

Lab Reports and Projects in Sport and Exercise Science

A Guide for Students

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2.2.1 Types of literature review

Within your literature search you will come across both original research articles and review articles. The latter are an ideal way to introduce yourself to a topic and also to see how literature reviews are structured. Literature reviews consist of a detailed and comprehensive narrative analysis of recent or evolving developments in specific topics (Ng and Peh, 2010a). Literature reviews may also help to consolidate data or opinions within a specific area or re-evaluate current knowledge in light of new findings or concepts. In this respect, literature reviews are often more up to date than textbooks (Green *et al.*, 2001). Although review articles may synthesise information from previous studies they generally do not present new data. This is the main difference between 'original' journal articles and literature reviews. The former have methods and results sections whereas the latter do not. For undergraduate and postgraduate students your literature review needs to demonstrate that you understand the area and current theories as well as the underlying processes or mechanisms. Furthermore, and importantly, you also need to identify a gap (or gaps) in the literature which can then be developed into your research question and subsequently your aims and hypotheses.

Literature reviews can be further separated into 'systematic' and 'narrative' reviews. The latter are sometimes termed 'non-systematic reviews', although this does not mean that a systematic approach has not been undertaken or that they are any less worthy (Sandelowski, 2008). Within both the scientific and educational literature there are a range of articles providing guidance on how to approach writing both narrative (Green *et al.*, 2001; Peh and Ng, 2010) and systematic (Ng and Peh, 2010a; Sandelowski, 2008; Wieseler and McGauran, 2010) reviews of literature, and on how to search scientific literature (Foote, 2009a). The purpose of this section is to provide an awareness of the different types of literature review and reviewing processes. As noted earlier, regardless of whether you are writing an introduction for a lab report or an article for a journal, a literature review is essential.

2.2.1.i Systematic literature reviews

Systematic literature reviews are often found in medical or clinical areas of research and are considered to be the cornerstone of evidence-based practice (Sandelowski, 2008). Such reviews help clinicians keep up to date with medical research findings and aid in the development of practical guidelines and policy decision making (Weiseler and McGauran, 2010). As the approach undertaken when writing systematic reviews is explicitly structured this process is considered to be the least biased and most rational way to search and report literature (Ng and Peh, 2010b). So how does a systematic review differ from other reviews? The key factor is the way in which the research studies are searched and subsequently included within or excluded from the review. For example, systematic reviews often relate to clinical trials where patient populations, age ranges, types of drugs or interventions employed, randomised control trials, double blind studies, etc. may all differ and significantly affect any clinical outcome. Ng and Peh (2010b) give the example of a literature search where 121 articles were retrieved from a given database. Fifty-one of these articles were excluded after reading the abstract. Of the 70 remaining articles, 42 were excluded as they did not fit the criteria for the review, leaving 28 articles to be included.

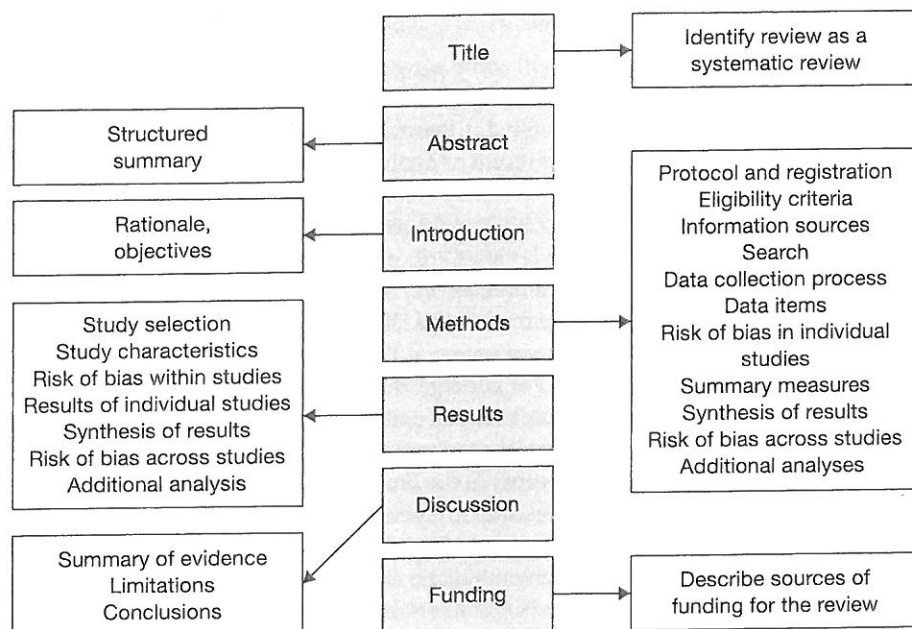


Figure 2.4 Summary of PRISMA checklist for systematic reviews and meta-analyses
Source: based on Moher *et al.* (2009)

Owing to the importance of systematic reviews in shaping clinical practice, and in order to provide consistency in systematic reviewing, the 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA) statement was developed. The PRISMA statement provides a 27-item checklist for systematic reviews and is available online (www.prisma-statement.org) as well as being published through a number of journals such as the *British Medical Journal* (e.g. Moher *et al.*, 2009). Many of the key components to be included in systematic reviews represent the range of possible subheadings included within structured abstracts (see Chapter 1, Section 1.2.1). Although this structured approach requires (and hopefully ensures) all key aspects of importance to clinicians and specific clinical outcomes are included, many of these factors are not key components for Sport and Exercise Science, which generally involves 'healthy' or non-clinical participants. However, the underlying principles for searching literature are essentially the same as for narrative reviews and it is certainly worth looking at the components of the PRISMA statement. A summary of the items presented in the PRISMA statement are shown in Figure 2.4. These will be considered later in this chapter (See Section 2.3 on literature searching). For details regarding the specific content of the PRISMA statement please consult the full document.

2.2.1.ii Narrative literature reviews

Narrative literature reviews are the most commonly found form of literature review in Sport and Exercise Science. However, like systematic reviews, narrative reviews often provide a statement regarding the search terms used and any inclusion or exclusion criteria applied to the various research studies obtained. In contrast to systematic reviews no relevant report is excluded (Sandelowski, 2008) and authors must be careful

to avoid bias and remain objective in their information extraction (Green *et al.*, 2001). Narrative reviews therefore have the potential to be more wider reaching and inclusive than systematic reviews. However, regardless of whether you are writing a systematic or narrative review you first have to acquire your literature sources. Therefore, we will next address the basics of searching literature.

2.3 Literature searching

Your initial literature search will depend upon how familiar or experienced you are with a topic (Thomas and Nelson, 2001) and your current level of understanding of the area. Students who are not well grounded in a topic may benefit from reading appropriate textbooks and other sources of information (Thomas and Nelson, 2001). This approach is the most likely starting point for most undergraduate students, especially in their first year of study. For those students who are more confident in their understanding of their topic area reading a review article is a good first step. Not only will review articles provide up-to-date information at the time of publication, they will also give an overview of the area and recommendations for future research. In addition there is likely to be a long list of references to consult.

Through university modules on research methods, most students will have been made aware of the range of literature search engines and how to use them. Tutorials relating to this will often be available through your university or college library or through the education sections of medical journals, for example Greenhalgh (1997). Scientific search engines are a great way to get an idea of what literature is available on your chosen topic but also, depending on your university or college library subscriptions, this is a good way of obtaining electronic copies of journals. When you first obtain an article in a literature search it is likely that you will be able to access the abstract. This will give you an overview of the study and the key findings (see Chapter 1). Although it is always best to read the full article the abstract may give you some important and useable information. However, your search doesn't have to be limited to electronic or web-based searches. Don't forget that browsing the hard copies of journals on library shelves and in their reference lists is also a good way of finding information.

When considering the process of searching the literature a number of important factors should be considered (Foote, 2009a; Figure 2.5). First, consider the basics of undertaking literature searches, including determining the search terms to be used, databases to be searched, range of dates to search, type of articles to consider, etc. Second, the output of the search should be reviewed. Your resultant output may require your search terms to be refined to enable a more helpful search output or a manageable number of sources to be obtained. The third consideration is then the 'explication', or analysing and explaining the literature in order to construct the review (Foote, 2009a). Thomas and Nelson (2001) suggest six steps to ensure a thorough and productive literature review. When combining these steps with Foote's considerations you can see that although experienced and less experienced researchers may have different starting points for their searches they still undertake essentially the same processes (Figure 2.6). As you progress through your project it is also very important to update your searches as new and pertinent literature may be published while you are writing

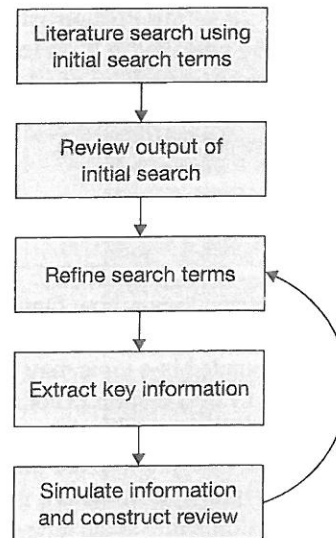


Figure 2.5 Schematic representation of literature searching and writing
 Source: based on Foote (2009a)

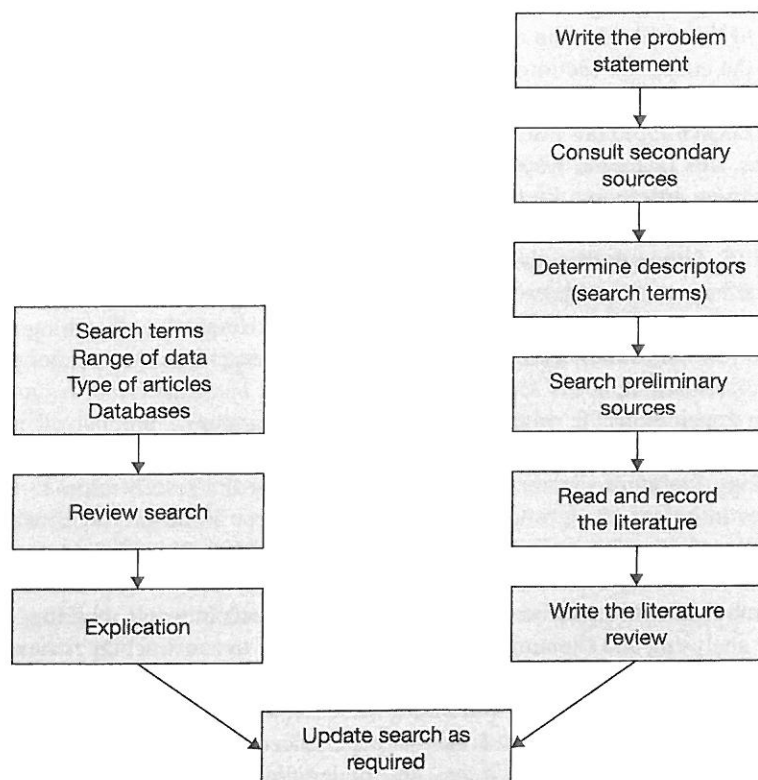


Figure 2.6 Schematic representation of literature searching
 Sources: based on Foote (2009a) (left) and Thomas and Nelson (2001) (right)

up your project. As already noted, always read the full text of any article of interest and do not dismiss those articles that you can't get free online. Most universities have excellent inter-library loan systems and many also allow students of other universities to access to their resources. This aspect is certainly worth checking out.

Exercise 2.2: Literature searching

When searching for literature, note that if your search terms are quite general, such as 'anxiety', 'performance' or 'carbohydrate ingestion', you will have many thousands of results. You may find it easier to include more specific search terms such as the specific aspect of performance or sport you are interested in. Refining your search terms will provide a more specific and useable search output. Table 2.1 shows that although search results can initially be overwhelming they can then be constrained and reduced to those more appropriate to your needs. Searching for literature and getting to grips with appropriate search terms is a skill in itself. However, the more you search for information and the more you read around an area, the more likely you are going to be able to refine and undertake your searches successfully.

Within Table 2.1 are spaces for you to add your own search terms. Try different combinations of terms to obtain a useable output of potential articles. Once you have done this move on to the next section.

Table 2.1 Likely outputs from one search engine for three topics in Sport and Exercise Science

<i>General search</i>		
<i>Area of interest</i>	<i>Search terms</i>	<i>Number of articles found*</i>
Anxiety	Anxiety	127 289
Performance	Performance	480 950
Carbohydrate ingestion	Carbohydrate ingestion	18 139
Your area of interest		
<i>Specific search</i>		
<i>Area of interest</i>	<i>Search terms</i>	<i>Number of articles found</i>
Anxiety	Anxiety AND Tennis	21
Performance	Performance AND Running AND Elite	463
Carbohydrate ingestion	Carbohydrate ingestion AND Marathon running	24
Your area of interest		

*From a typical scientific or academic search engine on any given date

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2.4 Extracting information and using literature sources

Now that you have undertaken a literature search and obtained a range of information sources, what do you do with them? When you are using your various sources of information it is important to be able to extract exactly what you want from them. This may seem obvious, but when you haven't used this type of information before it may not be as straightforward as you think. Furthermore, it is likely that within your literature review or lab report introduction you will be explicitly required to use scientific literature to back up your statements.

So, what information is important? This will depend quite simply upon what you require. Your needs may be quite broad, such as an example of how anxiety is measured or an example of a personality questionnaire. Conversely, your needs may be more detailed, such as an in-depth explanation of the mechanisms of fatigue or how anxiety differs between performers. Review articles will often include a table that summarises key research studies. This is a very useful way to consolidate your thoughts on the available literature and consistently assess the same key points from each article you have read. Indeed, when you are reading journal articles certain aspects may continually come to mind that may affect the results of a given study. For example, the participants studied, the protocols or methods used and the design of the experiment as well as specific measures taken can all affect the results obtained. With this in mind, summary tables are likely to include information regarding participants and methodological aspects. Consider these aspects with respect to the key components of a structured abstract (as noted in Chapter 1) and for systematic reviews. When using a summary table the reader can quickly assess different approaches taken within the area and how diverse these may be, which may be why there are differing viewpoints within a topic.

Whether or not you include a summary table in your thesis is down to personal choice and supervisory guidance. However, as a way of summarising what may be quite a daunting pile of research papers a summary table can be very useful. A simple approach to summarising data will relate to your research question. For example, if your research question relates to the effects, on performance of a nutritional supplement, such as sodium bicarbonate or creatine phosphate ingestion, what is the general consensus? Here you would simply need to note for each research study that you read whether performance was improved, negatively affected or not affected at all. You might then want to find out if there was a consistent aspect in those studies that found enhanced performance. Examining the participant characteristics, exercise protocols, administration of the supplement, etc. may help pinpoint specific important factors. Similarly, you may be interested in the effects of anxiety on performance. You could again determine from your research articles those that showed performance to be affected by anxiety and those that did not. From here you may be able to determine a certain level of anxiety where performance is affected or whether certain groups of participants or certain types of skill are most affected by anxiety. You could of course obtain all this information from simply reading the research articles and remembering the facts, but you may find that summarising your data this way is helpful.

Exercise 2.3 will help you to assess how well you extract information and also give you some practice in determining what may be important in a given source of information. When recording information from literature sources, Thomas and Nelson (2001)

suggest considering, amongst other factors, the characteristics of participants, instruments and tests (including reliability and validity), testing procedures, treatments applied, study design, and statistical analysis and key findings. The list of factors that you may be interested in will be similar to those usually considered when critiquing studies (see Section 2.8). Indeed, there are a range of guidelines for critiquing scientific studies, such as a checklist sheet from Thomas and Nelson, the PRISMA statement, a peer-review checklist developed by Seals and Tanaka (2000) and an assessment checklist sheet for narrative reviews (Green *et al.*, 2001). However, as many of these are designed for the peer review of journal articles they are possibly more complicated and consider more factors than you require at present. Consider what it is you really want to find out from a particular source. You may not need all that detail.

Exercise 2.3: Extracting and using information

Following this exercise are four abstracts relating to the maximal oxygen uptake example lab class we are using within this book. The abstracts were obtained from a Medline (PubMed) literature search using the following search terms: 'Maximal oxygen uptake AND elite marathon runners'; 'Maximal oxygen uptake AND elite cyclists'; and 'peak oxygen uptake AND upper body exercise'. These are terms that you may use if interested in examining the aerobic capacity, fitness or physiological responses of athletes across exercise types. The abstracts give values or information relating to four different scenarios but can be combined quite fluently in a number of ways. These particular abstracts have been chosen simply because they provide information that can be used to help us demonstrate and practice the skill of extracting information, rather than for any other particular aspect. As with all sources it is up to you to critique them further and fully.

First make short notes on what you think the important findings are from each abstract. It is important to make notes in *your own words* rather than copying directly from the abstract or article. Once you have done this try and integrate the information you have highlighted. A worked example is also provided (see Table 2.2).

Table 2.2 Example key points from each abstract

Abstract 1	Maximal oxygen uptake increased with competition distance. Values for 800–1500-m athletes were $72.1 \text{ ml.kg}^{-1}\text{min}^{-1}$ and for 5000–10,000-m group, $78.7 \text{ ml.kg}^{-1}\text{min}^{-1}$.
Abstract 2	Compared maximal physiological variables in men and women. Physiologically, triathletes were most like cyclists. Maximal oxygen uptake was greatest for the treadmill test, then cycling and then arm exercise.
Abstract 3	$\dot{V}\text{O}_{2\text{max}}$ of hockey players did not change during a competitive season, although values did tend to increase over the season. Body fat reduced during the season. Muscular strength reduced during the season.
Abstract 4	Peak oxygen uptake during arm exercise was greatest for able-bodied athletes when compared to wheelchair athletes. Peak oxygen uptake was lowest in a tetraplegic athlete when compared to paraplegic athletes.