

Understanding the quality of a quantitative paper

KEY WORDS

- ▶ Critical appraisal
- ▶ Evidence-based
- ▶ Literature review
- ▶ Methodology
- ▶ Research quality
- ▶ Quantitative

In previous papers in this series, we have looked at many of the features of research and the various methodologies and methods used in health and social care research. We have previously considered how one might consider the quality of a piece of qualitative research and what this might mean for informing practice (Ellis, 2018a; 2018b). In this paper, the first in a mini-series, we will start to consider how to critically appraise quantitative research.

Quantitative research has its own rules as to what constitutes good-quality research and these differ vastly from those associated with qualitative research and even, to some extent, between the various methodologies within the quantitative paradigm.

This paper looks at some of the ways in which quantitative papers can demonstrate their quality and some of the questions the informed reader might ask of a paper when reading it. The purpose of this paper is to set the scene for critical appraisal, which might precede the adoption of research into the clinical setting; that is, critiquing research as part of the evidence base for nursing.

Why asking questions about quality is important

Quantitative research seeks to be generalisable – applicable to all similar persons and situations – such that the findings from quantitative research can be used to inform health and social care practice (Moule, 2021). It is incumbent on health and social care professionals, therefore, that they are able to consider the merits of any research they are reading, which they might then use to inform what they do in practice by considering its applicability to the people they care for and the sort of conditions they treat (Ellis, 2019a).

Not all research is done well and not all research that is done well is necessarily applicable to the sorts of patients any particular health or social care professional looks after. Conversely, well done research that applies to the sort of patients a health professional cares for, should be considered as part of the evidence-base that is used to inform practice.

Understanding this makes it clear as to why the ability to critique research is important, not only for excluding research, but also in informing its adoption in the clinical setting.

The adoption of evidence for clinical practice is driven by many factors, which will be explored in detail in a future paper in this series. It is sufficient to say here that there is an ethical imperative for healthcare professionals to adopt good-quality evidence because of the benefits it can bring to the people they care for (Cathala and Moorley, 2018).

Using a critiquing tool

There are a large number of critical appraisal tools and frameworks available to help guide the novice, and more experienced, individual to critique a research paper. Perhaps the best known of the critical appraisal tools sites is the Critical Appraisal Skills Programme (CASP), which can be found at <https://casp-uk.net/>. Within the CASP website, there are various tools available for health and social care professionals, with the most important for our purposes being the checklists. A similar array of tools is available on the Joanna Briggs Institute website: <https://jbi.global/critical-appraisal-tools>. Both organisations are highly regarded and their tools well worth considering.

On their checklist pages, there are a number of different, focussed checklists for use in critiquing different research methodologies, including in the quantitative paradigm, randomised controlled trials, cohort studies and case-control studies. It is important to apply the correct checklist to a piece of research, as the questions are specific to research methodologies and methods, and using the wrong checklist will prove misleading.

As well as online tools, various research and evidence-based practice textbooks contain their own critiquing frameworks, some of which are generic and others methodology-specific – e.g. Moule, 2021; Ellis, 2019a. Whenever applying a critical framework, it is a good idea to have a research methods textbook to hand to help define research terminology.

The question/hypothesis/aims/objectives

In reality, it does not really matter what terminology the researchers use to describe the reasons for the research they are undertaking; what is important is that it makes sense. How the researchers arrive at the question(s) needs to be clearly laid out in the introduction and literature review, which forms the start of the paper.

It may seem like a waste of time reviewing the literature review to see if the authors have arrived at a reasonable question for their research, but it is not. The literature review will enable the reader to get a good overview of the existing research in an area, assuming it is comprehensive, and will let them see where the proposed research sits in relation to adding to the existing knowledge base in the area. A well derived literature review will contain all of the recent, and any older but important, research that has been used to inform an area of practice. Omissions in the literature used tend to suggest the research question has not been well thought out.

When reading a literature review at the start of a research paper, the purpose of it is to elicit the need, or not, for the research yet to be undertaken. This is in contrast to a literature review undertaken to inform practice or as part of an academic exercise, where the literature review is itself used to inform the evidence base. Whatever the reason, Coughlan and Cronin (2017) identify how a literature review must be comprehensive, succinct, logical and objective. A good rule of thumb is that if you did not know what the researchers were setting out to research, you should be led on a journey through the literature review that leaves you asking the same, or a broadly similar, question to the one they end up asking.

Methodology

We have seen in various papers in this series how different quantitative research methodologies are used to answer different types of clinical questions. We have also seen how using the wrong methodology will mean that the question the researchers have set out to answer cannot be answered, or that it will be answered inadequately (Ellis, 2014).

One of the most important starting questions when considering a piece of research is therefore whether the researchers have placed their question in the right paradigm and then whether they have chosen the right methodology (or methodologies) to answer it. The qualitative research paradigm is used to answer questions relating to human experience, opinion and beliefs (Creswell and Creswell, 2018), while the quantitative research paradigm answers questions about things that may be described numerically, about correlations and associations (Polit and Beck, 2017).

It is important to remember that different methodologies allow researchers to answer different types of quantitative questions. You would therefore expect to see cohort studies, experimental and randomised controlled trials used to explore cause-and-effect relationships, case-control to explore potential associations, cross-sectional to explore prevalence of a phenomenon, and ecological studies to examine potential relationships between variables at population level (Ellis, 2019b). The methodology chosen must therefore fit the research question. One cannot, for example, prove that wound dressing A is better than wound dressing B using a cross-sectional study: only experimental study methodologies, like randomised controlled trials, allow for this. This idea is important when it comes to reviewing the conclusions of a study also, as the conclusion must fit the question and methodology used, which all too often is not the case.

Conclusions

In this paper, we have examined some of the elements that go towards determining the quality of a piece of quantitative research. We have identified that being able to critically appraise research is essential for the health and social care practitioner seeking to use it to inform their clinical practice. We have identified that not all research is of a quality practitioners would wish to use to inform what they do. Even where it is, and the applicability to the sorts of people and clinical problems the practitioner deals with, need also to

be established – although this will be dealt with in more detail in a later paper in this mini-series.

We have seen that the researchers will need a solid base on which to conceptualise and build their research and this should be spelt out clearly in the literature review. We have seen that the question asked should follow logically from the findings of the literature review and the question in turn then informs the choice of research methodology. We have identified that the wrong choice of methodology means that the research cannot answer the question(s) it sets out to answer. We have seen that it is advisable to use a methodology-specific critical appraisal tool to support a critique and that the use of a research textbook to support this process is also prudent.

In the next paper in this series, we will continue to explore how practitioners might critically appraise the quality of the papers they read by considering elements of the research including the sampling

of people for the study and methods used for data collection..

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