

Doing a
**SYSTEMATIC
REVIEW**
A STUDENT'S GUIDE

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Carrying Out a Systematic Review as a Master's Thesis

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guide
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meta-analysis
synthesis student
FAQ question qualitative searching
discussion databases management
post-graduate
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thesis data
review
systematic

This chapter will help you to:

- understand the term 'systematic review';
- gain an awareness of the historical context and development of systematic reviewing;
- appreciate the learning experience provided by conducting a systematic review;
- become familiar with the methods involved in carrying out a systematic review.

Introduction

In this chapter we introduce you to the concept of systematically reviewing literature. First, we discuss what systematic reviews are and why we think carrying out a systematic review is a great learning experience. Second, we give you an overview of the evolution of systematic review methodology. Third, we introduce the key steps in the systematic review process and signpost where in the book these are discussed. Finally, we highlight how systematic reviews differ from other types of literature reviews. By the end of the chapter we hope that you will be confident that you have made the right decision to carry out a systematic review and that you are looking forward to starting your research.

What is a systematic review?

A systematic review is a literature review that is designed to *locate, appraise* and *synthesize* the best available evidence relating to a specific research question to provide *informative* and *evidence-based* answers. This information can then be combined with professional judgment to make decisions about how to deliver interventions or to make changes to policy.

Systematic reviews are considered the best ('gold standard') way to synthesize the findings of several studies investigating the same questions, whether from health, education or other disciplines. Systematic reviews follow well-defined and transparent steps and always require the following: definition of the question or problem, identification and critical assessment of the available evidence, synthesis of the findings and the drawing of relevant conclusions.

A systematic review: a research option for postgraduate students

As a postgraduate student you may be offered the choice of conducting a primary study (for example, a cross-sectional survey) or a secondary research project (for example, a systematic review) as part of your academic accreditation. There are very good reasons why you are asked to carry out a research project as part of your studies, the most important being that *doing* a research project enables you to both understand the research process and gain research skills.

Systematically reviewing the literature has been accepted as a legitimate research methodology since the early 1990s. Many Master's programs offer instruction in systematic review methods and encourage students to conduct systematic reviews as part of postgraduate study and assessment. It is widely acknowledged that this approach to research allows students to gain an understanding of different research methods and develop skills in identifying, appraising and synthesizing research findings.

Every Master's course and every academic institution is different. For you, this means that the presentation of your thesis as part of postgraduate study must be carried out within the accepted guidelines of the department or university where it is due to be submitted. Your thesis must be an independent and self-directed piece of academic work; it should offer detailed and original arguments in the exploration of a specific research question and it should offer clarity as to how the research question was addressed. Conducting a systematic review offers you the opportunity to showcase your skills both as a reviewer and as a researcher.

Let's assume that you are interested in studying issues related to unintended teenage pregnancy. As a researcher, you have a variety of investigational methods open to you. However, the likelihood of being able to pursue these may be impeded by time and resource constraints, as well as by the specific requirements of your academic institution. Table 1.1 illustrates a number of possible project options open to you and the likelihood of you being able to successfully complete your chosen project as part of your postgraduate thesis.

In our experience, students who opt for primary research will mainly explore questions relating to current status and/or correlation factors; the main problem with this kind of research is that its generalizability is often hampered by small sample sizes and time constraints. However, students who

Table 1.1 Example project options for postgraduate students interested in unintended teenage pregnancy

Question	Research options	Type of research	Risk* of not being able to complete this as a Master's student
Relationship questions			
What is the incidence of unintended teenage pregnancy in my practice or region?	Epidemiological survey	Primary	Low
What programs are available in my practice or region for reducing teenage pregnancy rates?	Survey	Primary	Low
What are the most commonly reported methods being used to decrease rates of teenage pregnancy?	Systematic review	Secondary	Low
Correlation questions			
Is there a relationship between education levels and rates of teenage pregnancy in my practice or region?	Survey of existing data	Primary	Moderate
What are pregnant teenagers' views on the importance of sex education?	Focus groups or structured interviews	Primary	Low, with small sample size
What is the reported relationship between education level and rates of teenage pregnancy?	Systematic review	Secondary	Low
Causation questions			
Will the provision of emergency contraception in schools decrease teenage pregnancy rates?	Intervention study	Primary	High
What impact do one-to-one counselling and group meetings have on rates of abortion for teenagers experiencing unintended pregnancy?	Randomized controlled trial	Primary	Very high
What have been shown to be the most effective programs for decreasing teenage pregnancy rates?	Systematic review	Secondary	Low
Qualitative questions			
What are the views of teenagers on the reasons for high teenage pregnancy rates?	Focus groups	Primary	Low, with small sample size
What are the reported views of teenagers on the reasons for high teenage pregnancy rates?	Systematic review	Secondary	Low

* Low = you are in control or have unlimited access to the data that you need; moderate = you may or may not have to go through an ethics committee, you are dependent on other people to give you data or you need to recruit participants; high = your study is likely to be expensive, time consuming and/or dependent on the interest of others.

form questions to be addressed using systematic review methodology have the opportunity to work with a variety of different study designs and populations without necessarily needing to worry about the issues commonly faced by researchers carrying out large-scale primary research. Due to the very nature of a systematic review, students are able to work in the realm of existing research findings whilst developing critical appraisal and research synthesis skills. A systematic review provides an excellent learning opportunity and allows students to identify and set their own learning objectives.

Good research is rarely carried out on an ad hoc basis. From the outset, you need to be clear about why you are carrying out your systematic review. For example, you may want to evaluate the current state of knowledge or belief about a particular topic of interest, contribute to the development of specific theories or the establishment of a new evidence base and/or make recommendations for future research (or you might just want to carry out your review as quickly and as effortlessly as possible to gain your qualification). However, you need to think about what you want to learn from your systematic review. You might find that balancing your learning objectives with the objectives of the review may be challenging at times; this is most likely to be true if you are reviewing a topic of interest in your professional field (as we suggest you do). Discussing your learning objectives with your supervisor and exploring alternatives with your classmates or colleagues can often help you to clarify these objectives. Box 1.1 outlines some of the advantages and disadvantages relating to conducting a systematic review as part of a Master's thesis.

Box 1.1

A systematic review as a Master's thesis: advantages and disadvantages

Advantages:

- You are in control of your learning objectives and your project;
- You can focus on something you're interested in;
- You don't have to gain formal ethical approval before you begin;
- You don't have to recruit participants;
- You can gain understanding of a number of different research methodologies;
- You can gain insight into the strengths and limitations of published research;

- You can develop your critical appraisal skills;
- The research can fit in, and around, your family (or social) life.

Disadvantages:

- You don't experience writing and defending an ethics application;
- It can be isolating as you will be primarily working on your own;
- You don't face the challenges of recruiting participants;
- You may not get a sense of the topic area in terms of lived experience;
- You are reliant on the quality and quantity of available published information to address your research question;
- You may find the process dull or boring at times;
- There are no short cuts and the process is time consuming.

Evolution of the systematic review process

There are some common misconceptions about systematic reviewing. Some students (and supervisors) choose empirical projects over systematic reviews because they worry that systematic reviews aren't 'proper research', or that systematic reviews can only be conducted in the field of health. If you are thinking of conducting a systematic review as part of your Master's thesis, then we think that it will set your mind at ease to know a little bit about the history and evolution of the systematic review process and the disciplines to which systematic reviews apply.

It might surprise you to know that the systematic review of published evidence is not new. As early as 1753 James Lind brought together the data relating to the prevention of scurvy experienced by sailors. He wrote:

As it is no easy matter to root out prejudices ... it became requisite to exhibit a full and impartial view of what had hitherto been published on the scurvy ... by which the sources of these mistakes may be detected. Indeed, before the subject could be set in a clear and proper light, it was necessary to remove a great deal of rubbish. (Chalmers, Hedges and Cooper, 2002, p. 14)

From Lind's farsightedness we move to the 1970s. Two important events took place that laid the foundations for a revolution in the way that evidence could be used to inform practice in health care and other areas. In the UK, a tuberculosis specialist named Archie Cochrane had recognized that health care resources

would always be finite. To maximize health benefits, Cochrane proposed that any form of health care used in the UK National Health Service (NHS) must be properly evaluated and shown to be clinically effective before use (Cochrane, 1972). He stressed the importance of using evidence from randomized controlled trials (RCTs) to inform the allocation of scarce health care resources. At about the same time, in the USA, work by Gene Glass (1976) had led to the development of statistical procedures for combining the results of independent studies. The term 'meta-analysis' was formally coined to refer to the statistical combination of data from individual studies to draw practical conclusions about clinical effectiveness. In years to come, outputs of both research communities would combine to form the basic tenets of systematic review methodology. In 1979 Archie Cochrane lamented:

It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials. (Cochrane, 1979, pp. 1–11)

In response, a group of UK clinicians working in perinatal medicine made every effort to identify all RCTs related to pregnancy and childbirth. They categorized the studies that they found and then synthesized the evidence from these studies. This work led to the development of the Oxford Database of Perinatal Trials (Chalmers et al., 1986). In addition, their ground-breaking work was published in a two-volume book which detailed the systematic and transparent methods that they had used to search and report the results of all relevant studies (Chalmers, Enkin and Keirse, 1989). This work was instrumental in laying the foundations for significant developments in systematic review methodology, including the establishment of the Cochrane Collaboration in 1992. The Cochrane Collaboration is an international network of more than 28,000 dedicated people from over 100 countries who work together to help health care providers, policy makers, and patients and their advocates and carers make well-informed decisions about health care. They do so by preparing, updating and promoting the systematic reviews that they conduct, which are known as Cochrane Reviews (The Cochrane Collaboration, 2012). Since the development of the Cochrane Collaboration, others have followed suit. The Campbell Collaboration was established in 2000 and is focused on reviewing literature to demonstrate the effects of social interventions, particularly in the areas of education, crime and justice (The Campbell Collaboration, 2012). More recently, the Department for International Development (DfID) has used the results of systematic reviews to develop national and international policy in many countries worldwide (Department for International Development, 2012).

Why all the fuss? Why have people spent so much time developing a systematic review process? The answer is quite simple. Given the amount, and complexity, of available information and the limitations of time, there has been a real need to develop and establish a process to provide, in a concise way, the results of research findings. Most notably, the dramatic increase in the amount of accessible research today makes it impossible for decision makers, policy makers and professionals to keep up to date with advances in their field. Systematic reviews allow concise synthesis of a large body of research and therefore address some of these issues.

Why are we telling you all of this? Well, there are two important points to take away from this historical background. First, we want to convince you that *systematic review methodology is accepted as a research methodology in its own right*; in light of this, we use the terms 'review question' and 'research question' interchangeably throughout the book. In fact, most funding bodies require a systematic review of the literature to be performed before they will fund an empirical research project. In the UK, systematic reviews form the basis for the National Institute for Health and Care Excellence (NICE) guidelines for treatment and clinical practice. Throughout the world Cochrane Collaboration and Campbell Collaboration systematic reviews are viewed as the gold standard in this type of research. Literature reviews are also an integral component of any doctoral thesis. Whilst you wouldn't necessarily be expected to produce a review as detailed or as comprehensive as a Cochrane or Campbell review for your thesis, if you follow the systematic review methodology outlined in this book, then you can be confident that not only are you conducting research, you are producing some of the highest quality research possible.

Second, we want to show you that although the systematic review process began, and is common, in the field of health care, *systematic reviews are being carried out and used to inform decision making in a variety of disciplines and professions*. In fact, if you conduct a quick Internet search combining the terms 'systematic review' with 'education', 'social work', 'veterinary medicine' and so on, you can see for yourself the widespread application of systematic review methodology. Irrespective of the field in which you study, the basic tenets of systematically reviewing the evidence are the same. When researchers or practitioners are faced with a problem, they aim to identify, assess and bring together the evidence relating to that problem. This information can then be used to inform changes to policy and/or professional practice.

What are the basic steps in the systematic review process and how can this book help me to follow them?

There are nine basic steps to be taken when carrying out a systematic review. These are presented in Box 1.2 along with signposts to the chapter(s) of this book in which they are discussed in more detail. These steps are continually referred to and explored throughout this book, so don't worry if you don't recognize all of the terms at this stage. A good-quality systematic review will transparently report all of the steps that have been carried out so that the reader has sufficient information to be able to replicate the review. Additionally, providing details about each step makes it easy for the reader to assess the validity of the review's findings. The remaining chapters of this book provide you with a pragmatic, yet detailed, approach to carrying out each of these steps and we focus our attention on research activities that are essential to the successful completion of your review as part of a postgraduate thesis.

Box 1.2

Nine steps in the systematic review process

Step 1: Performing scoping searches, identifying the review question and writing your protocol (Chapter 2)

In this step you carry out scoping searches to help you identify background literature which will help you to define and refine your review question and set your inclusion criteria. You will also write a protocol. The protocol is a written plan ('map' of your journey) that enables you to set out the approach you will use to answer the review question.

Step 2: Literature searching (Chapter 3)

The aim of this step is to identify papers (published and unpublished), using bibliographic databases and other evidence sources, which address your review question.

Step 3: Screening titles and abstracts (Chapter 3)

In this step you read the titles and abstracts of the studies identified by your searches and discard the ones that aren't at all relevant to your review question and keep the ones that may be relevant.

Step 4: Obtaining papers (Chapter 3)

This step involves obtaining the full-text papers of the evidence that you identified in Step 3.

Step 5: Selecting full-text papers (Chapter 3)

This is when you apply your inclusion criteria to your full-text papers and ruthlessly exclude ones that don't fit the criteria.

Step 6: Quality assessment (Chapter 4)

In this step you assess each included full-text paper for methodological quality using an appropriate quality assessment tool.

Step 7: Data extraction (Chapter 5)

This is when you identify the data you require from each paper and summarize these data in tables.

Step 8: Analysis and synthesis (Chapters 5, 6, 8 and 9)

This is where you scrutinize and synthesize your data, either narratively or through meta-analysis. We discuss how to do this step in Chapter 5 (if you want to undertake a narrative synthesis) and Chapter 6 (for those who have appropriate data for meta-analyzing). We also discuss how to analyze qualitative data in Chapter 8 and health economics data in Chapter 9.

Step 9: Writing up and editing (Chapters 7, 8, 9 and 10)

This is where you bring all of your hard work together. Step 9 involves writing up your background, methods and results, discussing your findings and drawing conclusions from your review. We discuss how to carry out this step in Chapters 7 and 10, and also touch upon it in Chapter 8 and Chapter 9 for those looking at qualitative evidence and evidence from economic evaluations respectively.

But don't all reviews follow these steps?

When we say that we've carried out a *systematic* review of the literature this means that we have clearly planned and fully described the review steps that we've taken; all of our actions are transparent; all of the key methodological decisions have been informed by theory and/or pragmatism and are explicitly set out for the reader to judge. Unfortunately, not all reviews that

are published have been written with *our* definition of *systematic* in mind. You may be familiar with the terms 'literature review', 'systematic review', 'narrative review' and 'integrative review' but you might not know exactly what the different terms mean. To complicate matters, in the published literature, these terms are frequently used interchangeably.

Literature reviews

The term 'literature review' is often a common catch-all term for any study that assimilates and synthesizes, or describes, the findings of more than one study.

Narrative reviews

Narrative literature reviews were (historically) and are (currently) typically prepared by 'experts' to provide an overview of a specific topic, to raise overlooked issues and/or identify information gaps, and to encourage new research. Authors of narrative reviews do not usually claim that their reviews are comprehensive. Some of the inherent differences between narrative reviews and systematic reviews, in relation to research process, are displayed in Table 1.2.

Integrative reviews

'Integrative reviews' are a recent development and came into use by researchers as a response to criticism that many systematic reviews only use evidence from RCTs; and that the value of systematic reviews is limited in areas where there is little, or no, trial evidence. To be more inclusive, the term integrative review was coined to reflect a literature review which included both quantitative and qualitative evidence (Sandelowski, Barroso and Voils, 2007). We believe that, with an appropriately stated research question, a single systematic review can include both qualitative and quantitative evidence (and not just evidence from RCTs). However, we believe that students should not be advised to conduct an integrative review as part of their postgraduate study unless they are experienced systematic reviewers. The approach is new and methods for use are evolving.

Table 1.2 Differences in review processes

	Narrative reviews	Systematic reviews
Defining a question	May or may not be clearly defined	Clearly defined and well-focused Always required
Writing a protocol	Not usually required	Recommended/essential
Methodology	Does not follow explicit or rigorous methodology	Follows explicit and rigorous methodology
Searching	No pre-defined search criteria Not necessarily comprehensive Generally relies only on published data Search strategies may be based on expert experience	Exhaustive and with an appropriate balance of sensitivity and specificity Carried out across a number of electronic databases, hand searching of reference lists from relevant papers and high-yield journals and documents/reports Unpublished literature/theses sometimes searched Comprehensive and explicit searching methods used and reported
Definition of inclusion and exclusion criteria	Not essential No selection of studies based on study design	Essential Study design can be selected (for example, only include qualitative data, RCTs or both)
Screening titles and abstracts; selecting full-text papers	Generally carried out by one researcher by reading through relevant papers and based on their own experience	Systematic screening and selection Usually cross-checked by another researcher
Quality assessment	Not necessarily	Yes
Data extraction	Yes	Yes
Analysis and synthesis	No clear method of synthesis	Can involve meta-analysis, narrative or qualitative synthesis
Application	Any field	Any field
Timescale	May be carried out relatively quickly	Can be time consuming due to rigor required
Replication	Not easily replicable	Explicit methods and therefore replicable

A few thoughts before you begin your systematic review

We like to think of the systematic review process as a journey and we use this analogy throughout this book. Experience has taught us that systematic reviewing can be challenging – especially when you don't have a good protocol (map) to guide you. We know that untoward conditions

mean that you might have to divert from your chosen route (for example, uncommunicative authors, missing papers, poor quality studies). Experienced systematic reviewers learn to anticipate what is going to happen next. Whether you are travelling on a busy motorway or on a rural lane, it is a good idea to pay attention to your journey time (time management) and plan what to do if your vehicle breaks down (contact your supervisor). Collective experience has taught us how to overcome the most common road hazards and we'd like to share our knowledge with you. In this book, we offer a whole range of tips and strategies to help you begin your journey and reach your final destination.

This chapter has introduced the notion of carrying out a systematic review as part of your Master's thesis. In the majority of the remaining chapters we talk you through the individual steps involved in conducting a systematic review and in Chapter 10 we discuss practical ideas about how you might plan and manage your review. Some of the concepts explored in the book will seem unfamiliar to you at first read, but the advantage of this book is that it hasn't been set out like a novel (that is, written for you to read cover to cover once). We hope that you will start by reading the whole book in chapter order, but we then expect that you will dip in and out of chapters at appropriate points in your research journey. Systematic reviews can be 'bitty' in that you might start a new step before the current one is fully finished. (This might occur, for example, if you are waiting for papers or for input from others.) Each chapter is therefore designed to stand alone.

Frequently Asked Questions

Question 1 Is a systematic review 'real research'?

This is a valid and common question posed by Master's students. There are some researchers and academics who argue that carrying out a systematic review is not 'real research'. We believe that they are wrong. Submitting a systematic review as a research project for a Master's thesis, or as part of a PhD thesis, has become commonplace in many universities and across a variety of different disciplines. We believe that the many

learning opportunities that are derived from the systematic review process can help students to achieve academic goals and can equip them with the skills that are required to meet the needs of research communities and enhance their continuing professional development and practices. Indeed, systematic reviews are now regarded as legitimate outputs for the periodic assessments of research conducted within UK universities.

Question 2 Am I taking the easy option with a systematic review?

No, definitely not. Systematic reviewing can be a difficult, time consuming and solitary activity. It's not for the faint-hearted. Whilst you don't (usually) have to go through the ethics process (which can take time and be fraught with difficulties), there are other challenges to face, such as coping with thousands of possible research reports or government documents or, worse yet, finding none. However, the rewards in terms of outputs and learning opportunities make carrying out a systematic review an excellent choice of project for your thesis. For example, it offers an opportunity to display rigorous and reflective practice in your write up and this effort will be acknowledged by the examiner marking your thesis.

Question 3 Can a systematic review form part of a PhD as well as a Master's thesis?

Yes, but it is worth bearing in mind that the focus of the review may differ. Master's students typically need to answer a single specific question, but PhD students tend to use systematic review methodology to describe the literature and/or theory base that informs their primary research. If you are planning to carry out a systematic review to inform a PhD then you may well find yourself conducting a series of mini-systematic reviews rather than one single review that aims to answer a defined and specific question. Alternatively, you might conduct a single systematic review on a very tightly defined topic and go on to conduct a wide-ranging narrative review to situate the results of your systematic review.

Question 4 Can I ask other people to help me with review activities?

If you are planning on publishing your work then collaboration on some specific review activities is essential (for example, searching, cross-checking quality assessment and data extraction). We strongly believe that the best way to conduct a high-quality systematic review is through teamwork, as working independently can be seen as a limitation of the review process. If working independently is your only option, then we believe that you should acknowledge this as a limitation when writing up your thesis.