the first set of brackets and one from the second).

Other database platforms use different proximity operators such as NEXT, NEAR or WITHIN – always check the help pages or 'search tips' for the databases you use.

Limits

Most databases offer the facility to apply limits to your search results. For example, you can often limit by language - though you should consider the potential risk of bias involved in doing so (Pieper & Puljak 2021). You can also limit results by year of publication, if there is a reasonable justification for doing so; though if you change your mind about your cut-off date

it is much easier to exclude records on this basis at the screening stage than to rerun all your searches for the years you missed. Some databases offer other limits (e.g. limiting by age group or study type); however, these are based on indexing which can occasionally be inaccurate or incomplete (especially for 'in-process' records recently added to the database). For this reason, we would advise using such limits for targeted, specificity-maximising searches only, rather than for those where sensitivity is critical.

Search filters

Search filters (sometimes known as **hedges)** are expert-designed search strategies which you can use 'off the shelf' and append to your topic search as a more robust and reliable way of limiting the results.

The best search filters have been carefully developed and tested against a 'gold standard' set of results to verify their sensitivity and specificity (a process known as 'validation'). Search filters are particularly useful for identifying types of research (e.g. randomised controlled trials; qualitative studies) or limiting results by geography (e.g. a filter listing all low- and middle-income countries). The Information Specialists' Sub-Group of InterTASC (ISSG) maintains a filter resource of common search filters (Box 5.1).

box 5.1

The ISSG search filter resource

Access the ISSG Search Filter Resource (https://sites.google.com/a/york.ac.uk/issg-search-filters-resource/home). The ISSG Search Filter Resource is a collaborative venture to identify, assess and test search filters designed to retrieve research by study design or focus. Browse through the list of study design or topic filters and select one entry. What search filters exist for your chosen study design/topic?

Saving your searches

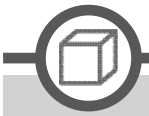
Many database platforms allow you to save your searches (advisable to allow you to rerun them quickly at a later date if required). You may need to rerun your searches if you realise you made an error or omitted an important term, or simply because you want to know if any new papers have been published while you have been working on your review – something which is particularly important with emerging topics and the advent of the 'living systematic review'. Some databases offer optional email alerts for newly added articles matching your search terms.

Searching the grey literature

Depending on your review topic, you may be interested to a greater or lesser extent in grey (gray or fugitive) literature sources. **Grey literature** (which might include guidelines, reports,

pamphlets or dissertations) is identified as such because it is often more difficult to obtain than that which is published through the mainstream channels (Adams et al., 2016).

No single search engine covers all grey literature sources; you should consider what *types* of grey literature are required and then develop a strategy for finding them (some possible sources are suggested in Table 5.3). Your overall aim should be to utilise a targeted approach that balances practicality with methodological rigour (Hoffecker, 2020).



box 5.2

Types of grey literature

- Conference papers
- Official publications
- Reports from non-governmental organizations (NGOs) and charities
- Unpublished or ongoing research
- Dissertations or theses.

You will find some types of grey literature via targeted searching in Google, but you will often need to visit organisational websites to access content not indexed by search engines. Keep records of your grey literature searches so you can report how you identified the evidence you find (Stansfield et al., 2016).

6. How to use supplementary searching

You might find it useful to use supplementary search techniques to ensure that nothing has been missed by your main topic searches (Delaney & Tamás, 2017; Cooper et al., 2018c).

Checking bibliographies and reference lists

One way to verify your search strategy is to check the reference lists of your included papers for anything you might have missed. If you do notice any papers which appear relevant but were not retrieved, spend some time establishing why that was. Were they indexed in the sources you searched? Did you omit an important search term? Would it have made a difference to your review overall to miss these papers (and others like them)? If so, you may want to run some targeted searches to see what else was missed.

Author searching

If your scoping search identified a number of key authors working in your topic area, you may find it useful to search for them by name to find their other publications, even without including your other terms (provided their names are sufficiently uncommon). Consider contacting

authors directly to ask if they have any ongoing research projects which would be relevant to your review – they may have interim findings they would be willing to share with you. Even if you do not receive a response, you can report the fact that you made multiple efforts to identify all the relevant literature rather than relying on database searching alone.

Citation searching

If you have older papers that are highly relevant, another way to verify your searches is to look for more recent papers that have cited them. Citation searching (sometimes known as 'forward chaining' or 'forward citation tracking') is most powerful on large, multidisciplinary databases like Scopus or Web of Science; but you can also run simple 'cited by' searches using Google Scholar. Citation searching is most helpful for papers that are at least five years old, and which have been cited mainly within their own discipline (for their findings) rather than for an innovative methodological approach (which might have been applied to unrelated research).

Hand searching

Many published reviews make reference to supplementary 'hand searching' (or 'handsearching') which traditionally referred to browsing printed editions of a shortlist of highly relevant journals in order to identify any studies missed by your database searches. Now that many major journals are online only, this practice is somewhat archaic but the term is still widely used. A modern counterpart might be to browse online tables of contents or even search the full text of online journals (the latter option should not replace your database search, since the search functionality on most journal websites is far less sophisticated, but it could allow you to search for highly specific terms which were not included in the title, abstract or other searchable fields).

7. How to manage your references

Management of references greatly assists the process of a systematic literature review. You should be able to account for all references retrieved in the search throughout the systematic literature review to ensure your methods are transparent.

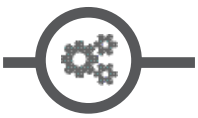
Electronic reference management software such as EndNote or Mendeley allows you to directly import references from individual databases (Peters, 2017). You can sort and search within your library of references; add descriptive tags or labels while screening them; and insert citations directly into your final report to automatically generate a reference list and bibliography (in diverse formats).

Available reference management packages include free and subscription-only, desktop and online options. Generally, web-based reference management systems are easier to use when you want to share references within a team, but they may not offer as many features as desktop software (e.g. they may offer fewer output citation styles). Some free packages (like Mendeley) offer a 'premium' option if you need increased storage space.

Table 5.4 Comparison of features in reference management packages ***(information correct at time of publishing)***

EndNote	• Online (free)/Desktop (paid) • Online version easy to set up and share folders • Desktop version more customisable and has many more output styles (tailored for specific journals), upgraded annually • Long established and widely supported
Mendeley	• Online/Desktop (free, premium available) • Quick to learn, easy to set up and share
RefWorks	• Online (paid) • Some organisations have an institutional subscription
Zotero	• Online (free – open source) • A powerful, free tool but may involve a steeper learning curve than some of the other options above

Table 5.4 shows some of the features of common referencing packages; see Parabhoi et al. (2017) for a more in-depth discussion of the features of Mendeley and Zotero in particular. You can find a list of software for reference management in the Systematic Review Toolbox (SR Toolbox) (www.systematicreviewtools.com), an online resource of tools to assist with the systematic review processes.



rapid review tip 10

Using software to accelerate your rapid review

Where available you should use online systematic review software (e.g. Covidence, DistillerSR, Rayyan or EPPI-Reviewer) to streamline your review process. Reuse templates (e.g. a PRISMA flowchart generator) and forms (e.g. quality assessment checklists) across reviews to save time. Be aware that it takes time to learn new software which is time best spent in between, not during, rapid reviews.

Garritty et al. (2021)

8. How to report the search process

If you are to demonstrate that you have followed systematic search processes you need to retain thorough documentation of all your search efforts. Increasingly, information specialists are devising methods to improve search documentation (Rader et al., 2014a). These include crafting an accompanying 'search narrative' (Cooper et al., 2018b) and use of a search summary table to improve search methods, results and efficiency (Bethel et al., 2021). Many databases allow you to generate an electronic copy of the strategy (typically as a text file to be copied and pasted into a Word document).

PRISMA-S checklist (for reporting literature searches in systematic reviews)

Section/topic		Checklist item	Location(s) reported
INFORMATION SOURCES AND METHODS			
Database name	1	Name each individual database searched, stating the platform for each.	
Multi-database searching	2	If databases were searched simultaneously on a single platform, state the name of the platform, listing all of the databases searched.	
Study registries	3	List any study registries searched.	
Online resources and browsing	4	Describe any online or print source purposefully searched or browsed (e.g. tables of contents, print conference proceedings, web sites) and how this was done.	
Citation searching	5	Indicate whether cited references or citing references were examined and describe any methods used for locating cited/citing references (e.g. browsing reference lists, using a citation index, setting up email alerts for references citing included studies).	
Contacts	6	Indicate whether additional studies or data were sought by contacting authors, experts, manufacturers, or others.	
Other methods	7	Describe any additional information sources or search methods used.	
SEARCH STRATEGIES			
Full search strategies	8	Include the search strategies for each database and information source, copied and pasted exactly as run.	
Limits and restrictions	9	Specify that no limits were used, or describe any limits or restrictions applied to a search (e.g. date or time period, language, study design) and provide justification for their use.	
Search filters	10	Indicate whether published search filters were used (as originally designed or modified), and if so, cite the filter(s) used.	
Prior work	11	Indicate when search strategies from other literature reviews were adapted or reused for a substantive part or all of the search, citing the previous review(s).	

Section/topic		Checklist item	Location(s) reported
INFORMATION SOURCES AND METHODS			
Updates	12	Report the methods used to update the search(es) (e.g. rerunning searches, email alerts).	
Dates of searches	13	For each search strategy, provide the date when the last search occurred.	
PEER REVIEW			
Peer review	14	Describe any search peer review process.	
MANAGING RECORDS			
Total records	15	Document the total number of records identified from each database and other information sources.	
Deduplication	16	Describe the processes and any software used to deduplicate records from multiple database searches and other information sources.	

Source: Rethlefsen, M.L., Kirtley, S., Waffenschmidt, S. et al. PRISMA-S: an extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews. *Systematic Reviews* 10, 39 (2021). https://doi.org/10.1186/s13643-020-01542-z

Documenting your search

A well-documented search (Niederstadt & Droste, 2010) should record:

- Databases searched (including platform or provider, e.g. MEDLINE via Ovid, CINAHL via EBSCO and years covered).
- Date searches conducted.
- Description of search strategy (how your question was conceptualised; terms used and how these were combined) in methods section.
- Any filters applied to your searches (including citations where required).
- Numbers of results retrieved at each stage (from each search/in total/after the removal of duplicates).
- At least one example search string reproduced in full (including numbers of records retrieved) as an appendix. Some systematic reviews provide *all* searches as supplementary material; others will make full searches available on request.

The **PRISMA** (Preferred Reporting Items for Systematic reviews and Meta-Analyses) statement (Page et al., 2021) is an established standard for authors reporting systematic reviews and meta-analyses. PRISMA-S (Box 5.3) is an extension designed to address the variability of reporting of search methods.

Note that the PRISMA-S checklist uses the term 'search strategy' to refer to the terms and syntax entered into each database. Although this usage is prevalent, we prefer to use 'string' for the specific terms and syntax and the broader term 'strategy' to refer to the overall approach used to identify evidence.

Other standards are proposed for reporting literature searches, including the STARLITE mnemonic (Sampling strategy, Type of study, Approaches, Range of years, Limits, Inclusions and exclusions, Terms used, Electronic sources) (Booth, 2006).

Use these examples to help you, and you may also find it useful to consult existing reviews to see how other authors have reported the search write-up. A recent synthesis (Chojecki & Tjosvold, 2020) identified a longer list of search elements that you may wish to report for maximum transparency. It is important to be consistent with the method you use across all the searching for your review, reporting the same elements each time.

Now we have explored the stages of the systematic literature search process, we move on to look at a case study of the search process. Complete Exercise 5.1 which examines the search methods used in a published systematic review.

exercise 5.1

Case study of the search process

Table 5.5 details methods of identifying literature for a systematic review on housing interventions for 'housing-vulnerable' adults and the relation to well-being (Chambers et al., 2018). The team retrieved 4540 unique references. Consider Table 5.5 and answer these questions:

1. How do you rate this search in terms of the number and types of sources searched? Is this adequate?

2. What disadvantages can you identify in the author's search approach?
3. What aspects of the search process in the case study might you apply to your own review?

Table 5.5 Anatomy of the search process

Description of review	
The objective of this review is to identify evidence on the effectiveness of housing interventions for 'housing-vulnerable' adults with an emphasis on well-being outcomes	
Focused review question	*Details of the search process used in this review*
Population: 'Vulnerable' groups (e.g. homeless persons, asylum seekers, victims of abuse) Interventions: Housing First; independent living; sheltered accommodation … Comparison – Not Applicable Outcomes: Well-being (Office of National Statistics 2015 definition) Context: United Kingdom	Key stage 1: Who should conduct the searches? Searches were conducted by 'highly experienced information specialists' as part of the project team Key stage 2: Purpose of search 'The aim of the searches was to identify all evidence on housing interventions for housing-vulnerable people that relate to the eight dimensions of well-being under consideration' Key stage 3: Preparation (scoping) Initial scoping search including outcome terms for eight dimensions of well-being found few relevant records, suggesting that terminology was inconsistent and relevant literature was being missed by inclusion within the search Key stage 4: Search strategy Broad search combining terms for housing with interventions and vulnerable population groups (but not specifying outcomes) Key stage 5: Database searches Medline, EMBASE, EconLit and PsycINFO (all via OVID), ASSIA (via ProQuest) and Social Sciences Citation Index (via Web of Science) Key stage 6: Supplementary searches • Scrutiny of introduction/background/reference list of papers retrieved to identify additional papers • Citation searching of key papers • Search of selected topic relevant UK websites based on research activity and recommendations from review advisory board members (charities, think tanks and other organisations with interest in housing for vulnerable people) • Search discussion papers, publications and activities of UK university research centres and groups focused on housing research; targeted call for evidence through expert network (the What Works Centre for Wellbeing) Key stage 7: Reference management Results imported into EndNote. Key stage 8: Reporting Sample Medline search strategy and details of the supplementary search methods provided *(in appendices of original report)*

Types of literature reviews

Remember that systematic approaches to reviewing the literature do not necessarily require the fully exhaustive search that often characterises systematic reviews. Table 5.6 examines the search methods used by different types of review.

Translating your review question into a search strategy

As you read this chapter you will no doubt be considering how the techniques discussed apply to your own review topic.

In Chapter 4, we introduced frameworks such as PICO(S) and SPICE to conceptualise your question. While you will find it helpful to identify all your key concepts (or facets) for the sake of clarity, you will not necessarily have to include all those concepts as search terms within your search strategy. When searching to support systematic reviews of effectiveness, often using the PICO(S) model, guidance suggests that search strategies focus on population, intervention(s) and study type(s). Adding terms for outcomes may significantly reduce the sensitivity of a search, something that would run the risk of missing relevant studies for this type of review (Frandsen et al., 2020).

Exercise 5.2 involves examining sample **search strings** to assess how effectively they have translated the review question.

exercise 5.2

Examining search strings

These sample search strings cover diverse topics and database platforms. Look at each in turn, and consider:

- How would you rate the search? Have the concepts of the research question (population, intervention/exposure, outcome(s), etc.) been successfully translated into search terms? Are there any other search terms that you might have included?
- What types of searching (thesaurus searching, free text searching) have been used and are these appropriate?
- Which search tools have been used (Boolean operators, truncation, etc.)? Have these tools been used successfully?

Table 5.6 Types of review

	Search Methods			
Type of Review	***Definitely Use ✓***	***Consider Using ?***	***Not Essential X***	***Example***
Scoping review: – Aims to identify key research in the topic area – May restrict the number of sources searched to key ones in topic discipline(s) – Often involve an assessment of ongoing research.	– Database Searching	– Grey Literature – Ongoing research	– Reference List Checking – Citation Searching – Contact with experts	Kelly et al. (2018) Walking on sunshine: scoping review of the evidence for walking and mental health. *British Journal of Sports Medicine*, 52 (12): 800-806. This scoping review aimed to identify and present the evidence base about the benefits of walking, to establish what is known and what remains unknown about the relationship to eight specific mental health outcomes. Searches covered MEDLINE, ProQuest and Web of Science and combined synonyms for walking with terms for each of the eight outcomes. No geographical limits were applied.
Mapping review: – Several examples exist of exhaustive, comprehensive searching in mapping reviews. – It would be reasonable to use any/all of the techniques (be guided by your topic area and/or aim of review).	– Database Searching – Grey Literature	– Reference list checking – Citation Searching – Contact with experts – Ongoing research		Emonson et al. (2019) Class time physical activity programs for primary school aged children at specialist schools: a systematic mapping review. *International Journal of Environmental Research & Public Health*, 16 (24): 5140-5170. This review aimed to identify and map class time physical activity programmes that have been implemented in specialist schools and classes. A search string was developed around synonyms for participants (children with disabilities), setting (special schools) and intervention (physical activity) and run on eight bibliographic databases. Additional searches for grey literature including dissertations were conducted and reference lists of included studies were checked.

(Continued)

Table 5.6 (Continued)

	Search Methods			
Type of Review	***Definitely Use ✓***	***Consider Using ?***	***Not Essential X***	***Example***
Systematic review: – Exhaustive, comprehensive searching of published and unpublished literature following a pre-defined protocol and reporting methods in full. All reasonable steps to identify relevant studies should be used.	Database Searching Grey Literature Reference List Checking	– Citation Searching – Contact with experts – Ongoing research (especially in fast-moving fields)		Fuller et al. (2019) First, do no harm: a systematic review of deforestation spillovers from protected areas. *Global Ecology and Conservation*, 18: e00591. This review examined the impact of national parks and other conservation initiatives on leakages and spillovers into neighbouring areas. The authors followed a protocol developed according to discipline-specific guidance. Searches (combining terms for deforestation, protected areas and outcomes such as displacement) were run on two broad multidisciplinary database platforms (Web of Science and Scopus) plus ProQuest Dissertations and Theses and Google Scholar. Bibliographies of included studies were checked for missed studies. A PRISMA flowchart reports the process by which included studies were identified.
Qualitative systematic review: May employ selective or purposive sampling Database searching may extend beyond core databases to include theses and unpublished reports. Emphasis may be placed on using other search techniques (such as citation searching and contact with experts)	Database Searching Grey Literature Reference List Checking Citation Searching Contact with experts	Hand Searching Ongoing research		Shakibazadeh et al. (2018) Respectful care during childbirth in health facilities globally: a qualitative evidence synthesis. *BJOG: An International Journal of Obstetrics & Gynaecology*, 125(8): 932–942. This review presents an evidence-based typology of respectful maternity care in health facilities globally. It conducted an extensive search of diverse sources, including electronic databases, web resources and other grey literature including theses and unpublished reports. In addition the authors contacted experts in relevant fields and checked the reference lists of relevant papers. Search strategies are reported in three Appendices. See Chapter 8 for more information about qualitative systematic reviews, including search approaches

For a more extensive set of examples of different review types and associated search requirements, see Sutton et al. (2019)

Research question A – Electricity pylons and schools

Is the location of schools near to electromagnetic fields from electricity pylons liable to have adverse health effects on schoolchildren?

Suggested search string for MEDLINE via OvidSP:

1. exp Schools/
2. school*.ti,ab.
3. 1 or 2
4. location*.ti,ab.
5. near.ti,ab.
6. next to.ti,ab.
7. adjacen*.ti,ab.
8. proximity.ti,ab.
9. 4 or 5 or 6 or 7 or 8
10. 3 and 9
11. exp Electromagnetic Fields/
12. electromagnetic* field*.ti,ab.
13. 11 or 12
14. 10 and 13

Research question B – ICT interventions to facilitate maths problem solving

Do information and communications technology (ICT) interventions improve primary school-children's performance in solving maths problems?

Suggested search string for ERIC via EBSCO:

S1 DE 'Elementary Schools'

S2 primary school*

S3 DE 'Children'

S4 child* or infant* or junior*

S5 S1 OR S2 OR S3 OR S4

S6 (DE 'Problem Solving')

S7 DE 'Information Technology'

S8 ICT or 'I.T.' or information technolog* or ('information and communication* technolog*' or computer* or tablet or iPad* or hand-held device*)

S9 S7 OR S8

S10 DE 'Mathematics Achievement' OR DE 'Mathematics Skills'

S11 math or maths or mathematics or numeracy

S12 S10 or S11

S13 S5 AND S6 AND S9 AND S12

Research question C – The benefits of solar-powered travel

Is the provision of solar-powered cars likely to result in benefits to society in an industrialised nation?

Note that this search focuses on environmental and financial benefits.

Suggested search string for Science and Social Sciences Citation Indexes via Web of Science:

#1 Topic = (solar power*) AND (car* OR vehicle* OR automobile*)

#2 Topic = (environment* OR pollut* OR emission*)

#3 Topic = (financ* OR econom* OR cost effective* OR cost benefit*)

#4 Topic = #2 OR #3

#5 Topic = #1 AND #4

Research question D – Early discharge of stroke patients

Is early discharge of stroke patients from hospital into the community more effective than standard hospital care?

Suggested search string for EMBASE via Ovid:

1. exp stroke patient/ or exp stroke/
2. stroke*.ti,ab.
3. cerebrovascular accident*.ti,ab.
4. 1 or 2 or 3
5. exp hospital discharge/
6. early adj2 discharge*.ti,ab.
7. 5 or 6
8. 4 and 7
9. meta-analys:.mp. or search:.tw. or review.pt.
10. 8 and 9

Note how this search demonstrates the use of a search filter (step 9), in this case devised by the Health Information Research Unit at McMaster University. Although much shorter than many published filters, this short string has been found to retrieve successfully 92% of systematic reviews when validated against a 'gold standard' set of articles (Wilczynski et al., 2007).

Now that you have examined existing search strings it is time to turn your attention to developing one for your own topic.

exercise 5.3

Planning a literature search for your own review

Think ...

about the purpose of your review – how comprehensive a search do you need to fulfil the purpose of your review?

about your focused question – what types of databases may index articles on your topic area? Which terms might describe each concept in your focused question?

do you know of any key citations or authors in your topic area? (Hint: ideally these papers should have been published at least 5 years ago in order to have accrued sufficient impact.)

Decide on ...

database sources to search, including sources of unpublished or grey literature (for assistance with identifying grey literature sources, see Table 5.3);

additional searching techniques: reference list checking, contact with experts, citation searching;

using a table, make a list of possible search terms for each concept within your focused question – think of all the synonyms and consider which terms might allow you to broaden or narrow each concept as required;

identify thesaurus terms for your search terms;

include free text terms (words you will search for in titles, abstracts and other 'unstructured' fields);

combine your search terms using Boolean operators (combine synonyms for each concept with OR; then combine different concepts with AND).

exercise 5.4

Pearl growing and author searching

In the grid provided (also available on the companion website) list three or four key citations you might consider useful 'pearls' in your topic area. List authors or institutions who might have conducted research studies in your topic area.

Candidate pearls:	Candidate authors or institutions for author searching:
1	1
2	2
3	3
4	4

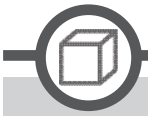
exercise 5.5

Sources to search

Using Tables 5.2 and 5.3, complete the search planning worksheet in the Toolbox section of this chapter (also available on the companion website), listing the different sources that would be useful to search for your chosen review topic area. Check your list with a librarian/information specialist if possible.

(Continued)

At the end of Chapter 4 (Defining your scope), you defined your review question as concepts and made a list of synonyms for each concept. The next stage is to identify **thesaurus** and **free text terms** for each synonym within a concept. Once you have derived a set of terms for each concept, you assemble your search strategy using the steps outlined in Box 5.3.



box 5.3

Assembling your search strategy

1. Combine terms within the same concept (all population search terms) using OR; and terms for different concepts (population AND intervention terms) with AND.
2. First combine population AND intervention/exposure terms to refine your strategy.
3. If your search result set is unmanageable, combine population AND intervention/exposure AND outcome terms.
4. If your search result set is still unmanageable, consider either combining with comparison terms OR applying limits. Note that the first step of the screening process is to read the titles to ascertain whether the reference will be potentially relevant to answer your review question. This is relatively quick to do, so bear this in mind when considering the number of search results you can manage.

Note: If your search does not fit a 'PICOS' question structure (see Chapter 4), carry out the same process using the headings for the structure you have chosen to define your question (e.g. SPICE), brainstorming terms, and combining together in a similar way.

Tip: if you are struggling to assemble a search, take a look at the examples in the 'Translating your review question' section (above) for guidance.

TOOLBOX – SEARCHING THE LITERATURE

Search planning worksheet

We have devised a template (also available on the companion website) for you to record which sources you will search to find the literature to answer your review question. Adjust the number of sources you will search according to the requirements of your topic and the time and resources available.

Also on the companion website you will find our 'source tracker' spreadsheet which allows you to record your search process as you go along, keeping track of the databases and websites you have searched; what you found there; and why you may wish to include it. Some reviewers prefer to use specialist reference management software (e.g. EndNote or Mendeley) for this purpose (Peters, 2017).

Search planning worksheet

Databases	Grey literature	Journals (hand searching)	Experts to contact?

SUMMARY

Systematically searching the literature ensures that you identify relevant studies for your review question. The breadth and type of approach you take will depend on the type and topic area of your review.

This chapter has outlined *eight* key stages in the process of identifying evidence: deciding **who** is best equipped to conduct (or advise on) the search; establishing your **aims**; **preparation** (scoping); devising a search **strategy**; searching **databases**; **supplementary** searching; managing **references**; and **reporting** your methods.

Techniques such as **thesaurus** searching, **free text** searching, **Boolean operators** and application of limits will help you to develop a search strategy for electronic databases. Sources to search are determined by your subject area, and may include electronic databases, registries of ongoing research, websites and conference proceedings. Central to systematically reviewing the literature is that your review question and your search approach must be fit for purpose (according to review type) and designed to identify the studies you need to answer your review question. It is good practice for all types of literature review to report how evidence has been identified so that someone else might reproduce the process from the methods described; this will strengthen your review.

key learning points

- Pre-plan your search and conduct a scoping search.
- Select the most appropriate sources to search.
- Take into account limitations of the literature, such as inconsistent terminology and problematic indexing, and include alternative search terms (including those used in known papers).
- Select the most appropriate search techniques for the sources that you have chosen. Consider whether it is appropriate to use search filters.
- Employ supplementary search approaches (e.g. citation searching as well as traditional database searching).
- Evaluate your search results, modify your search strategies accordingly and be sure to document the search process to allow you to report it accurately when you write up your review.

frequently asked questions (FAQs)

FAQ 5.1 How do I identify synonyms for my research topic concepts?

You can identify synonyms during the scoping search. The more you read in your area, the more familiar you will become with the terminology used. Consulting experts at the planning stage will help you to confirm whether you have overlooked any search terms. If you discover later in the process that you have missed a key term, you may need to run a follow-up search to see what you have missed (see FAQ 5.4 below).

FAQ 5.2 How do I know when to stop searching?

There is some debate on the stopping rules to apply to searching for reviews. If your topic is relatively narrow and focused, checking reference lists may give you a clue as you might start to recognise the same set of papers being cited repeatedly, suggesting you have identified all the relevant literature. For broader topics this may not work. Qualitative reviewers may aim to reach **data saturation** where new themes are no longer identified (Booth, 2010).

FAQ 5.3 Is it sensible to use NOT in a search strategy?

Use the operator NOT with caution as it may exclude studies that are potentially relevant. If, for example, you use NOT to exclude children from your search results, you may miss studies which cover multiple age groups, or studies where the abstract makes reference to earlier studies in children, while itself focusing on adults (a 'double negative' effect). NOT tends to be most useful as part of a search filter, excluding document types such as letters and editorials, or to eliminate records found in a previous version of the search, as outlined below, but if you do decide to use NOT we recommend that you examine at least a sample of the studies excluded.

FAQ 5.4 I have completed my searching, but have now discovered an additional search term that might be useful, what should I do?

Add the term to your search strategy and rerun the search to see if additional studies are identified. This is one situation where you can usefully apply the Boolean NOT operator to exclude results already screened from your original search:

#20 [original search string]

#21 [search string with additional term]

#22 [#21 NOT #20]

FAQ 5.5 Should I use abbreviations in my search terms?

Abbreviations can be useful in search strategies. However, if you find your search results increase dramatically with large numbers of irrelevant references, check that the abbreviation is not meaningful in multiple different contexts. For example, a search for evidence on attendance at GP appointments, focusing on factors that predict 'did not attend' rates, using the abbreviation 'DNA', would retrieve a large number of irrelevant studies relating to 'deoxyribonucleic acid'.

FAQ 5.6 I have noticed substantial duplication between the databases I have searched, how do I handle this?

Reference management software allows you to import all references from each bibliographic database you search into a single reference management library and to perform an automated duplicate check. You may find it necessary to perform an additional manual duplicate check as automated checks only identify duplicates that are an exact match in format. Experimental methods of de-duplication exist to improve sensitivity considerably over the default settings (Bramer et al., 2016). When writing up, note the total number of references found before de-duplication, and the total number of unique references (after de-duplication), and add these to your PRISMA flowchart. From experience, we advise retaining duplicates in the 'Trash' folder rather than deleting them completely – in this way, you can restore them, if necessary, for example if any have been deleted in error.

FAQ 5.7 Do I need to use a search filter?

This depends on your topic, the number of search results found and the purpose of your review. Conduct an initial search – if the number of references retrieved is manageable, you probably do not need to use a search filter. However, if you retrieve large numbers of references, you may find that a search filter is an appropriate way to limit your search. For example, if you are conducting a systematic review restricted only to randomised controlled trials (RCTs), you may find an RCT filter useful, particularly where the literature is plentiful. When considering a specific population, for example a geographic area, a published search filter (e.g. for the UK, Ayiku et al., 2020) helps to ensure that you identify all appropriate search terms. See the ISSG Search filter resource (https://sites.google.com/a/york.ac.uk/issg-search-filters-resource/) for a comprehensive list of search filters.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Aveyard H (2019) How do I search for literature? Chapter 4 in: *Doing a Literature Review in Health and Social Care: A Practical Guide*, 4th edition. Maidenhead: McGraw-Hill.

This chapter provides a step-by-step guide to searching the literature. The focus is on health and social care but it also addresses transferable skills, such as identifying inclusion and exclusion criteria, identifying keywords and recording your search strategy. The chapter also briefly covers using abstracts to assess relevance, retrieving references, and reference management. Tips on 'writing up your search strategy' are particularly useful – note these before starting your literature search to ensure that you are keeping an accurate record of the information required to report your search strategy efficiently.

Booth A (2016) Searching for qualitative research for inclusion in systematic reviews: a structured methodological review. *Systematic Reviews*, 5(1): 74.

Qualitative evidence synthesis presents its own unique challenges (see Chapter 8) not least in the retrieval of studies. This review examines and categorises the findings of papers on methods of searching for qualitative studies.

Booth A, Briscoe S & Wright JM (2020) The 'realist search': a systematic scoping review of current practice and reporting. *Research Synthesis Methods*, 11(1): 14–35.

Based on a review of search methods used in 34 published realist reviews (see Chapter 9), these authors note more rigorous searches for empirical data but poorer reporting around the process for identifying program theory. They recommend a six-component framework to offer greater transparency about the search process to inform reviews of this type.

Bramer WM (2019) Serving evidence syntheses: improving literature retrieval in systematic reviews. Doctoral Dissertation. Erasmus University Rotterdam. Available at: https://repub.eur.nl/pub/120107

Showcasing an extensive body of work on searching for the purpose of systematic reviews with a particular emphasis on the use of automated techniques, including de-duplication of results and the translation of strategies between database platforms. Bramer's thesis, available freely online, brings some of his key findings together into one volume.

Lefebvre C, Glanville J, Briscoe S, Littlewood A, Marshall C, Metzendorf M-I, Noel-Storr A, Rader T, Shokraneh F, Thomas J, Wieland LS. (2021) Chapter 4: Searching for and selecting studies. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA (eds), *Cochrane Handbook for Systematic Reviews of Interventions* version 6.2 (updated February 2021). Available from www.training.cochrane.org/handbook.

Chapter from key text for systematic review methods, focusing on search methods. While designed for those working in evidence-based medicine, many principles apply equally to other disciplines.

Levay P & Craven J (eds) (2018) *Systematic Searching*. London: Facet Publishing.
Superb collection of essays offering a 'deep dive' into the world of systematic searching that we have introduced in this chapter. Featuring chapters focusing in depth on topics like grey literature searching plus innovations in text mining and automation. Highly recommended.

Sutton A, Clowes M, Preston L & Booth A (2019) Meeting the review family: exploring review types and associated information retrieval requirements. *Health Information and Libraries Journal*, 36(3): 202–22.
Reviews best available guidance and current practice to provide detail on the different search methods considered appropriate for each of 48 review types (identified as seven 'families' based on their common features).

6

ASSESSING THE EVIDENCE BASE

in a nutshell

Selecting studies to include in your review and assessing their quality

- Different roles and challenges are associated with assessing the evidence base for quality and relevance.
- You must be able to assess studies for relevance and select studies to include in your literature review.
- Key concepts in quality assessment relate to validity and reliability; this chapter explores their importance within literature reviews.
- Other important concepts include applicability, transferability or generalisability.
- Identifying appropriate quality assessment resources, undertaking quality assessment and presenting the results of quality assessments are the key challenges of the quality assessment process.

key terms explained

external validity: the extent to which you can reasonably apply the results of a study to a definable population in a particular setting in day-to-day practice. Often described as applicability.

internal validity: the extent to which the design of a study demonstrates precautions that have been taken to avoid systematic errors or bias.

quality assessment: evaluation of the methodological quality of a research design within a study report to assess the extent to which the design and conduct of that study might impact on the credibility of the research findings.

quality assessment checklist: a tool used to perform a transparent and explicit evaluation of the methodological quality of a research design, using items, criteria or prompts.

subgroup analysis: analytical technique that involves dividing studies into subgroups according to a particular study design feature that might impact on study findings, for example the country in which the study was undertaken, or studies with large and small sample sizes, and exploring how these features might impact on the findings of the review.

Sensitivity analysis: a subgroup analysis to examine whether the results change if poor-quality studies are omitted.

INTRODUCTION

Assessing the **evidence base** is the point in the review process that focuses on the particular value that individual studies hold for your review question and the practical application of research. After searching the literature (Chapter 5), you will have identified a potential evidence base for your review, which often can be large and diffuse. From this list of references, you need to select systematically those that are *relevant* for your review question and exclude those that are not relevant. Once you have finalised your list of included studies for your literature review, you need to plan how to assess the evidence base. How exactly you will assess your included studies depends on the type of review being undertaken (see Chapter 3). Assessing the evidence base might simply involve briefly characterising the literature, for example in a **mapping review**. Alternatively, assessment might extend to a detailed examination of the methods and conduct of each study included in a systematic review. Within this overall assessment process this detailed examination is known as 'critical appraisal or quality assessment'.

'Critical appraisal' or 'quality assessment' are often used synonymously. Essentially, **critical appraisal** or **quality assessment** both focus on 'whether we can believe a study', and this is often referred to as internal validity. We tend to privilege the term 'critical appraisal' when referring to the assessment of a single study, perhaps with a view to applying it directly within professional practice. We prefer 'quality assessment' when referring to the procedure that examines numerous studies in a standardised way as part of a systematic review or evidence synthesis.

Systematic reviews carry out **quality assessment** as a standard procedure, and extensive multidisciplinary guidance exists on how to do this (Billotta et al., 2014; Higgins et al., 2021). We also need to assess **generalisability** or **applicability**, also known as **external validity**. Often this process is considered alongside **quality assessment**, but its focus is slightly different. Put simply, we assess the generalisability or applicability of an individual study by asking, 'Is the study relevant to the population targeted by our review question?'. Typically issues concerning **internal validity** are presented in the Results section of a review, while **external validity** is considered in the Discussion/Recommendations/Conclusion (see Chapter 10 for how to write up your review); however, many reviewers prefer to assess both in a single process, alongside **data extraction** (see Chapter 7).

This chapter discusses how to assess the evidence base, while focusing on quality assessment procedures (we will use this term throughout this chapter). The chapter starts by discussing how

to select relevant studies for a literature review in a systematic way. Then the chapter considers how to start to assess the evidence base and how the effort spent on assessment depends on the function of, and type of, literature review. The next section introduces the need for quality assessment. The section also outlines the different properties that you might assess in studies included in your review: validity, reliability and generalisability/applicability. Next, we provide an overview of different study designs, focusing on the implications of study design features. This is followed by a section on conducting your quality and relevance assessment, including presenting results and challenges of the process. The chapter details tools for assessing the evidence base. Throughout the chapter, we refer to examples from within different disciplines; however, you can consider how each section applies to your own review topic.

HOW TO ASSESS THE RELEVANCE OF STUDIES TO YOUR REVIEW QUESTION

At this stage, you have completed your literature search (Chapter 5), and as a result you have a list of potential studies for your literature review. From this 'long list' you need to select, for inclusion in your review, those studies that are relevant to the review question you formulated in Chapter 4. In some instances, depending on the quantity of research in your topic area, this can be a very long list of studies. At this point, you may feel overloaded with information!

Being systematic when selecting studies from the results of your literature search allows you to exclude studies that are not relevant to your review while ensuring that you do not miss studies that *are* relevant. This is important to help reduce **selection bias** within the review – the review findings should be based upon *all* relevant studies. It is essential that you have a clear idea of what is relevant to your review. Chapter 4 discussed formulating explicit **inclusion criteria** and **exclusion criteria**. It is at this stage where, if you devised an appropriately focused review question, you will find that selecting studies is made much easier. You look at your inclusion and exclusion criteria and assess how each potentially relevant study identified from the literature fulfils each criterion in turn. If a study does not fulfil a specific inclusion criterion or if it meets any of the exclusion criteria, you should not include that study in your review.

Looking forward to your review write-up, it is essential to keep a good audit trail of which references you have included and excluded, along with reasons for study exclusion. For references excluded when assessing titles and abstracts you should identify the main reason for exclusion at this stage, likely linked to your PICO criteria. You only need to document one reason when excluding any reference at the title and abstract stage (e.g. inappropriate population etc.). Systematic review software allows you to record that decision quickly and easily.

Documenting your decisions on inclusion and exclusion are equally important at the full text stage. Again, there may be multiple reasons why a specific paper might be excluded but you will only need to document one of these to justify your decision. Again software allows you to select a reason for exclusion from a list that you have pre-specified. Usually, for practical reasons, you will choose the most immediately apparent reason for exclusion; however, in some cases you may want to emphasise the impact of a particular criterion. For example, if you are only including randomised controlled trials but additional evidence is present in non-randomised studies you may want to document how many of these you have excluded. This information may help a funder to decide to commission a further review that takes into account these alternative study designs. A valuable function of a scoping or mapping review is to code the presence or absence of multiple characteristics so that you can 'model' the impact of each characteristic on the numbers of included studies and therefore decide where the boundaries (in terms of country

of origin, specific population or study type) might be drawn to produce a review that is both feasible and meaningful.

Steps in the study selection process

Experience suggests that the most efficient way of screening studies for inclusion in a literature review is first to examine the *titles* of articles from your literature searches. However, where time is at a premium, reviewers often combine screening of titles with the next stage which involves screening the abstracts. Often you can tell from the title of an article whether or not it is relevant. After screening titles, you move on to look at the *abstracts* of any studies where you could not judge relevance from the title alone.

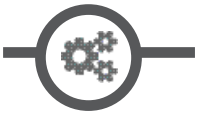
rapid review tip 11

Title and abstract screening

You will find it helpful to develop a standardised title and abstract form (e.g. an Excel spreadsheet) and then conduct a pilot exercise using the same 30–50 abstracts for the entire screening team. The pilot helps to calibrate and test the review form efficiently. As time often does not permit independent double observer screening, you can use two reviewers to dual-screen at least 20% (ideally more) of abstracts, with conflict resolution. One reviewer then screens the remaining abstracts and a second reviewer screens all excluded abstracts (to minimise the risk of discarding relevant studies), and if needed they also resolve conflicts.

Garritty et al. (2021)

Finally, you examine the *full text* of studies obtained on the basis of how relevant these abstracts are to your inclusion criteria. When excluding studies examined at the full text stage, you will find it useful to record reasons for exclusion of each study for the sake of transparency and to help in subsequent reporting. If you are using systematic review software, you can use it to record your decisions (Munn et al., 2019). Some literature reviews list studies excluded by this full text screen, usually only those that superficially look like they should have been included, together with reasons, in an appendix. This list offers transparency and allows you to justify decisions you make in the study selection phase. You can also anticipate queries as to why a particular study was excluded from your review.



rapid review tip 12

Full text screening

As for title/abstract screening, you should use a standardised full text form. For this stage you pilot the review form on the same 5–10 full text articles across the entire screening team. A single reviewer then screens all included full text articles and a second reviewer screens all excluded full text articles.

Garritty et al. (2021)

Using software for study selection

Chapter 5 presented different types of reference management software available to help you manage the literature review process. You can tag records or apply keywords to fields in your reference management database. For example, you can tag references that you have selected for inclusion in your review at the abstract stage with the keyword 'include abstract' in one of the unassigned database fields. This function allows you to retrieve a list of included studies in the review by searching in that field for the keyword 'include abstract'. Tagging references in this way also provides you with an audit trail for decisions you have made during the study selection process. At all times you should be able to know exactly which studies have been included or excluded, at what stage (title, abstract or full text examination) and, within a team, by whom they have been excluded. Systematic review software works in a similar way, automatically keeping track for you as you make inclusion and exclusion decisions. Chapter 10 discusses why it is important to keep accurate records of the study selection process.

Free software packages (such as Rayyan) or commercial packages (such as Covidence or EPPI-Reviewer) allow you to import references from databases. You can then devise review-specific menus of reasons for exclusion. If using systematic review software is not an option then there are alternatives. Often those conducting reviews, especially reviews that offer a mapping function, import the bibliographic records either directly from the electronic databases or from reference management software into Microsoft Excel (or some similar spreadsheet package) and construct pre-defined drop-down menus for each of the inclusion/exclusion criteria. You then proceed systematically through the list of studies, viewing the abstract in the top panel of the spreadsheet, and selecting the relevant category from the drop-down 'pick list' created in Excel. Categorising each reference in this way helps when completing the subsequent PRISMA flowchart (see Figure 10.1). Categorising also helps when mapping different types of studies and their frequencies. You can also filter on particular columns in Excel, to gain an instant result for how many studies met or failed a particular inclusion/exclusion criterion.

To apply the **inclusion and exclusion criteria** for your review for **study selection**, complete Exercise 6.1.

exercise 6.1

Study selection

Now, revisit your **inclusion and exclusion criteria** from Chapter 5 and write them in the grid provided. Keep this grid to hand while you go through your study selection process.

Tool for focusing your question – PICO, SPICE, etc.	
Inclusion criteria	Exclusion criteria
Population	Population
Intervention/exposure/focus of interest	Intervention/exposure/focus of interest

Comparator (if present)	Comparator (if present)
Outcome(s)	Outcome(s)
Context	Context

ASSESSING YOUR INCLUDED STUDIES – FIRST STEPS

Once you have selected the articles for inclusion in your review, the next stage is to assess this evidence base in more detail. Here you are seeking to become immersed in, and familiar with, each study so that you start to see how you might analyse and present your data. By this point, you have produced a list of studies judged to have met all your review inclusion criteria (matched on population, intervention/exposure/focus of interest, comparator, etc.; and study design) so you know that each included study will provide findings that answer your review question in some way. You need to examine each study in detail, taking all the meaningful information from each included study (**data extraction**), before you start compiling and synthesising the information. For whichever type of literature review you are undertaking, at this stage you are reading, becoming familiar with, digesting, reflecting upon and, perhaps unknowingly, making judgements on each study included in your review. All these processes are involved in *assessing the evidence base*.

The extent to which you assess the evidence base depends on the type of review and its aim. For example, a systematic review generally involves an in-depth quality assessment of included studies. Systematic reviews require you to reflect upon the credibility of the review's findings; it is essential that you identify how weaknesses or flaws of included studies impact upon review findings. However, for a **mapping review**, where the aim is to map out and categorise the literature as well as to identify any gaps (James et al., 2016), you assess the evidence base to identify its key characteristics, such as study design, country of publication or general direction of study findings, offering a rich picture of the literature to be described. The very existence of a study may be meaningful, regardless of quality. Having recorded that a particular aspect of a phenomenon has been studied, your secondary questions might then be 'and is the study good quality? … and can I trust its conclusions?'.

All literature reviews involve, and benefit from, some assessment of the evidence base, which helps to guide the subsequent stages of synthesis and writing up. If nothing else, at this stage your assessment allows you to familiarise yourself with the intricacies of each study and to spot where findings from studies agree with or differ from each another. More importantly, you will start to suggest possible reasons for study similarities or differences. For example, what does an individual study contribute to your review? Does it add strength to an argument, a conflicting argument, a new argument, perspective or theory, or, perhaps, nothing new at all?

To begin with, you should ask yourself, 'What do I need to find out from my included studies to fulfil the aim of my literature review?'. Table 6.1 presents four types of review (introduced in Chapter 3) and looks at their aims in relation to how you might assess the evidence base. For each review type, you can consider particular 'key questions' when assessing the evidence base (see Table 6.1). Answers to each question help to shape how you will proceed with your review. Hopefully, you can identify which questions apply to each particular review type. For example, in a systematic review most, if not all, of the questions in Table 6.1 are appropriate.

Table 6.1 Assessing the evidence base in different types of reviews

Type of review	Key questions to ask when assessing the evidence base	Practical application	Review example
Scoping review	• Do any previous reviews exist? • How much evidence exists on my review question? • What type of evidence is available?	Identifies previous reviews on your topic area to avoid duplication If there is a significant volume of evidence, you might want to consider refining your scope. Too little evidence and you might want to broaden your question 'Firms up' review question by exploring what kind of evidence is out there. For example, if your review is limited to randomised controlled trials (RCTs) but your scoping search finds no trials, you may need to consider other types of research design. Similarly, if you have limited your review question to UK studies but found no UK studies in your scoping search, you may wish to widen to include research beyond the UK. It is particularly important to assess generalisability if looking at studies outside of the setting (context) of your review question	A scoping review of the association between rural medical education and rural practice location (Farmer et al., 2015)
Mapping review	• Where is evidence plentiful? • Where is evidence lacking (gaps)? • How can I describe the evidence? • Are there relationships or key themes occurring?	Focus for subsequent literature reviews Key features of evidence base include study design, country of publication, populations or subgroups, nature of intervention or exposures analysed (are they similar or do they differ greatly?) Explores: • Directional effects (A affects B) • Whether studies are in agreement • Whether findings conflict	Maternity care services and culture: a systematic global mapping of interventions (Coast et al., 2014)

Type of review	Key questions to ask when assessing the evidence base	Practical application	Review example
Systematic review	• How can I describe the evidence? • Are there relationships or key themes occurring? • How credible is the evidence? • How applicable is the evidence to my situation/scenario? • Where is evidence lacking (gaps)?	Key features might include study design, country of publication, populations or subgroups, nature of intervention or exposures analysed (are they similar or do they differ greatly?) Directional (A affects B) Studies in agreement Conflicting studies Quality of the study conduct and design: subgroup analyses Generalisability of research Areas for future research	Psychosocial interventions for school refusal with primary and secondary school students: a systematic review (Maynard et al., 2015)
Qualitative systematic review	• How can I describe the evidence? • What themes or constructs are present between or within individual studies? • What is the quality of the evidence?	Key features, for example perspectives, settings (are they similar or differ greatly?) Interpretation of a phenomenon – broaden understanding Does this mediate the findings?	Treatment non-adherence in pediatric long-term medical conditions: systematic review and synthesis of qualitative studies of caregivers' views (Santer et al., 2014)

Now consider your own review, and use Exercise 6.2 to decide the level of quality assessment required.

exercise 6.2

Assessing the evidence base for your review

Consider the types of review in Table 6.1. Think about what questions you might want to ask when assessing the evidence base for your review:

Your review question:

Which key questions do you need to ask for your review?

What is the practical application of your questions?

ASSESSING THE EVIDENCE BASE IN DETAIL

Systematic reviews of either quantitative or qualitative research studies require a transparent and explicit exploration of study strengths and weaknesses to assess the impact of study quality on the findings of each individual study included in the review. Quality assessment then moves on to consider the findings of the literature review as a set of studies, documenting systemic flaws in a discussion of the strengths and limitations of the evidence base. The rest of this chapter considers quality assessment and its role in the review process.

The first step of quality assessment is to decide whether an article is worth reading. Complete Exercise 6.3 to practise this skill.

exercise 6.3

When is an article worth reading?

Before introducing quality assessment in more detail, when you come across a research study in a journal, consider:

1. How do you decide whether an article is worth reading?
2. What makes an article believable?

In addressing Exercise 6.3 you can probably divide your factors into three distinct groups:

- *Applicability* – the topic of the study, how important it is to you at the moment, the similarity of the setting to the one in which you work, the level at which it is written, the professional group or discipline for whom it is written, etc.
- *Extrinsic factors* – those external factors assumed to relate to, but not always associated with, the quality of the article: who wrote it, where they work, what their job or qualifications are, whether you have heard of them, who paid for the study, in which journal it is published, whether the authors have written on the subject before.
- *Intrinsic factors* – factors that relate to the study itself: the appropriateness of the study design to the question being asked, the suitability of the sample, the methods used to recruit the sample, and the methods used to obtain the results.

Assessing the quality of included studies – what is it and why do we do it?

Quality assessment asks you to discard prejudices you may have regarding the extrinsic factors. It asks you to make an initial judgement about the relevance of the study, to look then exclusively at the **intrinsic factors** using a structured checklist, before finally returning to issues that relate to its suitability to your practice. In this way you follow a process that is as objective and explicit as possible. On this basis, you can judge if a paper is worth reading, and if it is believable. **Quality assessment** forms part of the examination of confidence in research

findings. Quality assessment is critical 'for judging the overall strength of evidence on given research questions and is considered in evaluation of the methodological quality of a research design and implementation rather than the intervention's true effect in the process of research' (Seo & Kim, 2012).

Generalisability or **applicability** is often considered alongside quality assessment, and reflects on how research findings (if at all) impact on practice. In the context of qualitative studies you consider whether the findings are transferable. Considering how the research is applicable, transferable or generalisable defines the difference between **critical appraisal** and a simple 'critical reading' of the research (Booth & Brice, 2004).

Every study included in your literature review has weaknesses or flaws. You need to identify each weakness or flaw to determine, first, its potential impact on the findings of an individual study and, second, its implications for the findings of your review as a whole. You need to become aware of both the strengths and flaws of included studies in your review so that you can take these into account when presenting and discussing your review findings.

All studies have weaknesses but, by considering their impact upon the study findings, you can determine which flaws are critical and which are not. Remember that undertaking research is fraught with difficulties. Several things can 'go wrong' or not as originally planned in research studies (e.g. failing to recruit sufficient participants to your study). You may find yourself becoming very scathing about studies when you are assessing their quality! This belief that no paper is ever good enough has been labelled critical appraisal 'nihilism' (Sackett et al., 1997). However, the function of **quality assessment** is not to pursue some ideal of study perfection (Petticrew & Roberts, 2006). Assessing the **evidence base** focuses on how to apply research in practice and you need to be similarly practical when performing quality assessment. Therefore, if a particular flaw has minimal or limited impact on the findings of a study, is it really that important?

However, you do not only use quality assessment to identify study flaws. Using a structured formal approach allows you to explore the detailed contents of a paper in terms of both its methodology and findings. It is therefore basically a type of 'sensitisation' to a study; an important journey of discovery for the reader (Booth, 2007). By critically examining published research, you become aware of how others have conducted research. This also mean, you become better at designing and conducting your own research studies. For example, if you identify certain weaknesses in the design of a particular study, you might recommend that the research should be repeated using a stronger study design. Where a study failed to recruit enough participants, you might recommend repeating the study with a larger sample to determine conclusive results.

Lastly, quality assessment is helpful in identifying differences *between* studies; the technical term is **heterogeneity.** Heterogeneity is discussed further in Chapters 7 and 8. For example, smaller studies tend to overestimate findings in comparison to larger studies (Higgins et al., 2021).

Study designs – is there a hierarchy of evidence?

Before exploring quality assessment in more detail, you will find it useful to understand the different types of study design used in research. Some research designs are better able to answer certain questions. Therefore, early in the process of quality assessment, you need to consider: 'Is this the most appropriate study design to answer this research question?'. If you are not familiar with study designs, take a look at the resources available on the Oxford Centre for Evidence-Based Medicine website (www.cebm.net, Centre for Evidence-Based Medicine, 2020).

Question	Step 1 (Level 1*)	Step 2 (Level 2*)	Step 3 (Level 3*)	Step 4 (Level 4*)	Step 5 (Level 5)
How common is the problem?	Local and current random sample surveys (or censuses)	Systematic review of surveys that allow matching to local circumstances**	Local non-random sample**	Case-series**	n/a
Is this diagnostic or monitoring test accurate? (Diagnosis)	Systematic review of cross sectional studies with consistently applied reference standard and blinding	Individual cross sectional studies with consistently applied reference standard and blinding	Non-consecutive studies, or studies without consistently applied reference standards**	Case-control studies, or poor or non-independent reference standard**	Mechanism-based reasoning
What will happen if we do not add a therapy? (Prognosis)	Systematic review of inception cohort studies	Inception cohort studies	Cohort study or control arm of randomized trial*	Case-series or case-control studies, or poor quality prognostic cohort study**	n/a
Does this intervention help? (Treatment Benefits)	Systematic review of randomized trials or *n*-of-1 trials	Randomized trial or observational study with dramatic effect	Non-randomized controlled cohort/ follow-up study**	Case-series, case-control studies, or historically controlled studies**	Mechanism-based reasoning

Question	Step 1 (Level 1*)	Step 2 (Level 2*)	Step 3 (Level 3*)	Step 4 (Level 4*)	Step 5 (Level 5)
What are the COMMON harms? (Treatment Harms)	Systematic review of randomized trials, systematic review of nested case-control studies, *n* of- 1 trial with the patient you are raising the question about, or observational study with dramatic effect	Individual randomized trial or (exceptionally) observational study with dramatic effect	Non-randomized controlled cohort/ follow-up study (post-marketing surveillance) provided there are sufficient numbers to rule out a common harm. (For long-term harms the duration of follow-up must be sufficient.)**	Case-series, case-control, or historically controlled studies**	Mechanism-based reasoning
What are the RARE harms? (Treatment Harms)	Systematic review of randomized trials or *n*-of-1 trial	Randomized trial or (exceptionally) observational study with dramatic effect			
Is this (early detection) test worthwhile? (Screening)	Systematic review of randomized trials	Randomized trial	Non-randomized controlled cohort/ follow-up study**	Case-series, case-control, or historically controlled studies**	Mechanism-based reasoning

Figure 6.1 Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence

*** Level may be graded down on the basis of study quality, imprecision, indirectness (study PICO does not match questions PICO), because of inconsistency between studies, or because the absolute effect size is very small; Level may be graded up if there is a large or very large effect size.**

**** As always, a systematic review is generally better than an individual study.**

How to cite the Levels of Evidence Table

OCEBM Levels of Evidence Working Group*. "The Oxford 2011 Levels of Evidence".

Oxford Centre for Evidence-Based Medicine. http://www.cebm.net/index.aspx?o=5653

** OCEBM Table of Evidence Working Group = Jeremy Howick, Iain Chalmers (James Lind Library), Paul Glasziou, Trish Greenhalgh, Carl Heneghan, Alessandro Liberati, Ivan Moschetti, Bob Phillips, Hazel Thornton, Olive Goddard and Mary Hodgkinson*

Health research pays particular attention to how well particular study designs can answer particular types of research questions; the randomised controlled trial (RCT) is considered the **gold standard** study design to answer whether an intervention is effective. The idea of the 'best study design for a research question' has been used prescriptively within health research, where **hierarchies of evidence** have been proposed. These hierarchies rank study designs from the most robust down to the least robust for answering a type of question. For example, for reviews of effectiveness of an intervention, randomised controlled trials are normally placed at the top of the hierarchy with case studies at the bottom. Of course, high-quality systematic reviews that combine multiple well-conducted examples will always be considered superior to the findings of an individual well-conducted study. Checklists such as AMSTAR 2 or ROBIS perform similarly when used to assess whether systematic reviews are to be considered high-quality (Pieper et al., 2019).

One of the most cited examples of a published hierarchy is the 'Levels of Evidence' produced by the Oxford Centre for Evidence-Based Medicine (Howick et al., n.d.) (Figure 6.1). This hierarchy allows the reader to select a particular type of research question and to identify which study designs are the most robust.

However, classifying research designs in this way may cause problems (Petticrew & Roberts, 2003; Greenhalgh et al., 2018). First, hierarchies can give a false impression that a poorly conducted randomised controlled trial offers better evidence than a well-conducted observational study. Second, it is often not straightforward to determine which research design is the most appropriate since the choice may be limited by practical and ethical considerations. For example, it would not be ethical to randomise study participants to smoking tobacco cigarettes, so you could only observe what happens when people choose cigarettes for themselves. Third, hierarchies of evidence are not good at exploring the quality of qualitative research; a study design where a researcher lives alongside study participants is quite different from one where the researcher comes in as an outsider (Taylor et al., 2007). Finally, most hierarchies are health research focused, and their value is contested by researchers within other disciplines (Taylor et al., 2007). A more flexible approach creates a taxonomy for each type of question, so that you pick the appropriate taxonomy to match the question type (Petticrew & Roberts, 2003).

Whatever your discipline, you will find it invaluable to be aware of different types of study design, the flaws or biases to which they are prone and, particularly, their effect on study findings. However, in a multidisciplinary setting, you may find it more helpful to consider when particular studies may be reasonably used and what their strengths or weaknesses are. Thus, this section takes a broad look at three 'families' of study design: descriptive, analytic experimental and analytical observational.

Studies can be broadly classified into **descriptive** or **analytic** designs. Descriptive study designs focus on describing or giving us a picture of what is happening in a population (e.g. **cross-sectional surveys** and **qualitative studies**). **Analytic** studies try to quantify relationships between factors (Centre for Evidence-Based Medicine, 2020); for example, the effect of an Information Technology (IT) intervention on maths ability. Analytic studies are further classified according to whether or not researchers measure the effects of an exposure without manipulating the intervention or exposure in any way. In an experimental analytic study the researcher manipulates an intervention or exposure, for example in an **RCT** by allocating participants to different intervention or exposure groups.

The key characteristic of experimental studies is that they are designed to control bias. Beyond this they may differ in key features of their study design. Experimental studies may measure an outcome at a single point in time (**cross-sectional)** or measure that same outcome over an

extended period (**longitudinal**). Studies may also differ in whether they collect data as they go forwards in time **(prospective)** or whether they look backwards to collect data, whether from records or recollection (**retrospective**). Further variation will see studies containing a single or multiple group(s) of participants (including random or non-random allocation of study participants to groups within a study), and being described as either **blind** or **open label**. Each feature of an experimental study design has implications for the research, as explored in Tables 6.2–6.6.

Table 6.2 Cross-sectional versus longitudinal studies

Study design feature	Implications		Studies that often use this feature
Cross-sectional: records outcomes or examines relationships between variables at one point in time only (snapshot in time)	Cheap and simple to set up. Ideal for pinpointing the prevalence of a particular situation, for example what number of higher education students visit their public library?	Cannot determine a cause-and-effect relationship between two variables	Survey
Longitudinal: records observations over a period of time (can be several years)	Changes over time are recorded in a population or outcome so more plausible to determine a cause-and-effect relationship	More complicated to set up and more costly than cross-sectional studies. Causality may only be determined if confounding factors are controlled for	Cohort study Randomised controlled trial

Table 6.3 Prospective versus retrospective studies

Study design feature	Implications		Studies that often use this feature
Prospective: forward-looking and observe for outcomes. Typically, a group or cohort of individuals is identified and followed for a long period of time	Able to determine cause and effect and provide 'real' incidence rates. Can uncover unanticipated outcomes or associations	Can be prone to large loss of study participants (attrition). The outcome of interest must be common or the study will fail to recruit enough participants to make the findings meaningful	Cohort study Randomised controlled trial
Retrospective: identify a group of individuals who have had a particular outcome and then look back in time to record details about what interventions or exposures they received	Able to determine cause and effect; particularly useful when an outcome is rare	Looking 'backwards', particularly when asking study participants to remember events or details in the past makes retrospective studies particularly prone to recall bias	Case–control studies Cohort studies (occasionally)

Table 6.4 Studies with one group versus studies with more than one group

Study design feature	Implications		Studies that often use this feature
One group of study participants	Fewer participants need be recruited to the study	Between-group comparisons cannot be made Confounding factors may not be taken into account as easily	Survey Cohort study Case–control study
Two groups of study participants	Between-group comparisons to be made Confounding factors can be taken into account more easily Groups can be balanced	Requires extra participants to be recruited	Survey Cohort study Case control study RCT

Table 6.5 Random versus not random allocation

Study design feature	Implications		Studies that often use this feature
Non-random allocation	Not always possible or ethical to randomise participants to different groups (e.g. in a study investigating smokers and non-smokers)	Because participants may have chosen which study group they are in (or the researcher has done so for them), this significantly biases the outcomes For example, if there were two groups of children – Group 1 in the top set for maths and Group 2 in the bottom set for maths – and a study investigated performance in physics, the two groups of children are not similar	Cohort study Case–control study
Random allocation	Allows equal balancing of confounding factors Limits bias in terms of participant selection of an intervention or exposure	Not always possible or ethical to randomise participants to different groups	RCT

Table 6.6 Blind versus open-label studies

Study design feature	Implications		Studies that often use this feature
Blinding: an individual is not aware of what intervention or exposure they are given. Individuals who can be blinded include participants, researchers and analysts. So a study can be single, double or triple blind	Anticipation of the placebo effect: a phenomenon whereby study participants experience improvement in an outcome after receiving 'something' that should in theory not produce an improvement in outcomes Prevention of observer bias in researchers and analysts	Not always possible or ethical to blind-study participants or researchers	RCT Cohort study
Open label: an individual is aware of what intervention or exposure they are receiving Again, this includes participants, researchers and analysts	Not always possible or ethical to blind-study participants or research personnel, e.g. in a study investigating surgery versus no surgery	Participants may exaggerate an improvement if they think they are receiving something that is supposed to have an effect Researchers may exaggerate findings according to their own biases	RCT Cohort study

Quality assessment: validity, reliability and applicability

To undertake quality assessment, you need to understand the principles underpinning the process. These can be split into the three key concepts of **validity**, **reliability** and **applicability**. We consider each concept in turn.

Validity (are the results of a study true?)

The way in which research is designed and undertaken has an influence on whether the results can be considered 'true' or 'valid'. Are there any flaws in how the research has been carried out that may invalidate the findings? Simply the act of undertaking research can alter study findings from reality. Imagine if one of your tutors told you that the occupational health department wanted you and your fellow course participants to take part in a study of how often you wash your hands. Would you be likely to alter your hand-washing practices? Would the findings of the study accurately represent hand-washing practices or would they present a distorted picture?

So in assessing validity we ask, 'How much have the methods used to obtain the results thrown into question the findings themselves?'(Booth & Brice, 2004). The rigour of the research refers to the degree to which the design of the study and its conduct minimises the **risk of bias**

and takes into account **confounding**, two key flaws that can affect all studies. Bias is 'anything that erroneously influences the conclusions about groups and distorts comparisons' (Rose & Barker, 1994). Systematic errors in the conduct of a study include how participants are selected to take part, how outcomes are measured or how data is analysed. All of these can lead to inaccurate results (Cameron et al., 2014). **Confounding** is where you cannot ascertain whether an effect is caused by the variable you are interested in or by another variable. For example, a study may demonstrate a link between alcohol consumption and lung cancer. However, alcohol consumption is commonly associated with smoking, and thus smoking is a potential confounder for your study. Studies can be designed to take account of potential confounding at the analysis stage, or to ensure that groups within the study are stratified to achieve equal distribution of participants with the confounding factor (in this example, smoking). Whichever method is chosen, the researcher should demonstrate that they have identified potential confounders at the beginning of the study. Common **confounding variables** include age, sex and ethnicity.

To illustrate sources of **bias** and **confounding**, read the accompanying study scenario (Exercise 6.4). Try to answer the accompanying questions.

exercise 6.4

Study scenario – identifying sources of bias

Can an IT intervention improve primary schoolchildren's performance in solving maths problems?

A teacher selects 20 primary schoolchildren to take part in this study as a reward for good behaviour. At the start of the study, each child completes a maths problems test consisting of 10 questions. Each child then completes a one-hour online workbook in which they complete a series of maths problems in the form of fun games and exercises. The children then complete another maths problems test of 10 questions, and the number answered correctly is recorded. The teacher asks each child to recall how many they got correct in the maths test before the study started.

1. **What sources of bias can you see?**

   Hint 1: might the children selected to take part in the study differ in any way from those who did not take part?

   Hint 2: do you think the children could accurately (and truthfully!) recall their score for the test they took at the beginning of the study?

2. **Aside from the sources of bias in this study, what other factors might limit the credibility of the study findings?**

Reliability (what are the results?)

All research results are subject to the possible effects of chance. Reliability refers to the trustworthiness of the results: 'What is the likelihood that this study reports something that is

reproducible as opposed to being a "fluke or chance result"?' (Booth & Brice, 2004). Researchers can run statistical tests to determine how likely it is that results are due to chance. Techniques generate a range of plausible values for the repeated measurement of the effect. You can then judge whether you would make the same decision based on the very best and the very worst estimate of the effect. However, statisticians choose arbitrary thresholds for determining chance, typically 5% or 1 in 20; if something occurs more frequently than this, it is considered unlikely to be due to the influence of chance (Booth & Brice, 2004) and is labelled **statistically significant**. You should also consider whether results are meaningful – is the effect large enough to be **practically significant**? For example, a study might demonstrate a change in five points on a scale that measures improvement in computer skills. This change of five points might be **statistically significant** but a teacher may only consider a change of ten points or more to be **practically significant**.

Applicability (can we generalise the results?)

Once you have assessed the validity and reliability of a study, you need to determine whether the results actually are useful. Validity and reliability are concerned with estimating the strength of the evidence, whereas applicability is concerned with the strength of recommendations for practice (based on the study results).

Continuing with our study scenario, imagine you are the headteacher of a primary school and you are reading the results of a systematic literature review investigating whether an IT intervention improves primary schoolchildren's performance in solving maths problems. The review found seven studies designed to test this research question; however, the results are conflicting between the studies. Five studies found that IT did improve students' performance in a weekly maths test, while two showed no evidence of such an effect. By examining the studies in more detail, you realise that the five supportive studies were undertaken in a group of children aged 8–9 years old, whereas the two studies that did not find a positive effect were undertaken in children of a younger age group (4–5 years old). You might reasonably suggest that the IT-based maths computer program should only be taken up by classes of older children at the school. Note this is not a flaw of the individual studies included in the review, but simply reflects differences in the age of study participants. It thus relates to how your findings apply in practice.

Carrying out quality assessment

Now that we have covered the theory, how do you tackle the quality assessment? While every article is different, assessment of quality can be split into four stages (LoBiondo-Wood et al., 2002) (Box 6.1).

Even if you do not undertake full quality assessment for your review, you always need to follow the first two steps in Box 6.1. In developing a preliminary and then comprehensive understanding of each study, you arrive at an overall understanding of the individual contribution of that study. Most literature reviews involve some form of analysis understanding. The depth to which you break down the study into parts depends on which data is most important for your review. For example, in a **mapping review** you may be concerned with a few items of

information such as the type of studies, country and key themes. In contrast, in a **systematic review**, the details of study design are required in great depth, and so this involves 'drilling down' into the study for much of the necessary detail.

box 6.1

Four stages of quality assessment

Preliminary understanding – skimming or quickly reading to gain familiarity with the content and layout of the paper.

Comprehensive understanding – increasing understanding of concepts and research terms.

Analysis understanding – breaking the study into parts and seeking to understand each part.

Synthesis understanding – pulling the above steps together to make a (new) whole, making sense of it and explaining relationships.

A useful place to start is by reading the abstract. The format of the abstract varies between disciplines. Increasingly within the medical literature, structured abstracts (with headings) are being adopted. These help the reader quickly assess the study design, participants and key results. Abstracts in other disciplines may be less structured but give a flavour of what the study is about. After reading the abstract, to gain a deeper understanding of the study, you start to read the paper in full. While the Introduction, Discussion and Conclusion can help in understanding the paper, it is the Methods section that allows you to determine the quality of the paper. The Results section, too, may indicate the significance of the individual study. Remember that practical relevance may not feature in the Results section but may be considered in the Discussion section. An 'anatomy of a systematic review' is a useful tool to assist with understanding the parts that make up a systematic review and covers what information you would expect to find in each section of a review (National Collaborating Centre for Methods and Tools, 2017).

Published reviews in your subject area

You can start to understand quality assessment in your discipline by investigating methods used in reviews in your topic. You can start to understand why particular approaches have been chosen, which checklists (or combinations of checklists) are widely used, and how authors present information on study features (see, for example, Zhou et al., 2015). Finally, a review from a similar topic may help you to identify which key study flaws and strengths are most likely to occur in your review.

Different approaches to quality and relevance assessment are demonstrated by systematic reviews from different disciplines (Table 6.7). Similar variation is apparent for other types of literature reviews such as mapping and scoping reviews (examine the reviews listed in Table 6.1). Other types of reviews featured throughout this book may also be useful. Further examples are found in the EPPI-Centre, the Campbell Library, the Cochrane Library and the Environmental Evidence Library of Evidence Syntheses.

Table 6.7 Examples of systematic reviews from different disciplines

Topic area	Reference	Quality assessment strategy
Health	Breathing exercises for asthma (Santino et al., 2020)	As per Cochrane Handbook criteria of assessment of risk of bias version 2 (Higgins et al., 2021)
Social welfare	The impact of detention on the health of asylum seekers: a systematic review (Filges et al., 2015)	Studies assessed using extension of Cochrane Collaboration's original risk of bias tool. The extension covers risk of bias in non-randomised studies with a well-defined control group The risk of bias model used is based on nine items: • sequence generation • allocation concealment • confounders • blinding • incomplete outcome data • selective outcome reporting • other potential threats to validity • a priori protocol • a priori analysis plan
Psychology	Psychological and educational interventions for atopic eczema in children (Ersser et al., 2014)	Quality assessment addressed: • Randomisation (method of generation and concealment of allocation) • Blinding of observers (blinding of participants was not possible because of the nature of the intervention) • Loss to follow-up (presence of dropouts and withdrawals and the analysis of these) • Other bias Each component was categorised as low risk, unclear risk or high risk as advised by the *Cochrane Handbook for Systematic Reviews of Interventions*
Education	Impacts of after-school programmes on student outcomes (Goerlich Zief et al., 2006)	The study reviewers listed 39 qualities that they felt should be included in the reporting of a rigorous experimental study. These were adapted from the What Works Clearinghouse Study Review Standards (2005). Four specific standards were selected for a study to be included: (a) no specific evidence of control group contamination (b) neither overall study attrition nor differential attrition would bias impact estimates (c) appropriate statistical measures used for analyses and (d) primary impact analyses conducted on all available sample members at follow-up Two reviewers independently read each full study, applied study quality criteria and recommended whether study should be included

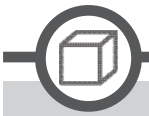
(Continued)

Table 6.7 (Continued)

Topic area	Reference	Quality assessment strategy
Library and information science	The attitudes and behaviours of illegal downloaders (Williams et al., 2010)	When selecting studies for inclusion, authors categorised literature into four 'classes', which included assessment of quality: • **Class A** – Studies with high validity and a robust methodology that have been highly cited. (Note: high citations do not necessarily indicate high quality – a study could equally be cited as bad research!) • **Class B** – Credible studies with a lesser degree of confidence, typically related to methodological issues: small-scale surveys, convenience sampling, limited case study interviews, etc. • **Class C** – Research that was not very sound in terms of methodology, rigour and validity • **Class D** – Minimal or no real research content (e.g. opinion pieces)
Computer sciences	Using text mining for study identification in systematic reviews: a systematic review of current approaches (O'Mara-Eves et al., 2015)	Critical appraisal conducted within data extraction tool. Quality assessed by two questions: • Sampling of test cases – how generalisable is the sample of reviews selected? • Is the method sufficiently described to be replicated?

Using checklists

For experienced and novice reviewers alike, checklists can be particularly helpful in guiding the process of quality and relevance assessment. For the novice reviewer, checklists provide a comprehensive list of what to consider for quality assessment. Checklists may also help when considering study relevance, typically considered by the last three questions on Critical Appraisal Skills Programme checklists (CASP, n.d.). However, as you become experienced at quality assessment, checklists act as a prompt to help you consider all relevant points. The tools in this chapter point to various multidisciplinary sources of checklists for diverse study designs. However, be sure to investigate reviews within your discipline to give you pointers on how quality assessment is undertaken within your research area (Davoudi et al., 2015). For example, checklists in social work and social care have been discussed (Wells & Littell, 2009) and developed (Taylor et al., 2007). Also consider whether a generic checklist for each type of question, such as CASP, meets your needs or whether you need to adapt a checklist to your own topic area. If you adapt a published checklist, be sure to note this when writing up the methodology for your review. However, we advise that you try to avoid devising your own checklist as far as possible; it may indicate you have not looked carefully enough for an appropriate tool, it makes it difficult to compare your assessments to other reviews, and checklist development is now a science (Whiting et al., 2017) requiring its own literature review and expert panel!



box 6.2

The CASP set of critical appraisal checklists

Access the **CASP Set of Critical Appraisal Checklists** (**https://casp-uk.net/casp-tools-checklists/**). This set of eight critical appraisal tools is designed for use when reading research. Browse through the checklists and select a checklist of potential interest (e.g. the checklists for systematic reviews or qualitative research). Familiarise yourself with the checklist structure and the individual question items. How can you tell that this checklist was designed for appraising individual papers and was not intended for quality assessing papers for inclusion in a review?

Table 6.8 lists a few key checklist resources by study design or topic. See Box 6.3 for tips on selecting a checklist. A recent article summarises the principal checklists for common study designs (Ma et al., 2020).

Table 6.8 Key quality assessment checklist resources – quantitative designs

Study design checklists	
Resource	**Details**
Systematic Reviews Toolbox (http://systematicreviewtools.com/)	Searchable online catalogue of tools to support systematic reviews. Focuses on automated tools (software), but other tools (e.g. checklists) also included. For quality assessment tools, select 'Other Tools' in 'Advanced Search' function and 'quality assessment' from 'Find Me' feature list
Critical Appraisal Skills Programme (CASP)	Checklists for following study designs: • Case–control studies • Clinical prediction rules • Cohort studies • Diagnostic test studies • Economic evaluation studies • Randomised controlled trials (RCTs) • Systematic reviews
STROBE (STrengthening the Reporting of OBservational studies in Epidemiology)	Checklists for: • Case–control studies • Cohort studies • Cohort, case–control, and cross-sectional studies (combined) • Cross-sectional studies
ROBINS-I: A tool for assessing risk of bias in non-randomised studies of interventions	In target trial, effect of interest is typically that of either: assignment to intervention at baseline (start of follow-up), regardless of the extent to which intervention was received during follow-up (sometimes referred to as 'intention-to-treat' effect); or starting and adhering to intervention as indicated in trial protocol (sometimes referred to as 'per-protocol' effect)

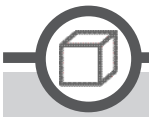
(Continued)

Table 6.8 (Continued)

Resource	Details
JBI Critical Appraisal Tools (https://joannabriggs.org/ebp/critical_appraisal_tools)	Checklists for following study designs: Cohort, case–control and cross-sectional studies (combined) Analytical cross-sectional studies Case–control studies Case reports Case series Cohort studies Diagnostic test accuracy studies Economic evaluations Prevalence studies Quasi-experimental studies (non-randomised experimental studies) Randomised controlled trials Systematic reviews Text and opinion
AMSTAR 2: Assessing the methodological quality of systematic reviews	An instrument for critically appraising systematic reviews of randomised controlled trials: https://amstar.ca/Amstar-2.php
ROBIS: A risk of bias assessment tool for systematic reviews (https://www.bristol.ac.uk/population-health-sciences/projects/robis/robis-tool/)	Tool completed in three phases: 1. Assess relevance (optional) 2. Identify concerns with the review process: • Study eligibility criteria • Identification and selection of studies • Data collection and study appraisal • Synthesis and findings 3. Judge risk of bias
Case studies (Atkins & Sampson, 2002)	Case studies
Mixed methods studies (Pluye & Hong, 2014)	http://mixedmethodsappraisaltoolpublic.pbworks.com/w/page/24607821/FrontPage
	Topic-specific checklists
Evidence-based library and information science (http://ebltoolkit.pbworks.com/f/EBLCriticalAppraisalChecklist.pdf)	
Education – ReLIANT (Readers guide to the Literature on Interventions Addressing the Need for education and Training) (Koufogiannakis et al., 2006)	
	Generic checklists
Standard quality assessment criteria for evaluating primary research papers from a variety of fields (Kmet et al., 2004)	

TOOLBOX – QUALITY ASSESSMENT CHECKLISTS

Do not be put off by the first few occasions you undertake quality assessment. From our experience quality assessment of a complicated study is time consuming and may require you to revisit your quality judgements, perhaps on multiple occasions. However, you will soon become proficient and, consequently, quicker – especially as you become familiar with a specific quality assessment method. The more quality assessments you undertake, the more adept you become at spotting the key strengths or weaknesses of a study – the same flaws in published studies often occur again and again, especially in the same topic area.



box 6.3

Tips on checklists

- Remember quality and relevance assessment vary by discipline. Take a look at reviews in your discipline and examine how authors have undertaken quality and relevance assessment, and also which checklist they have used. See Table 6.7 for examples and key features of reviews in different disciplines.
- Stick to checklists that have been validated or widely accepted in your discipline. Again, examining reviews in your discipline will help to identify the accepted checklists.
- Avoid checklists that employ scoring systems. It is dangerous to label studies with scores, and not particularly helpful in understanding how the study strengths and weaknesses contribute to the validity of the study findings. In fact, the Cochrane methods guide for systematic reviews actively discourages use of checklists that assess quality using a scoring system (Higgins et al., 2021).
- Remember what you are trying to achieve through quality and relevance assessment – checklists are only a guide. You may spot study features that are not picked up by your checklist and these can still be reported.
- Lastly, if a suitable tool *really* does not exist, rather than trying to create your own checklist from scratch (which is not advised), you could adapt an existing checklist, or select criteria from different checklists and devise your own meta-checklist. (However, do remember to justify why you have had to do so and reference the contributing checklist.)

Case Study – Drafting a checklist

When undertaking work for a UK national quasi-governmental organisation in 2017 we identified an absence of checklists for quality assessing **mapping reviews** and **scoping reviews**. We therefore produced two checklists that focused on how review methods are reported (i.e. how closely they follow recognised review methods) to help when reviewing types. Abbreviated versions of these two checklists are summarised in Tables 6.9 and 6.10. Subsequently a checklist for scoping reviews has been published (Cooper et al., 2021).

Table 6.9 Thirteen questions to help you make sense of a mapping review

Questions 1–3 are screening questions. You can answer these quickly. If your answer is 'yes', it is worth proceeding with the remaining questions. Prompts are given after each question. These remind you why the question is important

Whereas a scoping review provides an overview of 'what is out there' on a particular topic, a mapping review focuses on where literature is found

(A) Are the results of the mapping review valid?

Screening questions

1. Did the review clearly define its scope? Yes/No/Cannot Tell

Hint: Scope can be 'focused' in terms of PICOS, publication types, geographical/time limits/setting

2. Did the authors look for the right type of papers? Yes/No/Cannot Tell

Hint: 'The best sort of studies' would address the review's question and match a pre-specified list of study designs, if feasible

3. Is a mapping review the appropriate methodology? Yes/No/Cannot Tell

Hint: A mapping review seeks: to examine the extent, range and nature of research activity, and areas within a topic already adequately addressed by research/systematic reviews; to familiarise the reader with the current state of knowledge; to identify absolute gaps not adequately addressed by research and synthesis gaps not adequately addressed by systematic reviews; and to determine where full systematic reviews might usefully be targeted

Is it worth continuing?

Detailed questions

4. Do you think the important, relevant studies were included? Yes/No/Cannot Tell

Hint: Look for databases used; details of the search strategy and the terms used; journals in the topic area; vulnerability to time trends; use of reference lists, inclusion of unpublished/published studies/non-English language studies, if appropriate

Note: Bias in a mapping review depends not on whether content has been critically evaluated, but on how comprehensively/consistently the protocol has been followed and how well processes, decisions and results have been documented

5. Did the review team engage with appropriate stakeholders, if appropriate? Yes/No/Cannot Tell

Hint: Consider whether: review team sought published research and research in progress; stakeholder perspectives are included; stakeholders informed review scope, identification of literature, analysis and/or interpretation of review

(B) What are the results?

6. Have authors used a meaningful taxonomy or classification to organise/present results? Yes/No/Cannot Tell

Hint: Consider whether: users would recognise categories/classification/labels used; authors have used a recognised framework/coding system; when using a pre-existing taxonomy/classification, is there a clear/transparent link between categories used and literature coded within each category?

7. Are categories mutually exclusive, clearly defined, explicit and at an appropriate level of granularity for the review purpose? Yes/No/Cannot Tell

Hint: Consider whether definitions offer consistency of coding and/or of interpretation of results; inter-rater reliability is considered for categorisation

8. Do the authors characterise the quantity of included studies? Yes/No/Cannot Tell

Hint: Consider whether the review authors present total numbers of studies identified within meaningful sub-categories; discuss likelihood of missing studies; assess limitations of search process and implications for the mapping review

9. Do the authors characterise the likely quality/types of study designs of included studies? Yes/No/Cannot Tell

Hint: Consider whether the review presents overall data on study quality or categorises study designs within meaningful sub-categories; whether authors consider types of study/study design missed by search strategy; whether authors assess if the types of study retrieved by search answer the review question

10. Do the authors use appropriate narrative/tabular/graphical displays to present distribution of included articles, concepts within literature or linkages? Yes/No/Cannot Tell

(C) Will the results help in planning further research?

11. Do the authors provide a clear and unambiguous statement of implications of the evidence base for further research/further reviews, identifying strengths, weaknesses, opportunities or gaps? Yes/No/Cannot Tell

12. Does the review offer conclusions on the likely feasibility and potential added value of information yielded by further research/reviews? Yes/No/Cannot Tell

Hint: Consider whether authors suggest a clearly defined role for a further review

13. Is the data mapped within the review sufficient to sustain further related questions or analyses? Yes/No/Cannot Tell

Hint: Consider if: coding is sufficiently clear, transparent and comprehensive to sustain additional lines of enquiry/analyses; data supplements/complementary database are available for further analyses; authors can suggest topics or issues for further exploration and acknowledge uncertainties or volatility around interpretation of the map

Table 6.10 Eleven questions to help you make sense of a scoping review

Questions 1–3 are screening questions and can be answered quickly. If your answer is 'yes', you can proceed to the remaining questions. Prompts are given after each question. These remind you why the question is important

Scoping reviews are used to identify knowledge gaps, set research agendas and identify implications for decision-making

(A) Are the results of the scoping review valid?

Screening Questions

1. Did the review clearly define its scope? Yes/No/Cannot Tell

Hint: Scope can be 'focused' in terms of PICOS and publication types

2. Did the authors look for the right type of papers? Yes/No/Cannot Tell

Hint: 'The best sort of studies' would address the review's question and have an appropriate study design

3. Is a scoping review the appropriate methodology? Yes/No/Cannot Tell

Hint: A scoping review would seek to examine the extent, range and nature of research activity and the extent to which the topic is already addressed by research/systematic reviews; to determine the value of undertaking a full systematic review; to summarise and disseminate research findings; to identify uncertainties to be addressed by a focused systematic review question; and to identify research gaps (synthesis gaps) in the literature to position a subsequent systematic review

Is it worth continuing?

Detailed questions

4. Do you think the important, relevant studies were included? Yes/No/Cannot Tell

Hint: Look for databases used; use of reference lists; personal contact with experts; inclusion of unpublished/published studies/non-English language studies, if appropriate

5. Did the review team engage with appropriate stakeholders? Yes/No/Cannot Tell

Hint: Consider whether review team asked stakeholders to suggest items for inclusion, used stakeholders to establish the relevance of the scope or results, conducted a consultation exercise to establish a future research agenda

6. Did the review authors assess the quality of the included studies? Yes/No/Cannot Tell

Hint: This is not a formal requirement of a scoping review but if the review authors did assess quality consider: how well was quality assessment performed and how did the review team use the results of the assessments?

(B) What are the results?

7. What is the overall quantity of the literature considered within scope? Yes/No/Cannot Tell

Hint: Consider whether the review authors present total numbers of studies identified, within meaningful sub-categories; discuss what might have been missed by the search strategy; assess limitations of the search process and implications for the scoping process

8. What is the overall quality of the literature considered within scope? Yes/No/Cannot Tell

Hint: Consider whether the review authors present overall data on study quality or categorise study designs within meaningful sub-categories; discuss what types of study/study designs have been retrieved/missed by the search strategy; assess whether types of study retrieved by the search could answer the review question.

9. Do the review authors present the results of the scoping review using numerical, tabular and thematic approaches? Yes/No/Cannot Tell

Hint: Consider whether data provided by the review authors allows exploration of multiple options for finalisation of scope and their relative implications in terms of information yield and effort required

(C) Will the results help in planning further research?

10. Do the authors provide a clear and unambiguous statement of the implications of the evidence base for a future systematic review/further primary research, including potential boundaries for scope? Yes/No/Cannot Tell

Hint: Consider whether the authors make recommendations for the conduct of a future systematic review/primary research

11. Do the authors offer conclusions on the likely feasibility and potential added value of information of a future systematic review/further primary research? Yes/No/Cannot Tell

Hint: Consider whether the review authors suggest how a further review would be useful and can identify specific contributions that a further review might make

Evidence summaries

It is helpful to identify published examples where someone has performed a quality assessment of a published study, so investigate the journals and key organisations (grey literature) in your discipline to see if they do.

Examples include:

- BMJ clinical evidence summaries | The BMJ (https://www.bmj.com/specialties/bmj-clinical-evidence-summaries)
- Evidence Based Library and Information Practice (EBLIP) (https://journals.library.ualberta.ca/eblip/)

- NICE (National Institute for Health Care and Excellence) Evidence Summaries | NICE advice | Our programmes | What we do | About | NICE (https://www.nice.org.uk/about/what-we-do/our-programmes/nice-advice/evidence-summaries)
- Education Endowment Foundation Evidence summaries | Education Endowment Foundation | EEF(Toolkits) (https://educationendowmentfoundation.org.uk/evidence-summaries/)

Quality assessment of qualitative research

Considerable debate surrounds the quality assessment of qualitative research as to whether it can, or indeed should, be done. There is little consensus within qualitative research with over a hundred sets of proposals on quality in qualitative research (Munthe-Kaas et al., 2019) and widely opposing views. Essentially, two extremes exist: those who believe that concepts used in quantitative research apply equally to qualitative research, without further interpretation (reliability, validity); and those who believe that there are no quality criteria by which qualitative research can be assessed (Popay et al., 1998; Mays & Pope, 2020b). Further contention surrounds how best to approach quality assessment given evidence that it cannot be performed reliably; results from quality assessment differed across three appraisal approaches and six different reviewers (Dixon-Woods et al., 2007). In recent times, debate has shifted from whether or not quality assessment should be done and towards what criteria should be used (Carroll & Booth, 2015). A survey of 82 qualitative evidence syntheses (QES) published between 1998 and 2008 (Hannes & Macaitis, 2012) found that critical appraisal had been conducted in most cases, with only five reviews explicitly stating, and justifying, the absence of critical appraisal. Limitations included a focus on reporting rather than conduct and the presence of items that are separate from, or tangential to, consideration of study quality (e.g. ethical approval).

Cochrane Qualitative and Implementation Methods Group (CQIMG) guidance recommends that review authors should 'distinguish between assessment of study quality and assessment of risk of bias by focusing on assessment of methodological strengths and limitations as a marker of study rigour (a 'risk to rigour' approach)' (Noyes et al., 2018a; 2021). In the absence of a definitive risk to rigour tool, Cochrane further recommends that review authors select from published, commonly used and validated (i.e. evaluated) tools that focus on 'the assessment of the methodological strengths and limitations of qualitative studies'. For details on quality assessment of qualitative research, read the highly cited CQIMG Supplementary Guidance Paper 3 (Noyes et al., 2018a). This guidance informs Chapter 21 on *Qualitative Evidence* from the Cochrane Handbook for Systematic Reviews of Interventions (Noyes et al., 2021).

When undertaking quality assessment for your own qualitative review, you need to consider which checklist to use (Table 6.9). One review identified almost 100 appraisal tools for assessing primary qualitative studies (Munthe-Kaas et al., 2019). A review of eight tools identified six quality assessment/critical appraisal checklists (JBI, Popay, Walsh, ETQS, QF and CASP) (see Table 6.11) (Majid & Vanstone, 2018). The remaining two tools (COREQ and SRQR) focus on the quality of reporting, not on the appropriateness of methods used (see Chapter 8), a frequently noted limitation (Carroll et al., 2012). Checklists have been criticised for focusing only upon the 'technical/mechanical management of the creation and sorting of data' while ignoring the 'value of the product of the research' and failing to 'address the originality, the substance, the

contribution, and the potential results to the actual topic—which is after all the purpose of the project itself' (Morse, 2021). Alternatively, brief prompts for quality assessment of qualitative research have also been suggested (Dixon-Woods et al., 2004; 2006).

Table 6.11 Key quality assessment checklist resources – qualitative designs

Qualitative study design checklists	
Resource	**Details**
Critical Appraisal Skills Programme (CASP) https://casp-uk.net/wp-content/uploads/2018/01/CASP-Qualitative-Checklist-2018.pdf	10 questions to help you make sense of a qualitative research. Designed for reading single qualitative research articles but extensively used in qualitative evidence syntheses
Evaluation Tool to assess the Quality of qualitative research Studies (ETQS) (Long & Godfrey, 2004)	38 unstructured questions organised under 4 themes. Designed for qualitative evidence synthesis
Joanna Briggs Institute (JBI) https://joannabriggs.org/sites/default/files/2020-08/Checklist_for_Qualitative_Research.pdf	Developed by JBI and collaborators and approved by JBI Scientific Committee following extensive peer review. Designed for use in systematic reviews, but also used to create Critically Appraised Topics (CAT), in journal clubs and as an educational tool
National Institute for Health and Clinical Excellence (NICE) https://www.nice.org.uk/process/pmg4/chapter/appendix-h-quality-appraisal-checklist-qualitative-studies#checklist-2	Designed for those with basic knowledge of qualitative research. Used in producing public health guidance. 14 questions with categorical responses
Popay (Popay et al., 1998)	Designed for qualitative evidence synthesis. Eight 'markers': findings illuminate subjective meaning; iterative nature of research methods; appropriateness of sample; adequate description of findings; triangulation between data sources; flow of data/examples; interpretation; and claims of generalisability
Qualitative research (Dixon-Woods et al., 2006)	Brief prompts for qualitative research designed for experienced qualitative researchers
Quality Framework (Cabinet Office) https://www.gov.uk/government/publications/government-social-research-framework-for-assessing-research-evidence	Exhaustive tool for social research compiled from literature review of quality assessment concepts
Specialist Unit for Review Evidence (SURE) https://www.cardiff.ac.uk/__data/assets/pdf_file/0007/1142971/SURE-CA-form-for-Qualitative_2018.pdf	Adapted/updated from former Health Evidence Bulletins Wales checklist with reference to NICE Public Health Methods Manual (2012) and previous versions of Critical Appraisal Skills Programme (CASP) checklist
Walsh (Walsh & Downe, 2006)	Designed for quality assessment in a qualitative evidence synthesis, particularly for use in rapid reviews in policy

Second, reflect on why you plan to undertake quality assessment of qualitative research. The review of 100 appraisal tools was looking for a tool to facilitate GRADE-CERQual ratings of review findings (Munthe-Kaas et al., 2019). Examples exist where studies are excluded on the basis of quality (Brunton et al., 2006); however, most qualitative reviews do not exclude studies for that reason. You should be careful when using checklists to exclude studies from a review, making sure that all exclusions are supported by an explicit account of the researcher's view of 'good' and 'bad' studies, and reason for exclusions (Sandelowski et al., 1997). It is good practice to look routinely at the effect on the review of both including and excluding poor-quality studies, so-called 'qualitative sensitivity analysis' (Carroll & Booth, 2015).

Lastly, you should recognise that quality assessment of qualitative research is contested with methods work still ongoing (Garside, 2014; Munthe-Kaas et al., 2019; Morse, 2021). Research suggests that assessing qualitative studies for qualitative systematic reviews has little impact on *overall* review findings – exclusion of weaker studies shows no effect (Thomas & Harden, 2008). Exclusion of 'inadequately reported' studies from two exemplar reviews had no meaningful effect on the synthesis (Carroll et al., 2012). However, in one of the reviews, on online education, excluding inadequately reported studies could lead to exclusion of *the views of one particular group* of health professionals. For the moment, the main reason for assessing study quality for qualitative syntheses appears to be that editors and peer reviewers expect that quality assessment should be reported.

Quality assessment for mixed methods reviews

Quality assessment for mixed methods reviews is particularly demanding. It requires that you are familiar with the design features of both qualitative and quantitative methods with a knowledge of their strengths and weaknesses. You also need to consider the implications of bringing the two study designs together; for example, participants who have already been recruited to a trial may reflect distinctive attitudes or values if subsequently asked about their experience of a particular condition. Quality assessment of mixed methods studies is covered in Chapter 9. For the moment, it suffices to highlight three main options: using an all-in-one checklist, using compatible checklists from the same stable (from the analogy of a string of race horses) or using the 'best of class' checklist for each study (Table 6.12) (Noyes et al., 2019).

Table 6.12 Three options for quality assessment in mixed methods reviews

Option	Strengths	Weaknesses
'All-In-One Checklist' (e.g. the Mixed Methods Appraisal Tool (MMAT))	Looks at individual study features and also effect of integration	Uses scoring system
'Same Stable Checklists' (e.g. CASP (RCTs) and CASP (Qualitative))	Harnesses compatible checklist structures to aid cross-study comparison	Designed as 'reader's checklists' and do not reflect state of the art
'Best of Class Checklists' (e.g. Cochrane Risk of Bias for RCTs and JBI for Qualitative)	Uses current best options for each individual study	Not designed for compatibility and integration of designs is ignored

Applying quality assessment

Quality assessment of studies generates large quantities of information. Typically, in systematic reviews where quality assessment is the default, the Results section presents a few paragraphs that attempt to synthesise information on overall study quality, focusing on its impact on individual study findings. The information can also be tabulated by drawing out the key points of the checklist. Generally, the Discussion focuses on the key flaws, but you should not forget to include what has been done well! As mentioned previously, you should be aware of which flaws are critical and which are not – remember that it is the *impact* on the study findings that is crucial.

Reviewers do not generally exclude studies on the basis of quality. However, sometimes they perform a **subgroup analysis** to examine whether the results change if poor-quality studies are omitted (i.e. are results sensitive to study quality?). This form of subgroup analysis is usually referred to as a sensitivity analysis. Subgroup analysis may also be performed by splitting the studies into subgroups according to a particular study design feature that might impact on study findings, for example the country in which the study was undertaken or studies with large and small sample sizes, and exploring how these aspects of studies might impact on the findings of the review. For example, smaller studies may overestimate study findings (Higgins et al., 2021) and subgroup analysis has the potential to demonstrate this.

Finally, be cautious about labelling studies according to a level of quality (e.g. high, medium and low). While in principle this might appear useful, you need to be explicit about the criteria by which studies are categorised, so that ultimately the classification of studies could be reliably reproduced. Given this may be a highly subjective exercise, you do not want to mislead your audience as their concept of a high-quality study may differ from your own.

Issues and challenges in quality assessment

Assessing the quality of research is time consuming, particularly when you are new to the process. With experience, you become quicker as you become more familiar with the study designs and their inherent and anticipated weaknesses. You may also find it difficult to choose a checklist given the number from which to choose. As discussed earlier, you could examine examples of reviews in your subject area to identify common and well-used checklists for your research discipline.

Quality assessment is a subjective process. For systematic reviews, methods guides suggest that quality assessment should be carried out by more than one person and the results compared (Higgins et al., 2021). However, this is not always practical or necessary. Having a second reviewer check a sample of quality assessments offers a reasonable alternative, particularly for those elements of which you are unsure (with a supervisor or mentor perhaps). Use of checklists typically makes it easier to achieve consensus. As previously stated, fundamental issues concerning the subjectivity of quality assessment of qualitative research remain to be resolved.

Lastly, remember that **quality assessment** examines what is reported within a study report, and thus studies can only be as good as their reporting. Often studies do not report enough details of the methods employed and quality assessment can only measure what is reported. While it is possible to track authors down to elicit missing details, a good paper should include sufficient detail to allow you to assess its quality. The quality of reporting of primary and

secondary research (see Chapter 10) has been a subject of attention. The EQUATOR Network provides a comprehensive list of reporting guidelines (www.equator-network.org/ see Box 10.5). Over time, as more journals adopt standards for reporting the studies they publish, quality assessment should become easier – assuming that standardised reporting does not conceal more than it reveals, by making it difficult to identify poorer studies.

Use Exercise 6.5 to practise your quality assessment skills.

exercise 6.5

Quality assessment

In Table 6.13, three articles and their citations are presented for you to test out your quality assessment skills. Each of the three articles is open access and therefore freely available online.

We have selected articles that report different study designs and different topics. Skills that you acquire from undertaking this exercise will transfer to assessing studies from other disciplines, including your own.

First, read the full article and undertake a quality assessment using an appropriate checklist (suggested checklists are provided in Tables 6.9 and 6.10). Then look at the model answers for each article on the companion website. Based on the suggested checklists, see if you have identified the key points. Try to undertake the exercise before looking at the corresponding model answers! Then look to see whether you have identified the key points. Do not worry if some of your judgements disagree with the sample answers. Disagreements over the quality of individual studies can, and frequently do, happen within systematic review teams. This is why two reviewers make initial judgements, discuss discrepancies and, where agreement cannot be reached, a third reviewer acts as adjudicator to reach a final, agreed judgement. You are likely to have identified points that our sample answers have overlooked.

Table 6.13 Quality assessment of an article

Study reference	Study design	Checklist
Chocolate flavanols and skin photoprotection: a parallel, double-blind, randomized clinical trial. (Mogollon et al., 2014)	RCT	Critical Appraisal Skills Programme: https://casp-uk.net/wp-content/uploads/2018/01/CASP-Randomised-Controlled-Trial-Checklist-2018.pdf
Dying to be famous: retrospective cohort study of rock and pop star mortality and its association with adverse childhood experiences (Bellis et al., 2012)	Cohort study	Critical Appraisal Skills Programme: https://casp-uk.net/wp-content/uploads/2018/01/CASP-Qualitative-Checklist-2018.pdf
Robotic seals as therapeutic tools in an aged care facility: a qualitative study (Birks et al., 2016)	Qualitative study	Critical Appraisal Skills Programme: https://casp-uk.net/wp-content/uploads/2018/01/CASP-Cohort-Study-Checklist_2018.pdf

SUMMARY

All literature reviews involve an assessment of the evidence base. The first step is to select systematically those studies identified by the literature search that are relevant to your review question. The type of review that you are undertaking and its purpose will determine the approach you will use to assess the included studies in your literature review. For some reviews, you may briefly characterise the key features of the evidence base. In other reviews, you need to conduct an in-depth assessment of study quality to address the review question. Checklists that elicit a Yes/No/Cannot Tell response to questions can help you to accomplish this process, particularly if you are a novice reviewer. An experienced reviewer may progress to responding to a series of prompts. In both instances it is important to document the individual judgements and to use these assessments when interpreting the review findings. Many useful resources exist to support the quality assessment process. Quality assessment is, initially at least, a difficult and time-consuming process, although it does become easier with experience and practice. However, be sure to persevere as the process often alerts you to methodological flaws in studies included in a review. You may be surprised (or even shocked!) at the potential impact of a flawed study on the findings and conclusions of your review.

key learning points

- Use the inclusion and exclusion criteria you devised in Chapter 4 to help you select studies for your review in a transparent manner.
- Consider the extent to which you need to assess the evidence base for your review by thinking about the aim of your review.
- Consider how the design features of studies included in your review can impact upon the research findings.
- Three core components of quality assessment to consider when reading a study are:
    - Are the results of a study true? (Validity)
    - What are the results? (Reliability)
    - Can I generalise the results? (Generalisability)
- Quality assessment checklists help to guide the process of quality and relevance assessment.
- Look at research within your discipline, particularly reviews, to see how quality assessment is undertaken in your topic area.

frequently asked questions (FAQS)

FAQ 6.1 I am unsure whether to include a study in my review, what can I do?

You could ask for a second opinion, for example from your supervisor or mentor. Alternatively, you could hand a colleague your inclusion and exclusion criteria and ask them to apply these to the study in question to see what decision they reach. Systematic reviews being conducted by research teams, particularly those that are funded, would double-screen at least

(Continued)

a proportion of the studies, therefore any uncertainty can usually be resolved, including the opinion of a third reviewer/colleague if required.

FAQ 6.2 Do I need to record a reason for all the studies I exclude?

It will help to record the reasons for exclusion at each stage of screening. This will then help you to report how many studies were excluded at the title and abstract screen, and how many studies were recorded at the full-text screen. For your write-up, you only need to record reasons for any studies you exclude at full text. Systematic reviews usually include in the appendices a list of these with a (brief) reason for why they did not meet the inclusion criteria (such as incorrect population).

FAQ 6.3 How do I keep track of what I have included and excluded and at what stage?

The important thing is to have a system, whether manual or electronic. Reference management tools can help, as you can tag or label references accordingly as you go through the selection process – such as include-abstract or exclude-full-text. You can then retrieve lists based on the various tags/labels, for example to generate a list of excluded at full text studies for your appendices. Free software exists to help with the review process, for example Rayyan. Many reviewers use home-made solutions such as Excel spreadsheets with drop-down menus, importing references into the spreadsheet, so that they can filter and sort on inclusion/exclusion criteria and perform quick counts according to record status (Include/Exclude/Proceed to Full Text etc.) If you have access to systematic review software via your institution, or can afford to include it in the budget for your review, 'keeping track' is built into these programmes.

FAQ 6.4 I am unsure how much effort I will need to spend on quality assessment and how I should approach it for my review?

Refer to Table 6.1 as a starting point. You will find it helpful to look at reviews of a similar type (e.g. so if planning a scoping review, look at existing scoping reviews) and reviews in your topic (to identify subject-specific checklists or to see if researchers have used/adapted generic checklists). The Systematic Review Toolbox (www.systematicreviewtools.com) is a good source of quality assessment checklists and guidelines covering different disciplines.

FAQ 6.5 I am critically appraising a systematic review and I want to assess the issue of heterogeneity, whereabouts in the review should I look for this?

Reviewers may describe how they planned to deal with heterogeneity upfront in the Methods section. Also, check the Results section to see how they handled heterogeneity in practice. If the review presents a **meta-analysis**, you can check the forest plot to see whether it was appropriate to combine the results of the individual studies. A useful 'Anatomy of a Systematic Review' (National Collaborating Centre for Methods and Tools, 2017) tool will assist you when analysing others' reviews.

FAQ 6.6 Can I combine my data extraction with my quality assessment, so I don't need to read each study twice?

It is possible to record the data extraction and quality assessment together, and in the same data extraction repository (e.g. an Excel file or Word table). Various examples exist, including sample data extraction forms from the Cochrane Collaboration Developmental, Psychosocial and Learning Problems group: https://dplp.cochrane.org/data-extraction-forms. It really is a

matter of choice and what you find best for you. With any data extraction form, whether including critical appraisal or not, it is useful to pilot it first before using it throughout your review.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Ajetunmobi O (2002) *Making Sense of Critical Appraisal*. London: Arnold.
A useful book with a chapter on appraising each key study design. Read the chapter(s) that cover the study designs of your evidence base. New edition (2nd) planned for January 2021.

Aveyard H (2018) How do I critically appraise the literature? In: *Doing a Literature Review in Health and Social Care*, 4th edition. Maidenhead: Open University Press, 75–123.
This chapter gives an overview of critical appraisal. Particularly helpful is the 'six questions to trigger critical thinking'. Appraisal of a variety of information types is covered – quantitative and qualitative research, theory, practice literature, policy and guidelines, and information on websites.

Greenhalgh J & Brown T (2017) Quality assessment: where do I begin? In: Boland A, Cherry MG & Dickson R, *Doing a Systematic Review*, 2nd edition. London: Sage, 107–30.
This chapter covers the process of quality assessment from beginning to end, in a 6-step guide.

Greenhalgh T (2019) *How to Read a Paper: The Basics of Evidence-Based Medicine and Healthcare*, 6th edition. Oxford: Wiley Blackwell.
Now in its 6th edition, this essential book gives an overview of the evidence-based medicine process. Chapter 3, 'Getting your bearings: what is this paper about?', provides an introduction to quality assessment, before moving on to a chapter on assessing methodological quality (Chapter 4). Chapter 5, 'Statistics for the non-statistician', is particularly useful for familiarising yourself with the key statistical aspects of studies to inform your critical appraisal.

Oliver P (2012) How to select literature for inclusion. In: *Succeeding with Your Literature Review.* Maidenhead: Open University Press, 58–74.
A good introduction to quality assessment, does not cover formal critical appraisal, but highlights issues to consider when selecting studies to include in your review.

Porritt K, Gomersall J & Lockwood C (2014) JBI's systematic reviews: study selection and critical appraisal. *American Journal of Nursing*, 114(6): 47–52.
Part of a series presenting a step-by-step guide to systematic review, this article focuses on study selection and critical appraisal, with the aim of ensuring that your review produces valid results capable of providing a useful basis for informing policy, clinical practice and future research. The article helpfully presents appraising evidence of effectiveness (quantitative studies) and appraising evidence of experiences (qualitative studies).

7

SYNTHESISING AND ANALYSING QUANTITATIVE STUDIES

in a nutshell

How to synthesise and analyse quantitative studies

- You can summarise and synthesise quantitative data in narrative, tabular and, sometimes, graphical form.
- When planning whether to conduct meta-analysis you should first ask: is it appropriate to combine my studies in meta-analysis? Justify your decision in your text when you write up your review.
- Your choice of meta-analysis method is primarily determined by how similar or different your populations, interventions, outcomes and study (PICOS) characteristics are to one another (**heterogeneity**).
- You should always identify and discuss in your review report any heterogeneity across your studies, PICOS elements and statistical heterogeneity observed in the meta-analysis results.

key terms explained

meta-analysis: statistical analysis that combines the results of multiple scientific studies. Meta-analysis can be performed when multiple scientific studies address the same question and measure the same outcomes using similar or comparable methods. The aim is to use statistical approaches to derive a pooled estimate closest to the unknown common truth.

meta-regression: meta-analysis that uses regression analysis to combine, compare, and synthesize outcome data from multiple studies while adjusting for the effects of available covariates on the outcome of interest

network meta-analysis: technique for comparing multiple interventions simultaneously within a single analysis by combining direct and indirect evidence within a network of comparative studies (typically randomised controlled trials).

publication bias: selective distribution of research resulting in the systematic distortion of research findings, with subsequent implications on the quality of available evidence

selective reporting bias: form of reporting bias in which certain components of conducted research are not fully presented based on the nature or direction of the results. May be detected by comparing a research study (i) to a published protocol and (ii) to other published protocols/reviews on the same topic.

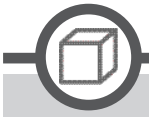
sensitivity analysis: analytical approach used to assess the robustness or consistency of review results under different methods, subgroups, definitions, assumptions, and so on. Typically used to explore the implications of including versus excluding studies of poor quality within a review or meta-analysis.

INTRODUCTION

Bringing together your review results together in a synthesis is a key step in a quantitative systematic review. Synthesis allows you to *juxtapose* the individual studies to identify patterns and direction in the findings, and to *integrate* the results to produce an overall bottom line that tells your reader whether an intervention works on average (Mays et al., 2005a). As you examine the composite **evidence base** for similarities, whether related to the **homogeneity** ('sameness') of study characteristics (i.e. how they were carried out) or relatedness of findings (i.e. what they found) you can contribute significant added value to your review process. As Mulrow (1994) comments:

> The hundreds of hours spent conducting a scientific study ultimately contribute only a piece of an enormous puzzle. The value of any single study is derived from how it fits with and expands previous work, as well as from the study's intrinsic properties.

The degree to which an individual study 'fits' within the overall puzzle relates to its heterogeneity. We therefore start this chapter with a brief explanation of heterogeneity (Box 7.1)



box 7.1

What is heterogeneity?

Put simply, heterogeneity is a word that signifies diversity. If you work or study in an institution with people from lots of different backgrounds then that institution is considered to possess the quality of heterogeneity. In the context of reviews, heterogeneity refers to any type of variability among studies included in the review. The three types of heterogeneity commonly considered in meta-analysis include:

(Continued)

1. **Clinical (practical) heterogeneity:** variability in PICO (population, interventions/comparators, or outcomes) among included studies.
2. **Methodological heterogeneity:** variability in the design or quality of studies; for example, the use of double blinding in some clinical trials included in a meta-analysis but not in others
3. **Statistical heterogeneity:** the observation that the observed difference in effects among studies in a meta-analysis is greater than one would expect on the basis of random error; this is usually the default meaning when the term is used by itself in the medical literature.

Statistical heterogeneity can be measured with established tools and reported in addition to visual inspection using forest plots. Three techniques that can be used to explore statistical heterogeneity are subgroup analysis, sensitivity analysis or **meta-regression**.

SYNTHESIS–ANALYSIS, ANALYSIS–SYNTHESIS?

Some authors may take issue with our SALSA framework in separating synthesis from analysis. Others may contend with our suggestion that synthesis precedes analysis. We can illustrate this distinction by considering the specific technique of meta-analysis. For meta-analysis the specific steps are as follows:

1. Tabulate summary data (data extraction).
2. Graph data (synthesis).
3. Check for heterogeneity of study characteristics (PICOS) (synthesis).
4. Perform a meta-analysis if heterogeneity of study characteristics is not a major concern (synthesis).
5. If statistical heterogeneity is found in the meta-analysis identify factors that can explain it (analysis).
6. Consider undertaking further meta-analyses in the form of subgroup or sensitivity analyses to explore sources of heterogeneity (analysis).
7. Evaluate the impact of study quality on results (analysis).
8. Explore the potential for publication bias (analysis).

Following data extraction, three steps associated with synthesis culminate in production of the well-recognised **meta-analysis** display of data. However, rather than being an endpoint, this meta-analysis is actually a starting point for further investigation and enquiry. Three steps of analysis include trying to identify factors associated with variation (**heterogeneity**), examining study quality as a possible explanation for variation and investigating the likelihood that important studies have been overlooked or omitted.

Overview of approaches to synthesis

Synthesis relies heavily on pattern recognition. You should select a method of synthesis that helps your audience to identify such patterns in your data:

> [Some] references may be organized chronologically in parts of your review where you may be evaluating developments over time; some may be arranged thematically, demonstrating similarities and allowing you to make creative connections (cross-currents) between previously unrelated research; and some arranged to demonstrate *comparison and contrast* perhaps using a common set of criteria as an 'anchor'. (Gray & Malins, 2016)

Comparison and contrast may therefore be used within a literature review to compare study by study (usually only possible for limited numbers of included studies) or by findings (i.e. similarities and differences across studies). Within a larger literature review, as carried out for a dissertation or thesis, you may want to combine both approaches.

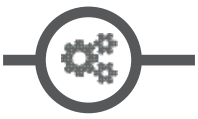
Approaches to synthesis can be characterised in three main forms: quantitative (this chapter), qualitative (Chapter 8) and integrative (i.e. bringing together quantitative and qualitative – Chapter 9). Once you have identified which type of data you will be using, you need to decide how best to synthesise and analyse your data. Of course, your obvious choice is to use quantitative approaches for handling quantitative data and qualitative approaches for processing qualitative data. However, your synthesis toolkit includes quantitative approaches to synthesising qualitative data (i.e. where the occurrence of themes or words is quantified as in **content analysis**) or qualitative approaches to synthesising quantitative data (i.e. where different types of quantitative study are described narratively (Mays et al., 2005b)). *Quantitative* approaches are best exemplified by the technique of meta-analysis.

Extracting quantitative data for your review

Data extraction is key to demonstrating that you have followed a systematic approach and handled different studies in a consistent manner. Data extraction is core to the review process and requires intensive effort:

> The next stage in systematic review is often considered its core, and a time consuming, uphill slog to boot. (Pawson et al., 2002)

Data extraction allows the reviewer to examine which elements of data are present in each individual study report. Studies are reported differently according to each particular journal within which they have been published. Extracting data from this disparate set of studies makes it easier for you to compare what is reported and what is missing. The human brain finds it difficult to assimilate variables from more than a handful of studies at the same time. Converting diverse study reports into a common format, a 'lowest common denominator', helps you to interpret the body of evidence and aids subsequent pattern recognition (Petticrew & Roberts, 2006). Without the formal tools to extract and summarise findings you would have to 'mentally juggle relationships among many variables. Systematic ways of exploring such relationships … make it far easier both to detect and understand them' (Light & Pillemer, 1984).



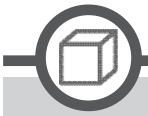
rapid review tip 13

Data extraction

Use a single reviewer to extract data into a piloted form. Then use a second reviewer to check for correctness and completeness of extracted data for all included items. Key for a rapid review is limiting data extraction to a minimal set of required data items. Where plentiful systematic reviews exist you could use data previously extracted for those reviews to reduce time spent on data extraction.

Garritty et al. (2021)

Elements for your data extraction form will cluster around the PICOS structure.



box 7.2

Possible elements for inclusion in a data extraction form

1. **Eligibility:** explicit statement of inclusion and exclusion criteria with the opportunity to indicate whether study is to be included in the review or not.
2. **Descriptive data:** information about study characteristics including setting, population.
3. **Quality assessment data:** information about the quality of the study. A formal checklist may be incorporated within the documentation.
4. **Results:** information about the results of the study in the form of data to be used in your review. Data may be in 'raw' format (directly from the paper) and/or you may convert it into a uniform format. Ideally, you will include both forms to indicate variation in methods and yet allow checking for accuracy.

Data extraction may be undertaken at the same time as **quality assessment** or performed separately, either before or after quality assessment. Both approaches have merits and disadvantages. Some say it is more efficient to examine the detail of reporting *and* the quality of the study from a single pass through the literature. Both require an in-depth reading of a study. Others contend that the two processes are dissimilar in that data extraction encourages you to focus on the minutiae of the report while quality assessment involves a holistic judgement of a study. For these reasons some prefer to make an overall assessment of quality to temper or moderate their subsequent examination of findings. Others prefer to immerse themselves in the detail of the study report before stepping back to view the whole that emerges from the sum of its parts (Barnett-Page & Thomas, 2009).

The level of detail for, and time spent upon, data extraction varies according to the type of review being undertaken. For a **scoping review** or **mapping review** you might extract key study characteristics such as the setting, the study design, number of participants, etc. (Ryan et al., 2009) as a prelude for study coding. A mapping study attempts to determine:

> what sorts of studies addressing the systematic review question have been carried out, where they are published, in what databases they have been indexed, what sorts of outcomes they have assessed, and in which populations. (Petticrew & Roberts, 2006)

There are many ways to undertake data extraction. For most reviews data extraction can be performed easily using a questionnaire format. One way of conducting data extraction is to use Google Forms. The resultant data can then be inspected within a Google Sheets spreadsheet or exported into Excel. You may find it helpful to map out the data extraction form in a word processing document first (Table 8.1) before converting it into a questionnaire format. Particular rows or columns from the data extraction form can then be pasted into word processing documents for the review report. Time spent on designing the method for extracting data is rewarded

by the ease with which you are able to produce data displays, to identify shared characteristics and patterns across studies, and to spot discrepancies or inconsistencies for further analysis.

The literature review template on the companion website offers a possible template for your own review (see Step 7: Data extraction).You can display extracted data as matrices, graphs, charts or networks (Whittemore & Knafl, 2005; Haddaway et al., 2019). Such displays help you to visualise patterns and relationships within and across your included studies. You can produce a data display (Table 7.1) to examine correlations between study characteristics and study setting immediately following data extraction. In Table 7.1 the reader glances down the columns to see that three (fictional) studies contain data from the United States (Studies 3, 4 & 5). Conversely, by looking across the rows the reader can see that only one study (Study 3)) is a multi-country study while all the others report data from a single country.

Table 7.1 Matrix for examining possible correlations

Country of origin	Australia	Canada	France	Germany	India	Japan	Netherlands	Romania	Singapore	South Africa	Spain	Sweden	United Kingdom	United States
Study 1: Bull (2004)													X	
Study 2: Ceaușescu et al. (2001)								X						
Study 3: Cosmo et al. (2007)	X		X	X	X	X	X				X	X	X	X
Study 4: Roosevelt et al. (2009)														X
Study 5: Washington et al. (2005)														X

Planning your synthesis strategy

A key early stage in the process of synthesis is planning your **synthesis strategy** – how you will approach the literature once it has been assembled (Kitchenham, 2007). You have several choices: your chosen approach is governed by your review type and its objectives (Table 7.2). You may need to switch from your initial strategy to an appropriate alternative as patterns from the literature become clearer.

Although your *initial* synthesis strategy is open to subsequent refinement and change, you nevertheless need to have a clear picture of your direction of travel. Clearly, if you intend to read and review an entire body of literature, albeit centred on a focused question, decisions on the order in which you handle the papers are less critical. Each paper will have the same opportunity to contribute equally to the final map or the pooled result.

After considering techniques for handling data, we look at how to undertake such activities within the context of different types of data presentation, namely textual, graphical, numerical and tabular.

Table 7.2 Approaches to synthesis in different types of reviews

Type of review	Approaches used to synthesis	Example of application	Reporting guideline
Scoping review	Coding Narrative synthesis Tabular presentation	Descriptive coding was applied to include study features such as design, country of origin, type of behaviour targeted, characteristics of population and type of incentive used. Outcome studies were coded in greater depth Paragraphs described the features of studies for each variable (e.g. types of intervention and incentive) Tables complemented narrative synthesis with frequencies and percentages of each type (Kavanagh et al., 2005)	PRISMA-ScR (Tricco et al., 2018a)
Mapping review	Keywording Mapping Studies not synthesised because they were 'disparate in their focus'	EPPI-Centre core keywording strategy used to classify studies according to a range of criteria, including bibliographic details (how the study was identified and whether it has been published) and contextual details (the language in which the study was written/published and the country where the study was conducted). Key aspects of the study coded, such as topic focus of study and information about the subjects of the study Mapping stage of review describes studies found to be relevant, gives overview of field of study and enables reviewers to focus on particular areas of map. Brief commentary given on each study with emphasis on conclusions not methods (Graham-Matheson et al., 2005)	PRISMA-ScR (Tricco et al., 2018a)
Meta-analysis	Data extraction Translation into common metrics Computation of missing values	Extracted data in standardised way – transformed all weights into kilograms (kg) and weeks into months. Attempted contact with authors to obtain missing information. Assessed each study using modified version of Ottawa–Newcastle Scale (Vadeboncoeur et al., 2015)	PRISMA
Systematic review	Categorisation Data extraction Quality assessment Narrative synthesis Tabular presentation Meta-analysis not possible because of variability of studies	Articles categorised by type of publication. Data from intervention studies included study design, sample and intervention characteristics, and data collection methods and measures. Studies assessed using checklist. Narrative description and tabulation of study features and of methodological adequacy (Webb et al., 2009)	PRISMA

When you explore patterns from quantitative data you are trying to answer the questions: Are the *settings* for a particular intervention (e.g. personal counsellors in secondary education) more similar than different? Are the *interventions* comparable? (For example, if something is described in multiple studies as a 'policy unit' does every study refer to the same entity?) Such questions at the synthesis stage inform subsequent analysis (e.g. whether you can identify naturally occurring subgroups for detailed investigation and whether your line of argument depends too much on particular individual studies or groups of studies). In short, you can decide whether, in fact, it makes sense to treat all included studies as a single group (**lumping**) or whether the studies make more sense as multiple, separate and distinct groups (**splitting**) (Lunyera & Diamantidis, 2019).

Examining consistencies

You should not simply catalogue all the variables to emerge from the individual studies and then amalgamate them into a long master list. You should seek to examine possible groupings to the patterns in your data, such as **explanatory variables** or **confounding variables**, which may be recorded consistently as codes or categories.

A key step in such data analysis is data comparison. Data comparison involves examining data displays of your primary source data iteratively to identify patterns or relationships. You are looking for shared characteristics of particular groupings of studies: Did some of the studies share a particular outcome measurement? Do some studies measure outcomes with objective measures while others use subjective measurement, such as self-reporting? You will find it helpful to make a distinction between *descriptive* grouping, which may contribute to your narrative commentary or synthesis (e.g. '10 of the 15 studies were conducted using the Edinburgh Depression Scale while the remainder used self reporting') and *analytical* grouping (where you may examine such differences to see if they might provide a possible explanation for differences (heterogeneity) in results).

Differences typically occur across one or more specific variables. You should not attach too much importance to a single preferred variable when a difference may be attributable to many variables working together. For example, instead of multiple interventions *working together*, more effectively it may be that an individual intervention *works alone* but its specific effect is masked among accompanying interventions (Higgins et al., 2021).

Of course, individual studies may differ from the main body of studies across diverse aspects (i.e. they are genuine 'outliers'). In such cases, you may wish to reconsider whether it truly makes sense to include them within an overarching analysis or whether they should be analysed separately. Such considerations of 'sameness' versus 'differentness' are fundamental to the entire process of synthesis.

You will not be able to answer all hypotheses generated from your data within your extracted data set. You may need to examine additional data sources, either within the current review or as a supplementary step. Process evaluations may help you to understand implementation difficulties or variations in implementation fidelity. Qualitative studies may help you to surface assumptions about the intervention or programme held by either recipients or those delivering the intervention (Noyes et al., 2018a).

Approaches to synthesis

Approaches to synthesis may be characterised in many different ways; we have chosen to characterise synthesis according to the type of data that you may be attempting to synthesise.

Narrative and textual approaches

Regardless of the type of review that you are undertaking, you will need to use some form of narrative approach. You can choose between a traditional narrative approach and the more formalised development of narrative synthesis. Some researchers promote the *traditional narrative approach* (Hammersley, 2013), which has evolved as a less formalised method for summarising large quantities of information. This traditional narrative approach largely involves compiling descriptive data and exemplars from individual studies. The output from this descriptive process is conceived as a mosaic or map (Hammersley, 2013). Narrative methods can be used to synthesise quantitative and/or qualitative studies. They have been used when experimental and quasi-experimental studies included in a systematic review are not sufficiently similar for a meta-analysis to be appropriate (Snilstveit et al., 2012). They seek to remain faithful to the wholeness or integrity of the studies *as a body* while also preserving the idiosyncratic nature of *individual* studies. Unlike meta-analysis, which requires a 'fit' between the type and quality of primary sources, a narrative review can accommodate differences between the questions, research designs and contexts of each individual study. A narrative review disguises such differences by weaving together a common line of argument.

Potential objectives for this narrative approach (Rumrill & Fitzgerald, 2001) are:

- to develop or advance theoretical models;
- to identify, explain and provide perspectives on complicated or controversial issues;
- to provide information that can assist practitioners in advancing 'best' practice;
- to present new perspectives on important and emerging issues.

Furthermore, such an approach offers an opportunity for the reviewer to be reflexive and critical (see Chapter 9). However, the traditional narrative approach falls short of the systematic approaches espoused by this book. A possible middle ground is offered by 'narrative synthesis' which focuses on how you summarise studies that address different aspects of the same focus of interest narratively to build up a complete picture.

Narrative synthesis addresses diverse questions, not just those relating to the effectiveness of a particular intervention. It is defined as:

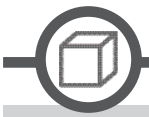
> An approach to the synthesis of evidence relevant to a wide range of questions including but not restricted to effectiveness [that] relies primarily on the use of words and text to summarise and explain – to 'tell the story' – of the findings of multiple studies. Narrative synthesis can involve the manipulation of statistical data. (Popay et al., 2006)

Despite excellent examples of its application, narrative synthesis was initially criticised because of its potential bias and lack of transparency and reproducibility. However, a formalised method of narrative synthesis involves four steps (Popay et al., 2006):

- developing a theoretical model of how the interventions work, why and for whom;
- developing a preliminary synthesis;
- exploring the relationships in the data; and
- assessing the robustness of the synthesised output.

Diverse tools and techniques are available to support each step. Therefore, narrative synthesis (Box 7.3) remains a method of choice for summarising the characteristics and findings of a body of research in a succinct and coherent manner (Daniels, 2019). Essentially you take a series of slices through your group of included studies according to different study characteristics. Rather than describing each study individually, narrative synthesis characterises studies within multiple groupings. This is preferable to describing each individual study in turn. Grouping studies increases the probability that the reader, and the reviewer, can characterise the included studies as a 'body of evidence' (Box 7.4). Most importantly, grouping included studies moves the reader towards identifying patterns in the data. Narrative synthesis is often used alongside tabular presentation. Both are essentially methods of descriptive data synthesis. It is common to use tables of data, whether using simple counts or more sophisticated descriptions, when composing the accompanying narrative commentary.

Despite frequent use and longstanding concerns about the validity of narrative synthesis, there was almost no methodological development (Campbell et al., 2019) to promote clearer methods for narrative synthesis since guidance was first published (Popay et al., 2006). Recently, SWiM (Synthesis Without Meta-analysis) reporting guidance has extended narrative synthesis reporting to offer alternatives to meta-analytic approaches (Campbell et al., 2020). Specifically, the SWiM guideline expands guidance on 'synthesis of results' items within PRISMA (Page et al., 2021) and RAMESES (Wong et al., 2013a). SWiM covers key features of synthesis including how studies are grouped, synthesis methods used, presentation of data and summary text, and limitations of the synthesis (see Box 7.2). SWiM is not intended for use in reviews that synthesise qualitative data. Reporting guidelines are already available, including ENTREQ for qualitative evidence synthesis (Tong et al., 2012) and eMERGe for meta-ethnography (France et al., 2019a) (see Chapter 8).



box 7.3

At a glance – narrative synthesis

Definition

A method of synthesis that primarily uses words and text to summarise the findings of multiple studies. It is therefore a process of synthesising primary studies to explore heterogeneity descriptively rather than statistically.

At a glance

Reviewer expertise

Information expertise

(Continued)

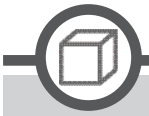
Time	🕘🕘
Resources	££

Overview of process

Table 7.3 SALSA approach mapped to narrative synthesis

SALSA stage	Procedure (Campbell et al., 2020)
Search	As for a systematic review
Appraisa**L**	As for a systematic review
Synthesis	Describe and provide rationale for groups used in the synthesis (e.g. groupings by PICOS) and provide rationale for changes made subsequent to the protocol
	Describe standardised metric and transformation methods used
	Describe and justify methods used to synthesise the effects for each outcome when it was not possible to undertake a meta-analysis of effect estimates
	Specific synthesis procedures:
	For: 'What is the range and distribution of observed effects?'
	Use: Summarising effect estimates
	For: 'Is there evidence of an effect in at least one study?'
	Use: Combining P values
	For: 'Is there any evidence of an effect?'
	Use: Vote counting based on direction of effect
	Provide criteria used, with justification, to select a study/studies for the synthesis or to draw conclusions from the synthesis (e.g. based on study design, risk of bias assessments, directness in relation to the review question)
Analysis	Investigate heterogeneity in reported effects
	Assess the certainty of the synthesis findings
Presentation	Use graphical and tabular methods (e.g. tables, forest plots, harvest plots) and specify key study characteristics (e.g. study design, risk of bias) used to order the studies, in the text and any tables or graphs, clearly referencing included studies
	Report limitations of synthesis methods used and/or the groupings used in the synthesis and how these affect conclusions to be drawn

In comparison with thematic approaches narrative synthesis is less good at identifying commonality (Lucas et al., 2007). While the techniques of narrative synthesis (e.g. charting, tabulation, exploring of relationships, etc.) can be used for most reviews, the specific SWiM guidelines are not intended for use in reviews that synthesise qualitative data, for which reporting guidelines, such as ENTREQ for qualitative evidence synthesis (Tong et al., 2012) and eMERGe for meta-ethnography (France et al., 2012), are available.



box 7.4

The inherent advantage of narrative synthesis

You are in a lift with your supervisor or mentor. They ask you how your review is going. You have reviewed 20 included studies. You start with 'Study 1 is a randomised controlled trial of 150 patients conducted in Sweden …'. Before you get beyond describing your fifth included study, the lift arrives and your companion alights with thankful relief. On the way down in the same lift, later that morning, the supervisor asks a colleague, also involved in a literature review, about their progress:

> Interestingly I found that only 2 of my 25 included studies target children; the remaining 23 study adult populations. I had thought that the Sheffield Stress Scale was going to be the most common outcome measure but in fact there is a proliferation of researcher-designed instruments. Only five studies used validated outcome measures; three of these used the Sheffield Stress Scale. So I am already starting to plan my own primary study to be targeted at children using a validated outcome scale.

Which review will the supervisor remember (for the right reasons!) on the way home that evening?

Four processes involved in narrative synthesis can serve as reference points to formalise activities that should occur naturally throughout your review (Popay et al., 2006):

- Developing a theory of change: you can use reviews either to generate some explanatory theory or to explore or test existing theory.
- Developing a preliminary synthesis: this involves mobilising findings from the literature and stringing them together in order to tell a plausible 'story'.
- Exploring relationships in the data: this involves examining consistencies in the data and actively seeking the disconfirming case.
- Assessing robustness of the synthesis product: this corresponds to the analysis phase of the SALSA mnemonic (see Chapter 2). This involves using a variety of tools to examine lines of enquiry suggested either a priori or as a result of the synthesis process.

Tabular presentation

In addition to narrative synthesis, you can describe included studies using tabulation. Again, because you are using tabulation to describe studies, not to analyse them, it is useful for all types of studies. You might use tabulation to describe characteristics of the population, intervention, comparator and outcome (measures). You may also use **tabulation** to describe study characteristics (e.g. study design). Some reviewers use tabulation to report how individual studies perform with regard to study quality. This makes it easier for the reader to identify higher-quality studies. In quantitative studies where meta-analysis is not an option, you can use a table to present a

summary of results. Cells may indicate whether an effect is positive, negative or neutral and whether a specific effect is statistically significant or not.

Tabulation is particularly valuable within the context of **cross-case comparison** and for 'eyeballing' patterns across rows or down columns. However, tabulation may be criticised as necessarily reductive, resulting in a loss of important context or detail that aids interpretation of the studies.

Numerical presentation

Where you observe the same effect measured by multiple similar studies, you may find it possible, and advantageous, to combine their results statistically. Combining studies in this way, known as **meta-analysis**, may help to produce a conclusion about a body of research. For example, it may be that there are insufficient large studies to have proved an effect conclusively. Alternatively, those studies that do exist may show different patterns of effects. In the latter case, using simple vote counting (i.e. how many studies find in favour of an intervention and how many find against) may be misleading (Gurevitch et al., 2018).

Reporting guidelines for synthesis without a meta-analysis

The SWiM guideline covered already in this chapter, is intended for those who want to examine quantitative effects of interventions when a meta-analysis is either not possible or not appropriate (Campbell et al., 2020). The SWiM reporting guideline provides nine reporting items to promote transparent reporting of how to group and synthesise studies in a review:

- Grouping studies for synthesis. Helping the reviewer to provide a description of, and rationale for, the groups used in the synthesis.
- Describing the standard numerical metric. Helping the reviewer explain why the metric(s) was chosen (e.g. odds ratio or relative risk), and describe any methods that were used to transform reported metrics that were not those of the review, to those of the review, citing any methodological process that was used to do this.
- Describing the synthesis methods. Helping you to describe and justify the methods used to synthesise the numerical data for each outcome when it was not possible to undertake a meta-analysis.
- Describing the criteria used to restrict the synthesis to a subset of studies (e.g. those of better methodological quality, greater sample size, or the relevance of the evidence). Helping you describe the criteria and supporting justification.
- Describing the investigation of heterogeneity. Helping you to describe the methods used to assess heterogeneity when a meta-analysis has not been undertaken.
- Describing the assessment of the certainty of the evidence. Helping you to describe how the precision of the synthesis finding (confidence interval if available), the number of studies and participants, the consistency of effects across studies, the risk of bias of the studies, how directly the included studies address the planned question (directness), and risk of publication bias have been assessed. You can undertake an assessment of certainty using the GRADE (Grading of Recommendations, Assessment, Development and Evaluations) approach (Guyatt et al., 2011).

- Describing the data presentation methods. Helping you to describe the graphical and tabular methods used to present the effects (e.g. tables, forest plots, harvest plots) and specify key study characteristics (e.g. study design, risk of bias) used to order the studies.
- Reporting results. Helping you to describe the synthesised findings and the results in the context of the review question.
- Describing the limitations of the synthesis. Helping you to report the limitations of the synthesis methods used and how these might affect review conclusions.

Even if you do not use the entire SWiM guideline, you may find the guidance useful in undertaking the narrative synthesis for your own review, as described in the 'Narrative and textual approaches' section above.

Meta-analysis

Statistical meta-analysis involves the aggregation of a weighted average of the results of individual studies in order to calculate an overall effect size for an intervention (Denyer et al., 2008). The logo of the **Cochrane Collaboration** (see Figure 7.1), a stylised plot for a **meta-analysis**, demonstrates an actual scenario where seven small individual studies appeared to show conflicting results but which, when subject to meta-analysis, found an overall effect in favour of a life-saving intervention. Although the high profile of the Cochrane Collaboration, and its associated **Cochrane Library** product, has ensured that meta-analyses of **randomised controlled trials** are best known, meta-analysis may also be used to synthesise other study types such as **observational studies**. Meta-analysis can be effective in disciplines where suitable and comparable quantitative data exists in multiple studies (Denyer et al., 2008).

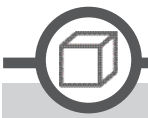
Meta-analysis as a technique meets a need to demonstrate an 'average effect'. Simultaneously, this represents its great strength and its associated weakness. As a strength, if an intervention consistently displays the same effect across diverse situational and contextual variables (e.g. country, population, ethnic group, etc.) you can conclude with increasing confidence that it will apply to your own context. This means that you do not need to replicate these studies with your own population to evaluate the effect locally. At the same time, it means that if an intervention works differentially in a variety of contexts, being successful in some and unsuccessful in others, you are not able to conclude about whether it is useful in your specific context. Although an intervention may work *on average* you cannot be sure that your context is one in which people benefit. This explains why mere synthesis on its own is not enough. You also need to undertake follow-up analysis to be able to explain differences in findings across multiple studies (see Chapter 9). Where variations exist in study design, the nature of evidence

Figure 7.1 The Cochrane Collaboration logo

and study context, meta-analysis is seen to be problematic (Hammersley, 2013). Indeed, critics of meta-analysis assert:

> This mixing of diverse studies can make for a strange fruit salad: mixing apples and oranges may seem reasonable enough, but when sprouts, turnips or even an old sock are added, it can cast doubt on the meaning of any aggregate estimates. (Davies & Crombie, 1998)

Meta-analysis follows prescribed procedures that summarise the findings from studies in a systematic way. Provided that the reviewer makes appropriate assumptions and uses appropriate methods of analysis, following this process reduces the chances of incorrectly interpreting findings and drawing misleading review conclusions. Because meta-analysis uses systematic data collection and data analysis, it is effective when reviewing large homogeneous bodies of research. Meta-analysis is useful in highlighting gaps in an extensive literature, although the reader should bear in mind that meta-analysis can only be conducted when outcomes are comparable and quantifiable. You can use the subsequent analysis to explore the influence of a large number of variables including different contextual factors. You can use narrative synthesis (qualitative) and meta-analysis (quantitative) to cross-validate findings from each other (Melendez-Torres et al., 2018). Therefore, you can use meta-analysis to quantify and corroborate review conclusions rather than use only one of these methods.



box 7.5

At a glance – meta-analysis

Definition

Meta-analysis is a quantitative literature review method for data synthesis used widely to complement and extend narrative literature reviews. Meta-analysis uses a set of statistical procedures to integrate, summarise or organise a set of reported outcome data from studies that investigate the same research question using the same methods of measurement (Gurevitch et al., 2018). Therefore, many reviewers endorse meta-analysis as a practical and systematic way of drawing review conclusions.

At a glance

Reviewer Expertise	
Information Expertise	
Time	
Resources	££

Overview of process

A meta-analysis follows the five-stage model of the integrative review (Cooper, 1982), corresponding to the chapters of this book: (a) problem formulation (Chapter 5), (b) data collection

(Chapter 6), (c) data evaluation (Chapter 7), (d) analysis and interpretation (Chapters 8 and 9), and (e) public presentation (Chapter 10).

Table 7.4 SALSA approach mapped to meta-analysis

[Question]	(a) problem formulation – the process begins with clearly identifying a problem from a gap in the literature
Search	(b) data collection – the literature search should be systematic in its approach and comprehensive using multiple search methods
AppraisaL	(c) data evaluation – it is crucial to assess the quality or internal validity of the studies selected. Appraisal is one way that you can attempt to mitigate bias in the studies selected
Synthesis	
Analysis	(d) analysis and interpretation – requires a narrative analysis and integration of existing data and is a complex undertaking that requires transparent and credible methods. You extract data into matrices (tables) and analyse it for similarities and differences (patterns) in relation to your review questions. Your statistical synthesis should include numerical and graphical presentations of the data, and you should look at the strength and consistency of the evidence, and investigate reasons for any inconsistencies Specifically, meta-analysis includes:
	Pooling data – Your choice of pooling model (fixed effect versus random effects) should be based on similarities among studies in terms of their PICOS. Combining data from very different studies (i.e. mixing apples and oranges) is flawed – the summary estimate is neither meaningful nor representative of single studies that address the problem. A fixed-effect model is appropriate when you have strong reason to believe that studies to be pooled are all estimating the same or similar effect based on their PICOS
	Statistical heterogeneity – measured with established tools and reported in addition to visual inspection using forest plots. You should explore significant statistical heterogeneity with subgroup analysis, sensitivity analysis, or meta-regression
	Publication bias – the preferred strategy to reduce/eliminate publication bias is conducting a systematic search for published and unpublished articles. Funnel plots and associated statistical tests for publication bias are seldom useful because of typically limited numbers of included studies. Methods to detect publication bias are underpowered, so a nonsignificant result does not prove that publication bias is absent
	Sensitivity analysis – used to evaluate the robustness of the results of a meta-analysis to assumptions made in the process. Guiding questions are included in the Cochrane Handbook.
(Dissemination)	(e) public presentation – occurs when a reviewer communicates their synthesis of research to a targeted professional community

rapid review tip 14

Choosing appropriate methods of synthesis

Rapid reviews should typically specify narrative synthesis as their default. You can use text, tables and diagrams effectively for synthesis. As a consequence, you should only consider meta-analysis if appropriate (i.e. studies are similar enough to pool). Remember that a Rapid Review is no less reliant on following standards for conducting a meta-analysis than a corresponding Systematic Review.

Garritty et al. (2021)

It is beyond the scope of this text to provide a full description of methods for meta-analysis (for excellent guidebooks see Cooper & Hedges, 1994; Lipsey & Wilson, 2001). It will suffice to highlight the main considerations when using a meta-analysis. First of all, **meta-analysis** is only intended to be undertaken when studies address comparable populations, interventions, comparisons and outcomes using the same study design. Of course, the degree of similarity between studies (**homogeneity**) requires a subjective judgement – is it meaningful to combine these studies together in pursuit of an average effect? However, heterogeneity can be quantified using a statistical **test for heterogeneity** within the meta-analysis. If studies are sufficiently similar (the test for statistical heterogeneity has a low value, i.e. the studies are not significantly different) they may be combined using a **fixed-effect analysis**. If, however, they are not considered sufficiently similar (either from the statistical test for heterogeneity produced by the meta-analysis or from observed heterogeneity in the study characteristics) they may be combined using a **random-effects analysis**. In essence, this distinction means that we combine studies that are dissimilar, using the random effects method, to produce a conservative estimate of the intervention effect. Use of the random-effects method means we are less likely to conclude that an intervention works where it does not. However, we are more likely to conclude that an intervention does not work when it is actually marginally beneficial.

Graphical approaches

Graphical approaches make an important contribution to synthesis by assisting in the identification of patterns. In particular, graphics help a reviewer to visualise the relationship of parts to the overall whole (Haddaway et al., 2019). Graphics may also be used for cross-linking across disparate features of a review (e.g. for depicting a link between study characteristics and findings). For example, colour coding might be used to indicate whether qualitative findings from a review are associated with negative (red), neutral (yellow) or positive (green) results from quantitative effectiveness studies. Creative, critical use of data and data displays is key to data comparison and 'identification of important and accurate patterns and themes' (Whittemore & Knafl, 2005).

Graphical methods include techniques for exploring data (Table 7.5) as well as those for actually presenting the data. So, you can use **mind maps**, **concept maps** and **idea webs** to map out the main variables in a creative and imaginative way. You can use **logic models** to present the inputs, processes, outputs and outcomes for a particular intervention (see Chapter 9). Graphical approaches have been developed for specific purposes (such as the **harvest plot** – see Table 7.5 and Box 7.7) for 'synthesising evidence about the differential effects of population-level interventions' (Ogilvie et al., 2008). Nevertheless, outside the specific requirements of meta-analysis, graphical approaches are comparatively underdeveloped (Kossmeier et al., 2020) and there is much to be learnt from the use of graphics and diagrams for research in general (Wheeldon & Faubert, 2009; Umoquit et al., 2011; Smith et al., 2019).

One reason for the success of **meta-analysis** as a technique is that it supports statistical methods with a fairly intuitive method of graphical presentation known as the **forest plot** (see Box 7.6).

Table 7.5 Graphical methods for exploring data

Method	Description	Application
Concept map	Concept maps are useful when identifying key concepts in a document collection or research area. You can use concept maps to identify additional search terms during the literature search, clarify thinking about the structure of the review and to understand theory, concepts and the relationships between them (Rowley & Slack, 2004; Georgiou & Heck, 2016)	Braithwaite (2010) devised a concept map of key themes in the literature on organisational social spaces, networks, boundaries and holes for his systematic review on between-group behaviour in healthcare
Forest plot	A forest plot is a graphical representation of a meta-analysis. The forest plot (Figure 7.2) depicts the relationship between the success rate of an intervention of interest and the success rate of its comparator. This ratio is compared with a 'line of no effect': that is, the assumption that intervention and comparator are equally effective/ineffective. Usually accompanied by a table listing references (author and date) of studies included in the meta-analysis (Sedgwick, 2012)	In a review of the Freshman 15 weight gain phenomenon a forest plot displays the average (mean) weight change (kg) from baseline to follow-up in first-year university students. The overall mean weight change across 22 studies was 1.36 kg (Vadeboncoeur et al., 2015).
Harvest plot	The harvest plot is a method for combining research with different study designs and outcomes to give an overall visual effect. It can also demonstrate study appropriateness, quality and outcome measures. The plot groups studies based on whether they demonstrate a positive, negative or no effect, and, for each study, provides information on outcome measures, suitability of study design and quality of the study. The reader can judge not only where most studies lie (tally counting) but also where the most appropriate and highest quality studies lie (Ogilvie et al., 2008; Crowther et al., 2011)	In a Cochrane review of interventions for slum upgrading (Turley et al., 2013) differences between the included study interventions and outcomes precluded meta-analysis so results were presented in a narrative summary with illustrative harvest plots. Harvest plots were used to show health, socioeconomic and quality of life findings across main and supporting studies

(Continued)

Table 7.5 (Continued)

Method	Description	Application
Idea web	Used to conceptualise and explore connections among findings reported by the studies included in a review. Approach uses spider diagrams to develop a visual picture of possible relationships across study results (Campbell et al., 2019)`	Arai et al. (2007) present an example of idea webbing conducted by one of their reviewers for their review of barriers to smoke alarm implementation
Logic model	(Also known as impact models) originate from within programme evaluation, and are typically diagrams or flowcharts that convey relationships between contextual factors, inputs, processes and outcomes. They are considered valuable in providing a 'roadmap' to illustrate influential relationships and components from inputs to outcomes	Dinh-Zarr et al. (2001) used a logic model to examine possible mechanisms involved in increased use of safety belts. For example, it included the possible effect of penalties for non-use
Mind map	Diagram used to represent words, ideas, tasks or other concepts linked to, and organised around, a central keyword or idea. Essentially a creative vehicle that operates at a conceptual level rather than representing a logical linear progression (compare logic maps). As such, you can use them at an early stage of a review, before you have identified any relationships, and then you can determine the exact nature of relationships between concepts at a later stage, following evidence synthesis	In a review on consumer and community engagement in healthcare the review team manually produced a mind map which they found helpful in making sense of a complex field (Sarrami-Foroushani et al., 2015)
Network meta-analysis	Allows readers to visualise and interpret a wide picture of the evidence for specific conditions and to understand the relative merits of multiple interventions. The geometry of the network allows the reader to understand how much evidence exists for each intervention, whether some types of comparisons have been avoided and whether particular patterns exist in the choices of comparators. Numerical estimates allow the reader to see how interventions that have not been directly compared might perform if pitched head-to-head	Alfirevic et al. (2015) identified 280 randomised clinical trials of prostaglandin-type drugs to bring on labour compared with placebo, no treatment, alternative dose or administration, or a different drug. They compared multiple drugs to conclude which was least likely to result in a caesarean section. Findings informed national and international guidelines and future research

exercise 7.1

Helpful graphical display

Briefly reflect on a journal article that you have recently read, not necessarily a systematic review. How does it use tables, diagrams or figures to make it easier to read? Do any features make it more difficult to understand and interpret? If so, why?

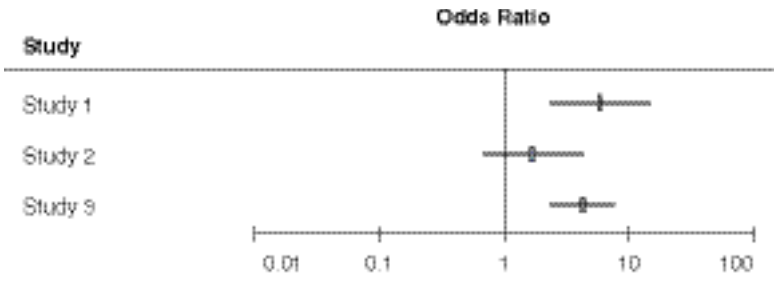


Figure 7.2 The forest plot

box 7.6

Forest plot

What is it?

A forest plot presents a series of **effect sizes** from studies included in a meta-analysis and their confidence intervals in a graphic manner, so that they can easily be compared (Lewis & Clarke, 2001). The effect sizes are represented by **point estimates** for each study (often represented as a square) and the confidence intervals by horizontal lines.

The relationship between the intervention of interest and its comparator is compared against a 'line of no effect': that is, the assumption that intervention and comparator are equally effective/ineffective. The greater the superiority of the intervention (or conversely its comparator), the further away its point estimate is plotted from the line of no effect. Multiple studies can thus be plotted on the same graph to provide a pattern of how studies relate both to each other and to the line of no effect. Each point estimate is provided with a **confidence interval** to illustrate the amount of variation between a best case and worst case scenario for that particular study. Finally, the pooled effect of combining all studies is depicted as a diamond where the centre of the diamond indicates the average point estimate for all studies combined. The horizontal extremities of the diamond shape indicate the confidence interval (best and worst case scenarios) for all studies combined. Your audience can therefore decide whether they wish to assume a best case result or a more conservative worst case estimate and, indeed, whether the difference between these two scenarios is important enough to affect any subsequent action (see Crombie & Davies, 2009). The Cochrane Review Manager (RevMan) software typically displays effect size estimates as squares, the size of which being proportionate to the size of the study and the weight assigned to it in the meta-analysis. A forest plot draws the eye towards studies with larger sample sizes/larger weights, and away from smaller studies with wider confidence intervals.

What can I use it for?

You can use statistical packages such as SPSS, Stata, SAS and R to perform meta-analyses. However, meta-analysis is not their primary function. Reviewers need to download external macros or coding in order to undertake a meta-analysis with them. Additionally, SPSS,

(Continued)

Stata and SAS are not available free of charge, while the open source R package requires programming. Some software packages are specifically developed for meta-analyses. Cochrane Review Manager (RevMan), a free-to-download program from the Cochrane Collaboration, is intended for producing Cochrane reviews in their entirety, including a meta-analysis and graphical representation thereof. The software can also be used to perform meta-analysis and its graphical representation, independently of a Cochrane review. Other commercially available software packages include Comprehensive Meta-Analysis (CMA) which has a purchase cost. Both RevMan and CMA allow the user to compute the effect size for each study and the overall meta-analysis effect size automatically and create forest plots. CMA also includes advanced features such as meta-regression analysis. It is also possible to produce a statistically adequate, but graphically appealing, forest plot summarising descriptive data, using only Microsoft Excel (Neyeloff et al., 2012). Add-ons for undertaking a meta-analysis in Excel include *Metaanalysis In eXcel* version 2.0 (MIX 2.0). The-free-to-download version has only built-in data sets, whereas the paid version enables creation of data sets and saving of analysis results.

How has it been used?

The Antiplatelet Trialists' Collaboration (1988) published a forerunner of today's forest plot which used squares of different sizes to show the weight of each study in the meta-analysis and the point estimates for the odds ratio from each trial, with the associated confidence intervals running through these. A rhombus, whose width was its confidence interval, provided the average at the bottom of the plot.

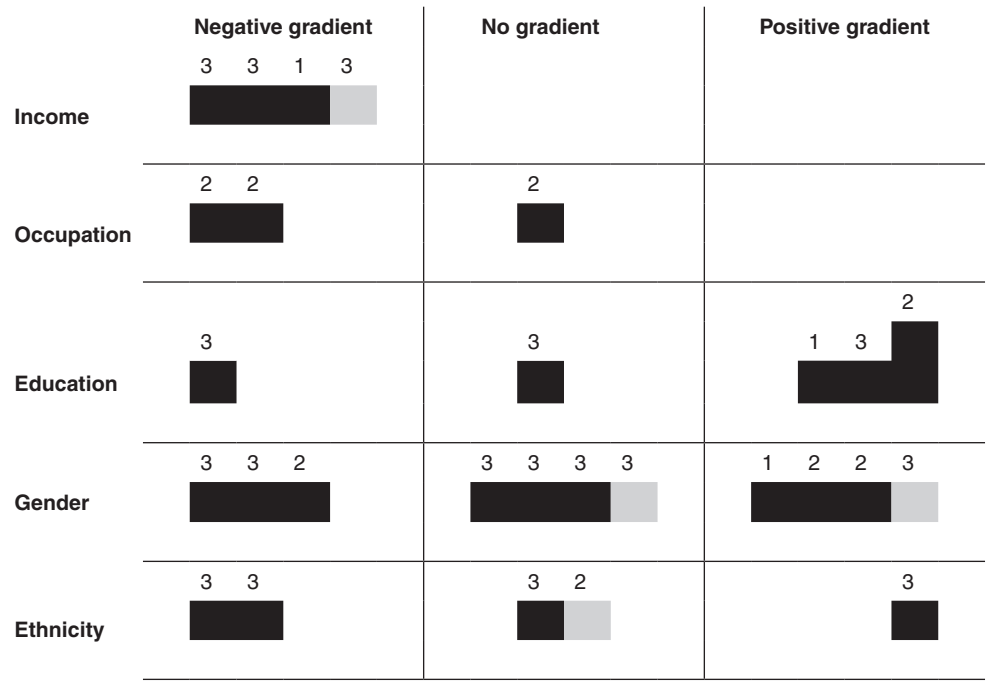
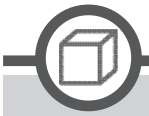


Figure 7.3 The harvest plot

Key: Each study is represented by a bar in each row for which that study had reported relevant results. Studies with hard behavioural outcome measures are indicated with full-tone (black) bars, and studies with intermediate outcome measures with half-tone (grey) bars. The highest bars represent the most suitable study designs (Education – Positive gradient) and the lowest bars represent the least suitable. Each bar is topped by how many methodological criteria (maximum six) were met by that study.



box 7.7

The harvest plot

What is it?

The harvest plot is an innovative approach to summarising the results of a systematic review of the effectiveness of population-level interventions. In contrast to forest plots (see Box 7.6), which are used in meta-analyses graphically to illustrate the overall results of the review, you can use the harvest plot to display and summarise evidence from a complex and diverse group of studies. Developing a harvest plot includes:

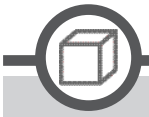
- Defining hypotheses to be tested.
- Allocating each study to the best supported hypothesis.
- Plotting the distribution of evidence.
- Writing a narrative synthesis to interpret the harvest plot.

What can I use it for?

The harvest plot is a useful technique for displaying the findings of a systematic review where studies measure diverse and complex outcomes of interest. You can use the harvest plot to summarise research findings on the effectiveness of population-level interventions that are relevant to decision-makers and policy-makers.

How has it been used?

The method was developed by epidemiologists at the Medical Research Council Epidemiology Unit in Cambridge to present diverse studies from a systematic review of population tobacco control interventions and their effects on social inequalities in smoking (Ogilvie et al., 2008).



box 7.8

Logic model

What is it?

Logic models have a long pedigree within programme evaluation and public health as a graphical means by which to understand complex programmes to improve social and health outcomes. A logic model illustrates how a programme is designed to achieve its intended outcomes. It can also be used to describe connections between determinants of outcomes.

What can I use it for?

Logic models offer a potential mechanism for depicting causative relationships for such complex phenomena as low high-school graduation rates or spiralling obesity rates, thus aiding development of interventions to target those causal factors. Logic models can aid in the conceptualisation of the review focus and illustrate hypothesised causal links, identify effect

(Continued)

mediators or moderators, specify intermediate outcomes and potential harms, and justify a priori subgroup analyses when differential effects are anticipated. They may also be used more instrumentally to direct the actual systematic review process. They can help justify narrowing the scope of a review, identify the most relevant inclusion criteria, guide the literature search and clarify interpretation of results when drawing policy-relevant conclusions about review findings.

How has it been used?

A logic model for a systematic review of after-school programmes for low-income elementary school youth was used to specify intervention components hypothesised to change conditions necessary to improve youth outcomes (Zief et al., 2006). This helped to code programme characteristics thought to contribute to programme success. The logic model provided an a priori justification for subgroup analysis by illustrating the possible influence of student demographic characteristics, prior academic achievement, family background, and school and community characteristics. In this way, the logic model elucidated hypotheses for how the intervention is expected to work, and considered how disadvantage might interact with the hypothesised mechanisms of action (Tugwell et al., 2010).

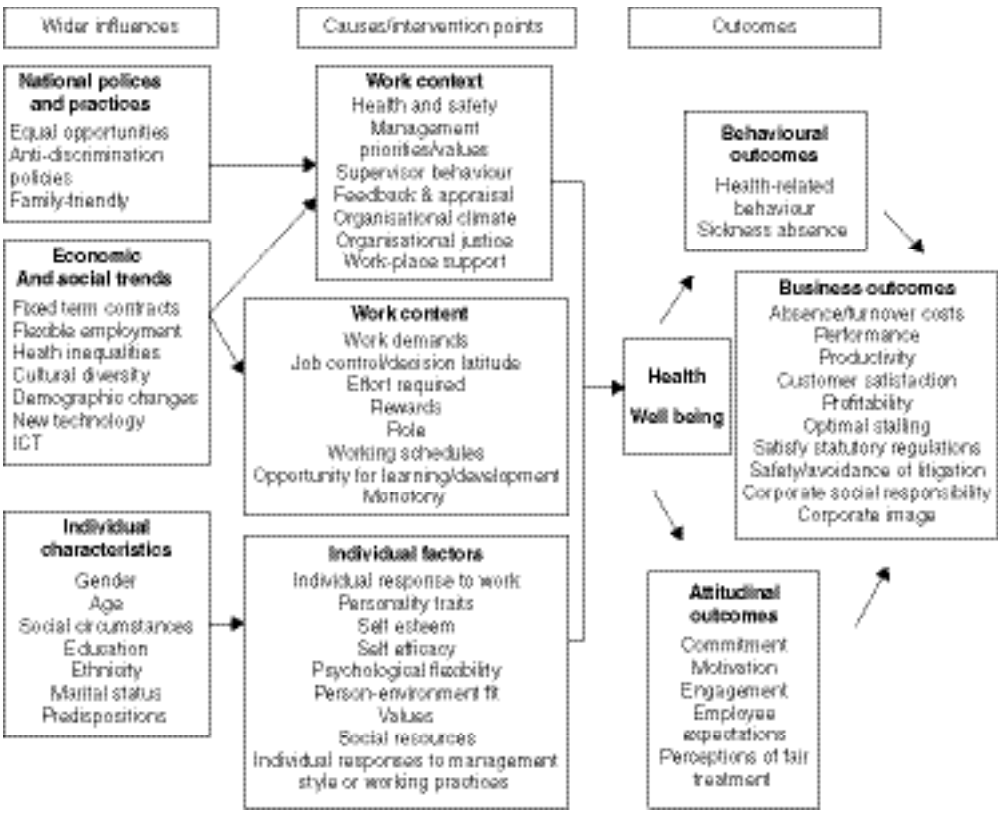


Figure 7.4 Example of a logic model

box 7.9

At a glance – network meta-analysis

Definition

Network meta-analysis (Table 7.6) is a technique for comparing multiple treatments simultaneously in a single analysis by combining direct and indirect evidence within a network of randomised controlled trials (Caldwell., 2014; Rouse et al., 2017). Software can be used to facilitate the process of network meta-analysis (Neupane et al., 2014)

At a glance

Reviewer expertise	
Information expertise	
Time	
Resources	£££

Table 7.6 SALSA approach mapped to network meta-analysis

SALSA stage	Steps of a systematic review	Considerations for a Network Meta-analysis (NMA) (based on Rouse et al., 2017)
	1. Define the review question and eligibility criteria	Question should benefit from NMA Define treatment network
Search	2. Search for and select studies	Search should be sufficiently broad to capture treatments of interest
AppraisaL	3. Abstract data and assess risk of bias	Abstract information on potential effect modifiers which may violate the assumption of transitivity
Synthesis	4. Synthesise evidence qualitatively	Evaluate the network geometry Evaluate transitivity
	5. Synthesise evidence quantitatively	Conduct pairwise meta-analyses first Use statistical models appropriate for NMA Evaluate inconsistency Summarise results using approaches suitable for network meta-analysis, e.g. league tables If ranking, use appropriate ranking statistics
Analysis	6. Interpret results and draw conclusions	• Carefully interpret results, especially rankings • Interpret results in context of outcomes examined • If using GRADE approach to evaluate quality of evidence, adapt for network meta-analysis
	7. Report findings	• Follow the PRISMA extension for network meta-analysis

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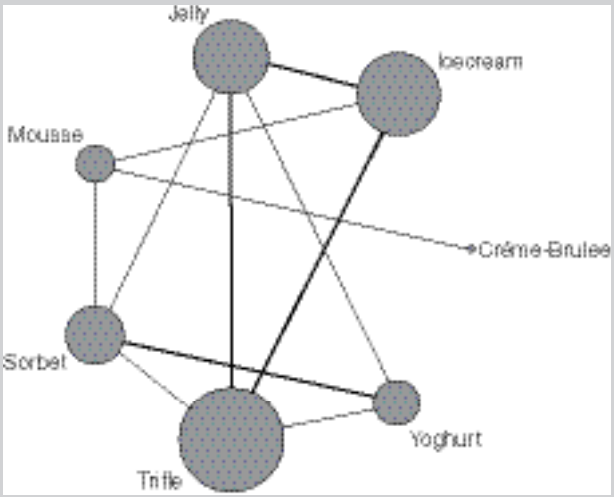


Figure 7.5 Network meta-analysis

Analysis of quantitative research

Having performed an initial synthesis you are ready to explore both what has been found and what is missing. The synthesis stage aims to tell you what the literature *says*. Analysis provides you with an opportunity to assess the strength of evidence for drawing conclusions about the results of synthesis and their generalisability to your intended context.

You will find it helpful to select analytical techniques according to the robustness of the original synthesis and the underlying purpose of the analysis. For example, 'best evidence synthesis' involves combining meta-analytic and narrative techniques to gain insights on effects from the quantitative synthesis combined with contextual data from accompanying narrative descriptions (Helfand et al., 2019).

Use of validity assessment

For quantitative studies the validity assessment is a useful method for exploring study findings. A common criticism of reviews, even those performed by the Cochrane Collaboration, is that they may conduct a validity assessment but do not use it to discriminate between the findings of high-quality studies and those underpinned by lower quality studies (de Craen et al., 2005). As previously mentioned, you can conduct such an assessment illustratively by ordering studies by quality and looking for patterns from the findings or, more typically, by dividing studies into the three categories of high, moderate and low quality. Dividing studies according to quality paves the way for sensitivity analysis, either by removing all studies of low quality or by only including studies of the very highest quality.

Checking with authors of primary studies

Studies report that checking with authors of primary studies is potentially valuable (Arai et al., 2007) but enjoys differential success (Danko et al., 2019; Reynders et al., 2019). However, this process depends upon 'the accessibility and generosity' of authors (Arai et al., 2007). Although they report that contacting authors to validate data was reported as overwhelmingly positive, this characterises topics where researchers provide continuity over many years rather than more volatile areas of policy evaluation.

Subgroup analysis

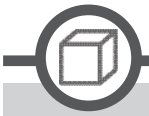
During data extraction and coding you will have identified different groups or 'families' of studies, perhaps sharing population characteristics (e.g. small firms versus large firms, streamed classes versus mixed ability classes, acute hospitals versus primary care settings) or characteristics around the intensity or exact nature of a programme or intervention. Are such subgroups part of the total population, representative of the average effect or the exception to the rule? For example, Thomas et al. (2004b) examined interventions to promote healthy eating among children. After establishing overall effect estimates, they started to unpack the different components of the included programmes. After removing studies that contained a physical activity component, identified as qualitatively different, they further divided the studies into those that emphasised health messages and those that did not. They found that the studies that achieved the most significant gains in vegetable consumption were those with little or no emphasis on health messages. This subgroup analysis achieved two purposes – it helped to explain significant heterogeneity between the different studies and led to generation of a hypothesis to inform and possibly direct the development of future programmes or interventions.

Of course, even a relatively homogeneous group of studies includes a significant degree of possible variation (heterogeneity), dependent in part on how extensive the reporting of studies has been and how thorough the extraction of data. It is therefore a helpful and robust approach to identify possible subgroup analyses before examining any of the results. Indeed, the review protocol should specify likely areas of variation and the principal subgroup analyses to be used in exploring that variation. However, this is not always possible because the key components of each programme may only be identified once the qualitative component of a review has been completed (Thomas et al., 2004b).

Sensitivity analysis

Sensitivity analysis is characterised as the formal exploration of 'what ifs' (Greenhalgh, 2019). Throughout the review process, you have made arbitrary decisions on what to do where data or methods are missing, unclear or incorrect. Depending upon the purpose of your review, and the amount of data from which to choose, you decide whether to interpret limitations strictly or generously. Of course, the extreme position is actively to exclude studies on the basis of missing information. More typically you include such studies, perhaps flagged with a question mark, and then, once you have combined studies to look for an overall pattern, revisit such question marks to examine their implications for your review. In a **meta-analysis**, for example, a single

effect size is typically accompanied by a confidence interval. The simplest sensitivity analysis is to ask, 'Would I make the same decision based upon this review if I assume that the actual result is located at the less favourable end of the confidence interval compared with assuming that the result is at the most favourable end?'. Typical indications for performing sensitivity analysis are given in Box 7.10.



box 7.10

Reasons for considering a sensitivity analysis (quantitative)

You might consider conducting a **sensitivity analysis** where:

- You have significant and persistent doubts about whether a study is eligible for inclusion within a review; you could look at the effect of including and then excluding the result of that study from your review.
- You have identified significant differences in the quality of included studies; you could calculate results using all studies and then excluding poorer quality studies.
- You are uncertain about whether included studies are heterogeneous or homogeneous; you might perform calculations using the two alternative methods of meta-analysis (fixed and random effects) to assess the robustness of the results to the method used.
- You observe that one study has very different results from the remaining studies (i.e. it is an obvious outlier); you might investigate what might happen if you exclude it.
- You have made some assumption about a missing value (e.g. in carrying forward the last available measurement or, alternatively, in assuming a least favourable outcome); you might explore what happens when you change each assumption.
- You consider the overall result to be particularly influenced by one particular study (e.g. the largest, the earliest, etc.); you might look at the pattern of results were this study to be excluded.

Identifying gaps

For an **aggregative** review, such as those that include a **meta-analysis**, the decision on when to stop is relatively simple and involves one of three choices. (i) You can choose to set a time limit for how long you will look for studies – after which you do not accept further studies. (ii) You can decide how many times during the life of the review project that you will repeat the full **search strategy**. (iii) You can put in place regular updating mechanisms so that new studies are identified up to the point when the final report is produced. Use of last-minute updates opens up the possibility of **selection bias** but may be appropriate for a literature review in a policy context (e.g. a **rapid evidence assessment**) where policy-makers want to avoid being 'caught out' by the appearance of an important new study.

You can show that you have followed systematic approaches by demonstrating that your sample of literature is adequate. This contrasts with the typical advice given for a narrative review:

> Of course, it is likely that new articles will come to light after the data collection period has concluded. However, unless the new article is critically important, I suggest leaving it out.

> Otherwise, the reviewer may have to open the floodgates and start anew the data collection process. (Randolph, 2009)

Having considered the diverse techniques that comprise analysis, refer to the sample reviews in Table 7.7 to see how they match analysis to their purpose.

Table 7.7 Examining methods of analysis used in reviews

Type of review	Methods of analysis used	Application of methods	Review example
Scoping review	Identifying gaps Checking professional perceptions of existing intervention response	Identified near absence of interventions targeting perpetrating females Further work could be undertaken with 'gatekeepers', such as general practitioners, to facilitate access to support	Interventions for perpetrators of online child sexual exploitation: a scoping review and gap analysis (Perkins et al., 2018)
Mapping review	Identifying gaps Subdivided by intervention type	Need for further research on interventions undertaken outside urgent care system and a better understanding of acceptability to patients. Separates interventions for identifying older people who are frail or at risk and interventions for managing them	What evidence is there for the identification and management of frail older people in the emergency department? A systematic mapping review (Preston et al., 2018)
Systematic review	Thematic analysis Validity assessment Identifying gaps	Identified important geographical and thematic gaps Need to improve transparency in the design and validation of results Availability of relevant, reliable and updated data is a major constraint	Learning from experience: a systematic review of assessments of vulnerability to drought (González Tánago et al., 2016)

REVISITING THE REVIEW QUESTION(S)

While you should expect to have to return to your review protocol and question throughout the review project, it is especially important to do this at the analysis stage. Having sought to identify whether the authors of primary studies have been selective in their reporting you do not want to discover, after publication, that you have omitted important outcomes. If a **logic model** featured in your original mapping of your review questions you may want to map the literature against each node to gain a picture of which questions are well covered and which are data poor. Revisiting your review question will also suggest lines of enquiry for your analysis.

For example, you may now be able to identify what tables and which supplementary analysis techniques, such as sensitivity analysis and subgroup analysis, you will require.

Discussing the limitations of the evidence

You should recognise any limitations of the evidence when placing your review findings in context. You should clearly highlight how each article, and the review as a whole, perform with regard to their **validity**, their closeness to the truth (see Chapter 6). You can help your reader by using a system such as GRADE (Granholm et al., 2019) (or GRADE-CERQual for qualitative studies (Lewin et al., 2020)) to assign levels of confidence to review findings. You should go beyond a mere listing of the magnitude and direction of random and systematic errors and associated problems with validity. You should interpret what errors mean and how they may have influenced your conclusions. Your audience will be able to take away from the Discussion section a clear picture of how any validity problems have impacted on the review results.

rapid review tip 15

Grading the certainty of quantitative evidence

Use a single reviewer to grade the certainty of evidence, with a second reviewer to verify all judgements (and footnoted rationales).

Garritty et al. (2021)

Recognising the likelihood of bias

In theory, systematic reviews should evaluate and take account of the **internal validity** (i.e. the extent to which systematic errors or bias are avoided) of each included study as well as their **applicability** and **generalisability** or **external validity** (i.e. whether you can reasonably apply the results of a study to a definable population in a particular setting in day-to-day practice).

Key to the robustness of review results is consideration of the presence or absence of bias. The **Cochrane Collaboration** has developed and tested **risk of bias tools** to appraise the **internal validity** of the results from randomised controlled trials (Risk of Bias in Randomised trials (RoB 2.0)) and non-randomised controlled trials (Risk of Bias in Non-randomised Studies – of Interventions (**ROBINS-I**)) that are included in systematic reviews. However, evidence suggests that variability results more from different interpretations of a tool than because of different information identified in the study reports (Hartling et al., 2013). Comparison with established methods of quality assessment suggests little agreement, indicating that different approaches may capture different study features. However, the overall assessment of the **risk of bias** is potentially useful for identifying low-quality studies that may be exaggerating likely treatment effects.

The risk-of-bias tool

An assessment of the risk of bias using the **Cochrane risk-of-bias tool** begins by assessing bias in individual studies and then examines systematic bias within the component studies in a review. The process begins with quality assessment of an individual study (see Chapter 6). An example of a structured risk of bias assessment is seen in Table 7.8.

Table 7.8 Example of a 'risk-of-bias' table for a single study (fictional)

Entry	Judgement	Description
Randomisation process	High risk	Quote: 'patients were allocated according to alternate days presenting at the clinic'
		Comment: this opens up possibility of systematic bias
		Quote: 'allocation was performed from a printed schedule'
		Comment: opportunity to break allocation via alternation
Deviations from intended interventions	High risk	Comment: reports in the discussion that a limit of the trial was that it was 'open'. Imbalances in withdrawals across groups with >25% withdrawing in the active treatment group
Missing outcome data (for each outcome)	High risk	Comment: 15 smokers missing from intervention group, only 5 from control group
Measurement of the outcome	Low risk	Quote: 'biochemical tests used to corroborate abstinence at three months'
		Comment: objective measure ascertained by laboratory
Free of selective reporting?	High risk	Comment: no reporting of independently confirmed smoking cessation at one year reported as an outcome in the study protocol
Overall	High risk	Comment: at least one of the RoB domains judged at high risk (note, for an overall judgement of low risk, all domains should be at low risk; a mix of low- and unclear-risk judgements would result in an overall unclear-risk judgement)

Once you have completed the assessment table, you can 'translate' data on risk of bias into a quantitative form. You quantify each threat of bias to produce a graphical display (Figure 7.4). This graphical display uses a red–amber–green colour (or black and white symbols) scheme to help you identify patterns across each individual study.

rapid review tip 16

Risk of bias

Use a valid risk-of-bias tool, if available, for study designs included in your rapid review. Use a single reviewer to rate risk of bias, and nominate a second reviewer to verify all judgements (and support statements). Focus the risk of bias ratings on the most important outcomes, paying attention to those most important for decision-making.

Garritty et al. (2021)

Finally, the risk of bias instrument (Figure 7.6) comes into its own as a tool for synthesis. Each component study in the review (six studies in our hypothetical example) is colour coded, using red–amber–green notation (with monochrome alternative symbols of '+', '?' and '-'), against each of eight quality domains (Figure 7.7). At a glance, the reviewer can identify systematic patterns of bias across studies. You can explore such patterns in more detail, linking them to an overall assessment of the robustness of the review's conclusions and the strength of its recommendations.

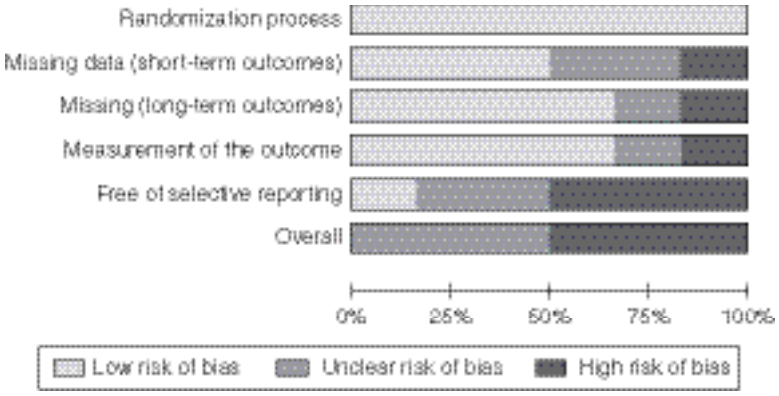


Figure 7.6 Example of a risk-of-bias graph

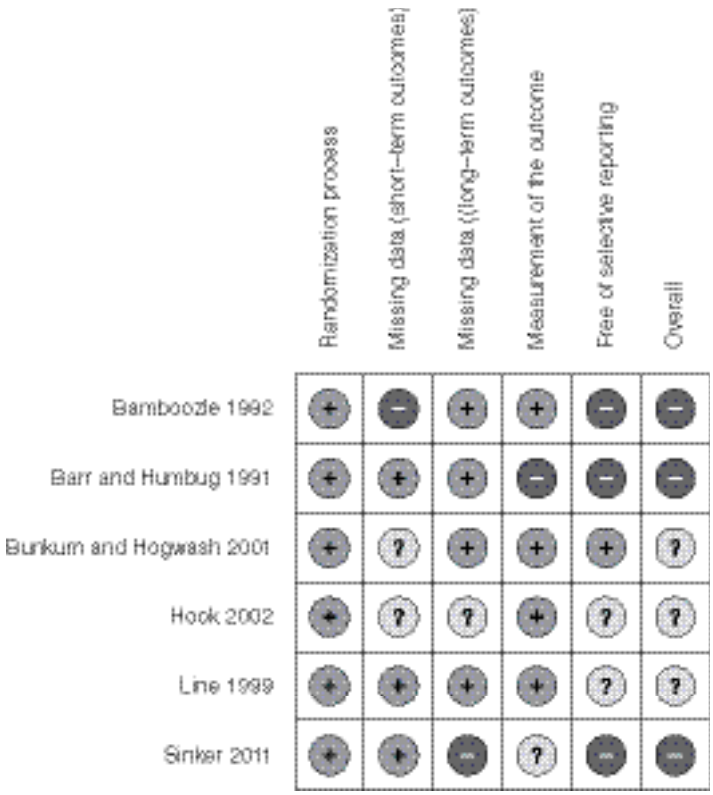
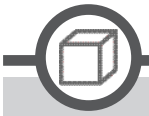


Figure 7.7 Example of a risk-of-bias summary

Just as it is important to avoid being misled by biases and the play of chance when planning, conducting, analysing and interpreting individual primary studies, you must take similar steps when planning, conducting, analysing and interpreting evidence syntheses. When you are conducting your overall evaluation of your review and its limitations you need to ask such questions as specified in Box 7.11.



box 7.11

Questions to ask when assessing the likelihood of bias in your review

1. Have I clearly specified the question to be examined by my review, how included studies address this question and the extent to which my conclusions resolve this question?
2. Have I defined explicit and objective eligibility criteria for studies to be included?
3. To what extent am I confident that I have identified all potentially eligible studies?
4. Am I sure that I have applied the eligibility criteria in ways that limit bias (possibly resulting from inappropriate acceptance or rejection)?
5. Have I extracted as much relevant information as possible from the included studies (guarding against **outcome selection bias**)?
6. Have I used a variety of analyses to explore any uncertainties associated with my review findings?
7. Are my findings and conclusions presented in a structured report with clear links between what is observed and what is concluded?

Answers to the questions in Box 7.11 will largely determine what you discuss within your review limitations and how strongly you frame recommendations. In particular, questions 3 and 5 from Box 7.11 highlight aspects that are largely beyond your control; namely **publication bias** and s**elective reporting bias**.

Toolbox – Template – Identifying Bias

First, use the template (Table 7.9) to identify the main threats to validity (likely **sources of bias**) for your particular review. Then, record any steps that you might take to minimise the potential threats posed by each source of bias. You can use this template to populate your protocol and, subsequently, to discuss the limitations of your review (see Chapter 10).

Table 7.9 Template to identify threats to validity

Threat	How it might prove a threat to my review?	How I could counter this threat?
Change of scope		
Publication bias		
Selection bias		

(Continued)

Table 7.9 (Continued)

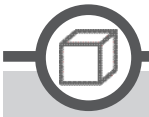
Threat	How it might prove a threat to my review?	How I could counter this threat?
Inclusion of poor-quality primary studies		
Selective outcome reporting		
Misinterpretation of findings		
Researcher bias in presentation		

Publication bias

Critics of systematic reviews and meta-analyses highlight how they are vulnerable to **publication bias** (i.e. that **statistically significant** results tend to be published more than non-statistically significant results) (Chan & Altman, 2005).

Publication bias refers to a family of biases that include **language bias**, **location bias**, **database bias**, etc. These biases are collectively grouped as 'Dissemination- and publication-related biases' (Song et al., 2010).

What steps can you as a reviewer take in your analysis to try to identify whether your review is a likely victim of dissemination- or publication-related biases? Suggestions are given in Box 7.12.



box 7.12

Suggested ways of exploring dissemination or publication biases

1. Look at your list of databases and search sources. How likely are you to identify non-English studies/unpublished studies?
2. Look at your final list of included studies. Does your list include a high proportion (>20%) of studies in languages other than English?
3. Look at your final list of included studies. Does your list include a high proportion (>10%) of studies published in the grey literature/fugitive literature?
4. If only including English-language studies, examine abstracts of non-English studies that would otherwise be included. Do their conclusions confirm or contradict your included English-language studies?
5. Map sample size versus effect size on a graph as a funnel plot. Are there similar numbers of small negative studies and small positive studies?

Table 7.10 identifies the main types of bias that apply to quantitative studies. Some of these biases also apply to other types of study but are less frequently explored.

Table 7.10 Types of reporting bias with definitions

Type of bias	How does it happen?	What is its effect?
Citation bias	When chance of study being cited by others is associated with its result (Song et al., 2010)	Use of reference lists may be more likely to locate supportive studies, which could bias the findings of the review (Boutron et al., 2021)
Database bias	When there is biased indexing of published studies in literature databases (Song et al., 2010)	Journals indexed in databases are more established, in the language favoured by database producer and include larger studies. Journals from developing countries are less likely to be represented in databases produced in the developed world (Egger & Davey Smith, 1998)
Funding bias	When design, outcome and reporting of industry-sponsored research may result in sponsor's product showing favourable outcome (Lexchin et al., 2003)	Positive studies supporting a product are more likely to be published. Negative studies may be delayed or even suppressed
Grey literature bias	When results reported in journal articles are systematically different from those in reports, working papers, dissertations or conference abstracts (Song et al., 2010)	Studies may contain interim findings, may not have been subjected to peer review or may include selective reporting of outcomes
Language bias (including English-language bias)	When reviews are more likely to include studies published in the language of that review	Problem for English-language reviews with non-English authors more likely to publish significant results in English rather than in their own language (Egger & Davey Smith, 1998)
Multiple publication bias (duplicate publication bias)	When multiple/duplicate publications are produced from single studies	Studies with significant results are more likely to lead to multiple publications and presentations, making them more likely to be located and included in reviews. Inclusion of duplicated data may lead to overestimation of the effect size (Egger & Davey Smith, 1998)
Outcome reporting bias	When a study in which multiple outcomes were measured reports only those that are significant, rather than insignificant or unfavourable (Song et al., 2010)	Important clinical outcomes are present in some studies but not in others
Publication bias (also known as positive results bias)	Selective submission of papers (by authors) or selective acceptance of papers (by editors)	Authors may anticipate rejection (Egger & Davey Smith, 1998) and decide not to submit their paper. Editors may not consider an inconclusive result sufficiently newsworthy
Study quality bias	Studies of (typically) lower quality are associated with positive or favourable results	Studies of lower quality less likely to be published (Song et al., 2010)

box 7.13

The catalogue/catalog of bias

Access the Catalogue of Bias (https://catalogofbias.org/). It provides definitions, explanations and examples of the most important biases that can affect health research. Browse through the list of biases and select one entry. Familiarise yourself with the definition of your chosen item of bias. Follow the link to a fuller explanation with an example. How likely is this bias to occur in studies included in your review (or in the review itself)?

box 7.14

The funnel plot

What is it?

A funnel plot is a graphical device (scatterplot) to help you explore the possibility of publication bias by plotting the effect estimates from individual studies against some measure of each study's size or precision. The standard error of the effect estimate is often chosen as the measure of study size and plotted on the vertical axis so that larger, most powerful studies are placed towards the top. The effect estimates from smaller studies should scatter more widely at the bottom, with the spread narrowing among larger studies at the top. If publication bias is not present, and provided the studies are not demonstrably different, the scatter will be entirely due to sampling variation. The scatterplot will resemble a symmetrical inverted funnel (Figure 7.8). A triangle centred on a fixed-effect summary estimate and extending 1.96 standard errors either side will include about 95% of studies if no bias is present and the true treatment effect is the same in each study.

What can I use it for?

For a funnel plot to be valuable requires more than a mere handful of studies. (As a rule of thumb, tests for funnel plot asymmetry should not be used with fewer than 10 studies because test power is usually too low to distinguish chance from real asymmetry (Sterne et al., 2011).) A funnel plot is only an indication, not a guarantor, of bias. It offers a starting point for further investigation, not an end in itself (Sterne et al., 2011). Where publication bias is possibly present, there will be a missing 'chunk' of data (Figure 7.9).

How has it been used?

Small studies of magnesium for heart attack formed an asymmetrical inverted funnel, suggesting publication bias. Studies in which magnesium was beneficial were more likely to be published, and those in which magnesium was ineffective or detrimental were less likely to be reported. Hence, the overall meta-analysed effect (open diamond on the forest plot) suggested a beneficial effect of magnesium. However, a subsequent large trial, ISIS-4, found no benefit. The lack of agreement of the meta-analysis effect with a subsequent large randomised controlled trial demonstrates the importance of performing funnel plots and related statistical tests of asymmetry and likely publication bias (Haidich, 2010).

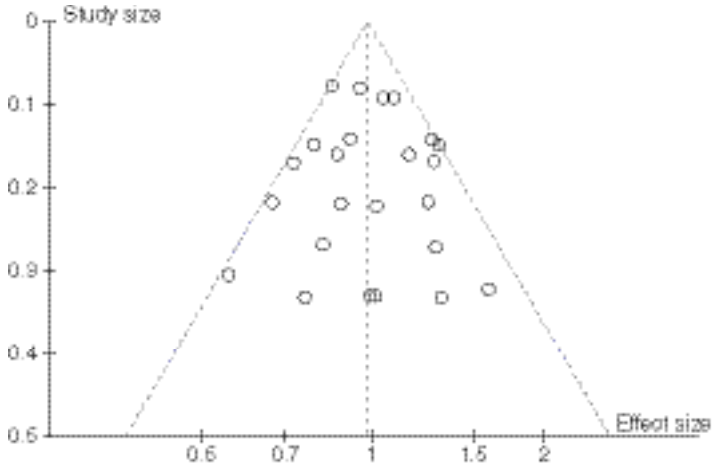


Figure 7.8 Funnel plot with no evidence of publication bias

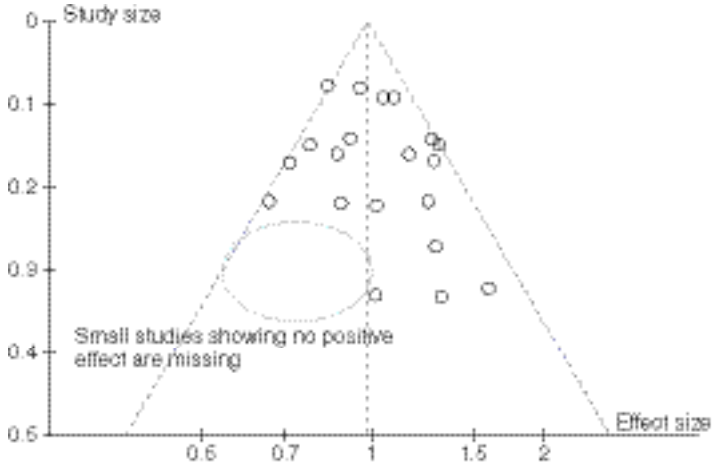


Figure 7.9 Funnel plot with possible publication bias

Note: In the figure a possible population of studies (those at the bottom of the left-hand side of the funnel) showing no beneficial effect of treatment is missing.

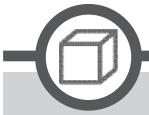
Selective outcome reporting bias

Selective outcome reporting bias is a specific instance of a generic problem, **selective reporting bias**, defined as the 'selection of a subset of analyses to be reported'. Whereas publication bias relates to missing studies, selective reporting bias represents a problem of missing data within a study. Consequently, selective reporting bias is difficult to detect and requires familiarity with the specific topic. Selective outcome reporting is the principal concern because it relates to biased selection of outcomes and so may present a particular programme or

intervention in a favourable light and thus lead to erroneous conclusions as to whether such an intervention should be introduced into practice (Williamson & Gamble, 2005). At its most innocuous, but nevertheless still potentially harmful, a researcher may have measured the same outcome in multiple ways and then selected the measure that best helps to understand the data. The researcher then only provides results using the chosen method. Obviously, such an approach is flawed in connection with **meta-analysis** which is only usually possible where the same methods of outcome measurement are used by multiple studies. More serious, however, is where a study measures important and meaningful outcomes but suppresses the results because they are unfavourable to the overall verdict.

Expert knowledge of your topic may help you to identify a problematic variant of selective outcome reporting, namely use of surrogate outcomes. Surrogate outcomes are comparatively easy to measure but bear little relation to what is most important when judging success or achievement of an 'effect'. Consider, for example, where a government agency records the number of new small businesses to which it has provided 'start-up' funds but the public is more interested in how many of such businesses return an operating profit after *x* years. Similarly, a company may report that its drug lowers blood pressure by a certain number of units but the doctor and patient are more interested in whether it reduces health-threatening events (such as strokes or heart attacks).

How can you as a reviewer analyse your included studies for the presence of selective outcome reporting? *Suggested* questions are provided in Box 7.15.

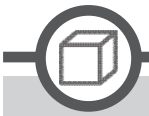


box 7.15

Questions to detect possible outcomes reporting bias

1. To what extent do outcomes listed in the literature match the outcomes that stakeholders in your topic consider important and meaningful?
2. Examine the full list of outcomes compiled across all studies. Have any studies neglected important outcomes from this list? Do any studies report demonstrably fewer outcomes than their counterparts?
3. Try to identify study protocols for your included studies. How does the list of proposed measurements compare with the list of actual measurements reported in the published papers?
4. Try to identify abstracts from conference proceedings for your included studies. Are any particular measurements reported in interim results but not reported in final published papers?
5. Contact authors of published papers and ask for additional data, either on specific outcomes or on all non-reported outcomes. Can they point you to supplementary publications that you have not previously identified?

What steps can you as a reviewer take in your analysis to try to identify whether your own review is vulnerable to reporting bias? Suggestions are given in Box 7.16



box 7.16

Questions to detect possible reporting bias in your own review (Chan et al., 2008)

1. When initially reading a paper, look at which outcome measures are reported. Are all the outcome measures that are reported associated with statistically significant results? If so, they may reflect selective reporting.
2. Again, in your initial reading, count how many separate outcomes are reported. If there are fewer than five different outcomes there is a very high likelihood, between 5 and 10 a high likelihood or between 11 and 20 a moderate likelihood, of selective reporting bias.
3. In your initial reading, look at the outcome measure used to calculate the sample size. Is this the same as the primary outcome from the Results and Conclusions? Has this primary outcome been 'hijacked' by a less important outcome?
4. Finally, in your initial reading of the paper, look for evidence of **data dredging** (i.e. where researchers stumble upon potentially significant associations during data analysis and attribute greater importance to these than practitioners would).
5. In following up includable papers, try to obtain relevant study protocols and compare the list of intended outcomes with the list of those reported in the final paper. Are they identical? Are any outcomes missing? Have any outcomes been promoted up the list?
6. In following up includable papers via protocols, are sample size and statistical methods in published trials clearly discrepant with respect to the pre-specified protocols?
7. In synthesising your data across studies, construct a matrix of all reported outcomes against all studies. Are any common outcomes missing from individual studies? Are any important outcomes comparatively under-reported?
8. In analysing your data from included studies, do outcomes presented at meetings or appearing in conference abstracts perform better than the others? Was this advantage confirmed by subsequent publication?

SUMMARY

Synthesis is not simply assembling the raw ingredients of the review (i.e. the individual studies). It also includes the creative elements of seeking patterns, examining for consistency and identifying the divergent or disconfirming case. In this way, you should explore reasons for variations, discrepancies and inconsistencies. This exploration, together with a general testing of the robustness of findings, constitute the next phase of the review, analysis.

Analysis is a high-order research skill required when reviewing the literature systematically. In contrast to synthesis, analysis is often presented as a natural sequel with few formal procedures. Nevertheless, formal procedures do exist and are informed by recognised methods of quantitative analysis. These include use of **funnel plots** (to investigate publication bias), **subgroup analysis** (to explore commonalities that exist between subsets of studies) and **sensitivity analysis** (to test how robust results are to particular assumptions). Having used these analytical techniques to explore the internal validity of your review, you can start to examine external validity. Observations on applicability, generalisability, replicability and

implementation fidelity will shape your recommendations for research and for practice. Once such recommendations are drafted and exist in a fluid or malleable state, you are ready to focus on how best to present the report, the focus for Chapter 10.

key learning points

- Data extraction is a key step towards synthesis and you will find it helpful to picture what the final synthesis might look like before selecting data to be extracted.
- Numerous approaches to synthesis exist and you should look at existing published methods and examples before selecting a methodology that is fit for purpose.
- You can select from a large variety of types of data presentation, including textual, graphical, numerical and tabular approaches.
- Analysis initially involves testing the robustness of your synthesis in the light of what you know about the quality of included studies.
- Particular concerns relate to the presence of dissemination- and publication-related biases.
- Having assessed the overall robustness, your attention will focus on the extent to which the findings may apply within the specific context of your review.

frequently asked questions (FAQs)

FAQ 7.1 Do I need to be skilled in statistics to conduct a systematic review?

Not necessarily. Systematic reviews can analyse quantitative literature or qualitative literature, or even combine both types of literature (mixed methods reviews). Generally speaking you should be able to read and interpret the type of literature you intend to review, plan how to obtain those skills (such as through reading or training) or identify a resource (e.g. a statistician or research support service) to access as and when needed. Not all quantitative reviews are suited to pooling in a meta-analysis. Numeracy is more critical than statistics. Skills in qualitative research are equally important, although a less common source of anxiety.

FAQ 7.2 How do I decide which method of meta-analysis to use?

A **meta-analysis** combines results from two or more primary studies statistically. Essentially you must choose between a fixed-effect model or a random effects model. A fixed-effect model considers the set of studies included in the meta-analysis and assumes that a single true value underlies all of the study results. The model assumes that if all studies that address the same question were infinitely large and completely free of *bias*, they would yield identical estimates of the effect. Assuming that studies are free from *risk of bias*, observed estimates of effect will differ from each other only because of *random error*. In contrast a random effects model assumes that the studies included are a random sample of a population of studies addressing the question posed in the meta-analysis. Because of inevitable differences in the patients, interventions and outcomes among studies that address the research question, each study estimates a different underlying true effect, and these effects will have a normal distribution around a mean value. The random effects model takes into account both within-study variability and variability in results beyond what can be attributed

to within-study variability. The random effects model is less likely to demonstrate that an intervention is effective when it is not; it is more conservative. If you have concerns about the heterogeneity of your included studies then it is best to use the random effects model.

FAQ 7.3 Are there any software that will help with data extraction?

The "big 4" systematic review software packages (EPPI-Reviewer, Covidence, DistillerSR, JBI-SUMARI) all have data extraction functionality as standard. Data extraction features range from systematic review management and collaboration (e.g. ensuring all your data extractions are stored in one place and are accessible to your fellow reviewers) to line-by-line coding of PDFs. It may be possible to combine text and/or data-mining to assist with extraction, by using a tool compatible with systematic review software such as Data Abstraction Assistant (Jap et al., 2019).

FAQ 7.4 What software is available for performing a meta-analysis?

As with most software for supporting a systematic review, you have a range of options, some fee based and others freely available. Comprehensive meta-analysis is considered by many as an easy-to-use commercial package; as its name suggests it is purpose designed. A general widely used statistical software package is STATA, which may be available under licence within your academic institution. This performs most required meta-analytic statistical procedures but cannot be used to manage the whole review. In contrast, the Cochrane Collaboration's RevMan software is designed for preparing and maintaining Cochrane reviews and is freely available. Several software packages exist to support meta-analysis (Bax et al., 2007). For a list of potential software to use for meta-analysis, see the Systematic Review Toolbox (www.systematicreviewtools.com). To retrieve the meta-analysis tools, select 'Meta-analysis' from the list of features in 'Advanced Search' (see Figure 7.10).

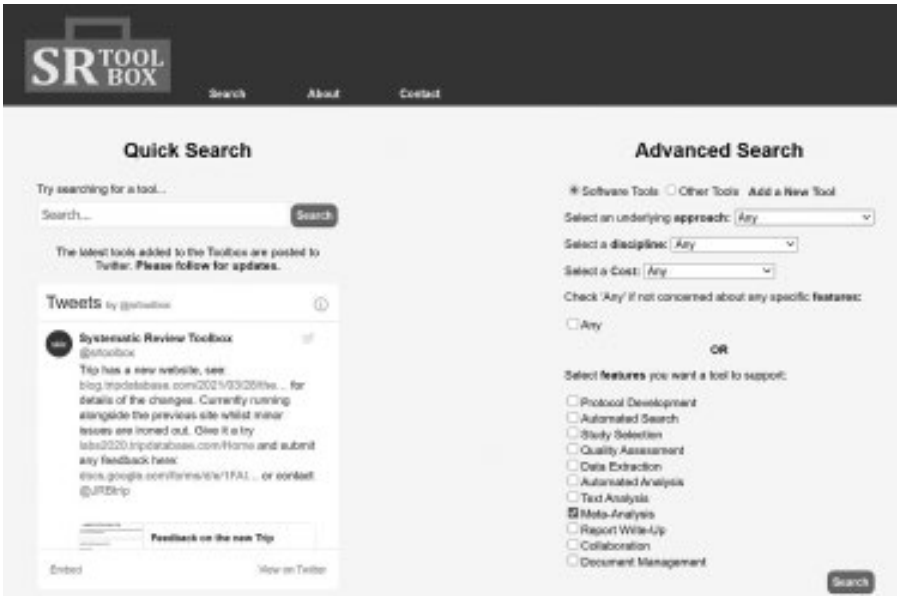


Figure 7.10 The Systematic Review Toolbox

(Continued)

FAQ 7.5 What if the studies in my meta-analysis are of variable quality?

If you are trying to investigate possible causes of variability in your review then you should conduct a sensitivity analysis. This is equally true when the study quality is variable. Essentially sensitivity analysis involves repeating an analysis under different assumptions – for example, assuming that studies of any quality are included versus assuming that only high-quality studies are included. You can then identify how 'sensitive' the overall review result is to bias from poorer quality studies.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Crombie IK & Davies HTO (2009) *What Is Metaanalysis?* 2nd edition. London: Hayward Medical Communications.
A brief educational briefing that summarises meta-analysis in a concise easy-to-read format.

Deeks JJ, Higgins JPT & Altman DG; on behalf of the Cochrane Statistical Methods Group (eds) (2021) Analysing data and undertaking meta-analyses (Part 2, Chapter 10). In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ & Welch VA (eds), *Cochrane Handbook for Systematic Reviews of Interventions*, version 6.2 (updated February 2021). Available from www.training.cochrane.org/handbook.
Authoritative chapter from the Cochrane Handbook summarising current thinking on meta-analysis.

Deeks JJ, Higgins JPT, Altman DG (eds). Chapter 10: Analysing data and undertaking meta-analyses. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA (editors). *Cochrane Handbook for Systematic Reviews of Interventions*, version 6.2 (updated February 2021). Available from www.training.cochrane.org/handbook.
Companion chapter to the previous item from the Cochrane Handbook. Description of risk-of-bias procedures from those who have developed them.

Pope C, Mays N & Popay J (2007) Methods for evidence synthesis. In: Pope C, Mays N & Popay J, *Synthesizing Qualitative and Quantitative Health Evidence: A Guide to Methods*. Maidenhead: Open University Press, 45–114.
Good overview of approaches across quantitative and qualitative methods.

Page MJ, Higgins JPT, Sterne JAC (2021) Chapter 13: Assessing risk of bias due to missing results in a synthesis. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA (editors). *Cochrane Handbook for Systematic Reviews of Interventions*, version 6.2 (updated February 2021). Available from www.training.cochrane.org/handbook.
Further chapter from Cochrane Handbook, an authoritative contribution on publication biases.

8

SYNTHESISING AND ANALYSING QUALITATIVE STUDIES

in a nutshell

How to synthesise and analyse qualitative studies

- Typically, you summarise qualitative data as themes or constructs.
- You can also summarise and synthesise qualitative data using narrative, tables and, sometimes, graphics.
- When choosing your method of synthesis you need to balance the need to aggregate (bring studies together) with the need to interpret (make sense of findings from the studies).
- You should also consider whether your focus is on the literature as a body of work, on the individual studies or on themes or findings within those studies.
- If you plan to integrate your qualitative synthesis with a quantitative review you must consider in advance how to bring the two reviews together (see Chapter 9).

key terms explained

aggregative: review approach concerned with assembling and pooling data (either quantitative as with meta-analysis or qualitative as with thematic synthesis). Compare configurative, a review approach that addresses open questions, typically answered with

(Continued)

qualitative data and iterative, by examining experiences and meaning to generate and explore theory.

disconfirming case: analytic strategy to protect against generalisation or caricature when synthesising qualitative evidence. The search for disconfirming evidence, or negative cases, offers a valuable strategy for assessing the credibility or validity of qualitative research claims.

meta-ethnography: interpretive approach that aims to provide a new interpretation of studies or a new theory to explain research findings encountered, rather than a simple aggregation.

qualitative evidence synthesis: umbrella term, as promoted by the Cochrane Qualitative and Implementation Methods Group, for methodologies associated with the systematic review of qualitative research, conducted either as a stand-alone review or as part of a review of complex interventions, systems or for guideline development.

SPICE (Setting–Perspective–Interest, phenomenon of Comparison–Evaluation): structured approach to formulation of qualitative questions that builds upon the PICO acronym; the Population component is split into Setting and Perspective and the Outcomes component is replaced with the more inclusive Evaluation component to incorporate concepts such as outputs and impact.

INTRODUCTION

Qualitative methods allow you to gather detailed and specific information and, most importantly, go beyond statistical associations by investigating how complex mechanisms operate in different contexts (Miles et al., 2018). Qualitative synthesis involves identifying patterns within your data – patterns related to concepts, ideas or themes rather than to numbers or trends. A qualitative review seeks to identify commonalities across data and, equally importantly, looks for exceptions to an overall pattern or 'rule' (Booth et al., 2013b). You must recognise that the value of your review does not lie in merely identifying and bringing together related studies. By *juxtaposing* findings from different sources (putting them side by side) you may spot patterns or themes not previously recognised by the authors of individual studies. Furthermore, you may *integrate* your data to produce a new explanation or theory to explain why findings differ under different circumstances (Durach et al., 2017). Bear in mind, too, that you may not only spot patterns in the collective findings (what the individual authors found) but also notice differences that are explained by how researchers have carried out the individual studies (**meta-method**). Differences in methods used by included studies may explain inconsistencies in their findings or, ultimately, suggest how best to conduct such studies in the future.

A key principle of any synthesis is 'making a new whole out of the parts' (Cruzes & Dybå, 2011b). This 'new whole' may form a new line of argument, a new theory or a new 'take home message'. You can rearrange conceptual 'building blocks' (studies or findings) within an existing fabrication (e.g. a theory or framework) (Booth & Carroll, 2015b), integrate them with new studies or use them to produce an entirely new construction (Anderson et al., 2013; Brunton, 2017; Brunton et al., 2020).

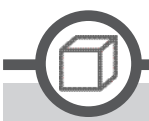
This chapter starts by rehearsing the generic stages of a qualitative evidence synthesis (QES) before focusing attention on choice of synthesis and the procedures of basic and advanced synthesis and analysis. Featuring three main types of qualitative synthesis, namely **thematic synthesis**, **framework synthesis** and **meta-ethnography**, it then focuses attention on new forms of synthesis including **rapid QES** and reviews of qualitative reviews (namely, **mega-aggregation** and **mega-ethnography**).

Synthesis–analysis: an iterative process

Although some forms of qualitative synthesis, such as **meta-aggregation**, follow a linear process, it is more common for synthesis and analysis to be iterative (Garside, 2008). You may generate an initial finding. You might then confirm the presence of this finding in the existing data using some analytical technique. Many analytical techniques are common to multiple types of synthesis. The distinction between synthesis and analysis is clearest when we define the tools available for each of these two stages.

OVERVIEW OF APPROACHES TO QUALITATIVE SYNTHESIS

As mentioned in Chapter 7, synthesis relies heavily on pattern recognition. Techniques such as *analogy* (looking for similarities between different phenomena), *metaphor* (thinking about one thing as if it were the same as another) and *homology* (looking for direct and corresponding relationships between natural and synthetic structures) translate readily to evidence synthesis (Tranfield et al., 2003). Other useful techniques include *comparison* and *contrast* (Gilson, 2014; Gray & Malins, 2016). In Box 8.1 we illustrate these principles in a familiar setting.



box 8.1

A simple illustration of qualitative synthesis

Ask your colleagues to provide three phrases to describe their perfect holiday. Some may be clear and specific (e.g. 'good waves for windsurfing'). This example holds little possibility for confusion although they may need to clarify what waves this requires. What, however, if two or more colleagues use such phrases as 'good weather'? Clearly this differs between settings (e.g. temperate versus tropical) and types of holiday (beach versus skiing). You would need to clarify whether these colleagues have similar or different ideas in mind. Alternatively, where colleagues use different terminology (e.g. 'many places of interest' and 'rich cultural heritage'), you need to establish whether these phrases 'translate' into the same concept or idea. If by 'many places of interest' one colleague means restaurants, bars and nightclubs it is unlikely that the two phrases translate into each other! Of course, the difficulty of this process is compounded for published studies because you cannot usually go back to your informants to clarify what was meant.

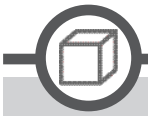
Aggregative, configurative or integrative?

Drawing together findings from multiple qualitative studies is increasingly common as an important source of evidence to support policy and practice (Classen & Alvarez, 2015). Approaches to synthesis can be **aggregative**, **configurative** or **integrative** (Kastner et al., 2016). **Aggregative synthesis** is 'stocktaking', as typified in mapping exercises. Aggregative synthesis answers such questions as: What are the main study designs used to investigate the focus of interest? What are the principal themes across multiple studies? Are any populations poorly represented, or not represented, at all across studies?

Configurative synthesis involves capturing a 'rounded' picture of the focus of interest. Configurative synthesis addresses such questions as: How do the individual themes identified across studies relate to each another? Do my explanations for the focus of interest capture all important perspectives? Do the studies agree with each other or can I detect areas of disagreement (**dissonance**)?

Integrative synthesis brings together different types of data (either different types of qualitative data or data from quantitative and qualitative studies) such as integrating thematic data with responses from surveys. Chapter 9 focuses on integration of quantitative and qualitative studies or integration of quantitative and qualitative data within those studies (Noyes et al., 2019).

Approaches to synthesising qualitative research include meta-narrative, **critical interpretative synthesis, meta-study, meta-ethnography, grounded theory, thematic synthesis,** textual narrative synthesis and **framework synthesis,** and **ecological triangulation** (Booth et al., 2016; 2018). The novice researcher faces a bewildering choice! Guidance on how to choose synthesis methods is structured around the RETREAT mnemonic (Booth et al., 2016; 2018b) (Box 8.2) (see also Chapter 3).



box 8.2

The RETREAT mnemonic for choosing a review type

Research question

Epistemology

Time/timeframe

Resources

Expertise

Audience and purpose

Type of data

Before we walk you through a generic process for a qualitative synthesis we suggest that you familiarise yourself with a published example (Exercise 8.1). Debate exists on the extent to

which a qualitative evidence synthesis resembles other systematic reviews or whether it's pedigree derives more from primary qualitative research methods (Booth, 2018).

exercise 8.1

Navigating around a qualitative evidence synthesis (QES)

Find an example of a qualitative evidence synthesis/qualitative systematic review. Use either the reading guide by Tong et al. (2016) or the SBU (2019) *Tool to assess methodological limitations of qualitative evidence synthesis* (https://www.sbu.se/contentassets/14570b8112c5464cbb2c256c11674025/methodological_limitations_qualitative_evidence_synthesis.pdf) to read critically the example you have found. Bearing in mind that the journey is more important than your destination, answer:

1. Are the methods of your chosen example of a QES well reported?
2. Is this a good example of a published QES?
3. What single improvement would you make to the methods of this particular QES? (*You may want to return to this question after having read the whole of this chapter.*)

A STEP-BY-STEP GUIDE TO QUALITATIVE SYNTHESIS

As with other systematic approaches, qualitative syntheses start by focusing the question (see Chapter 4) and searching and screening the literature (see Chapter 5). These processes are covered in detail in the referenced chapters and are mentioned only briefly below.

Step 1 – Formulating the question

Although you can formulate a question for qualitative synthesis using the generic **PICO** (Population–Intervention–Comparison–Outcome) framework, some commentators suggest that it is more appropriate to use a variant of **PICO** (Harris et al., 2018). **SPICE** breaks Population into Setting and Perspective, replaces Intervention with focus of Interest and Outcome as the wider-ranging Evaluation (Booth, 2016). **SPIDER** accommodates qualitative and mixed methods questions (Sample, Phenomenon of Interest, Design, Evaluation, Research type) (Cooke et al., 2012). A recent addition, **PerSPE(c)TiF** (Perspective–Setting–Phenomenon of interest/Problem–Environment–(optional Comparison)–Time/timing–Findings) consolidates elements from existing question frameworks (Booth et al., 2019b). Regardless of the framework used you should structure your review question (see Chapter 4) to shape the subsequent search, inclusion/exclusion and data extraction processes. You should involve stakeholders from the very beginning and throughout your entire review (Harris et al., 2015; Bayliss et al., 2016; Downe et al., 2019).

Steps 2 and 3 – Searching and screening the literature

In comparison with identification of quantitative studies (see Chapter 5), search procedures for retrieval of qualitative research remain relatively underdeveloped (DeJean et al., 2016). Particular challenges are associated with non-informative titles and abstracts, diffuse terminology, poor indexing and the predominance of quantitative studies in databases (Booth et al., 2016). You could start planning your search using the **7S framework** (Noyes et al., 2021) (Table 8.1). This characterises important considerations from sampling and sources through structured questions, search procedures, strategies and filters and supplementary strategies to standards for reporting (Booth et al., 2016).

Table 8.1 The 7S framework for qualitative searching

Component	Starting principles
Sampling	Where approaches other than comprehensive sampling are used, reviewers must **justify their sampling strategy, match it to their synthesis method** and describe fully how it was implemented
Sources	For health topics, **MEDLINE and CINAHL** (Rogers et al., 2018) **are considered a minimum, augmented by topic-specific and setting-specific sources** (Stansfield et al., 2012). Devise specific strategies to find specific types of grey literature, where included
Structured questions	Your **question structure should match the purpose and focus of the review**. When paired with an intervention review, the qualitative question may be coterminous or could seek broader aspects of the focus of interest
Search procedures	Given comparatively low yield of qualitative topic-based searches, reviewers should **privilege specificity (retrieval of relevant items)**. You can use relevant items to develop supplementary search strategies. You should compensate for indexing deficiencies using well-chosen supplementary strategies
Search strategies and filters	**Filters should match the intended purpose of the review** (Rosumeck et al., 2020; Wagner et al., 2020). When extensive supplementary strategies are used to improve sensitivity, **topic-based searches may use a simple filter (using terms such as qualitative OR findings OR interview)** (Rogers et al., 2018)
Supplementary strategies	**Reference checking is a default for every review.** For diffuse topics, or those with significant variation in terminology, **tables of contents, citation searching or contact with authors/experts** may be productive. Where context or theory is important, **the CLUSTER method may be appropriate.** Study identifiers may be useful for **sibling or kinship studies**
Standards	In the absence of a consensual standard for reporting, you should use **ENTREQ, *eMERGe*** supplemented by **PRISMA** and **STARLITE** to report your search

Determining which studies to include, based on consensus from two reviewers, enhances rigour (Atkins et al., 2008). For example, will you include mixed methods studies with a qualitative component or not? Will you include data from free text responses to surveys? You may use two reviewers to reach consensus on screening decisions, resolving conflicts through discussion or by consulting a third reviewer (Atkins et al., 2008).

Step 4 – Extracting qualitative data for your review

Data extraction precedes synthesis and is key to demonstrating that you have followed a systematic approach:

> Standardized data extraction approaches and forms are essential in minimizing error, providing a historical record of decisions made about the data, and establishing a data set for subsequent synthesis. (Munn et al., 2014)

When extracting data you systematically identify information relevant to the review question (Finfgeld-Connett, 2018b). Remember that you are trying to ensure that you handle different studies, with their different designs and publishing conventions, in a consistent manner. You should decide which data to extract and how to do this (Finfgeld-Connett & Johnson, 2018). Data extraction requires that you pre-specify, and then examine, which elements of data are present in each individual report (Munn et al., 2014). Think how the data you extract relates to your review question. The Cochrane guidance (Noyes et al., 2018a) suggests four approaches to data extraction:

1. Using a standardised, or adapted, data extraction template.
2. Using an a priori extraction conceptual framework.
3. Using a software program (e.g. NVivo) (Houghton et al., 2017) to inductively code original studies.
4. Using a logic model of the programme theory to inform data extraction, analysis and synthesis.

Data extraction forms require a descriptive section that mirrors your focused question (e.g. SPICE or PerSPE(c)TiF – see Chapter 4), to capture the setting, the perspective, the intervention/focus of interest as well as characteristics of the population sample. Beyond the generic SPICE format your data extraction is shaped by your method of synthesis. For framework synthesis your framework may be a conceptual model, logic model or pathway of care (Booth & Carroll, 2015b) from which your data extraction form will accommodate concepts and sub-concepts. Allow extra unlabelled fields for uncoded data to which you will subsequently return. Your challenge is to balance the granularity of the data extraction form with the quantities of relevant data (Brunton et al., 2020); you do not want either 'just-in-case' empty fields or large quantities of data lumped under broad labels.

Interpretive reviews challenge conventional data extraction. The raw data of a qualitative systematic review is ideas or concepts. Ideas or concepts are not uniquely found within the Results section of a primary study. Novel thinking may appear in the Discussion and Conclusion sections (Noyes et al., 2018a). When synthesising qualitative research, reread the original findings to compare emerging ideas with the concepts as originally written. Continually look out for overlap, similarities and contradictions (Mays & Pope, 2020a). Your data extraction form should stimulate insights and interpretation. Use different ways of extracting and juxtaposing concepts (coding original papers, tabulation, mind maps, colour coding, short text descriptions, etc.). Rather than deciding everything in advance, revisit your forms and data continuously as new interpretations emerge. You should also seek to highlight information about contextual factors from included studies to explain differences across studies (Booth et al., 2019a).

The value of data extraction for qualitative research depends upon whether the overall intent is **aggregative** (bringing multiple studies together in a common format to facilitate assimilation and summing up) or **interpretive** (where data extraction is enhanced by creative techniques to optimise the explanatory value of the data). The units of extraction in this case are specific findings and illustrative excerpts from the text.

Step 5 – Quality assessment (appraisal)

Quality assessment of qualitative research is contentious, both on how it is best conducted and, indeed, on whether it should be undertaken at all! Quality, in the context of qualitative research, is considered elusive (Toye et al., 2013). Nevertheless, peer reviewers and editors typically expect *all* systematic reviews to assess quality, making compliance the path of least resistance. When seeking to establish the confidence or certainty associated with research findings (such as GRADE-CERQual), quality assessment of methodological limitations becomes essential (Munthe-Kaas et al., 2018; 2019). Excluding an entire study on the basis of an appraisal of study quality may not be appropriate (Dixon-Woods et al., 2004), particularly if it contributes an important insight:

> the 'study' is not the appropriate unit of analysis for quality appraisal in research synthesis. There are often nuggets of wisdom in methodologically weak studies and systematic review disregards them at its peril. (Pawson, 2006c)

Tools for quality assessment are described in more detail in Chapter 6. The Critical Appraisal Skills Programme (CASP) checklist for qualitative studies has become ubiquitous (Hannes et al., 2010). Meanwhile, the Qualitative Assessment and Review Instrument designed by Joanna Briggs (JBI-QARI) (Hannes et al., 2010; Toye et al., 2013) and the Quality of Reporting Tool (Carroll et al., 2013) have gained traction within **meta-aggregation** and **best fit framework synthesis** respectively. Current appraisal checklists highlight valid concerns about inconsistent judgements and an inherently subjective appraisal process (Toye et al., 2013; Delefosse et al., 2015; Morse, 2021; Morse, in press). Noticeably, no tool is currently designed for assessing studies for inclusion within a **meta-ethnography**. The Cochrane Qualitative and Implementation Methods Group has issued guidance on how to select appropriate instruments and criteria (Noyes et al., 2018a).

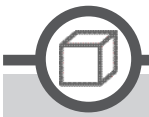
Step 6 – Synthesis

A key early stage is planning your initial **synthesis strategy** – how to approach the literature once you have assembled it (Petticrew et al., 2013b). You may, in fact, need to switch from your initial strategy (Box 8.4) to an appropriate alternative as patterns from the literature become clearer. Whatever methods of synthesis you use you will:

- map similarity,
- ensure that categories are exclusive and avoid overlap, and
- create secure and well-defined concepts as the building blocks of your process.
- These procedures will enable you to create a taxonomy, produce a framework or **meta-framework**, develop a coding scheme or generate a **thematic synthesis**.

Synthesis and analysis form a substantive part of the remainder of this chapter. We will focus only on how to get started with each activity in this introductory section. Broadly speaking synthesis and analysis requires:

1. Initial assessment of study reports
2. Analysis and synthesis
3. Preliminary analysis and interpretation
4. Full analysis and interpretation.



box 8.3

Planning your synthesis strategy

1. Decide whether to read swiftly through all papers *or* to work through papers in detail one by one.
2. Decide how you will document contents of *individual* papers (memos, notes, structured form).
3. Select a starting paper (e.g. index paper – according to age, conceptual richness, number of citations, source discipline, etc.).
4. Decide how you will tackle subsequent papers (chronological, purposive sampling, maximum variation sampling, etc.).
5. Construct cross-case comparisons across the *set* of papers (e.g. tabulation etc.).

While you may need to refine and change your *initial* synthesis strategy, you nevertheless need a clear direction of travel. Clearly if you intend to read and review an entire body of literature it will not matter in which order you handle the papers; you will categorise data from each additional paper which will be compared with data from previous papers, using the **constant comparative method**. If, however, you are planning to sample purposively from the literature (Combs et al., 2010) then you need to be confident that you have constructed your **sampling frame** appropriately (Benoot et al., 2016; Ames et al., 2019a).

Step 7 – Analysis and interpretation

Analysis and synthesis involve further reading and rereading of study reports. **Preliminary analysis and interpretation** move forward from considering studies as individual reports towards examining them as a body of evidence. You start to categorise the findings from the studies. Your challenge is to extract findings from these studies without losing the context and relationships within each report. You may find that the techniques of narrative synthesis covered in Chapter 7 (e.g. mind maps, logic models, tabulation, etc.) help to make sense of qualitative studies and to explore the presence of patterns. At this stage, start to look for patterns both *within* and *between* studies. Detailed reading allows you to focus on technical aspects of the reporting and to start thinking about whether methods used are appropriate. You need not implement a hierarchy of study designs (Petticrew & Roberts, 2003) but rather consider whether each method is suitable for the research question under examination.

Full analysis and interpretation move you beyond the elementary synthesis techniques used in the preliminary stages to formal methods of synthesis such as thematic synthesis, framework synthesis or meta-ethnography. Three synthesis approaches are particularly useful (Suri, 2013; Benoot et al., 2016):

- Pursuing a line of argument.
- Examining consistencies.
- Identifying the disconfirming case.

By engaging with findings at this depth you will be able to spot meta-level characteristics – for example, how findings have been informed by a particular research tradition or how concepts have developed over time (Barnett-Page & Thomas, 2009). You may reveal incompatibility between certain theoretical or ideological stances. For example, our study of community engagement exposed a divide between top-down governmental approaches and participatory bottom-up approaches (Harris et al., 2015).

At this stage you can start to consider how your findings are influenced by study quality. While synthesis steers the reader towards patterns of similarity you should be particularly active in seeking the divergent or disconfirming case (Booth et al., 2013a). Where the data is sufficiently rich you may proceed to theory development – perhaps by constructing if–then causal chains or logic models (Kneale et al., 2015).

Data presentation

How review findings are defined and presented depends on the review question, the synthesis methods used, the intended purpose or audience of the synthesis, and the richness of the data available (Gough et al., 2017). Typically, a **formative** presentation might include 'literature review maps/diagrams, matrices, or outlines that indicate main themes, subthemes, categories, subcategories, patterns and sequencing of ideas' (Combs et al., 2010) to illustrate work in progress. In contrast a **summative** presentation helps the intended audience make sense of the completed review's findings and key take home messages (Leary & Walker, 2018).

Further detail on summative presentation is discussed later in the chapter in the section on writing up and presenting review findings (see also Chapter 10).

GETTING STARTED IN QUALITATIVE SYNTHESIS

A previous publication identified 15 *qualitative* approaches to research synthesis (Booth et al., 2018). Our list excluded **critical interpretive synthesis** (Snilstveit et al., 2012) and **realist synthesis** which feature as mixed methods approaches in Chapter 9. However, as with the main review types, we can limit the 15 approaches – in this case to a four-item QES Survival Kit! (See Box 8.4.)

QES Survival Kit

1. Framework synthesis
2. Meta-aggregation

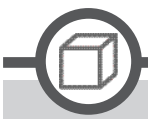
3. Meta-ethnography
4. Thematic synthesis

Guidance from the **Cochrane Collaboration** (Noyes et al., 2021) and the World Health Organization (Flemming et al., 2019) seeks to further simplify the choice to three methods: **thematic synthesis, framework synthesis** and **meta-ethnography**. Collectively, they identify all three methods under the umbrella term – **qualitative evidence synthesis** (**QES**). **Thematic synthesis**, based on **thematic analysis** methods used in primary research, remains one of the most accessible methods of qualitative synthesis. **Framework synthesis**, adapted from **framework analysis**, begins with an a priori conceptual framework, which develops iteratively as new data is incorporated and themes are derived from the data. **Meta-ethnography**, likened to **grounded theory** approaches, represents the most ambitious of the three methods and moves explicitly towards the generation of theory. The Campbell Collaboration adds a further method, popularised by the Joanna Briggs Institute, namely **meta-aggregation** (see Hannes & Lockwood, 2011b). Meta-aggregation is 'a process that identifies meanings from qualitative studies that may be from different methodologies and further abstracts those meanings into categories that are then synthesized' (Tufanuru, 2015). It 'seeks to generate summaries to determine the value of the findings of individual studies in terms of their practical consequences' (Hannes & Pearson, 2012).

Recent years have witnessed attempts to move beyond merely documenting methods to identifying which method of synthesis is most appropriate under what circumstances (Booth et al., 2016; 2018b). It is useful to read the experiences of self-declared novice researchers when attempting these synthesis methods (Soilemezi & Linceviciute, 2018; Herber & Barroso, 2019; Kalpokaite & Radivojevic, 2019). We advise that you start from one of the more accessible methods of synthesis, namely thematic synthesis and framework synthesis. Both methods mirror corresponding established methods used for analysis of primary qualitative data, namely thematic analysis and framework analysis.

Thematic synthesis

Thematic synthesis seeks to provide a consistent analysis of content across included studies (Box 8.4). It seeks to identify the diverse factors that help in understanding the focus of interest. It then seeks to organise these factors into the principal (interpretive) or most common (aggregative) themes (Table 8.2).



box 8.4

At a glance – thematic synthesis

Definition

Thematic synthesis involves the systematic coding of data and generating of descriptive and analytical themes. It is an inductive approach. (Nicholson et al., 2016)

(Continued)

At a glance

Reviewer Expertise	
Information Expertise	
Time	
Resources	£

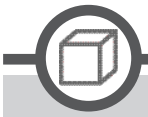
Table 8.2 SALSA approach mapped to thematic synthesis

SALSA stage	Procedure (Cruzes & Dybå, 2011b)
Search	Aims for 'conceptual saturation'. Purposive sampling may involve deliberately seeking negative cases, aiming for maximum variability and designing resulting set of studies to be heterogeneous (Sutton et al., 2019)
Appraisa**L**	Procedures for 'trustworthiness' seek to examine transparency, generalisability, quality and sensitivity analysis (Thomas & Harden, 2008). Trustworthiness increases when findings are presented in a way that allows the reader to look for alternative interpretations (Cruzes & Dybå, 2011b)
Synthesis	Extract data
	Code data
	Translate codes into themes
Analysis	Create a model of higher-order themes
	Assess the trustworthiness of the synthesis

Note: Cruzes & Dybå (2011b) produced a 21-item checklist for stages of a thematic synthesis.

Framework synthesis

Framework-based synthesis offers an important advance in conducting reviews of qualitative synthesis. The 'best fit' variant is particularly helpful when policy-makers, practitioners or other decision-makers need answers quickly, and can tolerate ambiguity about whether the answer is the very best that could be given (Dixon-Woods, 2011). Framework synthesis captures new understandings as data is incorporated into the framework (Brunton, 2017; Brunton et al., 2020). You can then express the resulting synthesis – for example, in the form of a model or chart.



box 8.5

At a glance – framework synthesis

Definition

Framework synthesis:

> originates from framework analysis, a method of analysing primary research data to address policy concerns. The research question and the background theoretical and

empirical literature shape an understanding of the issue under study into an a priori conceptual framework, which develops iteratively as new data are incorporated and themes are derived from the data (Brunton et al., 2020). The process of framework synthesis is mapped to the SALSA framework in Table 8.3.

At a glance

Reviewer expertise	
Information expertise	ⓘⓘ
Time	
Resources	£

Table 8.3 SALSA approach mapped to framework synthesis

SALSA stage	Activities (Gale et al., 2013)
Search	Comprehensive search for primary studies based on predefined criteria. Searches of multiple databases using qualitative methodological filters. May involve iterative searching of theoretical literature, without filters, for both identifying and populating a framework
Appraisa**L**	May not only require assessment of the quality of qualitative research but also appraisal of the theory or framework that has been identified for analysis (Booth & Carroll, 2015b)
Synthesis	Familiarisation: immersion in the included studies with the aims and objectives of the review
	Identifying or developing a thematic framework
	Indexing: applying framework to code individual studies
Analysis	Charting: charts contain distilled summaries of evidence
	Mapping and interpretation: using the charts to define concepts, map the range and nature of phenomena, create typologies and find associations between themes as a way of developing explanations for the findings

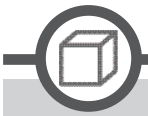
Best fit framework synthesis

'Best fit' framework synthesis is a variant of framework synthesis, specifically designed to meet the needs of systematic reviews. It applies innovative methods to identify theories in a systematic manner (Booth & Carroll, 2015a), and to create the a priori framework for the qualitative evidence synthesis (Booth & Carroll, 2015b). Subsequently, it combines existing methods of quality assessment (Carroll & Booth, 2015), analysis and synthesis (Carroll et al., 2011) to complete the review process.

Starting with a 'good enough' framework, you populate it with as much data as possible without forcing the data to fit. Following this initial deductive phase, you handle the remaining data inductively, creating new themes until all the data is processed. Best fit framework synthesis differs from other methods of framework synthesis, which allow the reviewer to add data inductively at any time in the process, by engineering a blatant gap between the deductive and inductive phases. This gap ensures a clear audit trail for themes derived from the original

framework and those subsequently identified by the inductive process of thematic synthesis. The gap provides added transparency and facilitates project management and version control by keeping the two stages phased and sequential, rather than iterative.

Best fit framework synthesis seeks to capitalise on inherent advantages of framework synthesis and thematic synthesis by offering a pragmatic methodology. Where available data is limited and primarily descriptive ('thin' data), the best fit method can still sustain limited theoretical development. The method relies on ready identification of a conceptual framework which best fits the data and may occasionally result in a 'false start' (e.g. if the framework is mismatched either by time or space). The method is compatible with current best practice in searching for and appraising qualitative evidence (Booth, 2016).



box 8.6

At a glance - best fit framework synthesis

How is best fit framework synthesis different from framework synthesis?

Although conventional framework synthesis allows you to keep on modifying the framework to codify new themes as they appear in the data, by doing so it sacrifices transparency and auditability. Best fit framework synthesis purposely engineers a gap between the data you process deductively through an existing framework and data you handle inductively, once you have completed coding against that framework. The originators of best fit framework synthesis claim several distinctive features:

- Pragmatically, it allows a review team to initiate synthesis where no existing conceptual model offers a close match to the data being extracted. So, a model of factors that influence women who take dietary supplements offered a good enough fit in the absence of a conceptual model for older people taking substances such as aspirin to prevent bowel cancer (Carroll et al., 2011).
- Frameworks are harvested systematically from the literature, via a parallel search process (Booth & Carroll, 2015b), rather than requiring detailed input from stakeholders. A match of 60–80% between themes from your data and those from a candidate framework indicates sufficient advantage over thematic synthesis.
- Multiple frameworks can be identified and merged to cover complementary aspects or levels of a phenomenon to form a single comprehensive **meta-framework** (Carroll et al., 2013). **Logic models** (Rehfuess et al., 2018) and policy frameworks offer alternative structures (Booth et al., 2015b) where theoretical frameworks do not exist.
- The best fit framework synthesis process (Table 8.4) clearly identifies where a new expanded model builds upon and extends the original framework.

At a glance

Reviewer expertise	
Information expertise	ⓘⓘ
Time	
Resources	£

Table 8.4 SALSA approach mapped to the best fit framework synthesis process

SALSA Stage	Procedure (Booth & Carroll, 2015b)
	1. Define review question
Search	2a. Systematically identify relevant primary research studies
	2b. Identify relevant (best fit) publications of conceptual models/ frameworks of theories
Appraisa**L**	3. Extract data on study characteristics from included studies and conduct study quality appraisal
Synthesis	4. Code evidence from included studies from the a priori framework identified in stage 2
	5. Create new themes by performing secondary thematic analysis on any evidence that cannot be coded into the a priori framework
Analysis	6. Produce a new framework composed of a priori and new themes supported by the evidence
	7. Revisit evidence to explore relationships between themes or concepts in order to create a model

PROGRESSING TO ADVANCED FORMS OF SYNTHESIS

Meta-ethnography

Meta-ethnography offers a way of synthesising findings from multiple qualitative studies to provide 'a range and depth of meanings, experiences, and perspectives of participants across health-care contexts' (Tong et al., 2012). By translating studies into one another, meta-ethnography seeks to create novel interpretations and ideas about the focus of interest (France et al., 2019b). If thematic synthesis and framework synthesis are the most accessible methods of qualitative synthesis then meta-ethnography is the longest established and most frequently cited approach (Hannes & Macaitis, 2012). However, this does not mean that meta-ethnography is executed well (France et al., 2014).

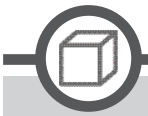
Noblit and Hare (1988) are credited with devising the principles of meta-ethnography. However, meta-ethnography was not initially presented as a generic method and so further developments in methodology (Campbell et al., 2011), updating procedures (France et al., 2016) and reporting (France et al., 2019a) have been required. The original text described three trajectories of synthesis that a meta-ethnography could pursue: **reciprocal translation**, **refutational synthesis** and **line of argument synthesis** (Noblit & Hare, 1988):

- **Reciprocal translation** occurs when different accounts are translated into each another. Reciprocal translation has been identified as a fundamental strategy present in most types of qualitative synthesis (Melendez-Torres et al., 2015).
- In contrast, **refutational synthesis** takes place when accounts stand in relative opposition to each other and are essentially 'refutational', as it allows interpretation of conflicting accounts. Attention should be paid to the assumptions, motivations and ideology behind a study. A benefit of conducting a refutational translation is that it

allows reviewers to identify if theories or ideologies underlying two or more studies differ (France et al., 2019b).

- **Line of argument synthesis** offers an overarching interpretation of the studies (Noblit & Hare, 1988); even 'dissimilar but related studies' taken together represent a 'line of argument', thereby revealing a 'whole' among a 'set of parts'.

Meta-ethnography (Box 8.7) persists as one of the most common forms of qualitative synthesis (France et al., 2019b). First you identify and list key metaphors (themes, perspectives, phrases, ideas and/or concepts) from each individual study (Noblit & Hare, 1988). You then 'put together' these metaphors by linking them across studies. By linking metaphors in this way, you offer a holistic understanding of complex phenomena (Brookfield et al., 2019).



box 8.7

At a glance – meta-ethnography

Definition

Meta-ethnography is an interpretive approach that seeks to preserve the social and theoretical contexts in which findings emerge (Noblit & Hare, 1988). Meta-ethnography involves systematically comparing conceptual data from primary qualitative studies to identify and develop new overarching concepts, theories, and models. The seven 'phases' of meta-ethnography are mapped to the SALSA framework in Table 8.5

At a glance

Reviewer expertise	
Information expertise	
Time	
Resources	£££

Table 8.5 SALSA approach mapped to meta-ethnography

SALSA stage	Procedure (France et al., 2017)
	Phase 1: Getting Started (incorporates the rationale, aims and protocol development). Identify 'an intellectual interest that qualitative research might inform' (Noblit & Hare, 1988)
Search	**Phase 2 Deciding what is relevant to the initial interest.** Identify and select study accounts to synthesise. Noblit & Hare (1988) did not advise how to do this; they selected studies purposefully. Systematic review methods had not yet been developed
Appraisa**L**	**Phase 3 Reading the studies:** 'repeated reading of the accounts and the noting of interpretative metaphors [...] requires extensive attention to the details in the accounts' (Noblit & Hare, 1988)

SALSA stage	Procedure (France et al., 2017)
Synthesis	**Phase 4 Determining how the studies are related:** 'the various studies are "put together"' (Noblit & Hare, 1988). Requires determining 'the relationships between the studies to be synthesized in order to decide how to synthesize them' (Noblit & Hare, 1988)
	Phase 5 Translating the studies into one another: involves systematically comparing the meaning of metaphors, concepts or themes and their relations across study accounts to identify the range of metaphors, concepts, and themes
	Phase 6 Synthesising translations: Involves 'going beyond the findings of any individual study' (Noblit & Hare, 1988). Translations from phase 5 are compared to identify common/overarching concepts and to develop new interpretations
Analysis	**Phase 7 Expressing the synthesis:** communicating the synthesis to your audience in a suitable format

Note: Meta-ethnography is typically described as seven phases (Cahill et al., 2018). These phases are best considered analytical procedures rather than sequential stages.

Sampling remains a key issue for meta-ethnography (Atkins et al., 2008; France et al, 2019b). Comprehensive search strategies may be prohibitive given the need to engage intensively with all included studies. An alternative is to construct a preliminary map of studies and sample purposively to ensure coverage of different populations, settings and experiences of the focus of interest. A third and final approach is to sample according to 'richness' of data – continuing to sample from studies of decreasing richness until a point analogous to theoretical saturation is reached (Ames et al., 2019a). However, typically comprehensive searches are required either (i) to locate all eligible studies or (ii) to create an optimal **sampling frame**.

Quality assessment was never key to meta-ethnography which privileges quality of interpretation above technical quality (Toye et al., 2013). However, quality assessment is often expected by funders, editors or peer reviewers. Increasingly, even interpretive methods (e.g. **meta-ethnography**) are subject to GRADE-CERQual assessments that require an assessment of **methodological limitations** (Munthe-Kaas et al., 2018).

Outputs from a meta-ethnography may include hypotheses generated from the synthesis and a model of factors relating to the phenomenon of interest (France et al., 2019b). Outputs can be presented in a simple, but not overly simplistic, diagrammatic format. To achieve uptake of findings into policy, programme development and research require multiple strategies, including publication in journals and communication at conferences (see Chapter 10). Harnessing meta-ethnography findings to an effectiveness review may help in mapping factors to existing interventions (see Chapter 9).

Having introduced you to the principal choices for qualitative synthesis we suggest that you reflect on your own choice of method – both to help you to write your protocol and to identify your future learning needs.

exercise 8.2

Choosing your method of synthesis

Examine the different methods of synthesis outlined in this chapter. Sort them into those of current potential for your review, those unlikely to prove useful at present, and those where you need further detail. Produce a draft learning plan for further reading/research on qualitative data synthesis.

1. Framework synthesis

   1a. Best fit framework synthesis
2. Meta-ethnography
3. Narrative synthesis (see also Chapter 7)
4. Thematic synthesis
5. Meta-aggregation

Current potential	Further detail required	Not relevant at present
To find out more on data synthesis I am going to read/research: *e.g. Meta-aggregation* By __/__/202_		

Toolbox – software for qualitative synthesis

Software may be specific to performing systematic reviews (McInnes & Wimpenny, 2008) or may be designed for primary qualitative research for use during the synthesis and analysis stages (Houghton et al., 2017; Haynes et al., 2019). EPPI-Reviewer is intended for use across diverse review types and allows you to employ a common review approach across quantitative and qualitative reviews (Park & Thomas, 2018). QARI from the Joanna Briggs Institute (JBI) is specialist software, particularly used for meta-aggregation (McInnes & Wimpenny, 2008), and is one of a suite of purpose-designed review programmes. Finally, you can use data analysis software, such as NVivo, to handle coding of texts from journal articles as if they were interview transcripts (Houghton et al., 2017).

You can use Google Forms to input data into a framework, specifying question formats using tick boxes or drop-down menus. You can export the resultant data into a Microsoft Excel spreadsheet or cut and paste the data into Microsoft Word tables. You can use NVivo for framework synthesis, illustrating that tools and methods of synthesis hold sufficient flexibility to allow interchangeability in procedures used (Houghton et al., 2017).

For thematic synthesis, or for the early stages of meta-ethnography, you could import the complete article into a qualitative data analysis package such as NVivo to allow you to code line

by line (Toye et al., 2014; Houghton et al., 2017). Uploading a PDF within NVivo allows you to code conceptual findings wherever they appear within each paper, and to compare individual team interpretations in one database (Houghton et al., 2017). NVivo offers the facility to record and compare interpretations, including 'memoing' to track developing ideas. Conventional data extraction assumes an 'extract once, read multiple times' way of working. If you are planning to 'read multiple times, code multiple times' you may find conventional data extraction a less useful model of working. **Constant comparison** may prove useful in moving to and fro between the findings of individual studies and the synthetic findings of studies considered thus far.

A word of caution: Just because you can cut and paste blocks of text from articles into your extraction form should not stop you from recognising that not all data is equally relevant. Effective data extraction revisits the review question to ensure that only data that is relevant, or potentially relevant, is extracted.

Qualitative data analysis

Analysing what you find

Having performed your initial synthesis you can explore what has been found and what is missing. The synthesis stage aims to tell you what the literature *says*. The analysis stage focuses on telling you what the literature *means*. If synthesis is when a detective assembles and organises all the clues, then analysis is when that same detective tries to make sense of them.

Many analytical techniques are available (Table 8.6) during the iterative phases of synthesis and analysis (Miles et al., 2018). Subsequently, you can present your data using textual, graphical, numerical and tabular techniques (Soilemezi & Linceviciute, 2018).

Table 8.6 Elements of data analysis

Elements	Application within synthesis methods
Noting patterns and themes	Meta-ethnography, thematic synthesis
Seeing plausibility (ensuring conclusions make good sense)	Meta-ethnography
Clustering	Content analysis, framework synthesis, meta-ethnography, thematic synthesis
Making metaphors	Meta-ethnography, meta-narrative review
Counting	Cross-case analysis, meta-analysis (Chapter 7), meta-summary
Making contrasts/comparisons	Meta-ethnography, meta-narrative review
Partitioning variables	Framework synthesis, meta-ethnography, meta-analysis (Chapter 7)
Subsuming particulars into the general	Meta-analysis (Chapter 7), meta-ethnography
Noting relations between variables	Logic models, realist synthesis (Chapter 9)
Finding intervening variables	Logic models, realist synthesis (Chapter 9)

(Continued)

Table 8.6 (Continued)

Elements	Application within synthesis methods
Building a logical chain of evidence	Logic models, realist synthesis (Chapter 9)
Making conceptual/theoretical coherence	Concept maps, logic models, meta-ethnography, meta-narrative review, realist synthesis (Chapter 9)

Source: Based on Miles et al. (2018)

Qualitative data has four tools of synthesis at its disposal, namely **textual**, **numerical**, **tabular** and **graphical**. Within qualitative synthesis textual approaches occupy the principal place. In addition to **narrative synthesis**, which can accommodate both paradigms, textual approaches include techniques from primary qualitative analysis. Table 8.7 illustrates approaches to synthesis found in different types of review.

Table 8.7 Approaches to synthesis in different types of qualitative evidence synthesis

Approaches to synthesis	Application	Review example
Thematic synthesis Word frequency count Thematic synthesis Synthetic working definition (cf. concept analysis)	Aimed to understand the concept of reflection by synthesising conceptual qualitative studies. Used 14 sources to construct 4 analytical themes: cognitive, integrative, iterative and active. Themes were explored in relation to existing research and a novel definition of reflection was proposed	The concept of reflection: a systematic review and thematic synthesis across professional contexts (Marshall, 2019)
Framework synthesis Thematic presentation by model categories Descriptive statistics on countries/regions Sensitivity analysis	Results of data synthesis presented by level of the socio-ecologic model (individual, social, physical and macro levels). Six models deconstructed into meta-framework with 72 constructs Sensitivity analyses conducted for study quality (high or low), population (adolescent girls or adult women), continent (Africa, Asia or South America) and setting (rural or urban)	Factors influencing obesogenic behaviours of adolescent girls and women in low- and middle-income countries: a qualitative evidence synthesis (Trübswasser et al., 2020)
Meta-ethnography	Synthesises findings of two ethnographic studies and a qualitative review on the influence of peer-assisted learning on student nurses. Identified four key themes underpinned by six sub-themes and developed a conceptual model of effective peer-assisted learning	Using meta-ethnography to develop a conceptual model of peer-assisted learning of nursing students in clinical practice (Carey et al., 2019)

The human brain finds it easier to identify overall patterns or similarities in data ahead of being able to spot inconsistencies or exceptions (Booth et al., 2013a). You are likely to be

subconsciously influenced to impose explanatory patterns over data that is either not present or non-apparent. The same skills you use in marshalling an argument can equally threaten the integrity of a study and its results. Furthermore, we are receptive to data that supports our underlying opinion and reject, or explain away, data that is uncomfortable or that does not fit easily. You should not focus all your attention on constructing a 'line of argument'. You should pay similar attention to nuanced findings from inconsistencies or contradictions. A review team (or student/supervisor) should maximise opportunities to 'challenge' persuasive or seductive lines of argument (Booth et al., 2013a). Those closest to the data, especially newer members of the team, should feel able to challenge and resist interpretations into which data is inappropriately 'shoehorned' (Booth et al., 2013a).

Few qualitative synthesis methods are operationalised as comprehensive step-by-step processes that offer practical guidance to researchers in producing a rigorous, clear report (Tong et al., 2012). While you should try to distinguish between different methodologies, it is equally important to identify generic processes of synthesis and analysis common to multiple methods.

Although creativity is an important feature of pattern seeking and interpretation, it is important that, at all times, you ground any theories or hypotheses in your data. Conclusion drawing and verification is required to move from the 'particulars into the general' (Whittemore & Knafl, 2005). As new data is accommodated, you should continually revise any conclusions or conceptual models so that they continue to be inclusive (Miles et al., 2018). You need to verify any patterns, themes, relationships or conclusions with your primary source data to ensure that they are both accurate and confirmable (Miles et al., 2018). At this stage, you are particularly vulnerable to a **cognitive bias** such as being locked into a particular pattern (premature analytic closure) (Miles et al., 2018) or you may exclude pertinent evidence because it is inconvenient or extraneous to your theorising.

To use our earlier example about a holiday, you might group individual data into overarching constructs, such as weather, location, attractions, companions, food and drink, etc. You may then wish to trace particular responses back to particular respondent characteristics: for example, are males more likely to mention food and drink? Do younger respondents tend to focus on extreme sports or strenuous activities? You may therefore need to re-examine the data in the light of such differences. Furthermore, you may identify tensions or conflict between respondents who desire 'peace and quiet' and those who require 'excitement'. Identifying tensions may lead you to explore how individuals manage these in practice, perhaps through alternation or having separate holidays to supplement a family holiday.

Data extraction against themes helps to identify patterns (Kalpokaite & Radivojevic, 2019). Within the limited number (three studies) of reports included in the thematic matrix (Table 8.8) for a hypothetical review on the attitudes of village communities to peripherally located supermarkets we observe:

Study 1 by Greenwood and Liffey focuses exclusively on economic considerations. Studies 2 and 3 both look at convenience with regard to road traffic. Study 3 by Swathe is overwhelmingly positive whereas Studies 1 and 2 cover positives and negatives. Studies 2 and 3 carry implications for (different) health-related services.

Therefore, a matrix is useful for pattern recognition (Harden et al., 2018). Themes may derive from the data (as with **grounded theory**, **thematic synthesis** or **meta-ethnography** approaches) or from a published framework or model (as for **framework synthesis**).

Table 8.8 Hypothetical thematic matrix for review on attitudes to peripheral supermarkets

	Article content		
Theme	**Greenwood & Liffey (2010) (Study 1)**	**Verdant (2010) (Study 2)**	**Swathe (2011) (Study 3)**
Convenience		Good communications via main roads Ample parking	On outskirts of village therefore reduces congestion
Household economy	Reduces price of staple products (e.g. bread, milk)	Reduced petrol prices	Cheap petrol
Focus for community		Location for charitable collections Health education stands	Venue for blood transfusion service
Threat to local commerce	Challenges bespoke traders (e.g. bakers, dairies)	24-hour competition to petrol stations	
Threat to community identity	Uniform character of hypermarkets – cheap builds	Reduced use of village centre Increased use by non-locals	

Testing or confirming review findings

Essentially analysis provides you with an opportunity to assess the strength of evidence for drawing conclusions about the results of synthesis and their generalisability in your intended context. Several techniques help you to do this (Table 8.9). These 'tactics' derive from primary research but apply equally within synthesis.

Table 8.9 Tactics for testing or confirming review findings

Elements	**Procedures**
Representativeness	Requires that you explore whether the various **study populations** match the characteristics of the **target population**. *Examine your component studies. Ask yourself, 'Are any particular groups underrepresented? Are any groups overrepresented? Am I confident that the characteristics of a particular group are not misrepresented or misinterpreted?'*
Researcher effects	Cultivate a healthy scepticism when exploring likely researcher effects. *Do the researchers favour a particular programme or intervention – for example, did they influence the selection of outcomes? Have they triggered inadvertent researcher effects, e.g. if a qualitative researcher is a doctor did this change how participants communicate or what they chose to share with them?*
Triangulating	Use different methods to research the same issue. *How do review findings compare across different study designs, different schools of thought, or different methods of data collection (Finfgeld-Connett, 2018a)? How do findings from secondary research compare when juxtaposed and discussed against those from your subsequent primary research?*

Elements	Procedures
Weighting the evidence	Asks you to ensure that your conclusions are not simply based on 'vote counting'. Not all studies are equal! *Look at the effect of ordering studies from the highest quality to the lowest quality. Ask yourself 'Are positive or negative aspects clustered around particular points in this ranking?'*
Meaning of outliers	Take precautions against over-generalisation. *Examine studies that show particularly extreme results (either very positive or very negative) or those that are a unique source of a particular theme. Discuss these findings with colleagues and topical experts. Ask them, 'Can you identify possible explanations for the difference in the findings?'. Explore colleagues' explanations in your analysis or suggest them as hypotheses to explore in future research*
Using extreme cases	Whereas outliers relate to extreme results, extreme cases represent atypical contexts. *Examine the characteristics of populations and interventions for an insight into better than expected or worse than expected (but not necessarily outlying) results*
Following up surprises	Following up surprises involves identifying where one or more studies do not fit within their anticipated place within a pattern. *Do more than simply look for outliers; a 'surprise' may lie embedded within the 'pack' of studies but not where predicted. Record surprises as you encounter them because, over an extended period of time, they may lose their capacity to surprise. Having validated surprises, highlight them in publications, oral presentations and press releases, and invite explanations*
Looking for negative evidence	Frequently overlooked because synthesis gravitates towards commonality rather than dissonance. Actively seek disconfirmation of what you believe to be true. Sample purposively from outside the original sampling frame, bring together different perspectives within the research team or harness other procedures to challenge the 'orthodoxy' (Booth et al., 2013a)
Make if–then tests	Testing possible relationships: For example, 'if a study mentions that ..., then the view expressed of... should resemble...'. *If one condition* is *the case, look to see if a second one is. If it is, you are on the way towards understanding what is going on and can make further similar tests. If it is not true, then you need to make other conjectures*
Rule out spurious relations	To follow up if–then testing you need to rule out spurious relations. Ideally, your studies would include those reporting the presence of the two conditions: the absence of each and the presence/absence of a third variable. *Consider whether a third factor or variable may possibly explain away the apparent relationship identified from the data*
Replicate a finding	You may need to refer to external data sources, e.g. in order to replicate a finding. *Perhaps, extend your sampling frame to an adjacent area of literature where the underlying explanatory mechanism is likely to be present. Alternatively, split your set of studies and use half of the studies to generate the theory or hypothesis and the other half to test and validate it*
Check out rival explanations	Keep your mind open to alternative explanations and check out rival explanations. *Record any theory underpinning each study as you extract the data from each. Revisit these theories when you complete your synthesis. Look for explanations in the Introductions/Discussions of the studies or accompanying editorial or commentary material*
Feedback from informants	Using informants to validate findings remains controversial, because the synthesis may not be recognisable to authors of a single study. This is not an argument against respondent validation per se but simply for how to handle and weight feedback against the synthesis. *Gain early and clear agreement on stakeholder roles. Clearly explain how you plan to use any feedback alongside your synthesis*

Source: Based on Miles et al. (2018)

A **truth table**, a matrix codifying the presence or absence of particular factors in individual studies, may be a useful practical tool for identifying such relationships (Cruzes & Dybå, 2011a). This is similar to the thematic matrix demonstrated earlier but with binary indicators of presence or absence (e.g. 1 versus 0 or check box versus empty cell) rather than qualitative themes (Table 8.10).

Table 8.10 Hypothetical truth table for review on attitudes to peripheral supermarkets

	Explanatory variables					Dependent variable
Study	**A**	**B**	**C**	**D**	**E**	**Orchestrated community opposition**
Greenwood & Liffey (2010) (Study 1)	0	1	0	1	1	1
Verdant (2010) (Study 2)	1	1	1	1	1	0
Swathe (2011) (Study 3)	1	1	1	0	0	0
Total	2	3	2	2	2	1

Note: A = Convenience; B = Household economy; C = Focus for community; D = Threat to local commerce; E = Threat to community identity.

Note that findings from this hypothetical truth table appear to show that orchestrated community opposition is less likely to be present if a supermarket emphasises its role as a focus for community activities. However, the contribution from the fictional Greenwood and Liffey study shows that opposition occurs even where this factor is present.

Where to next? Advanced forms of analysis

Up to now we have focused on primarily descriptive procedures of analysis. However, your analytical toolkit also obtains more advanced forms of analysis. We will briefly explore the potential to use the following:

- Identifying gaps
- Reviewer effects
- Identifying the disconfirming case
- Subgroup analysis
- Sensitivity analysis.

Identifying gaps

Qualitative reviewers seek reassurance that their literature sample is adequate: whether they have identified *all* studies (comprehensive sampling), whether they have enough studies (purposive sampling) or whether they have identified the right studies (theoretical sampling) (Suri, 2011).

For an **interpretative review** you should evaluate, with a colleague, supervisor or mentor, whether you have reached **theoretical saturation** (Booth, 2016). In theory, theoretical saturation should be less frequent than in primary research as, unlike interviewees, authors are not independent informants (Dixon-Woods et al., 2006a). Indeed, authors are incentivised to report innovative insights. To challenge **theoretical saturation** you should make strenuous

attempts to sample from other disciplines relevant to the review question or from other types of literature. Whereas **aggregative reviews** implicitly value the average result, **interpretative reviews** seek to identify **the disconfirming case** (Booth et al., 2013a).

As with primary qualitative research the often talked-about 'sweet spot' of **theoretical saturation** is difficult to identify. It is challenging to identify when theoretical saturation has been reached and studies are not adding new insights (Blandford et al., 2016). Some propose that, as an alternative, **bibliographical saturation** may be attainable when follow-up of cross-references no longer leads to included studies not previously identified (Revelli & Viviani, 2013). However, this requires further empirical testing.

Reviewer effects and reflexivity

Even systematic reviews, despite their precautions, cannot be considered neutral vehicles for research findings. A review reflects the 'perspectives, preferences and propensities' (Sandelowski, 2008) of its reviewers. Reviewer preferences operate at every stage from conception of the review and selection of the principal research question through to study identification, selection and assessment. Preferences can be further identified within synthesis and analysis. The Cochrane EPOC Group highlights a need for **reflexivity** within its review template (https://epoc.cochrane.org/sites/epoc.cochrane.org/files/public/uploads/Resources-for-authors2017/epoc_qes_protocol_and_review_template.docx), prospectively within the Protocol/Methods, upon commencement of a review project, and then retrospectively within the Analysis write-up (see Chapter 10). Analysis is the right time to consider, within the Discussion, likely researcher effects, not only in the component studies but also in the review itself.

Systematic reviews claim objectivity but, in reality, only aspire to 'disciplined subjectivity' (Sandelowski, 2008). As an honest reviewer your analysis should acknowledge likely challenges to objectivity posed by your own preoccupations and prejudices. You should recognise that your systematic review is 'situated, partial and perspectival' (Badenhorst, 2018) and communicate these limitations to your reader.

Publication bias

Publication rates of qualitative conference presentations, with less than half being eventually published, are directly comparable with quantitative research (Petticrew et al., 2008). However, qualitative research is more likely to be subsequently published if the study methods and findings are reported well in the abstract. More detailed investigation of patterns and causes of the non-dissemination of qualitative research are needed (Toews et al., 2016; 2017).

You should therefore explore likely publication bias with regard to qualitative studies or theoretical/conceptual studies (Booth et al., 2018a). For qualitative studies you might use a matrix to examine whether any populations, age groups or countries where the focus of interest is common are comparatively under-represented. For theoretical/conceptual studies you might brainstorm, either singly or with colleagues or a mentor, those disciplines that are likely to have studied the focus of interest. Compare your list with the characteristics of your included studies. Are any disciplines comparatively under-represented? Bear in mind that publication bias may apply *within* articles as well as *across* a set of articles. 'Truncation bias' (Campbell et al., 2011)

was coined to refer to the tendency for journals to truncate full reporting for qualitative studies due to article word limits.

While methods for detecting and reporting the effects of publication bias are most developed for quantitative studies (see Chapter 7), similar questions may be asked with regard to reporting bias in qualitative studies (Toews et al., 2016; 2017; Booth et al., 2018a). You can use a framework approach for examining qualitative studies to check whether themes, concerns or issues are missing or under-represented. You might consider whether any specific themes or concerns have not been reported because of stigma, peer pressure, the influence of the researcher, limitations of the methodology or concerns about confidentiality or possible reprisals. If you are conducting a review of barriers and facilitators you can examine whether (i) positive and negative expressions of the same barrier are equally present in the literature (e.g. time pressures and lack of time), and (ii) whether barriers may be paired with corresponding facilitators. Of course, you should examine reasons for such gaps, whether a feature of the data collection process, of incomplete reporting or whether genuinely unrecognised. However, do not make the mistake of thinking that the frequency with which a particular theme is reported relates to its importance:

> sampling research papers is fundamentally not like sampling people. Unlike people, research papers have a vested interest in being different from one another, and are (in theory at least) only published if they are saying something new. Missing out some papers may therefore risk missing out potentially important insights. (Dixon-Woods et al., 2006a)

For theoretical/conceptual studies you may wish to examine citation patterns. If authors neglect to cite a particular author or school of thought within the same field ask yourself, 'Why has this happened? Are other authors ignorant of particular arguments, do conflicts or tensions exist, or is this intentional?'. Look at how citations have cross-fertilised, or alternatively remain in 'silos' across disciplines. Use such observations to inform your own analysis.

Identifying the disconfirming case

Systematic approaches to the literature typically test the robustness of the emerging review product:

> Analytical honesty is a priority; the data analysis process is made transparent with rival explanations and spurious relationships thoughtfully explored. (Whittemore & Knafl, 2005)

While such an approach may seem daunting, particularly to the novice researcher, it is essential if the review is to establish itself as a reliable and authoritative contribution to the evidence base. Identification of the negative or disconfirming case is commonly regarded as the most difficult component of the synthesis process (Whittemore & Knapfl, 2005). It is particularly challenging when conflicting results are equally compelling and derive from high-quality reports. Such differences may typically occur across one or more specific variables. You should try not to attach too much importance to a single preferred variable when a difference may be attributable to the interaction of many variables. Is it possible that multiple interventions do **not** *work together* more effectively but rather that an individual intervention *works alone* with its specific effect being masked by the other interventions?

You can encourage diverse interpretations by valuing specific roles within the team, engineering different researcher viewpoints and through triangulation (Booth et al., 2013a).

Triangulation, a navigational metaphor, includes using multiple data sources (e.g. members of the public, those delivering a service or programme and other stakeholders), multiple data collection methods (e.g. use of in-depth interviews and focus groups), multiple disciplinary perspectives (e.g. education, management science and psychology) and comparison with existing theory (Korstjens & Moser, 2018). Of course, individual studies may differ from the overall set of studies as genuine 'outliers'. In such cases, reconsider whether it makes sense to include outliers within an overarching analysis or whether you should analyse them separately.

Because you could be led towards a wrong conclusion you must document all your hunches and other intuitive steps in the process. You can then retrace your steps and construct an alternative argument. Test any premises for your thinking with a supervisor or mentor and check assumptions with stakeholders or user representatives. Do not automatically assume that your line of reasoning is wrong just because your perceptions are not confirmed by other parties. After all, your synthesised insights extend beyond those of an individual researcher immersed in a single context. However, if conflicting evidence or viewpoints persist, you could suggest specific research that is needed to resolve the issue.

Subgroup analysis

Analysing a qualitative body of research involves moving iteratively between the whole and the component studies. Different groups or 'clusters' of studies share population, intervention, methodological or contextual characteristics. Are these characteristics shared by the total review population or is an individual study the exception to the rule? For example, in a review of e-learning among health professionals, where studies of doctors are in the majority, does the overall interpretation transfer to the subgroup of nurses represented by a smaller proportion of studies or even to another group represented by a single study?

Qualitative sensitivity analysis

As defined in Chapter 7 **sensitivity analysis** is the formal 'exploration of "what ifs"' (Greenhalgh, 2019). **Sensitivity analysis** is increasingly important in qualitative synthesis. Typical indications for performing **sensitivity analysis** in a qualitative evidence synthesis are given in Box 8.8. What is less clear, however, is what to do once such sensitivities are identified.

box 8.8

Reasons for considering a qualitative sensitivity analysis

Consider conducting a qualitative **sensitivity analysis** where:

1. You have had persistent doubts about whether a study is eligible for inclusion within a review; if you exclude this study would one or more themes from your synthesis become unsupported?

(Continued)

2. You have identified significant differences in the quality of included studies; are particular themes only present in poorer quality studies or are they distributed across both good- and poor-quality studies?
3. You are uncertain whether differences between included studies are more important than any similarities. How important are such similarities or differences likely to be in explaining the overall focus of interest?
4. You observe that one study has results very different from the rest of the studies (i.e. it is an obvious outlier); qualitatively does that study have important differences from all other studies or does it simply reflect a similar number and type of differences as are present collectively in other studies?
5. You have assumed that similarly worded themes mean the same thing; how open is your assumption to an alternative interpretation or nuance – i.e. that they are, in fact, substantively different?
6. You consider the overall framework or itemisation of themes to be particularly influenced by one individual study (e.g. the most content rich, the earliest, etc.); could you still find evidence of all the themes were you to exclude this study? (Bear in mind too that later authors may have a vested interest in emphasising additional or alternative themes – do they acknowledge the conceptual legacy of the earlier paper in their citations or have they not identified such themes in their data?)

Matching the analysis to the review purpose

Approaches to qualitative synthesis range from those that aim to identify and describe major themes to those that seek more generalisable, interpretive explanations for use in theory generating (Finfgeld-Connett, 2013). In fact, many syntheses use both approaches or include findings that are neither descriptive nor interpretive. Below, we explore how diverse qualitative reviews match their analytical techniques to their purpose (Table 8.11).

Table 8.11 Examining methods of analysis used in qualitative reviews

Type of review	Methods of analysis used	Application of methods	Review example
Framework synthesis	Qualitative sensitivity analysis Identifying gaps Recommendations for practice, policy and future research	Majority of studies rated as high quality. Reports of lower quality included in synthesis. Sensitivity analysis, using matrix queries within NVivo, confirmed findings from lower quality studies did not influence overall findings (weighting/contribution)	Healthcare staffs' experiences and perceptions of caring for people with dementia in the acute setting (Houghton et al., 2016)
Meta-ethnography	Used modified meta-ethnographic approach to inductively identify key concepts and synthesise themes	Chose meta-ethnographic approach because its inductive process can account for differences in methodology and focus. Potential for higher level analysis and to generate new research	A systematic literature review of the ethics of conducting research in the humanitarian setting (Bruno & Haar, 2020)

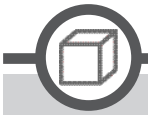
Type of review	Methods of analysis used	Application of methods	Review example
	Process of extracting themes using reciprocal translation and constant comparison across studies	questions. Three step analysis: (1) Identifying original concepts and ideas from each paper; (2) synthesising ideas into cross-cutting themes; and (3) identifying major themes. Process elucidated tensions and areas for future research	
Thematic synthesis	Results and discussion sections (or equivalents) coded as qualitative text. Findings translated into common set of qualitative codes. Then codes from first round reviewed and reorganised into hierarchical, thematic groups	Use 'thematic coding' (within approach called 'qualitative meta-synthesis') to analyse role of Australia's natural resource management programs in farmers' well-being	Healthier land, healthier farmers: considering the potential of natural resource management as a place-focused farmer health intervention (Schirmer et al., 2013)

WRITING UP AND PRESENTING REVIEW FINDINGS

Your key objective in writing up the findings of your review is to ensure that your synthesis is clearly and accurately reported (Finfgeld-Connett, 2018c). You can display extracted or coded qualitative data as tables, matrices, graphs, charts or networks (Whittemore & Knafl, 2005). Such displays help to visualise patterns and relationships within and across the constituent studies and offer a starting point for interpretation and analysis. Visualisation using a framework lends itself to critical reflection by a research team and diverse stakeholders, beyond insights from a single analyst (Brunton et al., 2020).

Using tables to present your data

You can use tables to describe characteristics of the population, intervention and top-level themes (Box 8.9). You can also use tabulation to describe study characteristics (e.g. study design). You may use tabulation to report the study quality of individual studies, making it easier to identify higher quality studies. Tabulation is particularly valuable for cross-case comparison and for 'eyeballing' patterns across rows or down columns. However, tabulation is necessarily reductive and loses details of implementation context. Selectively including data in tables can result in loss of detail that helps in interpreting included studies. More details of tabulation, together with examples, are given in Chapter 7.



box 8.9

Tell tale tables!

Tables of included studies are easy to compile, right? Wrong!

When reviewing a review assignment or manuscript we look for signs of carelessness:

1. Has the author only presented the included studies in the order that they came to hand?
2. Could the author have chosen a natural order for listed studies to support the accompanying narrative? For example, chronological order to show how the evidence base evolves over time? Reverse chronological order to emphasise current findings? Geographical region to group comparable studies?
3. If there is no obvious alternative order, are listed studies organised by author surname and then by date of publication? This allows the reader to locate familiar studies quickly.
4. Does it make sense to present listed studies in a single sequence or do they fall into natural subgroups or categories? For example, high-income countries and low- and middle-income countries; primary care and secondary care; children, adults and older people; and so on. Are they then sorted into a natural order within each of these categories?
5. Has the author simply cut and pasted raw data from the original articles into the review tables without editing? Careful editing seeks (i) to strip out unnecessary text (e.g. 'This study was conducted in'); (ii) to standardise the format and detail across studies; and (iii) to avoid splitting tables and cells across pages.
6. Has the author standardised inconsistent data under common labels, where appropriate, to help to identify patterns across columns? For example, categorising 'Survey design', 'Survey questionnaire' and 'Survey' under a single common label of 'Survey'. Note that this is not always appropriate where labels carry meaningful distinctions or where labels used by authors are the focus of study (e.g. 'Third World', 'Developing Countries' and 'Low-and Middle-Income Countries').

Using numbers to present your data

Although qualitative systematic reviews focus on textual and narrative methods of presentation, qualitative synthesis is both descriptive and analytical. For descriptive purposes numerical counting may be important – for example, how many studies come from each country, how many studies include perspectives from patients, carers and health professionals respectively, etc. You can also use numerical data to characterise the included population, for example to determine the average age of the population or the percentage who smoke. You can refer to contextual details to explain why qualitative themes/factors are present in some studies but not in others.

Using graphics to present your data

Before exploring the use of graphics in expressing your synthesis we suggest that you undertake Exercise 8.3.

exercise 8.3

Helpful display of themes and concepts

Briefly reflect on a research study from a journal article that you have recently read, not necessarily a systematic review. How does the presentation of themes and concepts help you when reading the study? Does anything make the themes or concepts difficult to understand and interpret? If so, what? How would you improve the presentation?

Graphical approaches help with the identification of patterns. They help to visualise how parts fit within an overall whole. You can use graphical approaches to cross-link disparate features of a review (e.g. for linking study characteristics to findings). For example, you could use colour coding to indicate whether qualitative findings from a review are associated with negative (red), neutral (yellow) or positive (green) results.

> Creativity and critical analysis of data and data displays are key elements in data comparison and the identification of important and accurate patterns and themes. (Whittemore & Knafl, 2005)

You should use graphs, charts, forms and figures to help you visualise, sort and compare the data across your primary sources (Whittemore & Knafl, 2005). You can use graphical methods to explore, as well as present, your data. You can use **mind maps**, **concept maps** and **idea webs** to map out the main themes or variables in a creative and imaginative way (Exercise 8.1). Graphical presentation can use lines and boxes to present how studies are linked together with thick lines indicating multiple studies and thin lines depicting a single study. Continuous lines may indicate a confirmed link with dotted lines for hypothesised links. Shading can be used to depict studies that contribute to a particular theme. Use of graphics is further considered in Chapter 10. You will find it helpful to think of graphical presentation as (i) methods of presentation that you use to explore patterns as you conduct a review (i.e. **formative** presentation) and (ii) methods of presentation that you can use when presenting findings to a target audience (i.e. **summative** presentation). Some methods are best for exploring and others for explaining – and some suitable for both. For example, one Cochrane review used a complex logic model while the review team was exploring potential connections *during* its review and a simplified published version to explain the principal connections to readers of the *finalised* review (Turley et al., 2013).

Revisiting the review question(s)

You should return to your **review protocol** and question throughout your review (Butler et al., 2016), for example when checking items against the scope or for planning your synthesis strategy. It is particularly important to do this at the analysis stage. By now you have been so intensively and extensively engaged with the literature that your review could drift from being question driven to literature driven. You need to check that the questions you are answering are those identified in the original review protocol. You also need to establish that the included studies map to each question or whether you need to conduct additional searches to populate any gaps. For a **mapping review**, you can identify where gaps exist, provided you are confident that

you have looked in the right places. For a policy review, you may have to settle for lower quality study designs, drilling down to lower forms of evidence such as case series, case study or even expert opinion. Such decisions will impact on how you describe your methods, discuss uncertainties surrounding the evidence base and make recommendations for action and for future research. You could map the literature against a **logic model** to identify which questions are well covered and which are data poor. Finally, revisiting your review question may suggest further lines of enquiry that your analysis might take. For example, a reference in your objectives to 'evaluating the quantity and quality of the retrieved literature' may prompt you to use tables and mapping to reflect the *quantity* of the literature and sensitivity analysis to investigate its *quality*.

Discussing the limitations of the evidence

Placing review findings in context requires that you identify the limitations of the evidence. One systematic way of doing this is to use the GRADE-CERQual approach. This approach is applied to individual review findings from a qualitative evidence synthesis (Lewin et al., 2015). Critical to the application of GRADE-CERQual is an understanding that a review finding is:

> an analytic output from a qualitative evidence synthesis that, based on data from primary studies, describes a phenomenon or an aspect of a phenomenon. (Lewin et al., 2018b)

GRADE-CERQual aims to describe how much confidence decision-makers and other users can place in individual review findings from syntheses of qualitative evidence. Confidence in the evidence requires that you assess the extent to which the review finding is a reasonable representation of the phenomenon of interest against four separate components (Table 8.12). This assessment communicates whether a research finding differs substantively (i.e. enough to change a policy or practice decision) from the focus of interest.

Table 8.12 Components of the GRADE-CERQual approach

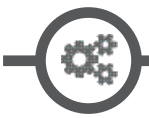
Component	Definition
Methodological limitations	The extent to which there are problems in the design or conduct of the primary studies that contributed evidence to a review finding
Relevance	The extent to which the body of evidence from the primary studies supporting a review finding is applicable to the context (perspective or population, phenomenon of interest, setting) specified in the review question
Coherence	The extent to which the pattern that constitutes a review finding is based on data that is similar across multiple individual studies and/or incorporates convincing explanations for any variations across individual studies
Adequacy of data	An overall determination of the degree of richness and/or scope of the data as well as the quantity of data supporting a review finding

Each GRADE-CERQual component (Table 8.12) is assessed individually, often requiring iteration between components such as coherence and adequacy (Lewin et al., 2018b), before a final overall assessment of confidence in the review finding is produced (Table 8.13).

Table 8.13 The GRADE-CERQual approach – definitions of levels of confidence in a review finding

Level	Definition
High confidence	It is highly likely that the review finding is a reasonable representation of the phenomenon of interest
Moderate confidence	It is likely that the review finding is a reasonable representation of the phenomenon of interest
Low confidence	It is possible that the review finding is a reasonable representation of the phenomenon of interest
Very low confidence	It is not clear whether the review finding is a reasonable representation of the phenomenon of interest

Finally a summary of qualitative findings table is produced, depicting the finding, the assessment for the finding, a brief explanation and identification of the contributing studies (Lewin et al., 2018a).



rapid review tip 17

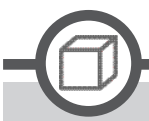
Grading the certainty of qualitative evidence

Use a single reviewer to grade the certainty of evidence. Use a second reviewer to verify all judgements (and to check the footnoted rationales of the first reviewer).

Garritty et al. (2021)

To discuss the limitations of your review well you do not simply list systematic errors and associated problems with validity. That is like a plumber who meets any problems, regardless of severity, with a sharp intake of breath! Instead, you should explain the meaning of any errors and their likely influence. Your audience will gain a clear picture of how methodological limitations impact on the findings of the review (Munthe-Kaas et al., 2018).

Just as you take steps to avoid biases when you plan, conduct, analyse and interpret individual primary studies, you must take similar steps when you plan, conduct, analyse and interpret evidence syntheses. When you evaluate your review, or the published review of another, you need to identify any methodological limitations (Tong et al., 2016; SBU, 2019) (Box 8.10).



box 8.10

Identifying methodological limitations in your review

1. Have I clearly stated the question examined in my review?
2. Does the review team include an appropriate mix of skills and perspectives?

(Continued)

Search

3. Are my search approaches appropriate to my research question?
4. Does my search strategy include the diverse terms required to identify the relevant studies?
5. Are the inclusion/exclusion criteria for my review clearly described?
6. Was study selection undertaken in an objective and independent way, including appropriate quality assurance procedures?

Appraisal

7. Did I assess any risks to rigour of included studies using explicit criteria, including appropriate quality assurance procedures?

Synthesis

8. Was the chosen method of synthesis appropriate to the research question, audience and purpose?
9. Were procedures for the chosen method of synthesis followed appropriately?
10. Is the relationship between the output from the synthesis and the original included studies clear and transparent?

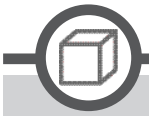
Analysis

11. Are the conclusions and recommendations from the review report supported by the synthesis?

(Based on Booth et al., 2013a; 2016; Lewin et al., 2018b; Tong et al., 2016; SBU, 2019)

Rapid QES (rQES)

Abbreviated timelines often do not allow for the full 6–12 months it may take to complete a QES, which has prompted several agencies to explore the concept of 'rapid qualitative evidence synthesis' (rQES) (Majid & Weeks, 2020) (Box 8.11). As with rapid reviews more generically, this involves using abbreviated methods (shortcuts) and/or accelerating standard procedures through using large, well-coordinated teams and/or technology (Campbell F et al., 2019).



box 8.11

What is a rapid qualitative evidence synthesis (rQES)?

An rQES uses accelerated or abbreviated review methods of qualitative synthesis to meet a policy imperative for person-centred healthcare and to ensure that patient and caregiver perspectives and experiences are central to healthcare decisions (Majid & Weeks, 2020). Shortcuts or fast-track procedures may take place at any stage of the SALSA process including limiting the number of databases, abbreviating or omitting quality appraisal,

using existing frameworks for synthesis and focusing on descriptive rather than analytical findings. A cross-sectional audit of rQES found few published, and a larger number of unpublished, examples (Campbell F et al., 2019). In 2020 the first ever Cochrane rQES was completed within a period of less than 30 days (Houghton et al., 2020). The authors shared lessons learned (Biesty et al., 2020). Published guidance exists to inform rQES methods (NHS Scotland, 2019).

At a glance

Reviewer expertise	
Information expertise	
Time	
Resources	££

Mega-ethnography and mega-aggregation (review of reviews)

The proliferation of qualitative evidence syntheses (QESs) had led to the appearance of reviews of QESs that seek to synthesise review-level findings. While there is no reason to suppose that such overviews can only harness a limited range of synthesis methods, the first of these methods have been labelled mega-ethnography (after meta-ethnography) (Toye et al., 2017; 2019) and mega-aggregation (which combines meta-aggregation with framework synthesis) (Hendricks et al., 2021). While such approaches remain in their infancy and examples are limited, Box 8.12 briefly defines each method. Table 8.14 summarises and juxtaposes the main procedures within the two methods.

box 8.12

What are mega-ethnography and mega-aggregation?

Mega-ethnography is a proposed method for synthesising multiple QESs using the methods of meta-ethnography. The innovation of mega-ethnography is to use conceptual findings from qualitative evidence syntheses as primary data. The process largely follows that for meta-ethnography but seeks qualitative syntheses rather than primary qualitative studies and adds an additional layer of interpretation (labelled fourth-level constructs) (Toye et al., 2017).

Mega-aggregation uses 'mega-aggregation framework synthesis, or synthesis of qualitative evidence syntheses using the methods of framework synthesis at the overview level'. Originators claim the novel method is a 'transparent and efficient method for assessing the quality and making sense of existing qualitative systematic reviews' (Hendricks et al., 2021).

Table 8.14 Comparison of mega-aggregation and mega-ethnography

Mega-aggregation (Hendricks et al., 2021)		Mega-ethnography (Toye et al., 2017)	
(1) Identify a clearly defined review question and objectives		Stage 1: Getting started	
(2) Identify a theoretical framework or model			
(3) Decide on criteria for considering reviews for inclusion		Stage 2: Deciding what is relevant	
(4) Conduct searching and screening			
		Stage 3: Reading the studies	
(5) Conduct quality appraisal of the included studies			
(6) Data extraction and categorisation		Stage 4: Determining how studies are related to each other	
		Stage 5: Translating studies into each other	
(7) Present and synthesise the findings		Stage 6: Synthesising translations	
(8) Transparent reporting		Stage 7: Expressing the synthesis	
At a glance		At a glance	
Reviewer expertise	🕒🕒	Reviewer expertise	🕒🕒🕒
Information expertise	ⓘ	Information expertise	ⓘ
Time	🕘🕘	Time	🕘🕘
Resources	££	Resources	££

SUMMARY

This chapter illustrates that synthesis includes creative elements of seeking patterns, examining for consistency and identifying the disconfirming case. As a reviewer you will find it stimulating to explore reasons for variations, discrepancies and inconsistencies. This exploration, together with testing of the robustness of findings, constitutes analysis, a high-order research skill. Analysis is often presented as a naturally occurring sequel lacking formal procedures. Analysis involves identifying patterns to data and included studies, investigating conflicting or outlying cases and exploring relationships between particular variables.

Concerns about applicability, generalisability, replicability and implementation fidelity shape recommendations for research and for practice. Once such recommendations are drafted and exist in a fluid or malleable state, you can turn your attention to how best to present the report, the focus for Chapter 10.

key learning points

- Numerous approaches to synthesis exist and you should explore published methods and examples before selecting a methodology that is fit for purpose.
- Data extraction is a key step towards synthesis; you will find it helpful to picture what your final synthesis might look like before selecting data to be extracted.

- Analysis initially involves testing the robustness of your synthesis in the light of what you know about the quality of included studies.
- You can select from diverse types of data presentation including textual, graphical, numerical and tabular approaches.

frequently asked questions (FAQs)

FAQ 8.1 How do I choose an appropriate method for qualitative synthesis?

Several publications itemise the rich choice of QES methods. However, relatively few offer guidance on how to match your review to the method of synthesis (Booth et al., 2016; 2018b). Look back to Chapter 3 and attempt the scenarios given. Use the RETREAT framework (Chapter 3) to specify key features such as Research question, Audience & purpose, and Type of data for your review. Consult sources that focus on selecting an appropriate method: Hannes and Lockwood (2011a) and Booth et al. (2018b). Gough et al. (2017) offer an overview of available choices and their theoretical underpinnings.

FAQ 8.2 Which methods of qualitative evidence synthesis are most suitable for a novice reviewer?

Review expertise is not the only issue to consider. You need to be familiar with qualitative research when reviewing qualitative literature. However, the most accessible methods of synthesis include meta-aggregation, thematic synthesis or framework synthesis. Meta-aggregation minimises the interpretive burden as the reviewer compiles themes articulated by the authors of the primary studies, supporting these with verbatim extracts from the texts. Thematic synthesis is considered intuitive to the novice reviewer (Soilemezi & Linceviciute, 2018). However, if your topic is well theorised and you are not confident in generating new themes then you might consider framework synthesis. Having gained confidence from mapping most of the data to an existing framework you may feel able to create new themes for data not previously accommodated within the framework.

FAQ 8.3 Once I have identified all my included papers where should I start?

You might start with a holistic approach that involves reading through the body of literature, with very little hesitation or interruption, perhaps occasionally memoing or annotating with brief points to return to later (Finfgeld-Connett, 2018a). Alternatively, you might start with an index paper against which to compare all subsequent papers. Considerable variation exists in how an index paper is identified. Some start with the earliest paper, the most cited paper, or the richest in terms of data or ideas, etc. Garside et al. (2008) describe how they chose 'the only paper with a strong conceptual framework. Other papers, while organising data under emergent themes, showed little attempt to provide explanatory concepts'. Their focus on creating an explanatory model justified selecting an index paper based on its conceptual richness. Alternatively, your topic may be suited to a sampling approach (Suri, 2011); the literature may fall naturally into different disciplines or schools of thought. By way of contrast, Toye et al. (2014; 2017) resisted choosing an index paper for both a meta-ethnography and a mega-ethnography, citing concerns about (i) being constrained by a priori concepts, (ii) difficulties in deciding which paper to use as an index paper, particularly as it can potentially affect 'the resulting interpretation',

(Continued)

and (iii) recognition that a review team may not 'find the conceptually "richest" study at the outset'.

FAQ 8.4 How many studies do I need for my qualitative synthesis?

As with any such question there is no definitive answer. However, you should bear in mind several important considerations. The available data must fulfil the GRADE-CERQual criterion for **adequacy**, which factors in the number of studies *and* the richness/thickness of the data. If the objective is to explore the effect of context then you require sufficient thickness of contextual detail to distinguish between studies. If you want to generate theorising then you require sufficient richness of data to allow conceptual development. Certain qualitative syntheses methods favour certain thresholds of numbers of studies. Typically, aggregative methods such as **meta-aggregation**, **framework synthesis** and **thematic synthesis** can accommodate larger numbers of studies. Interpretative reviews require more interpretation and so, potentially, may be impaired by larger numbers of studies (Campbell et al., 2011). France et al. (2014) report an average of 21 papers (range 3–77) in their sample of meta-ethnographies. However, such distinctions are becoming less definitive as Toye et al., (2014) report analysing over 70 papers by harnessing the functionality of NVivo software. Conversely, several commentators, such as Thorne (2015; 2017) and Bergdahl (2019), express concern at superficial analyses that may result from large numbers of thin studies, time constraints or relative analytical naivete of the reviewers.

FAQ 8.5 What guidance is available for reporting qualitative synthesis?

You should provide a rationale for how searching was conducted, following appropriate guidance/good practice for reporting literature searches, for example PRISMA-S (Rethlefsen et al., 2021) and STARLITE (Booth, 2006; 2016). In contrast, with quantitative systematic reviews and meta-analysis few published reporting guidelines exist for qualitative synthesis (France et al., 2014; Tong et al., 2012). The enhancing transparency in reporting the synthesis of qualitative research (ENTREQ) statement (Tong et al., 2012) was developed by a small international group of researchers to encourage transparency in the reporting of syntheses. The ENTREQ statement contains 21 items grouped into five domains: introduction; methods and methodology; literature search and selection; appraisal; and synthesis of findings. Uptake of the ENTREQ statement is relatively poor (France et al., 2014), perhaps reflecting its generic origins. In contrast, the eMERGe guidelines for meta-ethnography followed systematic processes of literature review and consensus development (France et al., 2019a). As a consequence, you may find the eMERGe guidelines a useful model even if you have not undertaken a meta-ethnography. Further details on reporting standards are given in Chapter 10.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Finfgeld-Connett D (2018) *A Guide to Qualitative Meta-synthesis*. London: Routledge.
Although targeted at 'theory-generating meta-synthesis' this book describes standard procedures for systematic reviews of qualitative research. It includes chapters that map closely to the SALSA process.

Hannes K & Lockwood C (2011) *Synthesizing Qualitative Research: Choosing the Right Approach*. Chichester: Wiley.
Tackles the choices offered by qualitative synthesis methods. Devotes a chapter to each main method of qualitative synthesis and walks through each methodology with a worked case example.

Munn Z, Tufanaru C & Aromataris E (2014) JBI's systematic reviews: data extraction and synthesis. *American Journal of Nursing*, 114(7): 49–54.
From a mini-series on systematic reviews from staff at the Joanna Briggs Institute (JBI), this article covers data extraction; often neglected in step-by-step guides.

Ring N, Ritchie K, Mandava L & Jepson R (2010) A guide to synthesising qualitative research for researchers undertaking health technology assessments and systematic reviews. NHS Improvement, Scotland.
The first text to examine qualitative synthesis within the context of health technology assessment, this report provides a good cross-sectional view of qualitative synthesis.

SBU (2016) Evaluation and synthesis of studies using qualitative methods of analysis. Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU), Stockholm.
An accessible text from the SBU that provides a good contemporaneous view of current methods and issues.

Soilemezi D & Linceviciute S (2018) Synthesizing qualitative research: reflections and lessons learnt by two new reviewers. *International Journal of Qualitative Methods*. https://doi.org/10.1177/1609406918768014
Refreshingly open reflection from novice reviewers on challenges and pitfalls in planning and conducting a QES. Particular challenges for new reviewers include how to identify relevant research to answer the review question and pitfalls during screening and evaluation.

9

SYNTHESISING AND ANALYSING MIXED METHODS DATA

in a nutshell

How to synthesise and analyse mixed methods data

- You can integrate data at Question, Search, Appraisal, Synthesis and Analysis stages. Alternatively, you could integrate two reviews, once completed, to form a third, integrative review.
- Approaches to integration require an overarching structure: a matrix, a graph, a logic model, a conceptual framework or an interweave approach.
- One alternative to integrating quantitative and qualitative reviews within a third synthesis is to use a mixed methods methodology such as critical interpretive synthesis, meta-narrative or realist synthesis.

key terms explained

convergent: approach to integration that involves conducting two (or more) review components (e.g. quantitative and qualitative) separately before integrating the different data and methods of analysis within a third, final step. Compare sequential, where you complete one review component first with the results of this shaping the subsequent component(s).

critical interpretive synthesis: a critical and reflexive approach to the literature, including consideration of contradictions and flaws in evidence and theory

mixed methods review: a generic term for a review that integrates (i) qualitative and quantitative research questions, (ii) qualitative research methods and quantitative research designs, (iii) techniques for collecting and analysing qualitative and quantitative evidence, and (iv) qualitative findings and quantitative results.

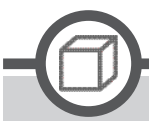
narrative review: a versatile approach that weaves together different questions, research designs, and contexts of individual studies within a common line of argument. Not to be confused with meta-narrative review which explores how a common concept has been handled within different research paradigms or traditions.

realist synthesis: synthesis of diverse evidence that seeks to identify underlying causal mechanisms and explore how they work under what conditions, going beyond 'What works?' to answer the question 'What works for whom under what circumstances?'. Also known as realist review.

INTRODUCTION

Increasingly decision-makers need to answer complex questions that require evidence from both the quantitative and qualitative literature. Alongside recognition that answering questions on effectiveness alone is not enough, issues of appropriateness, acceptability and equity (Tugwell et al., 2010) are acknowledged as equally important to decision-making. Interest in integration has increased recently with attention focused on complex interventions (Petticrew et al., 2013a). Complex interventions not only have *intended* effects that can be specified in advance and therefore measured by routine quantitative data, but also have *emergent* effects that are captured qualitatively as they unfold within an ever-changing environment (Moore et al., 2015). Recent years have witnessed an unparalleled growth in mixed methods reviews.

The term 'mixed methods reviews' refers to diverse types of review with different points at which quantitative data and qualitative data are brought together in an integrative synthesis (Harden et al., 2018) (see Box 9.1). Integrative synthesis may answer such questions as: *'How might I reconcile the findings across different methods, if at all?' 'Can I explain apparent inconsistencies between findings from different methods?' 'What does bringing together different data sources reveal about gaps in the evidence base?'*. You can summarise qualitative data quantitatively (e.g. counting how often themes or words appear using content analysis) (Bearman & Dawson, 2013). More commonly, you can synthesise quantitative data qualitatively as themes or constructs (Bearman & Dawson, 2013).



box 9.1

What is a mixed methods review?

Mixed methods research is 'a research approach in which a researcher integrates (a) qualitative and quantitative research questions, (b) qualitative research methods and quantitative research designs, (c) techniques for collecting and analyzing qualitative and quantitative

(Continued)

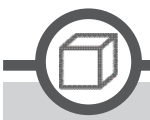
evidence, and (d) qualitative findings and quantitative results' (Pluye & Hong, 2014). A mixed methods review may:

1. analyse *unrelated* quantitative and qualitative studies separately and then bring both together in an integrative synthesis; or
2. include only *related* quantitative and qualitative studies that share a study context, and bring those two types of study together;
3. include primary studies where quantitative and primary qualitative data are reported in a single study report; and
4. integrate quantitative, qualitative and mixed methods data from primary studies.

To a large degree, the integration of quantitative and qualitative data is the outstanding methodological challenge for systematic approaches to reviewing the literature. When deciding whether to integrate quantitative and qualitative data you need to trade the simplicity of separate review messages against the added value of bringing both types of data together. Reviews may be mixed in three ways:

- By the type of study included (i.e., studies reporting qualitative/textual findings and those reporting quantitative/numerical results).
- By the type of synthesis method used (e.g., statistical meta-analysis and qualitative thematic synthesis).
- By the mode of analysis (e.g., theory testing *and* theory building).

As with any review there are key questions to consider when planning and before conducting a mixed methods review (Box 9.2).



box 9.2

Decision points when *planning* a mixed methods review

Will I integrate my review question or will I formulate two or more separate questions?

For example, a single question on what people prefer could be answered by qualitative data or by quantitative survey question responses. Alternatively, a question on what works (quantitative) may be followed by a complementary question on factors that impede or facilitate implementation (qualitative).

Will the quantitative and qualitative questions cover identical scope or will they have different boundaries?

It is not unreasonable, for example, for quantitative studies to focus exclusively on interventions but for associated qualitative studies to extend beyond interventions to include experience of a condition or situation, whether impacted by an intervention or not (Lorenc et al., 2012b).

Will I conduct a single search for quantitative and qualitative studies or will I conduct separate searches for each?

For a single search, abstracts and then full text are assigned to the relevant review during the sift process. Separate searches often use study filters (see Chapter 5) to identify particular study types or designs.

Will I use a single synthesis method for both types of study or will I use separate synthesis methods for quantitative and qualitative studies?

Certain synthesis methods (e.g. narrative synthesis, realist synthesis, critical interpretive synthesis and meta-narrative) are designed for all types of research study, regardless of whether containing quantitative or qualitative data. In other cases you might pick the most appropriate synthesis method for each data type.

Will I analyse quantitative and qualitative data in the same way (e.g. analysing both thematically or using frequencies for study characteristics) or will I analyse data in separate ways?

Although certain types of analysis are associated with particular types of study they are not exclusively so. You can handle qualitative data quantitatively (as frequencies or binary responses), or process quantitative data qualitatively (analysing thematic content).

Will I use a single structure for the data extraction form or separate structures for each type of study?

When focusing on study characteristics (as for a mapping review), rather than analysing actual results you could tabulate all types of study within a single format (e.g. study design, sample size, type of participants, etc.). You could also 'branch' different paths in an online form according to the study type.

Will I use a structure or framework to bring findings together or will I present findings separately?

A theoretical or policy framework, logic model or a matrix may be used as a common structure upon which to hang quantitative outcomes and qualitative findings.

Will I integrate the results within a single summary of findings table or present parallel summaries of results?

You may present quantitative and qualitative results together within a single table to assist decision-makers, alternatively you may 'segregate' quantitative outcomes from qualitative issues within parallel presentations.

UNDERTAKING A MIXED METHODS REVIEW

A common model for a mixed methods review is the **convergent approach**. In a convergent approach you conduct the two review components (i.e. quantitative and qualitative) separately before integrating the different data and methods of analysis as a third and final step (Pluye & Hong, 2014). Within broad inclusion criteria (or one set of criteria for the quantitative studies and one set for the qualitative studies) you bring studies together within the two sets and then use appropriate methods of synthesis for the different types of data (Gough, 2015).

Other mixed methods reviews use a **sequential approach**. One sub-review is performed first and then the results of this review shape the subsequent sub-review of the other type of

data (Pluye & Hong, 2014). So, you may conduct a review on the effects of an intervention and then look at whether the intervention is acceptable to its intended audience (i.e. quantitative followed by qualitative). For example, the EPPI-Centre's mixed methods review of barriers to healthy eating (Gough, 2015) found only a modest effect from a quantitative (effectiveness) review of public health interventions. A qualitative review of studies of how children and young people understand and view healthy eating revealed that the public health interventions did not account for their views. Interventions aligned to the views of the children and young people were found to be most effective.

Alternatively, you could conduct a qualitative synthesis to identify what features of an intervention users prefer and then undertake an effectiveness review limited to interventions that include these desired features. This model of using these complementary different reviews to examine what works for whom under what circumstances offers a feasible alternative to **realist synthesis** (see later in this chapter).

Some researchers use notation to indicate which of the two reviews is considered dominant and the sequencing of the reviews (Heyvaert et al., 2013b). So, QUAL–Quant indicates a review where the qualitative component (as indicated by the capitals) is the driver and where the qualitative precedes the quantitative (as indicated by the sequence). However, the most important consideration is that you ensure that how you describe each review is transparent and communicates how both review components are brought together (Pluye & Hong, 2014).

Tricco et al. (2016a) identify seven knowledge synthesis methods (critical interpretive synthesis, integrative review, meta-narrative review, meta-summary, mixed studies review, narrative synthesis and realist review) that can be used to integrate quantitative and qualitative data. In this chapter we will focus on the most versatile options, the mixed studies review and integrative review, while mentioning examples of the other methods in passing (Tables 9.1 & 9.2).

Mixed methods reviews are well suited to the exploratory phase of a dissertation or thesis where you need to identify what is known, together with any research gaps. In needing to be familiar with both quantitative and qualitative primary research, you are increasing the scale and technical complexity of the review project. Typically, such approaches require a widened skills base across the entire team and may require formal involvement of stakeholders. Decisions on when and how to bring the two syntheses together, whether conducted in parallel or serially/sequentially, add further to the complexity of project management. On the other hand, one of the components may already have been completed (e.g. a Cochrane or Campbell review) and you can focus attention on the complementary review and how to integrate it.

Notice (Table 9.2) how planning or 'Preparation' for a mixed methods review commands five of twelve procedural steps (i.e. steps 1–5). Essentially you are conducting three major projects in one: a review of quantitative data, a review of qualitative data and a method of integrating both reviews.

A STEP-BY-STEP GUIDE TO MIXED METHODS SYNTHESIS

While not all mixed methods reviews require three reviews in one, all are complex. The 'Take Home Message' is that a mixed methods review is not typically twice the effort of a single systematic review (i.e. a quantitative plus a qualitative review) – it is closer to three times the effort! While you may save time and effort along the way by combining review processes, you should start from assuming this triple level of effort.

Table 9.1 Examples of some mixed methods review methods

Review type	Definition	At a glance		Key reference
Mixed studies review	'the core intention is to combine quantitative and qualitative data (from primary studies) or integrate quantitative evidence and qualitative evidence to create a breadth and depth of understanding that can confirm or dispute evidence and ultimately answer the review question/s posed' (Lizarondo et al., 2020)	Reviewer expertise	🧍🧍🧍	Lizarondo L, Stern C, Carrier J, Godfrey C, Rieger K, Salmond S, Apostolo J, Kirkpatrick P & Loveday H (2020) Chapter 8: Mixed methods systematic reviews. In: Aromataris E & Munn Z (eds), *JBI Manual for Evidence Synthesis*. Available from: https://synthesismanual.jbi.global. doi: 10.46658/JBIMES-20-09
		Information expertise	ⓘⓘⓘ	
		Time	🕒🕒🕒	
		Resources	£££	
Critical interpretive synthesis	Specifically involves 'a critical and reflexive approach to the literature, including consideration of contradictions and flaws in evidence and theory' (Dixon-Woods et al., 2006b)	Reviewer expertise	🧍🧍🧍	Dixon-Woods M, Cavers D, Agarwal S, Annandale E, Arthur A, Harvey J, Hsu R, Katbamna S, Olsen R, Smith L & Riley R (2006b) Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC Medical Research Methodology*, 6(1): 1–3
		Information expertise	ⓘⓘⓘ	
		Time	🕒🕒	
		Resources	££	
Integrative review	Originators claim that 'The integrative review method is the only approach that allows for the combination of diverse methodologies (e.g. experimental and non-experimental research)'	Reviewer expertise	🧍	Whittemore R & Knafl K (2005) The integrative review: updated methodology. *Journal of Advanced Nursing*, 52(5): 546–53
		Information expertise	ⓘⓘ	
		Time	🕒	
		Resources	£	
Meta-narrative review	Approach to pursuing 'lines of argument' used to explore large and heterogeneous literatures by identifying the unfolding 'storyline' of research (Greenhalgh et al., 2005)	Reviewer expertise	🧍🧍	Greenhalgh T & Wong G (2013) Training materials for meta-narrative reviews. Global Health Innovation and Policy Unit Centre for Primary Care and Public Health, Blizard Institute, Queen Mary University of London
		Information expertise	ⓘⓘ	
		Time	🕒🕒	
		Resources	££	
Realist review	Focuses on understanding and unpacking the mechanisms by which an intervention works (or fails to work), to provide an explanation, as opposed to a judgement about how it works (Pawson et al., 2005). 'Realist review' and 'realist synthesis' used interchangeably	Reviewer expertise	🧍🧍🧍	Rycroft-Malone J, McCormack B, Hutchinson AM et al. (2012) Realist synthesis: illustrating the method for implementation research. *Implementation Science*, 7: 33. doi: 10.1186/1748-5908-7-33
		Information expertise	ⓘⓘⓘ	
		Time	🕒🕒	
		Resources	££	

Table 9.2 SALSA stages for the mixed methods reviews

Review type	Preparation	Search	Appraisal	Synthesis	Analysis	Conclusion
Mixed studies review	Constructing statement of overall goal/research problem Scoping the review Formulating the review question(s) Deciding on the review design Determining initial criteria for inclusion/exclusion	Conducting an extensive literature search Selecting final articles for inclusion	Assessing study quality Extracting the data	Synthesising and integrating the studies	Interpreting the evidence	Presenting the results No reporting guidance but suggested outline available (see below)
Critical interpretive synthesis	Formulation of an open research question to be refined during its execution and not finalised until the end of the review	Literature search: a broad searching strategy (e.g. website search, reference chaining, contacting experts) is initiated in addition to structured approach. Literature selected purposively with flexible inclusion criteria. Selection informed by conceptual framework based on theoretical saturation	Quality appraisal: is based on content of paper, likely relevance and theoretical contribution. 'Fatally flawed' papers excluded. Quality assessed using five questions. Exclusion by quality usually deferred as methodologically weak papers provide insights	Formulation of a synthesising argument: concepts constantly compared with data to identify relationships. Aim to develop synthesising argument as a coherent theoretical framework including a network of constructs and relationships.	Requires constant reflexivity with ongoing critical orientation by placing literature within its context. Construction of theoretical framework starts with analysis of sources, similar to meta-ethnography. Recurring themes identified using language from studies themselves.	No specific reporting guidance PRISMA/ENTREQ? (See Depraetere et al., 2020)

Review type	Preparation	Search	Appraisal	Synthesis Analysis	Conclusion
Integrative review	Problem identification involves identifying specific problem to be investigated	Searching or sampling the literature	Data extraction May include quality assessment	Critical analysis of the studies included: includes reduction, presentation and comparison of data, with conclusion and verification of data.	Presentation of results. No specific reporting guidance
Meta-narrative review	(1) Planning phase	(2) Search phase (3) Mapping phase	(4) Appraisal phase	(5) Synthesis phase	(6) Recommendations phase Reporting according to RAMESES guidance
Realist review	Define the scope of the review: Identify the question Clarify purpose(s) of review Find and articulate the programme theories	Search for the evidence	Appraise the evidence: Test relevance and test rigour Extract the results	Synthesise findings: Compare/contrast findings from different studies. Use findings from studies to address purposes(s) of review. Seek confirmatory and contradictory findings. Refine programme theories in light of evidence including findings from analysis of study data	Develop narrative: Involve commissioners/ decision-makers in review of findings Disseminate review with findings, conclusions and recommendations Reporting according to RAMESES guidance

The next 12 subsections steer you through the different steps of the mixed methods reviews, focusing on the main decision points. An alternative to the 12-step approach is the 8-stage Question–Eligibility–Source–Identification–Selection–Appraisal–Extract and Synthesis (QESISAES) framework (Pluye et al., 2016), which is in line with the PRISMA statement (Page et al., 2021). In comparison with the 12-step approach, the QESISAES framework focuses on the technical process, telescoping the initial four steps within 'Question' and the last three steps within 'Synthesis'. Mixed methods reviews constitute a topic for a book in their own right (Heyvaert et al., 2016) so we point to detailed resources wherever available.

Step 1: Constructing statement of overall goal/research problem

A mixed methods review typically involves multiple questions or, at the very least, multiple dimensions to the same research question. You are not choosing to undertake a mixed methods review simply to overcome the limitations of both quantitative and qualitative approaches to research. You use a mixed methods design because you are trying to harness the strengths of each approach to address your research question(s). While the specific questions you plan to address are formulated in step 3, at this earlier point you need to think more broadly about the research problem you plan to explore and examine. A framework such as FAME (Feasibility–Accessibility–Meaningfulness–Effectiveness (plus *Economic evidence*)) may help you to consider the dimensions that you will address and to start to think about the type of study/data required to address each dimension (Jordan et al., 2016).

Table 9.3 illustrates how the FAME framework helps when planning a systematic mixed methods review on the Feasibility, Appropriateness, Meaningfulness and Effectiveness of Parenting and Family Support programmes delivered in the criminal justice system (Troy et al., 2018). The review team moves from considering the dimensions to be covered by the review to thinking about the types of evidence required to populate each dimension.

Table 9.3 The FAME framework

Dimension/ Domain	Feasibility	Acceptability	Meaningfulness	Effectiveness	(Economic evidence)
Definition	Whether activity is practical and practicable	Whether activity/ intervention fits with a particular context	Whether activity/ intervention is positively experienced by recipients	Whether activity/ intervention, when used appropriately, achieves intended effect	Whether activity/ intervention delivers benefits proportionate to resources/ effort expended
Example (Troy et al., 2018)	Programme implementation	Facilitators of parenting programmes	Parents in criminal justice system	Programme outcomes	Programme resources/ outcomes
Types of study	Feasibility studies Process evaluations Current practice	Qualitative studies	Qualitative studies	Outcome studies	Cost studies; cost–benefit studies

Step 2: Scoping the review

Scoping a mixed methods review follows many processes outlined in Chapter 4. However, scoping should explore *all* the dimensions to be included in the review. Certain types of information are less plentiful than others and may be located in different, perhaps even non-conventional, sources. You should therefore (i) develop strategies to identify information beyond 'standard' qualitative and effectiveness studies and (ii) identify, and selectively sample from, other sources. For example, the need to identify current practice may extend beyond databases of journal articles to search **.gov** (US government) (or, in the UK, .gov.uk) domains using Google (e.g. **site:gov** AND 'parenting programs' AND 'criminal justice').

A key concern for the scope relates to whether included quantitative and qualitative data will be linked or separated. Ideally, a review would include mixed methods studies – that is, studies conceived as integrated in their own right with complementary quantitative and qualitative components – where both components are written up in a single study publication. However, genuinely mixed methods studies are comparatively rare and may pose challenges in terms of insufficient quantity and richness of the data. A largely satisfactory substitute occurs where a quantitative study and multiple other studies, including qualitative studies, share the same context and are conducted within approximately the same time period. These 'sibling studies' may be separately designed, funded and executed or may represent a single study that is artificially separated into quantitative and qualitative papers (Booth et al., 2013b; 2016). The shared context and time period makes it comparatively easy to link findings from quantitative and qualitative studies into common conclusions. Again, these studies may not be plentiful and may pose challenges in identifying study linkage. However often you can identify related studies through a project name, a trial registration number or shared authorship (Sutton et al., 2017). Major studies or trials frequently involve the injection of large sums of money and large amounts of preparatory work (pilot studies, feasibility studies and process evaluations) often resulting in student projects, research fellowships and small funded opportunistic projects. Finally, your mixed methods review may comprise completely unrelated quantitative studies and qualitative studies that simply examine the same intervention or focus of interest over different time periods, geographies and contexts. Scoping should help you to establish the likely scenario for your chosen topic.

Step 3: Formulating the review question(s)

You should start by considering why a mixed methods synthesis is being planned. Is it to answer:

- compound questions requiring both quantitative and qualitative evidence;
- questions requiring mixed methods studies;
- separate quantitative and qualitative questions?

Clearly specified key question(s), derived from a scoping or consultation exercise, will help you to identify whether both quantitative data and qualitative data are required and, specifically, where mixed methods studies are required. For the remaining stages of the process, itemised below, a review team faces challenges as to whether to handle each type of evidence separately, regardless of whether sequentially or in parallel, with a view to joining the two products on completion, or to attempt integration throughout the review process. In each case, the underlying

trade-off is between workload efficiencies and potential comparability against sensitivity to the underlying paradigm. A key consideration for the review question is whether to present:

1. A single integrated review question across both quantitative and qualitative aspects (e.g. 'the benefits and limitations of Intervention X' where both benefits and limitations are expressed either quantitatively or qualitatively).
2. A single review question that includes separately identifiable quantitative and qualitative components (e.g. 'the feasibility (qualitative and quantitative), acceptability (qualitative), meaningfulness (qualitative) and effectiveness (quantitative) of Programme Y').
3. A compound review question with separate sub-questions to be addressed variously by different types of data: (i) Which interventions for Z have been shown to be effective in reducing undesirable outcomes and do they show any additional benefits (quantitative); and (ii) What are the factors influencing uptake of interventions for Z (qualitative)?

While your decision on which format to use depends partly upon how important each part of the question is, a critical consideration relates to your chosen method of synthesis (see step 4 below). A truly integrated synthesis typically uses an integrated question, option (i). A review with multiple strands may privilege option (ii). Finally, a review with separate quantitative and qualitative strands, performed either completely separately (whether sequentially or in parallel) or for subsequent integration, may be best captured by option (iii).

A final consideration when formulating the review question is whether to use different question formats for quantitative and qualitative reviews (see Table 9.4). Alternatively, you might use a single formulation to cover both or, perhaps, to move beyond a flat question structure to alternative representations such as logic models. The Joanna Briggs Institute recommends a Population–Intervention–Comparison–Outcome (**PICO**) formulation for an intervention question and a derivative Population, phenomenon of Interest and Context (**PICo**) for qualitative questions (Lockwood et al., 2020). Setting Perspective Intervention (now Interest, phenomenon of) Comparison Evaluation (**SPICE**) is another alternative that largely maps to its PICO equivalent (Booth, 2006). Alternatively, Perspective Setting Phenomenon of interest/problem Environment (optional Comparison) Time/timing Findings (**PerSPE(c)TiF**) (see Exercise 9.1) represents an initial attempt to capture both quantitative and qualitative elements within a single question structure (Booth et al., 2019b). Finally, a logic model format based around Context Inputs Mechanisms/Processes Outputs and Outcomes offers an alternative way to represent multiple related questions (Ebenso et al., 2019).

Table 9.4 Mapping of question framework elements used in mixed methods reviews

Quantitative (PICO)	Qualitative (PICo)	Qualitative (SPICE)	Mixed methods (PerSPE(c) TiF)
Population	**P**opulation	**S**etting	
		Perspective	**Per**spective
			Setting
Intervention	**I**nterest, focus of	**I**nterest, focus of	**P**henomenon of interest/ problem
	Context		**E**nvironment
Comparison		(**C**omparison)	(**c**omparison)
			Time/timing
Outcomes		**E**valuation	**F**indings

exercise 9.1

Completing a PerSPE(c)TiF grid for your question (Booth et al., 2019b)

Look at Table 9.5 at potential question formats for a mixed methods review. Once you have familiarised yourself with the format attempt to formulate your own mixed methods review question. *(Note: If you are currently contemplating only a quantitative or only a qualitative question then practise by trying to envisage a complementary question to make your review mixed methods!)*

Table 9.5 Exemplar question grid for Exercise 9.1

Exemplar Question: From the perspective of parents how does the 'impact' of parenting and family support programmes run in prison or following release from prison within the criminal justice systems of high-income countries compare with that of parenting programmes in other settings?

NB: Use of the word 'impact' allows for both qualitative data on implementation and how recipients and facilitators perceive the programme and for quantitative outcomes on parenting, parent psycho-social health, children's social, emotional and behavioural development, family cohesion, and parental risk factors

Exemplar Formulated Question:

Perspective	Setting	Phenomenon of interest/ problem	Environment	(optional Comparison)	Time/ timing	Findings
Parents	Criminal justice system	Parenting and family support programmes	High-income countries	(Possibly parenting programmes in other settings?)	In prison or following release from prison	Qualitative data on implementation and how recipients and facilitators perceive the programme Quantitative outcomes on parenting, parent psycho-social health, children's social, emotional and behavioural development, family cohesion, and parental risk factors

Your Question:

Your Formulated Question:

Perspective	Setting	Phenomenon of interest/ problem	Environment	(optional Comparison)	Time/ timing	Findings

Step 4: Deciding on the review design

Planning your synthesis strategy, important for all reviews, becomes especially important for mixed methods reviews. Conducting separate-strand parallel quantitative and qualitative reviews undoubtedly holds benefits when informing a policy or practice decision. The decision-maker can address two or more considerations (e.g. whether an intervention works and whether the public is likely to accept it). However, you can unlock even greater advantages by planning a design where different types of data complement each other and, even more so, when they are truly integrated. So, a qualitative review could be used to identify which desirable features the target audience want from an intervention, thus narrowing down the number and types of information to be reviewed for effectiveness. Alternatively, an effectiveness review that reveals little or nothing to choose between the effectiveness of intervention alternatives may use qualitative data to identify an overall preferred option and identify why. Sequential (or serial) designs use the latter review to inform, or help make sense of, the former. However, serial designs are necessarily lengthy because the first review must almost be complete before the subsequent review can specify its full question.

One alternative is to conduct quantitative and qualitative reviews in parallel. However, this misses opportunities for synergies or shared learning points throughout the two reviews. For example, the quantitative review may classify included interventions as informational or educational. If the qualitative review team is unaware of this distinction then it could miss the chance to operationalise this within its own review. Mechanisms to 'cross-fertilise' throughout the conduct of both reviews include having one or multiple shared team members, regular 'large team' meetings and interim (formative) presentation of results. Disadvantages of the parallel approach include the additional time required to make sense of, or reconcile inconsistencies across, both reviews, the dependence of the speedier review upon completion of the slower review, and leaving the customer (commissioner, manager, policy-maker) to join up the two sets of review findings. In contrast, integrated approaches make the methods or the project management, or both, complex but tend to anticipate, and therefore plan for, additional time taken within the overall project timeline.

Step 5: Determining initial criteria for inclusion/exclusion

Your criteria for inclusion and exclusion are closely linked to decisions you made about the elements of the review question. Typically, you divide your question elements into two columns – those for inclusion and those for exclusion. You decide whether to specify only the elements that allow you to rule a study in or whether certain types of literature are so common that you need to state explicitly whether they are to be ruled out (see Chapter 6).

Not all mixed methods studies are conceived as a fully integrated primary study. A major funder may commission a major study, for example a trial or large cohort study, and then additional sources may offer funding for complementary studies. Alternatively, student projects, as Master's dissertations or doctoral theses, may grow up organically around the major funded project. In these cases it is understandable for each related study to publish separately. The challenges for you as a reviewer are, first, to identify these multiple accounts of related studies, particularly as they may not share a common identifier that makes their shared context self-evident (Noyes et al., 2016b), and then to find a way to synthesise across the shared context without betraying the integrity of the individual studies.

A final, and perhaps most common, publication pattern is for independent researchers to publish unrelated quantitative and qualitative studies. These separate evidence bases do not share a context but do broaden the pool of relevant contexts substantially. A reviewer must, first, establish that these are indeed separate studies (to avoid double counting). They must then assess how different, or similar, the contexts in each reported study are and how this might affect the certainty of any conclusions (Noyes et al., 2018b).

Step 6: Conducting an extensive literature search

Having defined your key questions, you need to choose between a single sensitive search that addresses all potential sub-topics and conducting specific searches for each sub-topic (Noyes et al., 2019b). Similarly, you need to decide whether to search separately for qualitative, quantitative and mixed methods evidence 'streams', using specific study filters, or whether to conduct a single ('big bang') search (Booth, 2016; Sutton et al., 2019) and then identify specific study types during study selection. Proven study filters exist to retrieve the main quantitative designs (InterTASC Information Specialists' Sub-Group, 2020) and to identify qualitative research studies (Booth, 2016). Filters to retrieve mixed methods studies are less well developed (El Sherif et al., 2016) – a search for quantitative *and* qualitative studies may retrieve abstracts that expressly state that they include quantitative but *not* qualitative data. Quantitative and qualitative studies may use multiple synonyms such as 'empirical study' or 'study of patient preferences'.

The big bang search has the advantage of being a single search process but typically involves very large numbers of records. Separate searches for each type of evidence retrieve smaller numbers of records, but may retrieve the same reference multiple times from each search or risk relevant references falling down gaps in indexing (Booth et al., 2020). Both approaches have advantages and disadvantages. Your final choice may depend on whether you have more time or person power for the search process (input from information specialists) or the sift process (effort from reviewers) (Noyes et al., 2019b). Other considerations include the role of screening or data-mining technologies and team priorities for screening (Waffenschmidt et al., 2019).

Step 7: Selecting final articles for inclusion

A related decision focuses on how you will screen and select studies to be included in your mixed methods review. Will team members screen records for all review types, regardless of the review they will work on ('altruistic study selection'), or select studies for the review type with which they are most familiar? The team could minimise the risk of missing relevant reports by screening for any research or evaluation study in the first instance. You can then code these studies as quantitative, qualitative or mixed methods reports at a subsequent stage. Some commentators suggest a need for an additional stage, between the title and abstract screen and the full text screen, known as the 'partial text screen' (Skalidou & Oya, 2018).

As a reviewer, and informed by the quantity and quality of the data and by the ambition of your review, you need to decide whether to privilege the depth and richness offered by the limited numbers of studies that are conceived and reported as single studies. Or will you reconstruct clusters of studies that are relevant, but separately conceived and reported, to piece together a collective picture of the study context (Booth et al., 2013b; Tsang & Maden, 2021)? Or even will you, as is more commonly the option, separately summarise quantitative studies and qualitative

studies and then integrate them at the synthesis level? Or, perhaps, you will include all eligible studies or publications, either from choice or out of necessity.

Step 8: Assessing study quality

Review teams may be limited in their choice of instruments to assess methodological limitations of primary studies, given that certain tools, such as the Cochrane risk-of-bias tool (Higgins et al., 2021a), are almost viewed as automatic choices for particular study types. However, where review teams can choose their appraisal instruments they face a choice between:

- unrelated quantitative and qualitative instruments,
- appraisal tools from the same development group or organisation,
- a mixed study appraisal tool, and
- a generic instrument that explores quantitative and qualitative study characteristics.

A key consideration, as with single data reviews, is how you plan to use the quality assessment verdict. Critical appraisal in mixed synthesis reviews is defined as 'a process related to judging the quality of qualitative, quantitative, and mixed methods studies reported in research papers' (Hong & Pluye, 2019). The purposes and choice of dimensions of quality to judge vary depending on the objectives and synthesis method(s) adopted in a given review (Heyvaert et al, 2013a). A framework for assessing the quality of studies for mixed methods syntheses identifies three main dimensions of quality (Hong & Pluye, 2019):

- Methodological (assesses Trustworthiness)
- Conceptual (assesses Insightfulness)
- Reporting (assesses Accuracy, Completeness, Transparency).

The Cochrane Qualitative and Implementation Methods Group has recently issued guidance on how to select appraisal instruments and core assessment criteria for qualitative research (Noyes et al., 2018a). The **Mixed-Methods Appraisal Tool** (MMAT), currently undergoing further development, offers a single quality assessment instrument for quantitative, qualitative and mixed-methods studies (Pluye et al., 2011; Hong et al., 2018). The MMAT includes quality criteria of five categories of study designs: (a) qualitative, (b) randomised controlled trial, (c) non-randomised, (d) quantitative descriptive and (e) mixed methods studies. The MMAT directs attention to core relevant methodological criteria and has five criteria per category of study design (Hong et al., 2018).

Other options include using different instruments from a set produced by the same organisation, for example using different Critical Appraisal Skills Programme (CASP) instruments (CASP, n.d.). Instruments developed by the same team or organisation often share common understandings of study quality. At a practical level these instruments offer consistent approaches to quality assessment and reporting. Alternatively, a paradigm-sensitive approach involves selecting the best instrument for each respective review and then resolving inconsistencies in verdicts later in the review process.

Step 9: Extracting the data

How data and evidence are extracted from primary research studies for review is influenced by what type of integrated synthesis you are undertaking and the purpose of your review

(Ferguson et al., 2020). You need to decide what type of data and evidence you need to extract from included studies. Typically, some fields are common to all study types, such as the title, date of publication, study type. Other fields are specific to quantitative studies, specific to qualitative studies or relate specifically to mixed methods primary studies. However, bear in mind that different quantitative study designs require slightly different data extraction forms. You will find it helpful to look at tables in similar reviews and to use their column headings as fields for your data extraction forms. Data extraction is often undertaken at the same time as quality assessment (Step 8) (see Chapter 6). Alternatively, you can perform both separately, in either order. Some reviewers find that they use similar reading approaches to both tasks. Others find that they focus on specific details for data extraction but engage with the study more holistically when assessing quality (Barnett-Page & Thomas, 2009).

Decisions around what data to extract are guided by how 'integrated' the mixed methods review will be. If you are synthesising quantitative and qualitative findings of studies separately, integrating them at the point of findings (e.g. segregated or contingent approaches or sequential synthesis design) (Sandelowski et al., 2006), you can use separate data extraction approaches. Where integration occurs within the review (e.g. integrated approach or a convergent synthesis design), you may want to extract quantitative and qualitative data in a single process. You may be able to identify a single data extraction framework that handles both types of data equally well. This may be a theoretical or conceptual framework identified from the literature or may be the logic model from your original review question.

When designing your mixed methods data extraction form you will find that extraction elements cluster around the elements of the PerSPE(c)TiF structure (Booth et al., 2019b).

A generic structure for a data extraction form is provided on the companion website in the literature review starter template (see Step 7) .

Alternatively, you might develop your framework after you have read a selection of included studies, and after sensitising yourself to the purpose of the review, early in the process. The Cochrane Qualitative and Implementation Methods Group provide further guidance on extraction of qualitative data (Noyes et al., 2018a).

Step 10: Synthesising and integrating the studies

We have characterised approaches to synthesis as quantitative (Chapter 7), qualitative (Chapter 8) and integrative (i.e. bringing together both quantitative and qualitative – this chapter). The same process of pattern recognition already described in Chapters 7 and 8, facilitated by analogy, metaphor and homology, comparison and contrast (Tranfield et al., 2003), applies equally, if not more so, when seeking to identify patterns within the quantitative and qualitative syntheses and across both syntheses.

As identified in Chapter 7, narrative synthesis addresses diverse questions, beyond the effectiveness of an intervention. A mixed studies review with a narrative synthesis is an approach by which the narrative element of qualitative, quantitative and mixed methods studies is systematically identified, selected, appraised and synthesised. A mixed studies review is particularly relevant to exploring complex and highly context-sensitive interventions, potentially offering a better understanding than when a single type of review approach is used alone. Such a mixed studies review will have an exploratory purpose where the qualitative component dominates.

You can use comparison and contrast to compare study by study (usually only possible with a limited number of items for inclusion) or by findings (i.e. similarities and differences across studies). Within a larger literature review, as carried out for a dissertation or thesis, it may be desirable to combine both approaches. Relatively few synthesis methods start off as integrative from the beginning. As a consequence, such methods usually perform well for one type of data (e.g. qualitative) but less well for the other data type. Your obvious choice is to use quantitative approaches for handling quantitative data and qualitative approaches for processing qualitative data. However, the synthesis toolkit includes quantitative approaches to qualitative data (e.g. quantifying the occurrence of themes or words as in content analysis) or qualitative approaches to quantitative data (e.g. where different types of quantitative study are described narratively (Schick-Makaroff et al., 2016)).

Methods that combine both quantitative and qualitative data in a neutral way typically pursue a line of argument through the literature: for example, how the literature problematises a particular focus of interest (e.g. access to healthcare – critical interpretive synthesis (Dixon-Woods et al., 2006b)) or how a concept develops differently according to different disciplines (e.g. diffusion of innovations – meta-narrative (Greenhalgh et al., 2005)). Further guidance on integrating quantitative and qualitative evidence has been produced by the Cochrane Qualitative and Implementation Methods Group (Harden et al., 2018; Noyes et al., 2019).

Step 11: Interpreting the evidence

In Step 11 the reviewers seek to develop conclusions that faithfully represent the findings and to communicate their certainty, perhaps using formal systems such as GRADE and GRADE-CERQual. Currently, there is no GRADE approach for assessing confidence in findings developed from *combined* quantitative and qualitative evidence (Noyes et al., 2019b). An experimental adaptation of GRADE has been attempted in a systematic review that includes mixed methods findings (Ames et al., 2019b). Review authors must specify how findings are relevant to specific interventions or programmes, seeking to integrate findings across quantitative and qualitative lenses of enquiry. Integration of results from across multiple strands and multiple sources of data into a cohesive final product poses one of the greatest challenges to mixed methods synthesis (Ferguson et al., 2020).

Having performed your synthesis you can now examine what happens when you bring the quantitative results and the qualitative findings together. Perhaps the 'Take Home Message' is synergistic – the most effective option is also the most acceptable or the easiest to implement. This synergy makes it easier to write recommendations for action. More typically the two evidence bases reflect a trade-off – an intervention is effective but not well accepted or a programme achieves its desired outcomes but finds it difficult to retain people within the programme.

Table 9.6 examines several examples of mixed methods reviews and focuses on the methods of analysis used.

Step 12: Presenting the results

Step 12 involves presentation of results from the completed review. Currently no reporting guideline exists for mixed methods reviews (Noyes et al., 2019). For the present, reports should

Table 9.6 Examining methods of analysis used in mixed methods reviews

Type of review	Review example	Methods of analysis used	Application of methods
Mixed methods – comparison integration strategy	Self-care for minor ailments (Richardson et al., 2018)	Identifying gaps and contradictions between review themes Behaviour models to identify factors and gaps between theory and research agenda	Four reviews conducted (Interview studies, Quantitative survey data and Effectiveness of behavioural interventions or services for minor ailments). Three reviews brought together in overarching synthesis using three behaviour change models to explore similarities, contradictions and gaps between syntheses and to suggest possible approaches to intervention
Critical interpretive synthesis	Examining and contextualizing approaches to establish policy support organizations – a critical interpretive synthesis (Al Sabahi et al., 2020)	Identifying concepts and contextual factors Develop conceptual constructs to create a framework	Started by identifying common themes and concepts. Greater attention given to themes from multiple documents that helped to understand how to establish a policy support organisation and how contextual factors influence process. Themes and concepts used to develop conceptual constructs then integrated to produce conceptual framework
Meta-narrative review	A meta-narrative review of Olympic education and its implications for realist evaluation of programmes for Tokyo 2020 (Hwang, 2018)	Identify and characterise different research traditions. Construct narrative for each tradition. Highlight similarities across traditions	Identified how Olympic education has been conceptualised within six research traditions: educational philosophy; critical sociology; curriculum development; education psychology; development of evaluation measures; and policy analysis and evaluation. Analysis subsequently provided basis for 'templates' against which to evaluate Olympic education programmes and systems associated with Tokyo 2020
Realist synthesis	Does incorporating participation and accountability improve development outcomes? Meta-analysis and framework synthesis (Waddington et al., 2019)	Organised interventions by broad intervention group and key mechanism. Critical case comparisons used to examine how moderators triggered different mechanisms under different contexts. Analysed patterns of moderators and mechanisms within each intervention set to identify those that frequently or persuasively facilitated sensemaking for each study	Examined high-quality evidence from 35 citizen engagement programmes in LMICs to promote engagement of citizens in service delivery through four routes: **P**articipation, **I**nclusion of marginalised groups; **T**ransparency; and/or citizen efforts to ensure public service **A**ccountability (citizen feedback and monitoring) – mechanisms collectively labelled using 'PITA' acronym

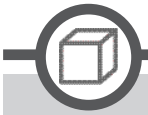
embody good practice from the relevant method-specific review reporting guidelines. Presenting results in a mixed methods review should therefore be informed by:

- the reporting of systematic reviews generally;
- the reporting of mixed methods research, in tackling how to present findings from both qualitative and quantitative approaches to research; and
- the unique standards of the individual approaches underpinning the study types that supply the data for the review.

Tables and figures draw on methods already highlighted in Chapters 7 and 8 such as statistical summary, descriptive tables and forest plots for quantitative synthesis and lists of categories, themes and sub-themes, concept maps and frameworks for qualitative synthesis. Study characteristics tables and accompanying descriptive paragraphs must contain information on the characteristics for all included studies. Different tables may be needed to present quantitative, qualitative and mixed methods studies.

Of particular value are methods that serve to integrate the quantitative and qualitative data, for example in creating a matrix of quantitative variables as rows and qualitative themes as columns (Candy et al., 2011). Logic models and conceptual models similarly juxtapose quantitative and qualitative data within a single display (Rohwer et al., 2017; Kneale et al., 2015; 2018). Some of these methods of presentation are fundamental to methods of synthesis and integration and are discussed later in this chapter. However, whatever your chosen method of integration you should think seriously about using integrative methods of presentation.

Further guidance is available in Chapter 10 which covers reporting guidelines for individual studies and for reviews. Separate guidance on reporting is available for meta-narrative and realist syntheses, for which researchers can use the RAMESES templates (Wong et al., 2013a; 2013b). Methodological reviews of the reporting of realist review (Berg & Nanaviti, 2016), the realist search (Booth et al., 2020) and critical interpretive syntheses (Depraetere et al., 2020) reveal that reporting quality falls far short of being optimal. Box 9.3 summarises components that have been suggested when reporting a mixed methods review.



box 9.3

Suggested components for reporting a mixed methods review (adapted from http://toolkit4mixedstudiesreviews.pbworks.com/)

TITLE (*explicitly stating that review included different type of evidence, e.g. 'mixed studies review', 'review of qualitative and quantitative evidence', 'mixed methods review', etc.*)

ABSTRACT (*Structured summary*)

INTRODUCTION AND OBJECTIVES

- Rationale for the review
- Formulated questions and/or objectives

METHODS

- Protocol and registration
- Justification for review of qualitative and quantitative evidence
- Eligibility criteria
- Information sources
- Search
- Study selection
  Process for selecting studies
- Data collection process
  Methods of data extraction from included studies (e.g. number of reviewers involved, piloted forms, etc.)
  List data extracted
- Quality assessment
  Process for appraising included studies (e.g. tool(s) used, number of reviewers involved) and specifically for assessing methodological quality of included qualitative, quantitative and mixed methods studies
  Specify how results of this appraisal are used in the synthesis, e.g. exclusions, inclusion of all studies or sensitivity analyses
- Synthesis
  Describe the synthesis design used
  Describe and justify the synthesis method(s) used
  Describe methods of additional analyses (e.g. sensitivity or subgroup analyses), if done

RESULTS

- Study selection
  Numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions
  Summarise this in a flow diagram (see below)
  Numbers of quantitative, qualitative and mixed methods studies included
- Study characteristics
- Result of quality assessments
- Results of synthesis
  Present both/all syntheses and present the results of any integration of the syntheses
  Additional analyses, if done (e.g. sensitivity or subgroup analyses)

DISCUSSION

- Summary of evidence
  Insight gained from the integration of qualitative and quantitative evidence
  Contribution *(with respect to review methods, scientific knowledge, practice, program planning and evaluation, policy-making, as appropriate)*
  Limitations *(at study, synthesis (quan/qual) and review levels)*

CONCLUSIONS (*including implications for future research*)

ACKNOWLEDGEMENTS

REFERENCES

An accompanying suggested flow diagram for mixed studies reviews follows the standard PRISMA diagram until the final stage which replaces the single Included Studies box with three separate boxes for Included Quantitative, Qualitative and Mixed methods studies respectively. Where separate searches have been conducted for each of these three types you can place three separate entry boxes at the top of the flow diagram, one for each respective study type. This is compatible with approaches illustrated in updated PRISMA 2020 guidance (Page et al., 2021).

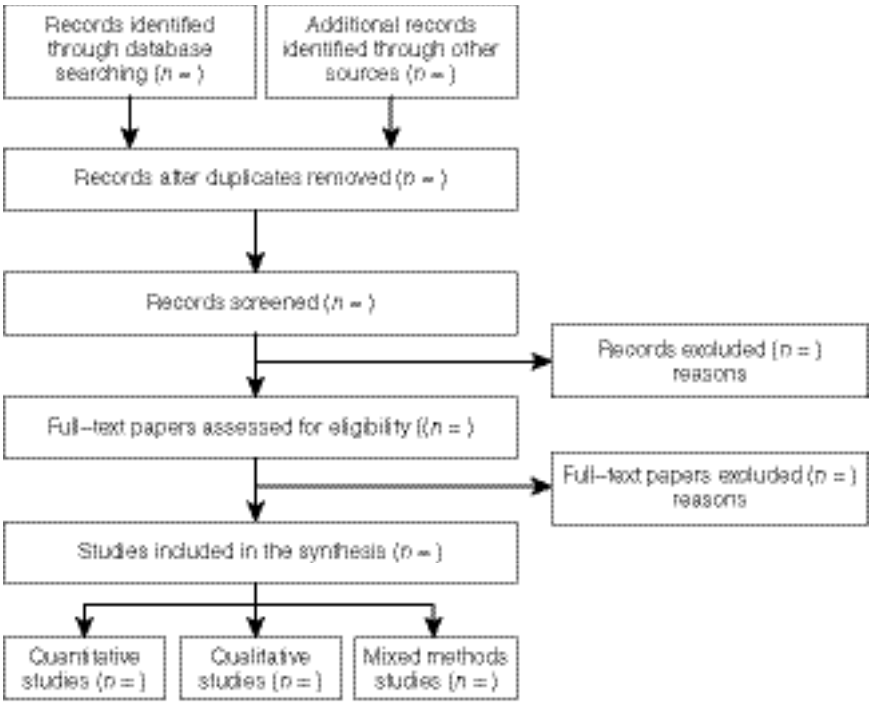
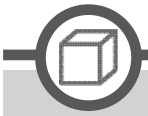


Figure 9.1 Sample PRISMA flow diagram for mixed methods review

Bear in mind that you may have identified relevant studies of any type from any of the three searches, adding to the complexity. This consideration similarly applies for PRISMA diagrams that seek to display systematic reviews and primary studies on the same diagram (or for any other 'mixed study' approaches).

Having walked through the process of a mixed methods review there are key questions to consider when *conducting* our own review (Box 9.4).



box 9.4

Key questions when *conducting* a mixed methods review

1. How will I plan and sequence quantitative and qualitative review components of the review? In parallel? Qualitative first and then quantitative? Quantitative and then qualitative? Will my choice matter for the final review?

2. What types of quantitative and qualitative studies will I include as data sources? Separate, unrelated quantitative and qualitative studies? Separate but related quantitative and qualitative studies? Integrated mixed methods studies? Or perhaps all of the above?
3. At what stages will I integrate the quantitative and qualitative components of the review? At a single stage (e.g. upon completion of separate reviews)? At two or more stages within the review? Throughout the review?
4. How will I integrate the quantitative and qualitative components of the review? By using similar processes for all components (e.g. matching data extraction forms)? By handling all data qualitatively? By handling all data quantitatively? By using a structure that integrates both types of data (e.g. a logic model, matrix or conceptual framework)? By using a method that handles the components equally (e.g. realist synthesis, critical interpretive synthesis, meta-narrative)?
5. How will I present and report the review and its components? As stand-alone separate sections with cross-references? As separate sections with an integrative section? Thematically? Sequentially, according to stages in a process? Using narrative? Tables? Graphics? Another alternative?
6. How will I plan and sequence the quantitative and qualitative review components? In parallel? Qualitative first and then quantitative? Quantitative and then qualitative? Will my choice matter for the final review?

POINTS OF INTEGRATION FOR QUANTITATIVE AND QUALITATIVE EVIDENCE

Review team level

Potentially, integration can take place at a review team and design level. Historically, the most common approach to integration was for separate teams to conduct separate syntheses of quantitative and qualitative evidence and then to integrate evidence within a third, integrative synthesis (Mays & Pope, 2020a). This approach is considered the least conceptually demanding and, consequently, is most commonly used (Mays & Pope, 2020a).

Integration at a team level acknowledges that different researchers possess different strengths. A quantitative reviewer feels best able to identify, synthesise and analyse quantitative study designs, with the reverse being true for a qualitative reviewer. Increasingly, however, mixed methods synthesis projects require that many stages of the review process are undertaken by researchers from either background. Team members still specialise for complex tasks, for example in quality assessment or in meta-analysis or meta-ethnography. Optimally, at least one, if not more, team members should be involved in both/all syntheses to make connections throughout the review. Mixed methods research tends to work best when the principal investigator values and oversees integration (O'Cathain et al., 2015).

Integration within the review process

More commonly integration may take place at multiple points in the review process. Four overall strategies are enumerated for integrating qualitative and quantitative data (Mays & Pope, 2020a):

- Integrating at the review level.
- Integrating using a common structure, framework or model.
- Integrating through 'transformation' of the data.
- Using an integrative method.

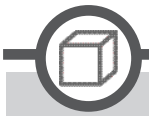
The next subsections consider these four approaches in turn. 'Ultimately, the choice of synthesis should relate to both the specific aim of the review and the nature of the available evidence' (Mays & Pope, 2020a); the Research question, Audience and purpose, and Type of data of our RETREAT mnemonic (Booth et al., 2016; 2018b). Often more than one approach is appropriate.

Integrating at the review level

Integrating at the review level is most common. Essentially, integration involves conducting three systematic reviews in one: a quantitative review, a qualitative review and then an integrative synthesis bringing the previously separate reviews together. For example, a review team could conduct separate reviews of effectiveness and of user views and then bring the two reviews together within a final integrated synthesis (Thomas et al., 2004b). At its simplest, integration is achieved through an integrative narrative, describing both quantitative and qualitative studies. Further integration is achieved through practical mechanisms such as tables, graphs or diagrams, described in the following subsection.

Integration via the review process

Several methods accommodate quantitative and qualitative data within the same review process. Some explore the narrative or **line of argument** of included studies so they examine patterns of studies rather than patterns of findings (**critical interpretive synthesis** and **meta-narrative review**). Examples include **meta-narrative review** which looks at how the same concept has evolved within different disciplines (Otte-Trojel & Wong, 2016). We conducted a meta-narrative review to follow the two paths by which community engagement has emerged as a concern, the one a government-owned top-down approach and the other a community-owned bottom-up response (Harris et al., 2015). We considered that this philosophical difference may explain differences in sustainability or success. Realist synthesis handles both quantitative data and qualitative data, in its broadest not necessarily literature-based form, in a similar way to generate causal chains (known as CMO configurations) and then to attempt to test them (Kneale et al., 2018). Bayesian meta-analysis uses qualitative data first to develop 'priors' or expectations for the data and then uses the quantitative literature to confirm or modify them (Thompson & Semma, 2020). So, for example, you could use qualitative data to identify parents' concerns regarding vaccination and then quantitative data to explore whether these factors impacted on uptake rates (Roberts et al., 2002). Each method merits a separate chapter in a more expansive text so we briefly introduce and characterise them and point to further sources for follow-up as appropriate.



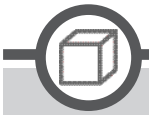
box 9.5

What is Bayesian meta-analysis/synthesis?

Some authors have sought to integrate qualitative and quantitative data using Bayesian meta-analysis (Roberts et al., 2002). Bayesian meta-analysis uses a sequential, rather than parallel, approach to elicit important factors or variables from qualitative data and then to quantify their individual effects within a meta-analysis. Bayesian meta-analysis uses a summary of *qualitative* data to develop a probability distribution (prior distribution) and then you test this distribution using a conventional synthesis of quantitative data. In so doing, you combine both qualitative data and quantitative data to produce a posterior distribution. Bayesian meta-analysis seeks to identify what it is reasonable for an observer to believe in the light of the available data and therefore explicitly takes account of the perspective of the potential user of the analysis. Few examples of Bayesian meta-analysis currently exist (Roberts et al., 2002; Voils et al., 2009). Thompson and Semma (2020) present a non-technical introduction to Bayesian meta-analysis that reanalyses data from a meta-analysis on the impact of media literacy interventions on attitudes and intentions related to risky health behaviours. They conclude that Bayesian and conventional (frequentist methods) are complementary, each with advantages and disadvantages, but sharing a common purpose.

Critical interpretive synthesis (CIS)

The thinking behind CIS resulted from a comprehensive review of existing methods for integrating qualitative and quantitative evidence (Dixon-Woods et al., 2005). The authors sought to counter the 'over-proceduralisation' of the systematic review achieved at the potential expense of theorising and creativity. They resisted the claimed objectivity of systematic review outputs, particularly questionable when interpretation is a stated objective of the review process. CIS involves an iterative approach to refining the research question and searching and selecting from the literature (using theoretical sampling) and defining and applying codes and categories. It favours relevance when appraising quality – that is, likely contribution to theory development – rather than methodological characteristics as a means of determining the 'quality' of individual papers (Barnett-Page & Thomas, 2009).



box 9.6

Case study of a critical interpretive synthesis

Khalid et al. (2020) conducted a CIS to develop a conceptual framework for strategies that facilitate, and address the barriers to, evidence use in crisis zones. They systematically reviewed empirical and non-empirical literature using an interpretive analytic approach to

(Continued)

synthesise the results and develop the framework. They used a 'compass' question to create a detailed search strategy across five databases. They included 21 eligible papers and purposively sampled 6 additional papers to fill conceptual gaps. Synthesis resulted in a novel conceptual framework that examines evidence use through political, health, international humanitarian aid and health research lenses.

Integrative review

An integrative review follows five phases (Whittemore & Knafl, 2005; Toronto & Remington, 2020). The first phase is problem identification, which involves identifying the specific problem to be investigated. Problem identification is considered the most important phase of the review because it determines which studies will be included, how they will be identified and which information will be gathered for each included study. Optimally, the topic for enquiry should align to theoretical principles and a rationale for how the intervention works.

The second phase involves searching or sampling the literature (Lawless & Foster, 2020). Database searches are broad and diverse, including searching electronic databases, manual searches in journals, follow up of references described in selected studies, contact with researchers and the use of unpublished material. Sampling criteria privilege representativeness of the sample; typically, this involves a comprehensive sample but random selection has also been suggested. Alternative, purposive methods of sampling should be clearly described and justified. Study selection therefore follows close specification of the problem, factoring in the participants, the intervention and the results of interest.

In the third phase, data extraction uses a pre-prepared instrument to organise relevant data, to minimise errors in transcription, to guarantee accuracy and provide an audit trail. Data should define the subjects, methodology, size of the sample, measuring variables, method of analysis and all concepts used.

The fourth phase involves critical analysis of the studies included. This requires an organised approach to weigh the rigour and characteristics of each study, checking the validity of the methods and results, and determining their usefulness in practice. This may or may not involve use of an evidence hierarchy. CASP checklists are typically used for formal critical appraisal (CASP, n.d.). Data synthesis may be thematic or may harness an analytical framework. Synthesis aims to identify patterns, differences and constructs that can be subsequently incorporated within the general discussion. Visualisation of data is used to depict important subgroups in the form of tables, graphs or charts, in which all selected studies can be compared.

Analytical procedures for an integrative review include reduction, presentation and comparison of data, as well as conclusion and verification of data (Whittemore & Knafl, 2005). Reducing data involves classifying and grouping the included studies. Categorisation is based on the type, chronology or characteristics of the sample, or on some predetermined conceptual classification. Next, data is extracted from the primary sources using the prepared instrument to simplify, summarise and organise the findings, so that each study is reduced to a single page. Organising data, in this way, facilitates comparison targeting specific topics, such as problems, variables and sample characteristics.

The final phase involves presentation, which aims to be transparent and complete so that the reader can critically assess the results. Methodologies should be clearly identifiable. Subgroups should be described, discussed and analysed.

Meta-narrative review

The literature may possess adversarial characteristics, perhaps with arguments attributed to particular 'schools of thought' – you will probably wish to sample initially from different stances or positionings. One such method is meta-narrative review. Meta-narrative reviews use a historical and philosophical perspective as a pragmatic way of making sense of a diverse literature (Otte-Trojel & Wong, 2016). They acknowledge the existence of heterogeneity within the different paradigms. The method was developed to explore characteristics of the literature on diffusion of innovation drawn from different paradigms (Greenhalgh et al., 2005). The authors identified 13 key meta-narratives from diverse literature traditions. Their review team reconciled seemingly contradictory data, by systematically exposing and exploring tensions between research paradigms.

The questioning process starts by asking:

- What research teams have researched this area?
- How did they conceptualise the problem?
- What theories did they use to link the problem with potential causes and impacts?
- What methods did they define as 'rigorous' and 'valid'?
- What instruments did they use?

The typical approach of investigating a broad open-ended question in terms of its main research traditions and schools of thought often fits well with the open-ended exploratory phase that characterises the first year of most PhD work.

The original review team conclude that the method is most useful where the scope of a project is broad and the literature diverse, where different researchers have asked different questions and used different research designs to address a common problem, where different practitioners and policy-makers have drawn on the research literature in different ways, where 'quality' is defined differently in different literatures and in the absence of a universally agreed process for pulling different literatures together (Greenhalgh et al., 2005).

Limitations include the fact that the method was developed to handle a pragmatic problem and therefore further work was required to develop the method. This limitation was subsequently addressed by the meta-narrative components of RAMESES (Greenhalgh et al., 2005). Standards for reporting meta-narrative reviews have been produced by the RAMESES initiative (Wong et al., 2013b) and training materials are available from the RAMESES website (http://ramesesproject.org/)

Realist synthesis

You may wish to conduct a realist synthesis to move you from 'what works' to what works for whom under what circumstances (Emmel et al., 2018). How has the intervention been theorised? Bear in mind that many disciplines arbitrarily publish papers that generate theory separately from those that test theory. Papers rejected from your intervention review might be repurposed within an exploratory or explanatory capacity. One realist synthesis sought to explain why school feeding programmes did not achieve their intended effectiveness when implemented in a real-world setting (Greenhalgh et al., 2007). The index child (receiving the intervention) did, in fact, benefit at school from the feeding programme. However, when the child returned home at

night the parents redistributed that child's food to other siblings, reassured that the index child had received a portion sufficient for subsistence but not growth.

Pawson (2002) argues that the 'primary ambition of research synthesis is explanation building'. To this end, realist synthesis brings together different types of research data, quantitative or qualitative, with other data sources to identify an underlying mechanism of effect (Otte-Trojel & Wong, 2016). This mechanism may explain why an intervention works in one context but not in a similar one. Pawson (2006a) contends that research synthesis should be targeted at identifying, and subsequently developing an understanding of, these underlying generative mechanisms. Pawson (2002) proposes realist synthesis for analysing the effectiveness of policy programmes through the development and testing of theoretical ideas on intervention–outcome relations. This pragmatic approach has been likened to the use of research synthesis for developing design propositions in management and organisation studies (Denyer et al., 2008). The purpose is to 'articulate underlying programme theories and then interrogate existing evidence to find out whether and where these theories are pertinent and productive' (Pawson, 2006a). While programmes are context specific and not generalisable, intervention–outcome configurations are. Consequently, analyses aim to discover context–mechanism–outcome combinations in order to know when, where and for whom to apply the programme, or elements of it. Realist synthesis involves investigation of:

- What is the nature and content of the intervention?
- What are the circumstances or context for its use?
- What are the policy intentions or objectives?
- What are the nature and form of its outcomes or impacts?

Realist synthesis, therefore, uses included studies as 'case studies, whose purpose is to test, revise and refine the preliminary theory' (Pawson, 2006b). Realist synthesis is able to accommodate research evidence from diverse study types (Booth et al., 2018c).

The realist search

Realist reviews share an imperative to be systematic, explicit and reproducible. Realist searches commonly challenge systematic reporting; searches are iterative and involve multiple search strategies and approaches (Booth et al., 2018c). Notwithstanding these challenges, you can structure the reporting of your 'realist search' to be transparent and to facilitate identification of innovative retrieval practices (Booth, 2019b). Information specialists propose a six-component search framework, consolidating and extending the structure advanced by Pawson, one of the originators of realist review:

1. formulating the question;
2. conducting the background search;
3. searching for programme theory;
4. searching for empirical studies;
5. searching to refine programme theory and identify relevant mid-range theory; and
6. documenting and reporting the search process.

Realist search reports poorly differentiate between the different search components (Booth et al., 2020). Review teams often conduct a single 'big bang' multi-purpose search to fulfil

multiple functions within the review (Booth, 2019b). Realist searches are typically iterative and responsive to emergent data. Overall, the search for empirical studies most closely resembles the systematic review search. In contrast, searches to identify and refine programme theory are poorly conducted, if at all, and poorly reported. Systematic search methods, using concept*, framework*, model* and theor* as search terms, exist to retrieve papers advancing theory to explain what is observed in intervention studies (Booth & Carroll, 2015a; Booth et al., 2020). The CLUSTER method was developed within a realist review of community engagement to present a systematic search method to identifying sibling and kinship reports to offer additional conceptual or contextual data (Booth et al., 2013b).

Classically, realist reviews do not base their assessment of evidence simply on technical quality. Rigour and relevance are the two features that are privileged within a realist review. We propose a third marker – richness – for prioritising selection of evidence, particularly where selection of a purposive sample is favoured over the comprehensive sampling approaches featured in systematic reviews.

A realist review focuses on understanding and unpacking the mechanisms by which an intervention works (or fails to work), thereby providing an explanation, as opposed to a judgement, about how it works (Pawson et al., 2005). 'Realist review' and 'realist synthesis' are often used interchangeably. We encourage use of the former where the focus is on the systematic assembly and assessment of sources, and the latter for the process of synthesis and the analytical output of that process.

Realist synthesis first articulates explanations for how interventions or programmes work (**programme theories**) and then interrogates evidence from the literature to find out whether and where these theories are pertinent and productive (Coleman et al., 2020). Analysis in realist approaches focuses on the programme theory and you also inspect primary data to discover what it reveals about the programme theory. The explicit purpose of the review is thus to test and refine programme theory. Realist synthesis therefore examines different types of evidence as they address specific questions or uncertainties within a programme. In some cases, therefore, questions relate to the effectiveness of a particular intervention, particularly as it might apply differentially in different contexts. In other cases, a review question may examine the acceptability of a programme or the attitudes of stakeholders towards it.

Realist synthesis produces 'mid-range theory', lying between minor working hypotheses from day-to-day research and broader systematic efforts to develop a unified theory (Pawson, 2002). You can use realist synthesis to examine possible theory underlying particular mechanisms to further explore why a programme works in certain circumstances but not in other apparently similar circumstances. You can examine policies or programmes at either a national level or at a local implementation level to identify variables affecting likely success or failure at either or both levels (Booth et al., 2021). The overall process for a realist review is documented by Pawson's Time and Task template (2006b).

Integrating using a common structure, framework or model

A second approach is to juxtapose quantitative and qualitative data within a common framework. In the context of synthesis, a framework refers to any structure used to integrate, map and display quantitative and qualitative evidence and findings (Harden et al., 2018). This framework could be a matrix, a logic model, a policy framework, a conceptual framework or map or something else (Noyes et al., 2019b). The structure might be used 'instrumentally', as

a common tool for extracting data during data extraction, or 'conceptually', as an analytical lens for identifying patterns across both two types of data. For example, a conceptual framework could be broken down into its individual elements to create a data extraction form. By using the same framework for both quantitative and qualitative data you can spot patterns or highlight gaps or incongruities. For example, a particular outcome or intervention component may be important to users in qualitative research but may be overlooked by quantitative studies.

Data extraction often surfaces specific challenges when populating the framework. So, a framework could reveal an absence of intervention effect data. Interventions may be so context specific and varied that they defy integration. Where integration is not possible a narrative commentary or summary of the included studies may be the only available option (Popay et al., 2006; Campbell et al., 2020).

More recently the 'logic model' is suggested for integrating data from quantitative and qualitative studies within a conceptual whole (Baxter et al., 2014). You can use logic models to structure logical elements for a particular intervention such as inputs, processes, outputs and outcomes (Allmark et al., 2013). Logic models can be used to map complex care pathways (Anderson et al., 2011; Baxter et al., 2014). You can revisit **logic models**, used to inform early scoping of the review (see Chapter 4), as a 'scaffold' from which to hang findings, constructs or themes.

exercise 9.2

Helpful integration of quantitative and qualitative data

Briefly reflect on a journal article that you have recently read, not necessarily a systematic review, that integrates both quantitative and qualitative data. What devices does the article use to integrate the two types of data. Look for the narrative, tables, matrices, figures and diagrams and conceptual models. Which methods are likely to be most suitable for integrating data within your review?

Integrating through 'translation' of the data

Synthesis approaches may 'quantitise' qualitative data or 'qualitise' quantitative data (Dixon-Woods et al., 2005). For example, cross-case comparison looks for the presence or absence of different factors within a set of studies, reducing qualitative complexity into a binary presentation (Creamer et al., 2021). Alternatively, data on context of randomised controlled trials could be analysed thematically (Noyes et al., 2019b).

'Quantitising' is more common than we might imagine, often being done subconsciously. For example, you could quantify the frequency of certain words or phrases within a keyword analysis. You can count and compare the frequency of themes. However, resist the dangers of vote counting or of interpreting the frequency of mentions of themes as an indicator of their relative importance! 'Quantitising' allows further statistical analysis

of data, but information from rich contextual data is always lost when converting from qualitative to quantitative (Noyes et al., 2019b). In contrast, 'qualitising' is less common; it might be used to convert a demographic profile of a population into a caricature or narrative vignette that is at the same time representative of most cases and yet true to none (Booth et al., 2019a).

As mentioned previously, bringing together your review results together in a synthesis is a key step to the review process. Synthesis of mixed methods data allows you to observe *and* explain patterns; the qualitative data may explain why one intervention did not work as well as anticipated. Variation in intervention components may suggest why one intervention is less popular than another. In short, we move beyond what works and what is acceptable to a more nuanced understanding of the context within which an intervention might best be expected to succeed.

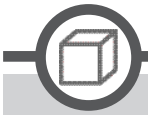
A recent methodological innovation in mixed methods synthesis is the so-called 'interweave' approach (Thompson Coon et al., 2020). This approach seeks to extend beyond the choice between parallel, sequential, or convergent methods to interweave the findings of individual reviews. Its originators claim three key innovations to mixed-methods synthesis methods:

- The use of intersubjective questions to understand the findings of the individual reviews through different lenses,
- Immersion of key reviewers in the entirety of the evidence base, and
- Commencing integration during the final stages of the synthesis of individual reviews, just as reviewers are starting to develop an understanding of initial findings.

As with most mixed methods synthesis the focus of the interweave approach is on exploring and identifying links between and across review findings. However instead of doing this at the level of the *study* the authors seek to explore and identify patterns and links between the *individual findings,* both between and across studies, hence the interweave label (Thompson Coon et al., 2020). Rather than seeking to compare and then integrate quantitative and qualitative answers as, for example, in the matrix approach, the team formulates (intersubjective) questions and then seeks to answer these by interweaving the quantitative and qualitative data into explanations of the findings.

ON THE ROLE OF THE NARRATIVE REVIEW

Probably the most straightforward way of integrating quantitative and qualitative studies is using a narrative approach (Madden et al., 2018). Chapter 7 illustrated how your choice in using narrative lies between a traditional narrative review and formalised development of narrative synthesis. The traditional narrative approach falls short of the systematic approaches espoused by this book. Instead you may employ 'narrative synthesis without meta-analysis' (Campbell et al., 2020) which allows you to summarise narratively studies that address a different aspect of the same focus of interest (see Chapter 7). In this way you can build up a more complete picture of that focus of interest. Nevertheless, you will also encounter structured approaches to narrative reviews. See Box 9.7.



box 9.7

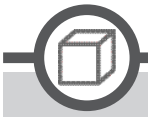
Structured approach for when a narrative review is the appropriate tool (Byrne, 2016)

A structured narrative review will typically include the following sections:

- Importance of review topic
- Conduct of literature searches
- Selection of citations
- Justified inclusion and exclusion criteria
- Citation of references
- Summary of information
- Critical evaluation of studies
- Tables/figures/diagrams
- Utility to new readers
- Contribution to body of knowledge

The usefulness of mixed methods reviews

Individual studies are often sliced into multiple publications (e.g. process and views studies or quantitative and qualitative studies) and these may defy integration. Under such circumstances a review team may generate, through synthesis, new explanations, propositions and hypotheses (i.e. findings) not immediately apparent at primary study level.



box 9.8

Example of a mixed methods review (medically unexplained symptoms)

Leaviss et al. (2020) conducted a mixed methods review to examine primary-care-based management of medically unexplained symptoms. The review team sought to acknowledge debates around the appropriateness of quantitative outcomes and also to value the experiences of those who present with this condition. Interventions were very different, making it important to examine common mechanisms by which different interventions might work as well as to evaluate costs and cost-benefit. The resultant highly complex review required a large team to compare the effectiveness of different interventions using a network meta-analysis and elicit the views of patients and staff through published qualitative research. In addition, a realist synthesis explored how diverse interventions achieved their effects and an economic evaluation examined the cost-benefit of different approaches. The review identified that much of the success attributable to interventions centred on the pivotal relationship

between the general practitioner and the patient: how the patient was initially received, the pathways of care towards which they were directed, avoidance of a vicious cycle in chasing a diagnostic label, and negotiation, and eventual agreement, between patient and practitioner, of a shared model of the condition.

Using analysis to examine an integrated synthesis

We mentioned earlier that when you bring the quantitative results and the qualitative findings together you may discover that the 'Take Home Message' is synergistic or, conversely, the two evidence bases may reflect a trade-off – as when an intervention is effective but not well accepted. Tensions or contradictions may also exist with regard to the research agenda. Quantitative studies such as RCTs may have examined easily measurable outcomes but the qualitative synthesis may reveal that outcomes important to the patients have been overlooked. The bringing together of quantitative and qualitative evidence informs the 'Discussion', 'Conclusion' and 'Recommendations'.

Techniques at your disposal for bringing together both types of evidence include various forms of graphing, the use of matrices and tabulation, and the analytical techniques listed in Chapters 7 and 8 (Noyes et al., 2019b). You could graph the quantitative studies by size of effect and compare this with the presence/absence of particular intervention components. For example, the EPPI-Centre team compared health messages on fruit and vegetables with the effects on increased consumption by children (Thomas et al., 2004b). They found it was ineffective to promote fruit and vegetables in the same way or to expect children to respond to messages regarding long-term health benefits. Alternatively you could place quantitative outcomes from included studies in rows (e.g. patient satisfaction score) and qualitative versions of the same outcome (patient satisfaction) in columns and examine the matrix to see whether both types of data are favourable, unfavourable or equivocal (Candy et al., 2011).

In a mixed methods review on appointment reminders (TURNUP) we ordered studies by the percentage of participants who attended. Population-based reminders (e.g. for blood donation) achieved poorer attendance than personal invitations. Personal invitations to adults achieved a lower percentage attendance than those targeting parents attending with a child (McLean et al., 2014). We hypothesised that commitment and personalisation are key to attendance; personalised reminders achieve higher commitment than blanket invitations and parents are more committed to a child's appointment than to their own. We then examined markers of commitment within specific interventions in a qualitative way. This led to development of a new theory (McLean et al., 2014).

SUMMARY

This chapter illustrates that mixed methods synthesis includes creative elements of seeking patterns, often across quantitative and qualitative bodies of evidence, with each offering a potential lens on the focus of interest. For a reviewer, exploring reasons for variations, discrepancies and inconsistencies constitutes the payback for the painstaking process of identifying, assembling, organising and interpreting the diverse bodies of quantitative and qualitative evidence. By identifying patterns to data and included studies, investigating conflicting or outlying cases, and exploring relationships between particular variables you find yourself privileged to gain insights perhaps unknown to those working in the foothills of the often-separate individual evidence bases. You are now ready to turn your attention to how best to present the report, the focus for Chapter 10.

key learning points

- Including quantitative and qualitative data within the same synthesis adds methodological complexity but can be rewarding in terms of value-added insights.
- The least complex approach conceptually is to conduct separate reviews for quantitative and qualitative data and then to link the two reviews through an integrating synthesis.
- Unless you use an integrated methodology you will require some 'bridging' device by which you can link the two types of data; this could be a matrix, a graph, a structural or process-based logic model, a conceptual framework or an interweave approach.
- Integrative methodologies include critical interpretive synthesis, meta-narrative or realist synthesis. However, these are not interchangeable; each method has been developed to meet a particular research need.

frequently asked questions (FAQs)

FAQ 9.1 Should I perform a rapid mixed methods review?

We have already considered the respective merits of rapid reviews versus systematic reviews (FAQ 3.6). We stated that systematic reviews should be preferred if time and resources are not an issue. This choice becomes even more important for mixed methods reviews – as mentioned earlier integrating two strands of literature, quantitative and qualitative, may triple the amount of time and resources required. Rapid reviews are typically used when decision-makers face time-critical decisions (Khangura et al., 2014). Nevertheless, conducting rapid mixed methods reviews that address both whether interventions work (quantitative studies) and how they work (qualitative studies) may offer a more complete answer than a single systematic review that addresses only one of those questions (Tricco et al., 2017).

FAQ 9.2 Which methods of integrating quantitative and qualitative evidence are most suitable for a novice reviewer?

Many reviewers find that use of matrices, to explore correlations or inconsistencies in the data across qualitative and quantitative studies, offers an intuitive way of handling data. So, for example, you can use a matrix to compare themes from qualitative data with outcomes measured in quantitative studies. Consider whether concepts measured quantitatively and qualitatively are actually measuring the same thing! You may find it helpful to map quantitative and qualitative data to a common structure such as a logic model or a conceptual framework using best fit framework synthesis. A scoping review rehearses some of the main methodological choices (Tricco et al., 2016a).

FAQ 9.3 Should I publish my mixed methods review as one publication or two?

This dilemma is familiar to those who publish mixed methods primary research. The trade-off is the added value of the integration of both types of evidence against word constraints that limit completeness of reporting. It is already difficult to do justice to the Methods and Results of a single review and mixed methods reviews compound this issue. Although the question centres on publishing one or two reviews a third option is to publish three reviews: the quantitative review, the qualitative review and an integrative review. Assuming, however, that you are unable to be this prolific, then you should consider an integrative review that focuses on the

quantitative results published in a high-impact journal and then a supplementary publication unpacking the detail of the qualitative review. Reasons for profiling the quantitative results in this way are strategic rather than methodological. Quantitative reviews tend to face a better chance of being accepted in high-impact journals. Citing the integrative review in the qualitative review offers the added prospect that the study report will be located through citation searching.

FAQ 9.4 Why should I consider conducting a mixed methods review?

A compelling reason for conducting a mixed methods review is that it values different world views and different types of knowledge and experience. The review team can accommodate the statistician and the qualitative researcher, as well as for the researcher who is comfortable in moving between quantitative and qualitative paradigms. The mixed methods review design seeks to preserve the integrity of the findings of different types of studies; it does not convert qualitative findings into numbers or quantitative findings into words. By using complementary frameworks for qualitative and quantitative research, or a neutral framework to accommodate both, a mixed methods review design aspires to preserving each method. As a novice you may find yourself moving outside of your comfort zone. Provided that you are prepared to familiarise yourself with the basics of each review method, to identify appropriate support and expertise as required and to acknowledge that both approaches carry their own limitations, you can emerge from a mixed methods review with a good basis for research training to equip you for future challenges.

FAQ 9.5 I can't decide between conducting two separate reviews of quantitative and qualitative evidence and undertaking a single mixed methods synthesis. What particular issues should I bear in mind?

As with most legitimate methodological choices there are arguments in favour and against both approaches. A reviewer who plans to summarise two 'strands' of research study and then integrate them is contemplating a task comparable with conducting three reviews, if not more! Typically, you should possess strengths in one or other of the quantitative/qualitative paradigms. However, even if you can move comfortably within one paradigm you may not be equipped to bring both together. At the same time, you should not underestimate the benefits for decision-makers of bringing both types of evidence together, particularly if both evidence strands share a common context.

Our conservative advice is to keep your options open; that is, to start by conducting separate reviews, perhaps achieving economies of scale, for example in the search phase, but continually to be looking for opportunities to integrate the two strands. Certainly, producing two separate reviews that address your different research questions and then narratively summarising them in your Discussion and Conclusions is an option to discuss with your supervisor/research team. If, while conducting your reviews, you identify some unifying matrix, logic model or conceptual framework then that is a bonus! However, promising, and then failing, to integrate, or running out of time, would be detrimental. If you are concerned about the workload you could restrict yourself to studies that form 'clusters': studies published as associated quantitative and qualitative papers or mixed methods studies reported in a single report. However, be aware that for some topics this might restrict the evidence too drastically! Alternatively, if you have both the inclination and the capacity to learn you might consider a mixed methods synthesis method such as **realist synthesis** or **critical interpretive synthesis** and therefore identify your review as mixed methods from the very beginning.

(Continued)

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Heyvaert M, Hannes K & Onghena P (2016) *Using Mixed Methods Research Synthesis for Literature Reviews: The Mixed Methods Research Synthesis Approach* (Vol. 4). Thousand Oaks, CA: Sage.

The only book at time of publication to specifically examine methods of mixed methods research synthesis. The book surveys developments that relate to the complementary roles of quantitative and qualitative reviews before detailing ways to synthesise, segregate, integrate and even to convert qualitative findings to quantitative, or quantitative to qualitative.

Leeman J, Voils CI & Sandelowski M (2015) Conducting mixed methods literature reviews. In: Hesse-Biber SN & Johnson RB (eds), *The Oxford Handbook of Multimethod and Mixed Methods Research Inquiry*. New York: Oxford University Press. Available from: http://dx.doi.org/10.1093/oxfordhb/9780199933624.013.12

Methods chapter from longstanding team of North American nurse researchers. A focus on complex health and social interventions makes this contribution of wide potential for the research community. Particularly valuable are examples of how mixed methods reviews have been applied to complex interventions and a concluding discussion on how to overcome some of the challenges involved.

Noyes J, Booth A, Moore G, Flemming K, Tunçalp Ö & Shakibazadeh E (2019) Synthesising quantitative and qualitative evidence to inform guidelines on complex interventions: clarifying the purposes, designs and outlining some methods. *BMJ Global Health*, 1: 4(Suppl. 1).

Highly cited output from a series of journal papers on methodological issues for complex interventions produced by an international writing team for the World Health Organization. This paper provides a useful structure against which to further explore the review process.

Pearson A, White H, Bath-Hextall F, Salmond S, Apostolo J & Kirkpatrick P. (2015) A mixed-methods approach to systematic reviews. *International Journal of Evidence-Based Healthcare*, 13(3): 121–31.

Outlines recommendations of the Joanna Briggs Institute International Mixed Methods Reviews Methodology Group and their preferred 'segregated approach' to mixed methods synthesis (separate syntheses for the quantitative and qualitative components). Describes use of a Bayesian approach to translate the findings of the initial quantitative synthesis into qualitative themes and then pool these with the findings of the initial qualitative synthesis.

Pluye P & Hong QN (2014) Combining the power of stories and the power of numbers: mixed methods research and mixed studies reviews. *Annual Review of Public Health*, 18(35): 29–45.

Probably the most useful starting point and overview for mixed methods research and mixed studies reviews. After considering the epistemological background for mixed methods the authors present the main types of mixed methods research designs and techniques. The authors offer guidance for planning, conducting and appraising mixed methods research and describe the main types of mixed studies reviews, providing a toolkit of examples.

10

WRITING UP, PRESENTING AND DISSEMINATING YOUR REVIEW

in a nutshell

How to write up, present and share your review findings

- When writing and presenting data from a systematic approach to the literature you should consider your audience and your message.
- Reporting guidelines exist for many systematic approaches to reviewing and if you follow these guidelines your literature review is more likely to be well received.
- Typically, you should consider what you will recommend for research *and* what you will recommend for practice.
- You should choose methods for data presentation that illustrate key messages from your review.
- You should publicise your review using diverse methods tailored to your specific audience(s).

key terms explained

dissemination: in the context of this chapter, making review results available to the scientific community, policy-makers and industry or public services using scientific language prioritising accuracy. Typically focuses on the results of the review project (although

(Continued)

planned much earlier), happens only when results are available and targets audiences who are most able to influence take-up and use of results.

EPICOT+: acronym that represents the structured format for formulating research recommendations according to the essential components of Evidence, Population, Intervention, Control, Outcome, Time. Offers a response to the imprecision implied by 'More Research is Needed.'

graded entry format: reporting format that allows stepwise access ('graded entry') to the evidence. Typically starts with a 'front-end' short interpretation of findings/conclusions followed by a short, contextually framed, executive summary or narrative report highlighting review results (often with locally relevant factors) and then the full systematic review itself.

reflexivity: the examination of a reviewer's or review team's own beliefs, judgements and practices during the review process and how these may have influenced the conduct and/or interpretation of the review. Typically focuses on interpretive reviews as aggregative reviews tend to focus only on conflict of interest.

reporting guidelines: recommended requirements, with accompanying explanation, that seek to make reports of particular study designs or research types more reliable and useful by promoting transparent and accurate reporting.

INTRODUCTION

We consistently argue that systematic approaches to reviewing capitalise upon transparent and auditable methods. The Methods section, typically only of interest to the subject expert (or latterly the systematic reviewer!), helps to establish how credible and objective your review is. Typically, review authors put the needs of their topic first (what do I want to say?), then the methods of their chosen type of review (why should they listen?). Only finally do they consider their audience (what do they want to learn?). Increasingly, there is recognition that those who synthesise evidence must speak directly to a specific audience and the audience that they select must, in turn, shape subsequent decisions on how to present the synthesis (Major & Savin-Baden, 2010b). This change in mind-set requires an interactive approach to research co-production.

Identifying recommendations for action

Your review may have identified methods or interventions that you now want to highlight for potential use in practice. However, just because these interventions *can* does not guarantee that they *will*! You have likely studied a *study population* within the context of an *intervention evaluation*. That does not necessarily mean that your findings will apply to a *target population* in an *implementation context*. Many factors determine whether research may be applied within a specific context. You may find it helpful to consider an applicability or transferability checklist (e.g. FITAR (Baxter et al., 2019) or TRANSFER (Munthe-Kaas et al., 2020)) when writing up recommendations. You could use a context framework within your actual review (Booth et al.,

2019a) to ensure that you have extracted data on aspects of context that are consistently important. If you are a practitioner–researcher you may already be familiar with your target context. Otherwise, as an external researcher, you may need to engage with stakeholders and a steering group to gain advice on the implications of your findings (Pollock et al., 2018).

You cannot simply contend that 'More research is needed' (Godlee, 2010). Exactly what types of research are needed, addressing what specific questions (Godlee, 2010)? Having spent many person-hours immersing yourself in the literature, surely you can now identify what has been researched or where considerable uncertainty remains. Try to communicate a specific question and future type of research required for the answer (see the EPICOT+ section of this chapter). Rather than generate an endless list of priorities for future research, picture where finite funds are best targeted. Make recommendations as an honest broker, not the potential beneficiary of future commissioned research; if you subsequently benefit from a gap that you have highlighted, then that is an unexpected bonus.

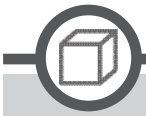
You can learn more about your target context from consultation documents, interim presentation of results to review commissioners, stakeholder conferences and presentations at professional meetings. This iterative 'dry run', when your findings are fresh and you can still shape their interpretation, is as much part of your analysis as it is part of subsequent presentation and dissemination. You may need to consider whether results are statistically significant and how much uncertainty surrounds the pooled results. Remember, too, that the pattern of your review findings was shaped by the eligibility criteria for your review. Focusing your review, even for good practical, logistic reasons (Chapter 4), may limit the extent to which it applies to populations beyond your main focus.

You may find that your recommendations for practice are limited by lack of detail in the included studies. You may be unable to judge, from limited information in the original reports, whether the studies are externally valid (applicable). Studies have found that reports of promising interventions so lack detail about the interventions that it is impossible to replicate these in practice (Hoffmann et al., 2014). Even where an intervention is clearly described the report may offer insufficient detail on *how* it was implemented.

Highlighting recommendations for future research

Any review holds the potential to identify research gaps. However, the injunction for all researchers to start writing up with the statement 'Further research is needed' is rightly treated with suspicion. You should be as specific as possible about what is lacking in research conducted to date. Does a theoretical framework already exist? If so, does it need further exploration or validation? If not, are we any further towards identifying what the essential features of a potential intervention might be? Is any population group that might benefit from the intervention under-researched or neglected? Have potential interventions been explored in small-scale studies? How large will a rigorous randomised controlled trial need to be to establish effectiveness conclusively? Are any suggested adjustments to an intervention yet to be investigated? Are the right outcomes being measured and reported? Does the field need to develop wider use of rigorous outcome measurement tools?

New research, including evidence syntheses, can contribute in multiple ways to existing research (Box 10.1).



box 10.1

The contribution of evidence synthesis to existing research

Theory testing or validation: if a review is contributing to an established line of theory and empirical research, it should make clear what the contributions are and how the study contributes to testing, elaborating or enriching that theoretical perspective.

Theory generation: if a review is intended to establish a new line of theory, it should make clear what that new theory is, how it relates to existing theories and evidence, why the new theory is needed, and the intended scope of its application.

Problem solving: if a review is motivated by practical concerns, it should make clear what those concerns are, why they are important and how this investigation can address those concerns.

Fact finding: if a review is motivated by a lack of information about a problem or issue, the problem formation should make clear what information is lacking, why it is important and how this investigation will address the need for information.

exercise 10.1

The contribution of new research

Look at the four contributions that new research can make to existing research (Box 10.1). Which are particularly relevant to your own review? Are other contributions that your review might make not covered by these four generic headings?

What are we seeking to achieve?

Systematic approaches to the literature are particularly valuable when presenting research findings. We shall consider four requirements under the acronym of CART (Clarity–Auditability–Replicability–Transparency). In seeking to highlight the relative importance of these four criteria (while not attempting to put the CART before the horse!) we deliberately exclude criteria such as comprehensiveness (a claimed virtue for quantitative systematic reviews), that may be present in some but not all such systematic approaches.

Table 10.1 CART criteria for systematic approaches to the literature

Criterion	Objective
Clarity	As a primary goal, your research question should be clear. So, too, should your methodology, the presentation of findings, the discussion of limitations in method and/or evidence and in linking conclusions to the original question. Structured reporting, captured in reporting guidelines, should make your review easy to navigate and easy to interpret

Criterion	Objective
Auditability	Good-quality research should be supported by a clear audit trail. You should carefully document all steps taken in conducting the review. This audit trail documents the evidence that supports each finding, where that evidence can be found, and how that evidence was interpreted. You can then look back at what exactly was done to defend a finding or interpretation although it is better to anticipate and forestall potential criticisms
Replicability	Reproducibility has long been a major driver for systematic approaches to the literature. Evidence synthesis does not seek the repeatability of laboratory experiments. Commentators favour 'replicability': a finished product should resemble its predecessor. Conclusions from one review can differ completely from another review written by a different author, even when exactly the same articles are reviewed. If we pay careful attention to detail, and use many of the same techniques to minimise inconsistencies, we can produce a review that is essentially similar. Inevitable inconsistencies are more easily identified, more completely understood and more appropriately remedied. Even for a gold standard systematic review, differences in search methods or the differential application of inclusion criteria can result in different review products. With multiple reviews on identical or closely related topics, we should focus on identifying and explaining differences rather than on eliminating them completely
Transparency	'A systematic review uses transparent procedures to find, evaluate and synthesize the results of relevant research. Procedures are explicitly defined in advance, in order to ensure that the exercise is transparent and can be replicated' (Campbell Collaboration, n.d.). Transparency often focuses on citing supporting documentation such as procedure manuals, implying that 'name-checking' a well-regarded methods source guarantees the review product. More important is whether documented procedures are followed; the reader should be able to make their own judgement on review quality. Transparency makes it possible to make such judgements

CONSIDERING YOUR AUDIENCE

Why might a particular review fail to impact on its audience despite using a structured review presentation? Concerns with technical detail or methodological niceties may interfere with the intended message or may even lead to reviews being considered boring (Greenhalgh, 2012)! The measured, cautious tone of a review, interspersed with nuances, may mask the potential usefulness of the review findings. Your efforts to find multiple instances of evidence from multiple contexts and circumstances may yield contradictory advice. Source reports may lack the detail required to replicate an intervention or programme, even when interventions are effective (Hoffman et al., 2014). The review team may have addressed a deliberately narrow question to make it easier to conduct the review. This narrow question may limit the options the review team cover making it less useful and less applicable. Particular sectors of the community may be excluded, either by not being studied or because of inconclusive evidence. Finally, the time taken to conduct the review may mean that options have moved on or been overtaken by external events. Clearly a review team should try to anticipate such concerns early in the review

process, particularly during commissioning and scoping (see Chapter 4). This chapter therefore focuses on aspects that remain unresolved at the point of writing up the review.

No review product has a *single* target audience (Hammersley, 2013). However, you should always be able to identify the *primary* audience for your review:

> whenever we address a particular audience we have to take account of what we can assume they already know, what they would and would not be interested in, and perhaps also what they might misinterpret. (Hammersley, 2013)

You should therefore prioritise those aspects of presentation that relate to the primary audience without compromising too much on the needs of secondary audiences. However, you will need to consider political context alongside technical requirements:

> We need to take account of the politics of how reviews are received and read by audiences. The reception of reviews is often driven by audiences' current preoccupations, and guided by relatively fixed preconceptions. (Hammersley, 2013)

Political concerns may appear less important for an academic output, particularly for a dissertation or doctorate. However, you still need to adapt your accompanying narrative to what the audience currently believes and where you want the audience to be once you complete your review. Do you need to exhort, reason, cajole or even berate? The tone that you adopt depends upon whether you are trying to encourage your audience to adopt some new method (start-starting), to dispense with an ineffective practice (start-stopping), to maintain proven good practice (stop-stopping), resist the lure of an ineffective technology (stop-starting) or simply to open the minds of the audience to a future possibility (start-thinking!) (Nicoll et al., 2000).

Consumers of your review

In marketing terms, we think about a synthesis product in terms of its primary audience (the main consumers of your review) and its secondary audiences (others who may be interested in your review). For example, the primary audience of a review included in your thesis might be the external examiner and secondary audiences might be your supervisor, other academics in your discipline and, possibly, practitioners in your chosen field. Complete Exercise 10.1 which gets you to think about likely beneficiaries from your review and where their interests may lie.

exercise 10.2

Who would benefit from knowing about my review?

Beneficiary	Likely area of interest	✓
For a research team		
Policy-makers and local government	Recommendations for policy and practice	

Practitioners	Recommendations for practice
Researchers	Research gaps and recommendations for research
Research students	Research gaps and recommendations for research
Academics (educators)	Current knowledge and best practice
Service users	Implications for services
Others	*Who else can you think of?*
For a research student	
Other research students	Methodology and as potential exemplar
Researchers	Overall findings and contribution to knowledge
Patients/public	Shared experience
Others	*Who else can you think of?*

Note: The above lists are not exclusive and potential beneficiaries may appear on both lists.

You would do well to ask three questions on behalf of your audience: 'do I understand it, do I believe it, do I care?' (Godlee, 2010). Choose one of the primary audiences from your list of beneficiaries in Exercise 10.1: *for that particular audience* complete the questions in Exercise 10.2.

exercise 10.3

Will they understand, believe, care?

For your own review complete this grid:

Which aspects of my review may my readers not understand?
Which aspects of my review may my readers not believe?
Which aspects of my review do I want my readers to care about once they have read it?

Writing for research funders

Research funders want you to reassure them that they have made a wise investment. They are particularly interested in knowledge gains made as a result of the review. They will also be interested in the added value that a systematically conducted review offers over and above other possible research approaches, whether primary research or other types of synthesis. Finally, they will want to know if you have identified other areas for research; either follow-up questions identified in the course of your review or proximate areas that you have not covered in your own work. Your research funders will find it particularly helpful if you identify, first, what is already known about the topic and, second, what this review adds. You will find it helpful to summarise your own review as two boxes of bullet points and then to use this structure to construct your own conclusions.

Writing for policy-makers

Although policy-makers will wish to know that the conclusions of your review are based on high-quality research studies wherever possible, they are particularly interested in the external validity (or generalisability) of your review (Avellar et al., 2017). In other words, they want to know the extent to which the results of your review can be reasonably applied or generalised to a definable population/populations in a particular context. If studies have not been conducted within the setting of interest, they will want to know any limitations or reservations they might have in applying results from elsewhere to their context. They will also want to have an idea of the limitations of the evidence in terms of any unresolved areas of uncertainty.

You should particularly bear in mind that policy-makers need reviews for decision support (i.e. to provide answers or direction) rather than for knowledge support (Pope et al., 2006). A review that has had to extend its search beyond high-level evidence may be more useful to a decision-maker than non-actionable conclusions that 'robust studies are unable to provide answers'. Similarly, policy-makers appreciate a holistic picture of all issues to inform their decision (i.e. they should 'address the full range of questions asked by managers and policy-makers') rather than a simple lens offering an answer to a very tightly focused question (Thomson, 2013). Increasingly, models of stakeholder engagement involve decision-makers in the entire review process, from asking multiple potential research questions to providing context for the specific question under study (Feldmann et al., 2019).

As well as a focus on pragmatic answers, policy-makers are interested in how reviews are presented. In particular, decision-makers should be able to scan reviews easily for relevance so that they can assess whether a review applies to local circumstances (Thomson, 2013). Although research is often conveyed using the 'Introduction, Methods, Results And Discussion' (IMRAD) format, some suggest this format may impair decision-making by clinicians, policy-makers and other stakeholders (Garritty et al., 2020). Others suggest use of alternative 'graded entry' formats that organise decision-relevant, summarised information upfront with more detailed information progressively revealed to the reader (Garritty et al., 2020). Graded entry approaches have popularised use of the 1:3:25 format (involving corresponding numbers of pages for take home messages (1 page), the executive summary (3 pages) and the full systematic review (25 pages)).

Writing for practitioners

A well-conducted systematic review can be invaluable for practitioners who feel overwhelmed by the volume of literature in their discipline and, therefore, prefer summaries of information to original publications (Nagtegaal et al., 2019). Review articles can help practitioners to keep up to date. High-quality systematic reviews define the boundaries of what is known and what is unknown as well as helping to 'avoid knowing less than has been proven' (Cook et al., 1997). Single studies rarely provide definitive answers, but systematic reviews can help practitioners solve specific problems. By critically examining primary studies, systematic reviews help decision-makers to understand why different sources of research evidence yield conflicting or inconsistent answers.

By quantitatively combining the results of several small studies, meta-analyses can create more precise, powerful and convincing conclusions. In addition, systematic reviews including multiple studies may better inform decision-makers about whether they can apply findings to specific subgroups of the population.

Despite the above features, systematic reviews do not always command practitioners' attention as much as might be expected. A provocative editorial argues why practitioners might find systematic reviews 'boring':

> The reason why Cochrane reviews are boring — and sometimes unimplementable in practice — is that the technical process of stripping away all but the bare bones of a focused experimental question removes what practitioners and policymakers most need to engage with: the messy context in which people get ill, seek health care (or not), receive and take treatment (or not), and change their behaviour (or not). (Greenhalgh, 2012)

Further criticisms from practitioners include concerns that:

- Reviews do not address issues of current concern for practitioners.
- Reviews may relate to topics where evidence is limited (Pagliaro et al., 2010).
- Reviews may be 'empty reviews' or reviews that include a single study (Yaffe et al., 2012).
- Interventions being studied may not reflect standard practice, leading to an outdated review (Pagliaro et al., 2010).
- Policy-makers do not appreciate lengthy reviews (of 40 pages or more).
- Policy-makers have only limited interest in the Methods section (which could therefore be placed in a technical appendix).
- Policy-makers want practicable recommendations for practice (Pagliaro et al., 2010).
- Specifically, the use of summary statistics may make it more difficult to apply findings to specific populations.

Such concerns shape how you write up your review; many relate back to scoping of the review (Chapter 4).

Writing for the research community

The research community is particularly interested in well-conducted reviews because they help to identify gaps in the evidence base and provide a quantitative basis for informing new research initiatives. Typically, a researcher responding to a funding call builds an argument for a

research proposal around an existing systematic review. A systematic review may inform design of new studies (Nikolakopoulou et al., 2019). However, reviews are not yet used as frequently in the design of studies as we might expect. Health funding bodies and prestigious journals have started to require that study authors identify related studies when presenting their own primary research, seeking to reduce the numbers of 'islands without continents' (primary studies that fail to make a connection with their own evidence base) (Lund et al., 2021). Increasingly, funders provide vignettes in support of invitations to tender that refer to findings from relevant systematic reviews. Requiring, or encouraging, researchers to cite systematic reviews in publications or within funding applications is a trend to be welcomed.

Writing for the media

The interests of review author and journalist rarely correspond. At best, their interaction may operate as a short-lived marriage of convenience. Certainly the 'discovery value' of research synthesis pales alongside the dramatic laboratory experiment or the miracle cure. Nevertheless a review author can point to the fact that findings from a review carry more accumulated weight than a single study.

In 1996 Smith bemoaned the absence of systematic approaches to reviewing the evidence base:

> We are, through the media, as ordinary citizens, confronted daily with controversy and debate across a whole spectrum of public policy issues. But typically, we have no access to any form of a systematic 'evidence base' – and therefore no means of participating in the debate in a mature and informed manner. (Smith, 1996)

Fortunately, this situation has undergone gradual change over the last 25 years. Reviewers and users of reviews alike are recognising that a well-conducted synthesis may provide the first occasion for seeing 'the whole picture' from otherwise conflicting research. Another selling point is the cumulative number of subjects, patients, studies or events that the review considers when compared with a single paper. Table 10.2 illustrates how reviewers have attempted to communicate the features of their approach to journalists and, ultimately, to the public.

Table 10.2 Lay explanations of systematic reviews/review findings from media reports

Definition	Source
Review: 'Systematic reviews are an important tool for scientists; unlike ordinary reviews, they are seen as original research and help to provide clarity in areas of uncertainty. The basic underpinning of a systematic review is that the process of conducting the review is pre-specified and that the review itself is as comprehensive as possible within these pre-specified limits. Reviews that are not systematic are much more prone to bias, especially with regards to the selection of papers included for review'	*The Times*: Great minds: attack science at your own risk (7 January 2010)
Review: 'A systematic review is a thorough look through published research on a particular topic. Only studies that have been carried out to a high standard are included. A systematic review may or may not include a meta-analysis, which is when the results from individual studies are put together'	*Guardian*: Heel pain, what treatments work? (2 March 2010)

Definition	Source
Review finding: 'One good-quality summary of the research (a systematic review), which included almost 900 people'	*Guardian*: Heel pain, what treatments work? (2 March 2010)
Review finding: 'The findings come from a review of 25 studies … the University researchers said: "This systematic review contributes a rigorous and objective synthesis of the evidence for added benefits"'	*Daily Mail*: Jogging in the park boosts energy and improves mood more than going to the gym (10 August 2010)

Writing for the public

A review author has two particular challenges in communicating the results of their review to the public. The first challenge relates to the *specific knowledge associated with the topic*. The author may have to simplify concepts, define unfamiliar terms and use readily accessible terminology. However, the second challenge relates to the *review product and its methodology*. The review author must try to convey the inherent advantages of systematic approaches over single studies and over other types of (non-systematic) review.

It is helpful in this context to use a definition of the review that does not just argue that the methods are technically superior but which stresses how the review product is more useful as a result of applying these methods.

Reflexivity and acknowledging potential bias

In qualitative evidence synthesis, reviewers should consider their own pre-existing biases and discuss how those biases might have affected the review (Downe et al., 2019). This approach, known as **reflexivity**, mirrors primary qualitative research where the investigator reflects on the effect of their own position as researcher (Newton et al., 2012). A review team should describe upfront how it plans to handle such biases and then, within the review itself, describe any such biases. Reflexivity statements may extend to between half a page and a full page and will appear prospectively in the Methods section and retrospectively in the Results and/or Discussion sections.

Complete Exercise 10.3 so that you and/or your research team can consider your likely influence on the conduct and interpretation of your review.

exercise 10.4

Being reflexive, individually and as a team

Consider the Reflexivity statements in the Methods and Results sections of Downe et al. (2019). What factors from the reviewer backgrounds do they recognise as potential influences on their synthesis? To what extent do these same influences apply to your own review?

(Continued)

Hint: consider the potential influence of your professional background(s), your research experience, your publication history. Consider whether you are more or less likely to identify the disconfirming case. Consider what processes and procedures you might put in place to minimise biases and keep interpretations open to wider influence, beyond the team.

Critical interpretive synthesis is one synthesis method that harnesses personal interpretation at the possible expense of **replicability**. Such approaches reflect a research tradition that recognises multiple truths and that the review may privilege one narrative from many possible interpretations. In contrast, quantitative reviews assume a neutral 'honest broker' perspective that presents the data transparently and considers review findings to represent fact. Such reviews belong within a tradition where the reviewer seeks to communicate a single truth but many factors (biases), whether conscious or subconscious, may deflect this intention. Mechanisms for minimising personal interpretation in quantitative reviews are crude by comparison, typically a **conflict of interest statement** confined, almost exclusively, to financial interest.

box 10.2

Sample conflict of interest statement

"AB declared no financial conflicts of interest. He was a co-author on three of the included papers and was therefore excluded from screening these papers.

DC declared no financial conflicts of interest.

CC declared the following financial conflicts of interest: [Describe and discuss how this was dealt with].

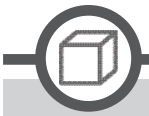
Non-financial issues, including personal, political and academic affiliations, could have influenced review author input when conducting this review. The review authors discuss this further in the sections on reflexivity in the Methods and Results sections".

Thinking of bias only as 'financial interest' misses the fact that researchers include professionals delivering a service, parents of children receiving an educational intervention, carers of relatives receiving healthcare or social care provision, taxpayers financing policy interventions, etc. Increasingly, it is practical to make potential bias transparent rather than trying to eradicate it completely. So, a reader should be able to identify, for example, where an educator stands with regard to a teaching intervention or a clinician in connection with a new drug or surgical treatment.

A SAMPLE REVIEW STRUCTURE

A good academic review presents its findings in a way that builds confidence in the abilities of the review team. To some extent, the structure of your review depends upon its purpose. For example, systematic reviews follow a clear structure that largely dictates how the review should be presented. However, you may be conducting your review as part of a coursework assignment,

research proposal or research dissertation. Within overall word limits and style constraints you are largely free to decide how you will structure your report. You should make sure that the systematic structure of your review report is immediately apparent to the reader. By being systematic you will find that some key elements are included in *all* literature reviews (Aveyard, 2019a) (Box 10.3).



box 10.3

Key elements in reporting a literature review

Title

Abstract

Introduction

Methods

Results

Discussion

Conclusion

Box 10.3 uses the familiar IMRAD (Introduction–Methods–Results–And–Discussion) format common to any primary scientific report. This same basic structure underpins the PRISMA statement, used to report 'full-blown' systematic reviews in peer-reviewed journals (see section on reporting standards later in this chapter). The PRISMA statement was:

> designed to help systematic reviewers transparently report why the review was done, what the authors did, and what they found. (Page et al., 2021)

In 2021, the creators of PRISMA produced an important update of the PRISMA statement (Page et al., 2021). Table 10.3 highlights the main differences that you might spot between the many examples of reviews already published and the current state of the art as outlined in the latest PRISMA statement. As well as helping to revise your expectations this table also provides a flavour of methodological (risk of bias, assessment of certainty, etc.) and scientific developments (conflict of interest and open science frameworks) over the intervening decade.

Table 10.3 Noteworthy changes in PRISMA 2020 from the previous (2009) statement

What you may see in pre-2021 reviews	What is now required (Page et al., 2021)
Variable quality in Abstract reporting	Inclusion of abstract reporting checklist within PRISMA 2020
'Protocol and registration' within Methods section	'Protocol and registration' item located in a new Other section, with addition of a sub-item for amendments post-registration or in the protocol

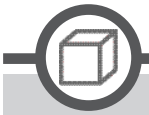
(Continued)

Table 10.3 (Continued)

What you may see in pre-2021 reviews	What is now required (Page et al., 2021)
Search strategy for only one database	Recommendation that authors present full search strategies for all databases, registers and websites searched
Limited details on study selection	Emphasis on reporting number of reviewers who screened each record and each report retrieved, whether they worked independently, and any automation tools used in the process
Limited details on synthesis of results	Splitting of the 'Synthesis of results' item in the Methods section into six detailed sub-items (including methods for visualisation, sensitivity and subgroup analyses and meta-regression)
Limited reporting of excluded studies	Recommendation under 'Study selection' item in the Results section that authors cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded
Limited reporting of risk of bias assessments, statistical syntheses, exploration of heterogeneity and sensitivity analyses	Splitting of the 'Synthesis of results' item in the Results section into four detailed sub-items
Limited reporting of GRADE and GRADE-CERQual	Addition of new items recommending authors report methods for and results of an assessment of certainty (or confidence) in the body of evidence
Immature methods for handling competing interests	Addition of a new item recommending authors declare any competing interests
Limited open access to data and review materials	Addition of a new item recommending authors indicate open access provisions

Various extensions to published standards also exist, for example PRISMA-S for searching (Rethlefsen et al., 2021), PRISMA-P for systematic review and meta-analyses protocols (Moher et al., 2015) and PRISMA-ScR for scoping reviews.

PRISMA's generic approach to study reporting offers a useful template for reviews in any discipline. In choosing between reporting standards you can follow a hierarchy outlined for qualitative reviews (Flemming et al., 2018). This forms the basis for a checklist in Box 10.4.



box 10.4

Which reporting standard should I use?

1. Is a specific reporting standard relevant to the type of synthesis that I have undertaken? If No then
2. Is it appropriate to follow a generic reporting standard in its entirety? If No, then ...
3. Is it appropriate to combine particular sections or items from one or more generic reporting standards into a single format? If No, then

4. Is it appropriate to supplement a generic reporting standard with reporting guidance for particular stages of the synthesis (e.g. the search process)? If No, then
5. Can I compile a list of relevant items for reporting from a recent collection (or summary article) of review features?

Below we expand on the seven sections covered by the PRISMA statement. However, the reader is referred to the most up-to-date version of the PRISMA statement (Page et al., 2021).

Title: Increasingly, scientific reports include not only a meaningful title indicating the subject but also, following a colon, a subtitle indicating the study type such as, 'The impact of learning on unemployed, low-qualified adults: a systematic review'. Alternatively, a **meta-analysis** may have a title such as, 'A systematic review and meta-analysis of set-shifting ability in eating disorders'. By including the study type in the title, you make it more likely that those interested will identify and retrieve your review report from Internet or database searches and that an indexer will code it correctly when adding details to a database record. It is equally important to indicate the study type in the title for other systematic approaches such as 'a rapid evidence assessment', 'a meta-ethnography', etc.

Abstract: The abstract is the 'review in miniature' and a reader should be able to identify immediately how well you searched, how many studies you reviewed and what your main conclusions are. Structured abstracts improve the chance that your intended audience (and others) will identify your work. Structured abstracts prompt the author for essential details including: the background; objectives; data sources; study eligibility criteria, participants and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; and systematic review registration number. Specific guidelines (PRISMA-Abstracts) have been produced for those reporting in journal or conference abstracts (Beller et al., 2013). Typically, the abstract should not exceed 250–300 words although individual journals have their own specific requirements. The abstract should be sufficiently informative to provide the reader with a brief picture of the overall findings; it should reveal, not tease (e.g. avoid statements such as 'The review goes on to describe findings of critical importance to all practitioners', but state briefly instead what these findings are). Generally, commentators recommend that the abstract is written last to reflect the final version of the review it summarises (Agarwal, 2012).

Introduction: The Introduction outlines the rationale for the review, in the context of what is already known, and a structured statement of the review question using **PICOS**, or some equivalent such as **SPICE** or **PICOC** (see Chapter 4). Typically, review authors should argue for how their review addresses a common, critical or important problem, how serious its consequences, how costly it is and how it impacts on services and on society more widely. If genuine controversy exists, perhaps seen in significant variations in practice, this should be acknowledged and both sides of the argument characterised as even-handedly as possible.

Methods: The length of literature reviews varies considerably and you must manage word limit allocations between the methods and the results, discussion and conclusion. While how many words you spend on describing the methods depends on the type of review you are undertaking and how much rigour the review requires, it is best to start from a complete list of possible items for inclusion and then to pare this down to match the word count. If you are producing a formal review for a government agency or an international collaboration, you may wish to indicate where a review protocol exists and how it may be accessed. Some journals allow you to submit your review protocol as supplementary online material. You might then proceed through

the eligibility criteria, the information sources accessed, the search strategies, and processes for study selection.

Formats and guidelines exist for reporting search strategies (Booth, 2006; Rethlefsen et al., 2021) (Table 10.4) although evidence suggests that these are imperfectly implemented (Rethlefsen et al., 2015). Cochrane expectations require reporting of the search process (including 'sources, searched, when, by whom and using which terms') (Lefebvre et al., 2021). Cochrane guidance suggests that you document the search process in enough detail throughout the review such that searches of all the databases are reproducible. At least one of your database searches should be reported in sufficient detail to repeat it.

Table 10.4 Guidelines for reporting search strategies

All search strategies for systematic reviews: PRISMA-S (Rethlefsen et al., 2021)	**Search strategies for qualitative evidence syntheses: STARLITE (Booth, 2006)**
INFORMATION SOURCES AND METHODS (Database name, Multi-database searching; Study registries; Online resources and browsing; Citation searching; Contacts; Other methods)	S: Sampling strategy (e.g. purposive, theoretical, comprehensive) T: Type of studies A: Approaches (other than electronic subject searches covered in the electronic sources section), e.g. hand searching; citation snowballing, etc.
SEARCH STRATEGIES (Full search strategies; Limits and restrictions; Search filters; Prior work; Updates; Dates of searches)	R: Range of years (start date–end date) L: Limits
PEER REVIEW (Peer review)	I: Inclusion and exclusions T: Terms used
MANAGING RECORDS (Total records; Deduplication)	E: Electronic sources (reports databases used and, optimally, search platforms, and vendors to assist in replication)

You would continue with details of study selection followed by data collection and a list of data items or variables of interest. Formal review processes, as used by the **Cochrane Collaboration**, then require details of the risk of bias within individual studies (i.e. a description of methods used for quality assessment) and the risk of bias across studies (see sections in Chapters 7–9 on **publication bias** and **selective reporting**). You will also detail the data being summarised whether by quantitative summary measures (e.g. risk ratio, difference in means), or by qualitative concepts or themes. Finally, having described your methods of synthesis you proceed to methods of analysis. Again, these may be either quantitative (**sensitivity** or **subgroup** analyses, meta-regression) or qualitative assessments of the robustness of the results and possible explanations for findings.

At this point we have reviewed just over half of the items from the 27-item PRISMA checklist. Only now have we reached the results. This emphasises that, while you the reviewer are interested in the review question and its findings, the reader needs convincing that your review product is up to the task.

Results: The Results section starts with a quantitative summary of the number of items identified and then moves to detail of the individual studies. A subsection on study selection gives numbers of studies screened, assessed for eligibility, and included in the review, with reasons

for exclusions at each stage. Increasingly there is a requirement, as with the PRISMA statement, to produce a flow diagram (Page et al., 2021). Our experience is that a PRISMA flow diagram is a useful aid for the reader for any type of review. Tables help to describe the characteristics of included studies and offers an easy look-up reference to individual citations in the reference list. Again, you present results for your assessments of the risk of bias within studies and the risk of bias across studies. These assessments typically precede the very important sections reporting the results of individual studies and the synthesis of results respectively. Such sections utilise tables and forest plots for each **meta-analysis** and thematic summaries, diagrams, and displays for qualitative data. If using a thematic approach, the account should flow logically from one section or theme to the next, to maintain continuity and consistency (Torraco, 2016).

Discussion: Up to this point you have provided the reader with 'crude' evidence, analogous to oil as it emerges from the ground. You now come to your *discussion* where you process 'refined' by-products that allow the consumer to use and interpret your findings. You start with a summary of evidence, giving particular attention to the strength of evidence associated with each finding. Having previously identified the main audiences for your review, you should provide the information each needs to answer their particular issues or questions. Be sure to:

> discuss the strengths and limitations of the literature, including a consideration of the scientific quality of the included studies and methodological problems in the literature (e.g., methodological rigor or lack thereof, the amount of evidence, its consistency, and its methodological diversity). (Siddaway et al., 2019)

Your role is to summarise and evaluate evidence about your topic, pointing out similarities and differences and offering possible explanations for inconsistencies uncovered. If your literature review has been conceived to inform the objectives, design or conduct of a follow-up primary study, you should focus on gaps in knowledge and improvements in methodology. In some cases, you might use emergent themes to construct a conceptual framework or **logic model** to inform the study (Chapter 7). Finally, you return to what was previously known, as described in your Introduction, to locate the results within the context of other evidence, and implications for future practice and/or research (*conclusions*). All reviews can provide Implications for Practice and Implications for Research (some funders resist 'Recommendations' because they imply a commitment to follow up actions).

If you are following reporting guidelines you conclude with several items labelled as *Other Information*. The current PRISMA statement includes: Registration and protocol, Support (sources of funding for the systematic review and other support, such as supply of data, as well as the role of funders for the systematic review), Competing interests (for conflict of interest) and Availability of data, code and other materials. You should also complete *acknowledgements* to those who provided substantive support to the review but who do not qualify for authorship.

An alternative to the IMRAD structure is the conceptual structure. This requires identification of the overarching structure before beginning to write. You can choose from one of three forms of conceptual structure: temporal structure (as the topic unfolds chronologically); methodological structure (around different methodological options or stages); and conceptual or thematic structure (around particular themes or a conceptual framework or model) (Torraco, 2016). Other structured approaches to presenting review findings include a dialectic (debate-type) approach between two or more competing schools of thought, or the meta-narrative approaches described in Chapter 9 which characterise the literature by source discipline.

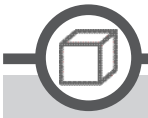
Reviews and reporting guidelines

Funders, editors and researchers increasingly recognise that it is important for research to be transparent. In recent years this has led to a veritable industry of publication guidelines and templates for presentation. While few can argue against the benefits of effective communication, some argue that shaping all research of the same study type to look the same makes published reports bland and less informative. Standardising reports may conceal rather than reveal; for example, stock phrases such as *'References were followed up and contact was made with authors'* may mask important individual differences.

It is agreed good practice to copy and paste a complete search string for all primary bibliographic databases into an appendix exactly as run and in full (Lefebvre et al., 2021). Alternatively, capturing a screenshot of the search may be more feasible (Rader et al., 2014) and some databases allow the exporting of your search string/strategy as a Word document or text file. Although web searches are not as reproducible as bibliographic database searches, because web content and search engines change, it is still important to document the search process transparently (Briscoe, 2018).

As a reviewer of other people's studies, as opposed to a review author, you will appreciate standardised reporting of individual primary studies. It makes creating data extraction forms, using standard quality assessment checklists and tabulating data, more straightforward. However, as we have implied, authors may omit informative detail of context or avoid tell tale slips in the reporting that might betray limitations in their methods.

Systematic reviews were early beneficiaries from reporting standards (Moher et al., 2014). Standards are available for many different types of review and it is challenging to keep up to date with all of them. Table 10.5 details important reporting guidelines and Box 10.5 points to EQUATOR, a single resource on what is available and what is imminent. Reporting guidelines should be produced following a detailed review of methods used and consensus from experts (Moher et al., 2010). However, several important standards (such as ENTREQ for qualitative syntheses, Tong et al., 2012) predate this formal process. A reporting guideline typically contains standard headings under which to report specific detail, a checklist of individual elements to be reported, an elaboration and explanation statement expanding on these items, and a flow diagram of the progress of studies throughout the review process (Moher et al., 2014).



box 10.5

The EQUATOR network

Access the **EQUATOR Network** (https://www.equator-network.org/). The EQUATOR (Enhancing the QUAlity and Transparency Of health Research) Network is an international initiative that seeks to improve the reliability and value of published health research literature by promoting transparent and accurate reporting and wider use of reporting guidelines. Browse through the reporting guidelines and select one appropriate to your review (e.g. systematic review or qualitative systematic review). How is the reporting guideline structured? Revisit your draft review structure (e.g. IMRAD format) and revise it to meet the requirements (Exercise 10.4).

Table 10.5 Most common standards for reporting reviews

eMERGe: Improving reporting of meta-ethnography (France et al., 2019a)	Incorporates new methodological developments and advances methodology of meta-ethnography. Intends to help researchers report important aspects of meta-ethnography and thus raise reporting quality
ENTREQ Statement: Enhancing transparency in reporting the synthesis of qualitative research (Tong et al., 2012)	Seeks to help researchers to report the stages commonly associated with synthesis of qualitative health research: searching and selecting qualitative research, quality appraisal, and methods for synthesising qualitative findings
MOOSE Statement: Proposal for reporting meta-analysis of observational studies in epidemiology (Stroup et al., 2000)	Contains specifications for reporting of meta-analyses of observational studies in epidemiology, including background, search strategy, methods, results, discussion and conclusion. Seeks to improve the usefulness of meta-analyses for authors, reviewers, editors, readers and decision-makers
The PRISMA 2020 statement: An updated guideline for reporting systematic reviews (**P**referred **R**eporting **I**tems for **S**ystematic reviews and **M**eta-**A**nalyses) (Page et al., 2021)	Aims to help authors report a wide array of systematic reviews to assess the benefits and harms of a healthcare intervention. Focuses on how authors can ensure the transparent and complete reporting of systematic reviews and meta-analyses
PRISMA extensions	Extension Statement for Diagnostic test accuracy reviews (PRISMA-DTA)
	Extension Statement for Systematic Reviews with a Focus on Health Equity (PRISMA-Equity)
	PRISMA for Abstracts (Beller et al., 2013)
	PRISMA for Complex Interventions (PRISMA-CI)
	Extension Statement for Overviews of Systematic Reviews Including Harms
	Extension Statement for Systematic Reviews Incorporating Network Meta-analyses of Health Care Interventions
	Extension Statement for Reviews of Individual Patient Data (PRISMA-IPD)
PRISMA-P (Preferred Reporting Items for Systematic reviews and Meta-Analysis Protocols) (Moher et al., 2015)	PRISMA-P checklist contains 17 items considered to be essential and minimum components of a systematic review or meta-analysis protocol
PRISMA-S (Preferred Reporting Items for Systematic reviews and Meta-Analyses literature Search extension) (Rethlefsen et al., 2021)	Seeks to complement the PRISMA Statement and its extensions by providing a checklist for authors, editors and peer reviewers to verify that each search component is completely reported and reproducible
PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension Statement for Scoping Reviews)	The PRISMA extension for scoping reviews checklist contains 20 essential reporting items and 2 optional items to include when completing a scoping review (Tricco et al., 2018a). See Table 10.6

(Continued)

Table 10.5 (Continued)

Realist And Meta-narrative Evidence Syntheses – Evolving Standards (RAMESES)	Two associated documents: RAMESES publication standards: meta-narrative reviews (Wong et al., 2013a) and RAMESES publication standards: realist syntheses (Wong et al., 2013b)
Synthesis Without Meta-analysis (SWiM) in systematic reviews: reporting guideline (Shamseer et al., 2015)	Describes development of the SWiM guideline for synthesis of quantitative data of intervention effects and presents nine SWiM reporting items with accompanying explanations and examples

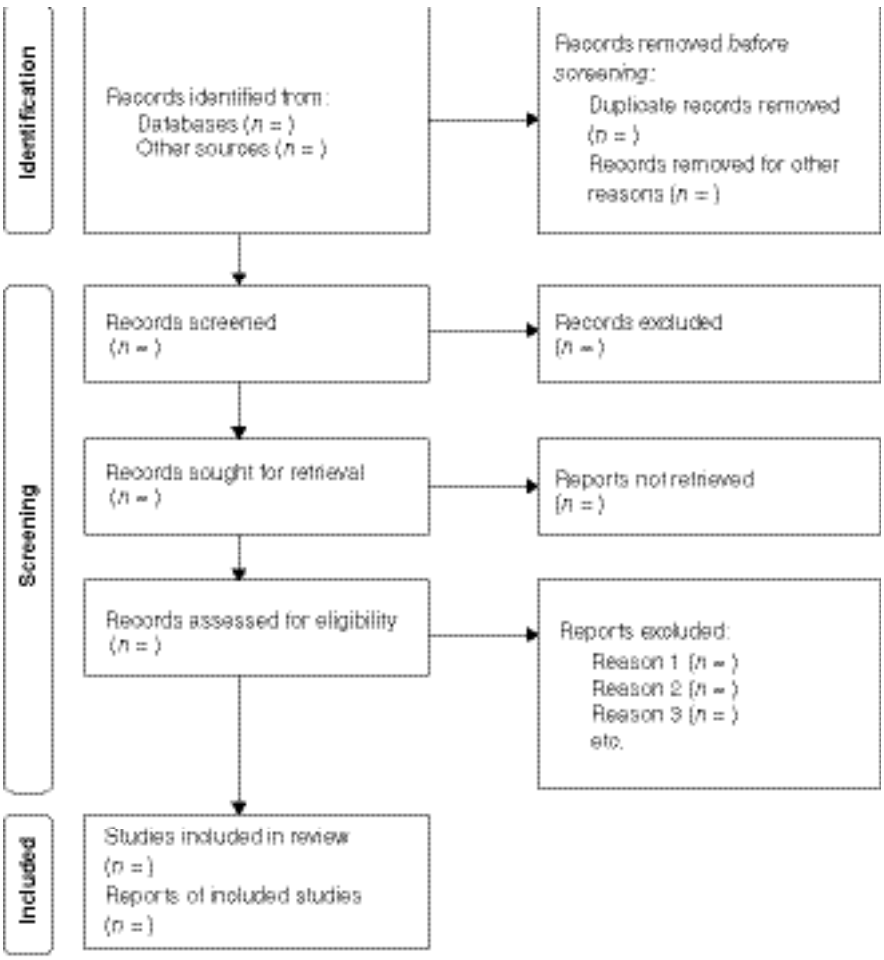


Figure 10.1 PRISMA flow diagram

Flowchart of included studies

One of the most self-evidently useful features of the PRISMA Statement is the flowchart for included studies. Indeed, PRISMA flowcharts are of potential value to less structured types of

review by accounting for studies during conduct and subsequent reporting of the review. The PRISMA flow diagram depicts the flow of information through the different phases of a systematic review. It maps out the number of records identified, included and excluded, and the reasons for exclusions. At each stage, the vertical 'plughole' continuation box and the horizontal 'overflow' box should combine to total the number of studies in the preceding box, ensuring that studies are accounted for at each point of the process. The main caution in using a PRISMA diagram relates to the difference between references and papers (many duplicate references may have been identified from multiple databases) and the subsequent difference between papers and studies (one study may be represented by reports in multiple papers). It is helpful to signal transparently when you transition from reporting numbers of references to numbers of papers and from numbers of papers to number of studies.

Even though reporting guidelines are now commonplace, considerable variation persists in how reviewers use the PRISMA flow diagram. Some authors use a *chronological* approach, others superimpose a *logical* structure, yet others reinterpret the diagram for plotting their *methodology*; such inconsistencies perpetuate confusion.

Use of tables and figures

You can use tables and figures to summarise vast quantities of data (as an alternative to extensive descriptive text) and to support what is already present in the narrative. Typically, tables and figures combine both purposes. 'Tables for doing the review' may not survive into the final published review (or may only appear in an appendix) but are invaluable in organising the data. These tables are primarily for use by the review team. In contrast, 'tables for presenting the review' (summary tables) find their way into the published report and are primarily for the reader and user.

Essential summary tables include:

1. A summary of study characteristics (e.g. number of participants, setting, study design, etc.).
2. A summary of methodological quality (e.g. whether comparative, which outcome measures have been used, response rates or completeness of follow-up, etc.).
3. A summary of results (producers and users of systematic reviews share a preference for statements that communicate findings combining size and certainty of an effect) (Santesso et al., 2020).

Summary tables are typically included within the main body of the text unless your review includes more than 20 included studies. You can integrate tables of less than 20 studies within the text without disrupting your flow too much; for example, you may fit them onto a single A4 page. In contrast, you place fully reported data extraction tables into an appendix to increase the auditability of your final review.

If you have combined studies within a meta-analysis, then your report may include one or more **forest plots**. While many meta-analysis software packages allow the export of such **forest plots**, you must be aware that these may not be of the print quality required for a final publication (Schriger et al., 2010). If relabelling or even redrawing a forest plot, you should pay careful attention to the orientation of the diagram (is more of an outcome better or worse?), how it is captioned (what exactly is the outcome of interest?) and the notation for the point of no

effect (does the forest plot present a ratio? – in which case the point of no effect is represented by one – or does it present a difference? – in which case the point of no effect is signified by zero).

Use of appendices and other supporting features

Few publications outline what should and should not be included within appendices. Nevertheless, custom and practice are starting to be evidenced by published reports. You first need to establish whether the review must fit within a set word limit. Increasingly, online journals offer flexibility with regard to the length, extent and number of published appendices. Typically, appendices would include:

1. at least one search string/strategy (and increasingly all available search strings/strategies – see Table 10.4) used for the review;
2. a list of excluded studies (for studies appearing to meet the inclusion criteria but not included) with brief reason for exclusion;
3. a sample data extraction form;
4. data extraction tables for included studies;
5. the quality assessment checklist used (unless commonly available);
6. results of quality assessments.

As requirements for rigorous conduct and reporting increase, this list will likely be further expanded.

Accurate referencing

We have already emphasised how important it is to document systematically bibliographic information on included studies (Chapter 5). Every type of literature review should conclude with a full bibliographical list of all the books, journal articles, reports and other media referred to in the work. Every citation in the text must appear in your reference list and every item in your reference list must be cited in the text. Structured approaches to the literature, such as systematic reviews, frequently make it easier to separate supporting materials from the background, which go into a general reference list, and the list of included studies. Supporting materials may be diverse: 'Three bibles, three dictionaries, and nearly 25,000 other things' (Clarke & Clarke, 2000)! You will save yourself much time towards the critical stages at the end of your review if you compile your list of references as you identify each new item. Although the Internet makes reference checking easier, it remains a time-consuming procedure. You cannot guarantee that other authors have correctly recorded their own references. Many academic supervisors use the reviews of their supervisees to update their topics of interest. This is another good reason for making sure your reference lists are accurate!

Structuring other types of review (scoping/mapping reviews)

The more structured your review, the more likely it is that you will find that formal guidelines exist for reporting that type of review. Journals produce guidelines for reviews that they commonly

encounter and institutions (such as the Joanna Briggs Institute) devise guidelines for reviews that they commonly produce. For example, the *Journal of Advanced Nursing* has unilaterally produced guidelines for *concept analysis* reviews. The guidelines require 'concept analysis' to appear in the title and the aims to be stated as: '*This paper is a report of an analysis of the concept of X.*' The structured abstract includes fields commonly associated with a systematic review such as data sources and review methods. Typically, a concept analysis justifies the importance of the concept, details the concept analysis method used (including quality assessment if present) and presents results organised according to the accepted terminology of the method (e.g. attributes, definition, antecedents, consequences).

Several approaches are suggested for presenting findings from a scoping review (Arksey & O'Malley, 2005). The first approach is what we describe as the 'epidemiology' of the literature where you describe the literature using a 'basic numerical analysis of the extent, nature, and distribution of the studies included in the review'. This involves producing:

> tables and charts mapping: the distribution of studies geographically and for the different [population] groups; the range of interventions included in the review; the research methods adopted and the measures of effectiveness used. (Arksey & O'Malley, 2005)

Such an analysis sheds light on 'the dominant areas of research in terms of intervention type, research methods and geographical location' (Arksey & O'Malley, 2005). It also enables the researchers to 'quickly get a flavour of the main areas of interest, and consequently where the significant gaps were', invaluable when presenting subsequent recommendations.

An alternative, complementary approach is to organise the literature thematically, perhaps by a shared characteristic such as intervention type. Ideally, categories should be mutually exclusive to minimise duplication and avoid double counting, but this is not always possible. The reviewer finds themselves constrained by how completely study authors have reported the component studies. Will you present a minimum data set only of data that is complete for each study or a more extensive matrix with many empty cells? To a certain extent, this depends on whether your focus is on the mapping of the existing evidence base, or the identification of gaps. Furthermore, for a **scoping review** or **mapping review**, where the review is a stepping stone towards another purpose, you will not be able to assess the component studies in detail. You may need to use the labels used by the authors themselves rather than constructing your own, more specific taxonomy, or make judgements based solely on titles and abstracts.

Alternative approaches to organising studies include coding by the 'theoretical or conceptual positions adopted by authors' (Arksey & O'Malley, 2005). This illustrates that the reviewer must be clear in what exactly they have done when reporting data so that readers can determine any potential bias in reporting or recommendations.

The PRISMA extension for reporting scoping reviews (PRISMA-ScR, 2018) includes 20 essential reporting items and 2 optional items (see Table 10.6).

Some authors have found it helpful to develop 'templates' in the form of tables that summarise the basic characteristics of all included studies accompanied by a 'commentary written under … nine headings: interventions; sample sizes; participants; research methods; outcomes; evidence relating to effectiveness; economic aspects; UK studies; gaps in the research' (Arksey & O'Malley, 2005). The objective is to allow reviewers, and readers, 'to make comparisons across intervention types; identify contradictory evidence regarding specific interventions; identify

Table 10.6 Checklist for Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2018a)

Section item	
Title	Critical appraisal of *individual* sources of evidence
Abstract	Synthesis of results
Rationale	Selection of sources of evidence
Objectives	Characteristics of sources of evidence
Protocol and registration	Critical appraisal within *sources of evidence*
Eligibility criteria	Results of individual sources of evidence
Information sources*	Synthesis of results
Search	Discussion
Selection of sources of evidence	Limitations
Data charting process	Conclusions
Data items	Funding

*Where sources of evidence are compiled from, such as bibliographic databases, social media platforms, and Web sites

gaps in the evidence gaps about individual interventions and across interventions as well as consider possible "new frontiers"' (Arksey & O'Malley, 2005).

exercise 10.5

Producing a draft report structure

Produce a draft report structure for your review using the sections described above. Try to allocate an appropriate word limit to each section based on the size and scope of your review and its intended focus.

Practical tip: If writing for a journal then find an existing review article of a similar type/topic. Open the PDF in a word processor and use the Word count facility to quantify the number of words in each section, for example 'Methods (750 words)'. This gives you an overall structure and helps you to assign realistic word limits to each section. You can use this same approach by opening a copy of reporting guidelines (for the structure only) or for the house style of a report series.

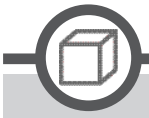
PUBLICISING YOUR REVIEW

As with any research project, you should give some thought to how to publicise your review findings. Timeliness is key: be prepared to drop everything else to accommodate journalists' tight deadlines with a radio, TV or podcast interview or well-chosen soundbite. Remember that a little creativity helps turn a statement into a quote – 'Speaking for the authors, Dr Booth confirmed: "Our review makes it very clear that a tasty soundbite is key to successful publicity"'.

Visual communication can be highly effective, where possible and appropriate; but rather than posting PRISMA flowcharts focusing on the review methods, focus on the people whose lives will be changed by your findings. What would draw the attention of the general public and help it 'connect' with your topic? Always use the highest quality graphics feasible.

While you may feel that your current review is the best research you have ever done, this is not necessarily how others will see it. A controversial or topical review question is a more likely marker for successful coverage. Do not be disappointed if the coverage does not deliver what you hoped – they may even get your name wrong. Press coverage is only one strategy in your overall portfolio (see Box 10.6). Media outlets do get reporting of research right more often than they get it wrong and will often link to the journal or to the study online.

Once you have secured press coverage you can retweet links to articles, photographs and tweets put out by your press office (Sinnenberg et al., 2017; Giustini et al., 2018; Ruano et al., 2018). One Cochrane Group ran its social media strategy using daily 'tweets', weekly WordPress blog posts and a monthly journal club on Twitter ('tweet chat') (Dyson et al., 2017). Each tweet, blog and journal club shared Cochrane evidence on a review topic. The group evaluated the strategy through (1) Twitter and blog site analytics, (2) traceable link (Bitly) statistics, (3) Altmetric.com scores for promoted evidence, and (4) participant feedback. Importantly, the group also tracked the resources required to write the blog, tweet content and manage the strategy.



box 10.6

Methods for sharing findings from systematic reviews (Rader et al., 2014b)

Decision Aids/Decision Aid Summary – algorithms presenting evidence supported decision choices and consequences.

Journal Club – professional/practitioner-led discussions (face to face, online, Twitter-led or email exchanges) of review quality and implications for practice.

Scenarios in General Journals – realistic situations in which review findings might be applied.

Summary of Findings Tables – Single-page summaries presenting benefits and harms of a review in a transparent and simple tabular format.

Plain Language Summaries – One-page or shorter summaries describing the same information as in the summary of findings table but giving key findings using language that is understood easily by the public.

(Continued)

Podcasts – Brief recorded broadcasts presenting review findings.

Tweets – Individual or strings of tweets profiling review bottom line and pointing to full version.

Clinical Answers – Question and answer format constructed around common questions.

Narratives as a Knowledge Translation (KT) tool – Storytelling using video, audio or narrative textual formats

Dr Cochrane – Professional-oriented storytelling centred on fictional character.

It is important to recognise that your target audience will not have a single preferred route to finding out about your review. Not only do individuals differ in their preferred formats, shaped by age, education, personality characteristics and learning preferences, but also the same individual may prefer different formats for different purposes. A comparison of infographic and critical appraisal formats for systematic reviews found that infographics are considered aesthetically appealing for summarising evidence; however, critical appraisal formats are considered clearer and more comprehensible (Crick & Hartling, 2015). Tools for knowledge dissemination and translation need to be targeted to the specific preferences and needs of different audiences.

TOOLBOX FOR PRESENTING YOUR FINDINGS

A key challenge, once the literature review process has been completed, is to decide upon an appropriate method for presenting your findings to your chosen audience. This Tools section looks first at the highly structured 1:3:25 report format increasingly favoured by policy-makers. It then turns attention specifically to the reporting of meaningful recommendations for future research using the EPICOT+ structure.

Graded entry format

Graded entry formats are typically encountered when publishing rapid review reports (Garritty et al., 2020). They allow stepwise access (hence 'graded entry') to the evidence. Typically, they start with a 'front-end' short interpretation of the main findings and conclusions, drawn from an evidence synthesis. These front-end concise summaries are often followed by a short, contextually framed, executive summary or narrative report in which the results of the systematic review (often with locally relevant factors) are highlighted. The front-end summary and the narrative report/summary are then combined with a full systematic review to make a three-component set.

The 1:3:25 report

The 1:3:25 report format acknowledges that writing a research summary for decision-makers is different from writing an academic journal article. Because reviewers have a different objective

to that for their academic outputs, they take a different approach. Every 1:3:25 report follows the same guidelines: starting with 1 page of main messages; followed by a 3-page executive summary; and concluded with findings presented in no more than 25 pages of writing, in language that is easy for a lay person to understand. Details of these three sections are as follows.

Main messages (the '1'): one page of main message bullets reporting the lessons decision-makers can take from your review. These go beyond a summary of findings because they have to tell the audience what your findings mean for them. Writing main messages is a challenge for researchers who are typically trained to provide an objective and detached view of the evidence. You will have to strike a balance between having something of interest and practical importance to report without going beyond what is actually present within your review.

Executive summary (the '3'): the executive summary condenses your findings for a busy decision-maker. The summary is problem focused and uses the journalistic technique of presenting the more meaningful content at the top, followed by background, context and less important information further down. Bear in mind decision-makers are not interested in your meticulous review methodology – only later will your Methods section act as a guarantor of rigour once your findings have been assimilated, understood and interpreted.

The report (the '25'): the 25-page report of your review allows more detail, but, nevertheless, requires a greater succinctness than typical in a final report. Take time to refine it with your decision-maker partners. Consider the following seven categories of information for inclusion in the report.

Context: the policy issue or managerial problem with a clear statement of the PICOS review question.

Implications: state what your review findings mean for decision-makers. Target the implications at your main stakeholders but anticipate other audiences who may be interested in your work.

Approach: outline your review methods, including the type of review undertaken, database sources and search strategies used, the numbers of studies found and the overall methods of synthesis and presentation. Brief details of limitations of the methods should be given with a fuller explanation provided in a technical appendix.

Results: summarised in a concise and informative way using a full array of graphical and tabular means to highlight key themes and messages. Subsidiary results will be placed in an appendix.

Additional resources: supporting materials (e.g. publications and websites) to help decision-makers follow up issues raised by your review.

Further research: resisting 'further research is needed' this section should frame specific questions that remain to be answered together with suggested research designs to address them.

References and bibliography: typically using the Vancouver numbered reference style with references at the end of the report.

It is a considerable challenge to condense the content of a systematic review, or even a rapid evidence assessment, within the 25-page strictures of this format. Nevertheless, creative use of appendices and judicious but rigorous reporting can achieve this aim.

Other graded entry formats include the following (Garritty et al., 2020).

Inverted pyramid format

The inverted pyramid format utilises a structure that places its 'bottom line' (key take home message) at the top; that is, it emphasises the conclusions or key messages upfront

followed by a brief (executive) summary. This 'bottom line upfront' (BLUF) format is followed by a lengthier report that provides specific details for the reader. This format is similar to the 1:3:25 format but emphasises function rather than sticking strictly to a prescriptive page count.

SUPPORT Summary format

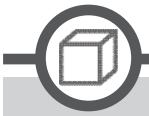
The SUPPORT Summary graded entry structure was developed to present the results of systematic reviews to decision-makers (Petkovic et al., 2016). First, it highlights key messages derived from findings. It then proceeds to other components (such as background information to provide context to review findings); a summary of the search approach and what was identified; and a detailed summary of the main findings, including methodological quality of the evidence. Particular features include highlighting relevance to low- and middle-income countries with reference to applicability, impact on equity, economic considerations, and the need for monitoring and evaluation, before concluding with references.

GRADE and GRADE-CERQual

GRADE (Grading of Recommendations, Assessment, Development and Evaluations) is a transparent framework for developing and presenting summaries of evidence and provides a systematic approach for making clinical practice recommendations (Granholm et al., 2019). It is the most widely adopted tool for grading the quality of evidence and for making recommendations with over 100 organisations worldwide officially endorsing GRADE. A complementary approach, GRADE-CERQual (Confidence in the Evidence from Reviews of Qualitative research), provides guidance for assessing how much confidence to place in findings from systematic reviews of qualitative research (or qualitative evidence syntheses) (Lewin et al., 2018a). The GRADE-CERQual approach was developed to support the use of findings from qualitative evidence syntheses in decision-making, including guideline development and policy formulation. GRADE-CERQual includes four components for assessing how much confidence to place in findings from reviews of qualitative research (also referred to as qualitative evidence syntheses): (i) methodological limitations, (ii) coherence, (iii) adequacy of data and (iv) relevance. The approach involves examining the individual components iteratively before making an overall assessment of confidence in a review finding and creating a GRADE-CERQual Evidence Profile and a GRADE-CERQual Summary of Qualitative Findings table.

The EPICOT+ format for reporting research recommendations

The EPICOT format has been proposed as the basis for formulating research recommendations and improving the presentation of proposals for further research (Brown et al., 2006). Subsequently, optional components have been incorporated within the proposed EPICOT+ format (Box 10.7).



box 10.7

Suggested format for research recommendations on the effects of treatments (EPICOT+)

Core elements

E Evidence (What is the current state of the evidence?)

P Population (What is the population of interest?)

I Intervention (What are the interventions of interest?)

C Comparison (What are the comparisons of interest?)

O Outcome (What are the outcomes of interest?)

T Time stamp (Date of recommendation)

Optional elements

d Disease burden or relevance

t Time aspect of core elements of EPICOT

s Appropriate study type according to local need

SUMMARY

Clearly, the intense and prolonged effort that goes into production of a literature review that harnesses systematic approaches will only be fully exploited if you give consideration to the intended audience for the review. The intended audience will determine the language and the format of the final review. Secondary products, such as plain language summaries (Dormer & Walker, 2020), 1:3:25 reports (see Tools section) and briefings (Chambers & Wilson, 2012) may be needed to cater for the information preferences of the intended audience. Given that all reviews have multiple audiences, authors must target multiple channels. Graded entry formats allow an individual user, or different users, to engage at different levels of the review. Three examples are the 1:3:25 format, the inverted pyramid format and the SUPPORT summary format (see Graded Entry Formats above)

key learning points

- It is critical when writing a systematic review to base what you write and how you present it on a detailed knowledge of your intended audience.
- Remember that your review will have multiple audiences and you should try, therefore, to anticipate and factor in their interests.

(Continued)

- Systematic approaches to presenting your methodology and findings will demonstrate clarity-auditability-replicability-transparency (CART).
- Published reporting guidelines may help you to present your methodology and findings in a clear and transparent way.
- In addition to a structured academic report you should consider other methods of presentation for your review including plain language summaries and briefings.

frequently asked questions (FAQS)

FAQ 10.1 How do I identify reporting guidelines that relate to my systematic review?

It is challenging to keep up to date with the appearance of reporting guidelines. Fortunately, the EQUATOR (Enhancing the QUAlity and Transparency Of health Research) Network website (see Box 10.5) compiles an index grouped into categories together with a brief description and links to external resources. Having located an appropriate reporting guideline you will find that most reporting guidelines are available via open access. Several websites, such as PRISMA, offer helpful checklists or reporting templates. Interactive PRISMA flow diagrams, into which you enter numbers of references for each stage, are also available on the Web. However, always make sure that they reference, and adhere to, the most recent version of the reporting guidelines.

FAQ 10.2 Is it mandatory to use reporting guidelines where available?

As this book emphasises, systematic approaches add value by using transparent reporting methods. Reporting guidelines are often the result of extensive consultation and, in some cases, a formal Delphi process. Some might consider it arrogant or foolish to ignore collective and free expert advice on how to report your review transparently. Many journals are adding reporting statements to their **Instructions to Authors**. Some journals require a completed checklist to demonstrate compliance with a particular guideline. However, even if this is not the case you will find that most peer reviewers will have a similar set of reporting characteristics in mind when they review your work. Take the opportunity to anticipate the information that they will want to see by following an appropriate reporting guideline. Remember too that these are only guidelines. If you identify a particular need for reporting your review then do try to innovate within the overall framework. For example, you may want to adapt your PRISMA flowchart of studies to illustrate a methodological point.

FAQ 10.3 What should I report if I produce an empty review?

An empty review can have many causes (Slyer, 2016). Perhaps your focus of interest has a limited research base. This can be a positive result if you are a postgraduate researcher seeking to contribute to new knowledge! Technically, however, you may have over-specified the population, intervention or outcomes when compared with the questions asked in primary research studies or placed an overly demanding restriction on study type, particularly if randomised controlled trials are not feasible. Hopefully, you anticipated these issues during scoping searches and when developing your review protocol. If your topic is too new to provide adequate evidence for synthesis, you may need to contemplate primary data collection as an alternative to a systematic review.

If your review does come up empty, you can highlight major gaps in the current evidence base (Slyer, 2016). By specialising in this topic you have become an 'expert' with first-hand knowledge of where research is needed. You can use an empty review to provide specific research recommendations to guide the types of research designs needed, eligibility criteria for sample selection and detail on the optimal intervention, comparator and outcome measures. These implications differ little from a review where the evidence was inconclusive or conflicting. Above all, resist the temptation to endorse conclusions based on excluded or non-eligible studies, based on other evidence or not underpinned by any evidence. The rules of the evidence 'game' do not change simply because your ball has been 'punctured'! You must not offer biased conclusions that are unsupported by evidence and that may misguide healthcare professionals in their decision-making.

FAQ 10.4 What outputs can I use to disseminate my review?

If your organisation, the commissioning organisation or a journal publisher produces press releases, you may want to work closely with the press office to produce an accurate yet public-friendly version of your review. Increasingly, you can use social media to flag up the appearance of new systematic reviews. A strategic approach is to create infographics; a blog post; a YouTube video; a podcast interview; and then to promote all of these via Twitter (perhaps even using 'Twitter cards' for visual appeal).

Make your outputs shareable and discoverable. Deposit your research data in community-recognised repositories where possible. Making research data available helps when promoting your published research. It also serves to raise your profile by making your research more discoverable, thereby encouraging citations. Increasingly you should be thinking about how you will promote your own profile as this is the key to featuring your outputs. Your communication strategy can begin from award of the research grant or studentship, through your protocol and early consultation activities, to preliminary conference results and the final paper. If you have not already done so then you should register for a unique ORCID author identifier to further improve your discoverability.

Bear in mind that it is your findings, not just the 'package' of the systematic review article, that you want to highlight. Consider the appropriate informational content and resources that relate to your target group. A strategy targeting research end-users might include instructional videos, digitised tools for download, public-facing, easy-to-read blog articles, infographics, posters, printable messaging materials (e.g. brochures, tip sheets), and promotional content offerings such as Twitter cards, Facebook images, Instagram images, sample ads and sample social media content.

FAQ 10.5 How can I promote outputs from my review?

Share your work with your social networks (Mollett et al., 2011). Be sure to alert your followers on Twitter, Facebook, Google+ and other social networking sites by announcing your published work. Produce a tweet version of your review on Twitter with an abbreviated URL link. Better still, create a sequence of four or five related tweets, each focusing on a different 'Take home message', and release them over 5–10 days. By making each tweet a reply to a previous tweet they become a 'thread'; then, for each instance you can retweet previous tweets in the thread before adding the latest one. Applications such as TweetDeck can help by allowing you to schedule tweets. Accompany your tweets with a link to your article – either in full or as an abbreviated 'tidy' URL. You can encourage sharing by using hashtags relevant to

(Continued)

your review topic. Tag co-authors or others working in your topic area who may be interested in your review. You could also use the 'Pinned Tweet' function so that details of your review can be seen by anyone who visits your Twitter profile. Update your professional profile to include details of your new review. Professional profiles such as Google Scholar, LinkedIn and Researchgate often alert members to new papers by others in their network. Identify appropriate blogs in your topic area and notify their authors. Even better, offer to guest a blogpost. Some journals host a blog and highlight featured articles from their output. For example, *Evidence & Policy* featured a post from one of our colleagues spotlighting a lesson-learned report from our synthesis programme (https://evidenceandpolicyblog.co.uk/2021/01/13/rapid-responsive-evidence-synthesis-to-inform-decision-making-and-research/). Have you thought about creating a YouTube video for your review? Often a graphic depiction of your review results will stick in your mind longer than a printed message.

Get more hands-on guidance!

Visit https://study.sagepub.com/booth3e for downloadable versions of the exercises, as well as some suggested answers. You can also access a glossary, literature review templates, source trackers, and a collated list of online tools to help you put together a successful literature review.

suggestions for further information

Aveyard H (2019) How do I discuss my findings and make recommendations? In: Aveyard H, *Doing a Literature Review in Health and Social Care: A Practical Guide*, 4th edition. Maidenhead: Open University Press, 153–62.

This slim volume represents one of the most accessible introductions to literature reviews. Now in its 4th edition it outlines the basics when writing up findings and recommendations.

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