

THIRD
EDITION

Introducing Research and Evidence-Based Practice for Nursing and Healthcare Professionals

JEREMY JOLLEY



Introducing Research and Evidence-Based Practice for Nursing and Healthcare Professionals

Research can seem difficult to get to grips with. However, at the heart of this new edition is the view that research is essentially a simple activity, the principles of which can be readily understood by students new to the subject.

Each chapter guides the reader to uncover the 'mysteries' of research, exposing each aspect in turn, while demonstrating how research in healthcare is a practical activity, orientated directly to patient care. Fully updated to refer to the latest sources and studies, the third edition includes:

- a new chapter on systematic literature views;
- a new chapter on research ethics;
- a completely revised chapter on evidence-based practice which now focuses more tightly on the implementation of research and other forms of evidence.

This book is designed for all students of nursing and allied health professions at any level but who find themselves studying research for the first time. Research is illustrated through examples of activities familiar to students from their daily lives, which help build confidence in undertaking research and evidence-based practice.

Jeremy Jolley has taught research for many years, to nursing and healthcare students at all academic levels.



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Introducing Research and Evidence-Based Practice for Nursing and Healthcare Professionals

Third Edition

Jeremy Jolley

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To Susan, Alice and Catherine



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Preface

This book has been written for those who are new to research and who may struggle to understand what it is all about. Of course, there are already lots of books on research. There are big books, complicated books, books that try to summarise the whole subject of research. Many of these books are tedious, stuffy and often incomprehensible to those new to the subject. This book is different: it deals only with the important aspects of healthcare research, what practitioners need to know for research to begin to make real sense. This book isn't stuffy. Real research is exciting, it is imagining something new, it is dealing with real-life questions and finding answers, it is making healthcare better for real patients and real practitioners.

The subject that is research can sometimes look complex and perplexing, it can make people feel unintelligent and lost. This book aims to put that right, to show the reader that research can be understood, that research is at its core really simple and genuinely useful. All healthcare practitioners are clever people, and no one gets as far as reading a book like this without possessing real vigour and enthusiasm for the subject they have chosen to study and to practise. We should all believe in ourselves; healthcare practice is our responsibility, and we need to understand research and evidence-based practice to ensure that healthcare continues to grow and to develop.

Nurses and healthcare practitioners often don't get the opportunity to experience research, to work on a real research project. This lack of a research-practice element to our studies makes it hard for us to understand what research is all about. We all learn by seeing and doing, and a lack of research practice makes it hard for us to understand research.

Healthcare practice, including medicine, exists as a particularly broad range of disciplines and, as a result of this, employs almost every kind of research strategy that exists. Healthcare practice, from nursing to physiotherapy to medicine, employs both quantitative and qualitative approaches to research. As such, we see the use of everything from surveys to experiments to approaches that seek one person's understanding of another at the deepest psychological and emotional level. The richness and diversity of research in healthcare practice leaves other occupational groups standing, but it also means that it is much more difficult for healthcare practitioners to get to grips with research. Let us be perfectly clear: there is a lot to healthcare research. It is sad that so very few existing texts try to help the learning practitioner through this maze. This book is different: it aims to provide just such guidance, to hold the reader's hand through the journey of discovery. The book does this, while consistently valuing the subject matter for its central importance to healthcare, for the intelligence of each and every practitioner and for the potential each of us carries within us to produce real advances in patient care.

The second edition enabled a welcome opportunity to add two chapters on qualitative research. Qualitative articles are usually written in accessible English, and the common use of the first person has the effect of making them seem friendly. The research itself often addresses the more human and emotive side of healthcare that many students find inter-

esting. However, anyone who has taken more than a glance at qualitative research will appreciate that it has a sting in its tail. For just beneath the surface, qualitative research gets seriously complex. Those who have turned their back on statistics and double-blind trials find themselves mixed up instead in nineteenth-century philosophy and wordy sociological constructs. The experience is like going for a walk on a pleasant summer's day only to become inexplicably entangled in a dense bramble bush, wondering how on earth one came to such a place.

Fear not, for in the spirit of the first edition, this text will lead the reader gently through the quagmire of convoluted terminology and constructs that is qualitative research. Just like quantitative research, its qualitative partner is actually really, really, simple. In fact, it is possible to write down how we undertake qualitative research (how it is done) on one side of a sheet of paper (I've done it, here). Of course, we shall look at qualitative research pragmatically, because healthcare practitioners are pragmatic people, interested in doing and understanding research, not for its own sake but rather to help us make things better for patients and clients.

This third edition updates the whole book, with a major update of the chapter on Evidence-Based Practice, which now has more focus on the implementation of research and other forms of evidence. The second edition mentioned research ethics briefly, but the third edition brings a whole chapter on research ethics. The research ethics chapter is still practical and down to earth. The literature review chapter has been updated and augmented by a new chapter on Systematic Literature Reviews. The changes in the third edition make this a much more comprehensive text. However, the central aim of the first edition still applies to every page of the third edition, that this should be a book for people new to research and perhaps confused by it. For those new to research and for those confused by research, this is the easy-to-understand book on research!

Chapter 1

Research is simple

CHAPTER OBJECTIVES

The objectives for this chapter are to:

- suggest that research IS relevant to healthcare practice;
- show that research can be interesting and even fun;
- argue that although research looks complex, it is in fact readily understandable and you know a lot of it already.

Chapter outline

People often find it difficult to understand the real meaning of the terms 'research' and 'evidence-based practice'. This chapter aims to make it possible for anyone to understand what these terms mean and why they are relevant to healthcare. In short, this chapter will help you make sense of what can sometimes seem a complex area of study. Research can seem to be complex, but this chapter will show you that research is really very simple. Indeed, this chapter will convince you that you already know about research.

What is research?

You are probably reading this because you have been asked to study research or evidence-based practice. Perhaps you have been asked to write your first research proposal. Research can seem complex, but it is actually little more than what you already do and what you already know. Fundamentally, research is simple, and this book aims to keep it that way.

Research is relevant to you and it is relevant to healthcare practice. In fact, research and practice are inseparable. Practice needs to be questioning, it needs to be seeking to find better ways to help people. Practice needs research. Indeed, research is similar to the questioning and investigative stance that clinical practitioners use all of the time. Think about it, when you first see a patient or client, you will want to talk with them, watch them and ask them questions. Your assessment of this patient isn't haphazard or random; it is organised, it is systematic. This systematic approach to the gathering of information is not only similar to research, it is what *defines* research. Research is not just any haphazard collection of data; research is organised, thought-through and systematised - exactly like your assessment of a new patient. Furthermore, in your own practice you will use skills that are identical to the skills used in research. You will, for example, try to collect data that are rich enough (sufficient enough) for your purpose, and you will use data-collection methods that are purposeful and thought-through, just as in a research project. When you see a new patient, you use a face-to-face interview; you do not give them a questionnaire or get them involved in a focus group. So it is with research: research uses the most appropriate means of data collection, and that may be and often is exactly the technique you use when assessing a new patient.

Healthcare students do sometimes become confused about research. They find that they are unsure about what research is. Now we know why they are confused. Research is what practice is, and practice is what research is. No wonder students are confused, they are looking for something new to study when in fact they have been living and breathing it since the first day of their course. You already know about research; it is in every fibre of your enquiring mind and you can use it to contribute to nursing and make things better.

Let us be clear, you are studying research because you have a lively and intelligent mind; in fact, you have already acquired so much knowledge of research that you will not find your present studies difficult. Indeed, you already know most of the important principles of research.

BOX 1.1 NEW WORDS

Data (Datum) Values or factual information collected during research. Note that 'data' is plural, so that a researcher might say 'these data are interesting'. The singular form is 'datum'.

You may be concerned that you are not very good at mathematics; well, that's no problem. Researchers need only to use computer applications that deal with numbers, as a word processor deals with words. Don't worry if you are not good with numbers. Many researchers are not good with numbers either.

You may be thinking, 'no, this isn't me at all. I just want to know what needs to be done and how it's done. I want to know the right way to do things and I want to be able to do everything in the time I have available within each shift'. You may be thinking, 'what pleases me, is to be like the other nurses and to get jobs done efficiently'. To some extent, we all want to be an accepted member of our team. We all want to get everything finished on time. However, to grasp the fundamentals of research, we need to add something to our mindset; we want also to make things better, to be able to do a better job than we managed to do today. We need to accept responsibility for advancing nursing because that is what research is all about. Research is all about making a difference and improving our practice for the benefit of the patient.

Definitions of research

Scientific method

The scientific method is a sort of philosophical underpinning for everything we call science. It is very similar to clinical reasoning within the Nursing Process in nursing (Alfaro-LeFevra, 2013) and in other disciplines (Cooper and Frain, 2016) in that it is systematic and objective. It goes something like this:

- 1 the hunch (a gut feeling about a possible enquiry);
- 2 literature review to find out what is already known;
- 3 problem identification;
- 4 the hypothesis;
- 5 plan for research;
- 6 data collection;
- 7 data analysis;
- 8 discussion of results/evaluation.

Research

Research is any enquiry that is systematic in its approach and that seeks to ensure that the results of the enquiry cannot be criticised on the grounds of poor technique.

Evidence-based practice

Evidence-based practice is said to exist where there is a clear attempt to base clinical practice upon known evidence. Research evidence is usually the best form of evidence, but sometimes other forms of evidence are used.

Figure 1.1 shows the relationship between three important concepts. The purpose of science and of research is to produce practice that is based on evidence; that is, practice that is understood and is known to be effective.

BOX 1.2 NEW WORDS

Robust

A word that means 'solid' or 'unshakable' and that is applied to research studies that are difficult to criticise. Qualitative studies often use the word 'trustworthiness' instead.

Quantitative research

This is research that we most clearly associate with traditional science. Quantitative research usually deals with numbers rather than text, and as the term suggests, deals with the 'quantity' of something. For example, we might measure patients' anxiety by asking them to complete allocate a number from 1–5 to indicate how anxious they are.

Qualitative research

This is research that deals mostly with language or text. As the name suggests, it is concerned with the quality of something. For example, we might interview patients about their anxiety. This would allow patients to talk about their lived experience of anxiety, what that experience meant to them and how it affected their daily lives.

So, what *is* research? All research is nothing more than systematic enquiry. Quantitative research is an endeavour to discover new information, in a manner that is structured, systematic and objective, while using techniques (methodologies) that are robust. Qualitative research is also systematic (it has a defined method or 'plan') but allows for the interpretation of data in a manner that may be subjective, but which is open to audit. All researchers want to produce research of good quality (research that is robust or trustworthy). If the methodology is questionable, so will be the results. The definition of research given here applies to all research, from that which takes place in laboratories, to that which focuses on human experiences. All research is just a systematic enquiry.

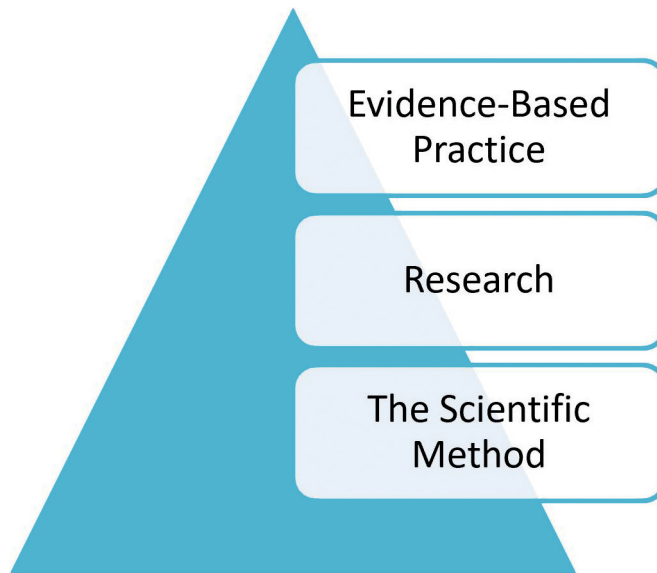


Figure 1.1 The relationship between the scientific method, research and evidence-based Practice

The 'salt bath' and poor methodology

Healthcare practitioners are good at using sound principles for the collection of data. However, occasionally those sound principles have not been well applied. The history of the salt bath is interesting because it warns us to be on our guard against poor methodologies.

Through most of the twentieth century, salt baths were used to help heal wounds. Patients could often be found relaxing in baths to which had been added a variable amount of table salt (Austin, 1988). It had long been argued that salt baths were more or less essential for wound healing to take place.

Now, let us prove that salt baths do work. Let's do an experiment. The next time you cut your finger, put it into a cup of water with salt in it (it doesn't matter how much salt). Do this three times a day (because 'three times a day' sounds therapeutic). Your finger will get better. So, salt baths work; we have proved it.

Of course, you will have seen that our methodology is less than robust. The chances are that your finger would have got better without the salt-water treatment. Wounds have a tendency to get better all on their own. The problem here is that we did not set up a 'control'. If we had tested, say, 50 cut fingers given no treatment and 50 cut fingers given a saline bath, then we would have found that being dipped in saline three times a day made no difference whatsoever to the healing rate or the incidence of successful healing.

However, before we criticise practitioners in the past for their lack of research (see Walsh and Ford, 1989), we should bear in mind that healthcare is a big discipline containing a great deal of expertise. We are all human, and it is difficult to question practices that are long established and widely accepted. When you next go to work, take a look at what you find yourself doing and ask 'What exactly is the evidence that this works?'

Research: a two-headed beast

It will probably not surprise you that there is more than one form of research. You are probably aware that a survey, for example, is not the same thing as an experiment. Research does come in several different forms. For the moment, however, it would be useful to introduce the two main research variants. Arguably, every research study will fit into one or other of these two variants:

- *Quantitative research*: this deals in quantities of things. The data from quantitative studies exist usually in the form of numbers, which can then be quantified (added up) and subjected to statistical analysis. Quantitative research is often used to 'demonstrate' the truth in a hypothesis, that is, to demonstrate that something we think is true, is actually true.
- *Qualitative research*: this deals in the quality of things. However, this definition is not very helpful. In practice, this category of research deals in data that exist as words and concepts rather than as numbers. Qualitative research is often used to 'explore' human experience, especially where the researcher simply doesn't know enough about that experience, even to know what questions to ask, so prompts such as 'tell me about your experience of [whatever]' are often used.

These two categories almost represent fields of research, with researchers often spending their whole career in one field or the other. This can lead to researchers valuing one approach over the other. However, it is possible to make use of both quantitative and qualitative forms of research and even of mixing the two approaches together within the same study (Curry and Nunez-Smith, 2014). In any case, healthcare practice needs both forms of research, and we should try to value what each can provide. Often, we need to 'test something out', we have an idea about improving practice, and we want to see if it works. Often, quantitative research works best for this. However, we also need to know how what we do is 'experienced' by patients and clients. Such a question is often best dealt with using qualitative research. In time, the results from qualitative research and our better understanding of what patients and clients experience, will lead us to examine specific aspects of that experience and this can often be done using quantitative research designs. In this way, both quantitative and qualitative approaches to research are not only useful but complement each other.

BOX 1.3 EXAMPLES FROM THE RESEARCH LITERATURE

Mohammadpour *et al.* (2014) looked at patients with Acute Coronary Syndrome, which causes chest pain due to a reduced blood supply to the myocardium. The researchers wanted to identify whether the application of heat for chest pain was or was not effective. This is a question that lends itself to a quantitative approach and so a quantitative, randomised, double-blind, placebo-controlled clinical trial was used. Patients were randomly assigned to either a group where heat was applied to the chest during episodes of chest pain or to a group where a placebo 'heat' pack (heated to 37°C) was used. The

study was 'blinded' in that neither the patient nor the operator knew whether the pad had been heated to 37°C or to a 'therapeutic' 50°C. A pain questionnaire was used to measure the patients' pain score. Using inferential statistical analysis, it was found that the heat pack (at 50°C) was effective in reducing patients' pain.

Maffoni *et al.* (2019) wanted to find out how people with Parkinson's Disease experienced the social impact of their condition. This would be difficult to research using a quantitative approach, mainly because we would not know what questions to ask, because we do not know enough about how people with this condition experience it. Consequently, a qualitative approach was used which involved interviewing 27 people with the condition. The interviews were recorded and analysed using a Grounded Theory (Corbin and Strauss, 2008) approach. It was found that people with Parkinson's Disease experienced their condition in terms of its impact in the past, present and future. One finding was that some people with this condition knowingly refused to think about the future; the future was something that they could not face. The authors argue that understanding how people with Parkinson's Disease view themselves and their world, is necessary if practitioners are to provide them with meaningful support.

BOX 1.4 NEW WORDS

Blinding, double-blind: Single-blinding is when the participant does not know whether they are receiving the active treatment or the non-active treatment. Double-blinding is when neither the participant nor the person providing the 'treatment' knows whether the treatment is active or not.

Grounded theory: This is a method of analysing qualitative data (e.g. interview data) in a systematic way. The transcripts are coded or given labels that summarise the meaning in the text. As more data are looked at, the codes are grouped into concepts and categories in an attempt to draw out the main 'themes' in the data.

Inferential statistics: A group of statistics (such as a 't-test') designed to demonstrate the probability that differences between two groups of data are due (or not due) to chance alone.

Placebo-controlled: A placebo is usually a tablet or medicine that has no clinical effect. However, anything can be a placebo, such as a heat pack presented at body temperature.

Randomised: Participants have an equal chance of being allocated to the treatment and the control group - that is, of being given the active treatment or not.

You already know about research

Research is essentially a simple activity. However, research often looks complex and research studies can be quite large. Research is simple but it possesses its own language, which can take time to learn. Research uses a range of techniques to ensure that the

resulting data are what they are meant to be and not biased or unreliable. These techniques can look complex at first, but they are not complex. Then there are those numbers: statistical analyses can look very complex. However, appearances are deceptive and the most advanced and apparently complex statistic will always be simple and intuitive at its core. Furthermore, it is the principles of research that you should learn now. For example, by the end of this book, you will understand the rationale for using inferential statistics, but you will not need to learn how to calculate every single statistical procedure. With these principles in your pocket, you will know all you need to know about research and, indeed, you will be ready to use research in your own area of clinical practice.

BOX 1.5 NEW WORDS

Bias: The unwanted inclusion of extraneous factors that influence the results of a study.

Reliability: The degree to which further implementation of a study will yield the same results.

Research is systematic enquiry and is something with which you are already very familiar. Say that you are looking for material for an essay on the management of post-surgery pain. You go to the library and you go to the section on pain management and then perhaps to the section on surgery. You might do an electronic literature search using the keywords 'surgery' and 'pain'. Finally, you might go and have a word with one of the faculty staff members who has done some work in this area. That's good. You have undertaken a search, but not just any old search: your search has been goal-orientated and systematic. You didn't look in the 'History of Art' section of the library; nor did you seek the assistance of that student who keeps failing his exams. You thought about it, not wanting to waste your time. You wanted to be focused, to be clear about what you were looking for. There is no material difference between this and research.

Perhaps you think that research is more complex because it often includes experiments, difficult language and lots of numbers. Not at all; in fact, you used a library – and lots of people can't do that. You used an electronic search engine – most people can't do that. Importantly, you used a goal-orientated and systematic approach – hardly anyone can do that (just watch MPs in the House of Commons trying to decide something). The fact is, you are brilliant, a real achiever, a star. Seriously, you are a very clever person. In fact, you already do research and what there is left to learn will come easily and intuitively.

What has research to do with healthcare practice?

Students at the beginning of their programme of study are often surprised to discover that they are expected to learn about research. When asked why they wish to be nurses, physiotherapists or theatre technicians, many interviewees will say that they want to make a difference to peoples' lives by doing something to help in times of illness or distress. Interviewees will often indicate that they are practical people with a gift for getting on with

others and that they want to do a socially useful job. It would be unusual in the extreme to come across a candidate who wanted to enter healthcare practice because of a desire to research or to spend their time in academia.

The fact that newcomers to the profession are sometimes surprised to learn even that there is such a thing as non-medical, healthcare research probably has something to do with the image of research and the image of nursing and para-medical healthcare disciplines. When you have a moment, use your computer to search for images of research. You will find pictures of men and women in white coats peering into microscopes, rows of test tubes in laboratories, and complex flow diagrams covered with tiny writing. Now look for images of nurses (for example). You will find pictures of uniformed men and women dealing with sick people in hospital. These images will be of nurses doing clinical things such as taking blood-pressure readings and helping people to walk (while invariably smiling). The words 'nursing' and 'research' seem to have little in common. Of course, it just takes a moment's reflection to realise that these are very simplistic depictions of both research and nursing, but in a way that's precisely the point, there is more to both nursing and research than there might first appear to be. Research, for example, does not always use expensive equipment in hi-tech laboratories. Sometimes, researchers will collect information using a method based on something we can all do, speaking to another person and listening carefully to what they say in response. Equally, the variety and complexity of nursing are not easily or accurately represented by the familiar stereotypes of paper caps, crisp uniforms and hospital beds.

Practice and research – the same motivation

Why do you turn up for work in the morning? Initially, practitioners may often be motivated by a desire to help and support other people in practical ways; this may also be true of you. Much of the research that you will read about in journals and textbooks will have been undertaken by practitioners. Some of these practitioners will have carried out research while working in a clinical role, while some research will have been carried out by people working as teachers and researchers in university departments. However, nearly all of it will have been done by people with a professional qualification. People don't stop being clinical practitioners when they become researchers: the motivation that led them to their profession is the same motivation that leads them to undertake and publish research projects. You can see this by turning to a journal and looking at the titles of the articles that are published there to get a sense of what they are about. The subjects that are being investigated will usually relate to everyday clinical problems and concerns.

Why knowledge can't simply be passed on from one person to another

Clinical practitioners, in their everyday work, try to help people to solve problems related to their health. Sometimes problems are entirely unique to one particular individual, while at other times they fall into patterns. For example, it's very common for patients to experience pain in various circumstances, and the practitioner will want to relieve this if they can.

Although each person's pain is unique in the sense that they are the only person who can feel it, experienced practitioners learn that peoples' stories of pain tend to have common features, not least of which is that pain is generally considered to be unpleasant. As practitioners build up a bank of experience, they may try a number of different ways of addressing these problems, some of which seem to work at least some of the time, while others are rather less useful. On occasion, they may resort to traditional approaches that they have learned from others, and again they may have variable rates of success as they use these methods. One of the problems of working on your own or in a small team is that you can build up what we might call 'customary' ways of working. Certain habits of practice develop. The problem is that it can be very difficult for an individual practitioner, or a small group of practitioners working together in a clinical area, to get an objective sense of the effectiveness of what they are doing.

BOX 1.6 FROM THE PAST

Here is an account by a lecturer in nursing, looking back at his early experience as a student nurse:

One of my first experiences as a student nurse was to be shown a traditional way of caring for a patient with a pressure sore. The patient was a man with advanced multiple sclerosis, and he had a sore the size of a 10p coin on his bottom. The ward sister showed me how to roll the patient on to his side, and then used a brush to apply beaten egg white to the sore. Next, she used a plastic tube to blow oxygen on to the egg white to dry it.

I was a bit surprised at this treatment and asked the sister what benefit it was. She explained that pressure sores occurred when tissue was poorly nourished and badly oxygenated. Thus, there was clearly a logic to what she was doing, though looking back I suspect that the simple act of turning the patient on to his side for a while was of more use than the egg white and oxygen.

There is a lot of knowledge out there and practitioners know how to do a lot of things. You can, for example, pick up a copy of the current Resuscitation Council (UK) guidelines (Resuscitation Council (UK), n.d.), read them and know what to do when someone needs to be resuscitated. In the same way, there exists a plethora of textbooks that the enquiring practitioner can use to guide practice. So, why is there a need for research? Why not wait until all the research becomes incorporated into the textbooks and then just read the textbooks?

Arguably, if you wait for this to happen, you are not participating in your profession. It's like waiting for someone to cook your dinner and then waiting for someone else to do the washing up. You are just sitting on the couch getting fat. Your healthcare discipline is *your* discipline: it isn't run for you, you are running it. There isn't anyone to do the washing up: you have to do it. If you want to eat, you have to cook your own dinner. Your chosen healthcare discipline belongs to you. As a clinical practitioner, you have a responsibility to make things better, to take things forward, to improve the service that is offered to patients. What we know now is not good enough; it can never be good enough because it can be even

better. Your job is to make it better, and research is the key way to make that happen. It is in this way that the healthcare disciplines are regarded as professions. If it were just a job, you could indeed wait for someone to tell you what to do. What you do is not just a job: you have a responsibility not only to your patients and not only to one particular shift and to your hospital or team but also to your profession. It is not good enough that you provide expert care only to your patient; you must also provide expert care, research and leadership to the whole profession. Most international standards of professional healthcare practice make reference to a responsibility to progress knowledge and participate in research (International Council of Nursing, 2012).

Patients and others who depend on us should be certain that 'their' healthcare practitioner is doing more than obeying orders or following the guidelines found in textbooks. From the most junior student to the consultant, people need to be aware of research and aware of the gaps in research where we are still ignorant of how best to help patients. However, even this is not enough: every practitioner should be capable of addressing the gaps in our knowledge and of seeking out ways to increase our understanding, so that practitioners everywhere are better able to provide the best care that is possible.

A practice discipline

Your discipline is a practice discipline; it has no purpose beyond its practice. For this reason, healthcare research is almost wholly inductive; that is, it seeks to answer questions about practice. Most healthcare disciplines do not have a well-defined concept-base; there are no real theories of nursing or occupational therapy as there are theoretical perspectives in psychology, such as Freudian theory and Behaviourism. Clinical research does not, on the whole, seek to produce either theory or pure knowledge as do disciplines such as psychology and sociology. Practice disciplines do not seek to produce either knowledge or theory for its own sake; rather, they seek to be able to do more and to be more effective.

BOX 1.7 NEW WORDS

Theory: A mature set of interrelated ideas supported by at least some evidence. Darwin's *Theory of Evolution*, is a 'theory'. In time, even a well-developed theory may be shown to have flaws.

Inductive research: Research raised from questions about practice rather than from theory. Inductive research can be used to generate new theory, but it usually exists to answer gaps in our knowledge.

Deductive research: Research that is derived from theory. This is unusual in Nursing and medicine, but more common in psychology; where, for example, one might speak of 'psychoanalytical research' (research that stems from psychoanalytical theory).

There is a study element to research. However, there is a study element to the life of every professional person. Learning is a life-long process in any profession. The student who thinks that 3 years of study will set them up for a lifetime of practice is misguided. So, yes,

there is a study element to research. One has to learn how to find research and then how to read it, interpret it, practice it, and implement research into practice. Get used to the idea, for it is common to professional life. For a full professional life, there must be study and practice. Research is almost always directed at questions of practice and is purposed to improve the work of all practitioners for the benefit of the patient.

Where is research?

Research can sometimes seem invisible, but it is present and is eminently practical in nature. When you first started in clinical practice, you probably found it all a little confusing. You had to find the ward then the ward office. Later on, you struggled to find the nasogastric tubes and the dermatology department. For a while, it was confusing. Eventually, however, you worked out where everything was, and you began to feel at home in your clinical environment. Perhaps you have come to feel a sense of mastery over it all and you can now be found telling more junior students what to do and where to go to find things. However, research may be something that you have never really managed to make much sense of. After all, where is it? Where is the research department? Ages ago, you worked out what dermatology was, but what is research? Surely any self-respecting thing ought at least to be visible? So it is that you may have relegated research to the weird and ephemeral, like theory and philosophy. After all, if research was real, you would see the staff practising it and talking about it; it would have become part of what you do.

The truth is that, for many practitioners, research is something other people do; for many practitioners, research is indeed weird and ephemeral. You will have asked yourself how this could be. More importantly, you will have asked why you are being asked to study research when there are lots of other, more practical things that you could be learning. The fact is that your discipline is developing. What you see around you is not what your discipline was 30 years ago, and it is not what it will be in 30 years' time. The non-medical disciplines are in the process of developing into fully fledged professions. They have come a long way but there is still a distance to be travelled. So it is that your programme of study is preparing you not for the past, and not even for today, but for your practice tomorrow.

Healthcare cannot afford to stand still. It must always be searching for better ways of caring for people and it should never be satisfied with the way things are now. So, your course should not fit exactly with what you see others doing in practice. You are the future of your profession and you are learning to practise in the future. When you first started, you probably wanted to be just like the others in your discipline, you wanted to be an accepted member of the team, to know the routine and to look and feel like a professional. That is as it should be, but sooner or later you will have to learn how to be yourself, to be your own sort of practitioner and to imprint yourself on the future of your discipline. You have seen the staff and tried to be like them. However, the time will come when you will have to create the future from your unique skills and your enthusiasm to make things better. Research is about moving things forward, rather than learning what other people already know.

Let us leave your own discipline for a moment and look at the disciplines of Psychology and medicine; let's see if we can find research there. Psychology is split broadly into two

career pathways, clinical psychology and academic psychology. Most psychology research is conducted by academic psychologists working in universities. So, psychology students have no difficulty working out where to find research: as they go through their programme of study, research will be all around them.

So where is research in medicine? You know that there is research in medicine. You will have heard about the struggle to cure diseases for which treatment is still largely ineffective. You will have heard of research that led to the development of vaccines for such diseases as Smallpox and Poliomyelitis, which once wrought death on a massive scale. If you work in a large teaching hospital you will even find that there are medical research departments. Your hospital might have a cardiac research department, for example. However, smaller hospitals often lack these research departments, so why is this? Most medical research takes place in universities. The larger teaching hospitals are staffed by the very same medical people who work in the universities and so you see research taking place there. However, in the non-teaching hospitals, the medical staff do not tend to have academic posts and so less research is carried out. It is different for the medical staff in smaller hospitals; for them, research is largely something other people do. However, all doctors take seriously their responsibility to ensure their practice is grounded in current research.

So, medicine is not perfect; but remember that you are learning to work in the future, not the present. The influence of research is growing very quickly. Even today, there are many practitioners for whom research is a central part of their working lives. Research is all around them and they live and breathe research every day. Suggest to any of these people that research is dry, academic and hard to define and they will look at you as if you have come from another planet. If they should have sufficient patience with you, they will pause and explain that research is anything but dry and academic. They will tell you that research is eminently practical; it is logically construed and orientated to finding answers to the everyday problems of clinical practice. Ask them to show you a researcher and you will be shown someone with their sleeves rolled up, doing work that could not be regarded as anything other than practical and pragmatic. If you thought that research was dry and academic, or ill defined and nebulous, you were wrong.

So, research is a very practical craft. It is, in fact, at the practical end of practice; it is as practical than much of the day-to-day work that goes on in clinical areas. So, you asked your professor to show you a researcher and you were shown a real person doing seriously practical work. You asked the researcher what was involved in the work and what was the goal of it, and you received a brief and plain reply. The work of the researcher is an eminently practical one.

The role of research in clinical practice

Let's think of an imaginary example of the role research plays in everyday practice:

Joe is a lively 9-year-old who loves to play football in his school team. One day he jumps to head a ball but accidentally collides with the goal post and cuts his head. The cut is

about 2cm long and there is blood all over the place. Joe's parents take him to the accident and emergency department of the local hospital. A nurse makes an initial assessment. The nurse asks Joe how he cut his head and asks his parents whether he lost consciousness. She then uses glue to stick the edges of the wound together before sending Joe and his parents' home.

This is a brief description of a simple event. Things like this happen every day and will be very familiar to anyone with accident and emergency experience. However, you may be surprised to learn just how much of the interaction is shaped by the findings of research.

People are often admitted to the emergency department after a head injury. But how should the practitioner assess the patient, how will it be determined how severe is the injury? Well, many years of experience will help answer this question, or access to someone with years of experience. However, research provides us with a better way; the Glasgow Coma Scale (McLernon, 2014) has been in use for many years and has been subject to many studies, some of which have caused it to be adapted, for example, to a prognostic indicator suitable for children. Practitioners use the Glasgow Coma Scale today as a quick and reliable means of assessing someone with a head injury. It is a useful tool, because if practitioners based their practice on experience alone, it might take them hundreds of years to learn what prognostic indicators could be used most effectively.

Dealing with Joe's wound may be both frightening and painful. The practitioner may decide to use distraction to help Joe deal effectively with the investigation and treatment of his wound. However, 'distraction' has not been researched as well as have drugs, for example. The practitioner will want to know that there is support for its use and will want to be assured that research continues to legitimise its use. The Cochrane Systematic Review by Birnie *et al.* (2018) provides up-to-date and regularly updated evidence of the amount and the quality of research conducted on this subject. Birnie *et al.*'s (2018) study, continues to recommend that distraction, and other psychological techniques, be used with children during painful interventions.

BOX 1.8 NEW WORDS

Cochrane Systematic Review: An objective and systemic review of the research literature on a particular topic. Systematic reviews sometimes include a meta-analysis of the data in the original studies. This is where the data from more than one study is collected together and subjected to statistical analysis. Systematic Reviews are arguably the best way of dealing with a situation where there is a lot of research, often of variable quality on a particular topic.

The practitioner's choice of glue to close Joe's wound was also a research-guided choice. There is quite a lot of research on the use of glue to close wounds in children, so the Systematic Review by Farion and others (Farion *et al.*, 2002) may provide a useful examination and summary of the research. In fact, glue has been used so successfully with minor lacerations that it might be considered a useful alternative to sutures in the operating theatre.

However, the Systematic Review by Dumville *et al.* (2014) found that sutures were superior to glue for surgical wounds.

Those new to research might consider personal experience to be preferable to research. Experience is definitely a good thing, in fact, nothing can ever really replace it. Nevertheless, which one of us would set about trying glue for surgical wounds when clear evidence already exists that sutures are superior. Research is a great thing, experience is a great thing but experience, used together with research, is amazing.

As you watch this practitioner in action, you might be forgiven for thinking that he or she is simply doing what is common sense or perhaps what he or she has been trained to do. You look at the practitioner, quietly and competently helping Joe; you do not see the research. However, in this simple scenario, research is everywhere. The practitioner's actions are guided at almost every step by research.

This example has begun to illustrate some of the reasons for our involvement in research and to show why practitioners are expected to learn about research and to apply the findings in their practice when they become qualified. People are often surprised by the extent and importance of clinical research because they imagine, quite wrongly, that practice and research are two entirely different things. On the contrary, indeed, the notion of evidence-based practice is used where practice is based on research, that is, where practice and research are intimately entwined for the benefit of patient care.

Who does research today?

Just as research itself can seem to be hidden from the real world, so too can the people who carry out research. Arguably, most healthcare research is undertaken by healthcare professionals who work in universities. However, we have noted that all healthcare research has a practice focus and the studies that take place tend to involve practice areas, patients, clients and professional staff.

Research tends to be expensive; people's time costs money and research projects can take a long time to complete. The agencies providing research funding need to make sure that their funds are used wisely – so funding tends to go to research teams that have a known history of producing good research. These research teams are likely to operate in one or more universities. However, those who fund research will usually want to see evidence of collaboration with the practice setting and, because of this, there are opportunities for practice staff to become involved in research – so most good research is managed by university staff in close collaboration with clinical staff. There are important exceptions to this, but it is still the case that the universities do and will continue to play a central role in the conduct of research studies.

If you are currently studying, you will be standing with one foot in the university and one foot in practice. You will probably see your future in practice, and look forward to the day when you will have both of your feet in the practice setting. It may be wise, however, to consider maintaining your links with your university. Research is as much a part of practice as medical research is part of medicine. This is a difficult but important idea to accept, especially for the student who may see their passage through the university as transient and

self-limiting. In fact, you have embarked on a life-long-learning profession, and as such, your relationship with the university should not end when you graduate. You will never stop having ideas about how practice could be improved, and it is sometimes good to share those ideas with university staff so that your discipline can be developed to improve the care provided to patients and clients. This is rightly a bilateral relationship. Practitioners know where they are frustrated by an inability to provide the patient or client with what is needed. University staff have the research expertise to develop a study that could move our knowledge forward. This collaboration of equal partners is an effective model for the building of research projects for the improvement of nursing care.

The message is clear: when you leave university, don't leave. If you have left university, go back. This does not mean that you should go back to undertake another course of study but that you should go back to maintain effective liaisons with academic staff. In this way, ideas are shared, projects are started, and the boundaries of practice and of science are pushed back - by people like you.

Try this: Go to the Dean of your faculty or search out one of the professors - go on, corner them! Ask them for a list of ongoing research taking place within the faculty. You may be surprised just how much research activity is going on all around you.

Now do one last thing, choose one of the studies taking place in your faculty, from the list you made - select something that looks interesting. Go and see the person in charge of this project and ask them to tell you about their project. Get the following details about their study:

- the title;
- the duration of the project;
- what the study aims to achieve;
- how the study relates to practice.

So, we have noted that most research is undertaken within universities but in close collaboration with clinical staff. It is unfortunate that a lot of research is invisible to the casual observer, even to students. However, if you just ask, you will find that research is already everywhere.

Research: why get involved?

There are two main reasons why people become involved in research:

- to push forward the frontiers of science and of practice;
- to push forward the frontiers of their career.

These two goals do not have to be in conflict. However, the acceptance of research in professional practice is sometimes limited by the belief that researchers are simply furthering their own career. Think about it though, how many wealthy researchers do you know? Few people ever made a fortune out of research. Furthermore, it is no bad thing to want to progress one's career. Take a look at the people you meet in your clinical area;

some of them will be happy to do what they are doing now until they retire. That's good because good practice needs good experience. However, look around you again; in fact, go and search out those practitioners who have progressed their career and talk to them about it. Go and talk with your clinical manager or leader. Here are some questions you can ask them:

BOX 1.9 QUESTIONS FOR A SENIOR NURSE

Why did you want to be anything other than a clinical practitioner, nurse, physiotherapist etc.?	
At what point did you realise that you wanted to progress your career?	
How can you contribute more now that you are in your present role?	

Being involved in research is one way in which practitioners can contribute more. A ward or community nurse, for example, does a great job; it is the job to which you may rightly aspire. However, nurses are not static creatures but find that they are able to deliver more as they gain experience, skills and knowledge. When you qualify and begin to work as a healthcare practitioner, you will be doing a fantastic job. That job will be uniquely practical and intellectual, and it will be rewarding on many different levels. However, it won't be easy: you have chosen one of the most difficult programmes of study ever offered by universities, and you are looking forward to doing a job that will tax every fibre of your body, mind and soul. It is precisely this sense of endeavour, this willingness to do more than what is easy and comfortable, that will drive you on to do more and more with your career. Importantly, you will come to a point in your career when you can deliver expert patient care. It is at that point that you will want to begin to influence not only what you can do but what all nurses can do. At this point, you will want to make a difference not only to one or two people but to many people.

For example, as a ward or community nurse, you will find yourself addressing this question: How can I ensure that this patient's pain is controlled more capably? Sooner or later, you will find yourself asking: How can nurses better manage patients' pain? This will be your defining moment. Go back to the responses you wrote down in the box above. You will find that those you spoke to can express that defining moment and the difference it has made to their outlook and their career.

Being involved in research is one way that practitioners can make a difference on a scale that is wider than the day-to-day care of their patients. However, researchers do not need to work with patient care *or* research; they can, and they do, do both.

Being a researcher may not be on your priority list just now, but one day it may be. This is the way it is because you are intelligent enough to be doing one of the most demanding courses available. You are courageous enough to enter a profession that is well outside

your comfort zone. You want to make things better for those who suffer. You are the stuff of progress, initiative and adventure. You could become a great researcher.

In the coming years, you will be stamping your own mark on your profession and re-fashioning it to improve it and make it right for the years ahead. There can be no doubt that research will play a bigger part in your practice in the future, in your future. The migration of the healthcare disciplines to research and evidence-led professions is already happening. In the years to come, there will be no confusion about what clinical research is or where it can be found; it will be everywhere. This shouldn't be frightening because you already value exactly what research values - that is, practice, a clear, objective focus and a demand that your discipline should never rest on its laurels but should instead be constantly researching new ways to deliver better, more effective care.

This chapter started by wondering where research could be found, and we thought that research must be both academic and irrelevant to the practice of healthcare. We have come to see that research will develop in the future as the healthcare professions develop. We have also seen that research is far from being dry and academic; rather, it is a practical endeavour, goaled to improve the care that nurses are able to deliver. Research in health-care is essential because the healthcare professions will never be content with what they know and what they can do. Your discipline, led as it will be, by you, will always strive to make things better.

What do you want to be doing in 5 years' time?

Just now you may be occupied with successfully completing your course. You will be looking forward to being a qualified practitioner. You may not have looked much further than this; after all, this is quite a big achievement. However, it can be useful to think about a longer-term vision. Take a few moments to jot down where you would like to be at the following points in your career:

BOX 1.10 IN 5 YEARS' TIME

In 2 years' time, or when you first feel that you are expert at your first post-qualifying post.	
In 5 years' time, when you will have lots of experience and may want to branch out and specialise.	
When you have been in practice long enough that people look to you because of your experience and knowledge.	

What kind of practitioner do you want to be?

Give this some thought and then tick just one of the following boxes:

BOX 1.11 WHAT KIND OF PRACTITIONER DO YOU WANT TO BE?

I want to be a proper nurse, physio, theatre practitioner etc. to look like a member of my profession and be respected for my practice. I want to be like the other people who work in my area of practice and work as a member of a team, with them.	
I want to work with other practitioners in my field and be good at what I do, but I also want to find my own mark and make my own unique contribution to my profession and to patient care.	

Which one is correct? That depends on you; both represent a significant achievement. However, there is an important distinction between the two answers. It is worth some thought. Pester the researchers in your faculty just one more time and ask them which box they would tick.

Concluding remarks

It is often thought that research is a dry and academic subject and one that is not at all suited to the very practical orientation that the healthcare professions have to their work. However, this chapter has argued that this is far from being the case and that research and evidence-based practice are at the very heart of your practice. This chapter has also suggested that research is not only easy to understand but that you already understand it and practice it. Research drives practice to become ever better at delivering care to sick people. Research is not as clearly visible as is 'orthopaedics' or 'surgery'; this is because research actually underpins everything that healthcare practitioners do. In this way, to find research, one needs not to look around oneself but rather to look at the ground upon which practice is standing.

Summary

- It is easy to be blind to the research happening around us, but examples of research affecting practice are everywhere; we only need to look.
- The healthcare professions are all 'Practice' disciplines. Their rightful orientation is the care of the ill person. Research has exactly the same orientation and is performed by practitioners exercising the same focus they had as students - that is, to improve patient care.

- Research is an eminently practical and focused activity.
- The principles of research are easy to understand. You are already familiar with research, and you practice it in your daily life as an intelligent person with great potential. This chapter has tried to persuade you to look at research in a new light, but it has not had to 'teach' you anything.
- Your goal at this point in your career is to become a skilled practitioner, to be accepted by the healthcare team and to have developed a sense of mastery over the clinical field in which you will choose to work. Your goal is entirely appropriate and creditable. However, there will come a time when you will want to exercise your professional duty to your profession as a whole, and to help people all over the world deliver better care. This is an orientation that you should begin to foster now. Being involved in research is one way in which you can make a difference on such a scale as this.

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Chapter 2

Reviewing the literature Getting started

CHAPTER OBJECTIVES

The objectives for this chapter are to:

- differentiate the professional literature from other, less formal literature;
- present the rationale for using the professional literature in preference to other forms of writing;
- outline how to locate the professional literature;
- clarify the meaning of description, analysis and synthesis.

Chapter outline

Research is a very practical activity. However, you could be excused for thinking that research exists only as a great deal of written material, much of it both long and complex. This chapter aims to clarify the purpose of the professional and research literature and how it fits in with the ethos of professional practice. This chapter will argue that although the healthcare disciplines do have a clear practice orientation, the professional and research literature is necessary for them to develop and to progress. This chapter will look at the differences between the professional and the research literature, how to find the literature and how to make sense of it.

BOX 2.1 JUST A THOUGHT

Are you a typical student? It does not take long for students (and staff) to realise that the Internet can be a very useful tool. Answers to almost any question can be found easily using one of the freely available search engines. In fact, the search engine and the Internet itself have become such an integral part of the computer that it is hard to imagine the point of a computer without the ability to browse the Internet. So, it is not surprising that students today use their Internet search engine (e.g. Google®) where, years ago, students would have used the university library. Indeed, it is probably the case that some students have yet to find their way to the library with its intimidating edifice, complicated catalogue and knowledgeable librarians. The university library can be an intimidating place, whereas we all feel 'safe' with Google® etc.

It is common sense that directs students to what seems to be easily the best source of knowledge, the Internet search engine. However, from time to time, it may be better to turn your computer (or your cell-phone) off for a while and go to your university library. Here's why:

There are some very special people found in a university library: other students. These students don't talk, they don't eat, and they are never seen to drink beer. These students are studying; they are focusing their whole mind on one single activity. There is silence except for the sound of the occasional dusty volume being moved from shelf to table. There is an atmosphere here that is conducive to study. Here, in the library, there is a strange, if not decidedly odd, camaraderie of fellow students, though communication between student and student is limited to the occasional eye contact, grimace or smile. This is powerful stuff; not only do essays get written in double quick time but we have known life-long relationships be formed in the library, grown up from all that eye contact and from the grimaces and smiles indicative of a common understanding. So, be wary of the library: you may get your essay written ten times faster than if you used Google on your phone - and you could end up with a friend to carry your essay home for you.

Research is just common sense. In this, it is no different from dealing with any other everyday challenge. It follows that science that is grounded in research is just common

sense too. Research is about questioning; it is about those situations where we are not sure we have an answer. However, not everyone questions; you may know people whose lives are chiefly orientated to 'doing the right thing', to complying with the rules set by others and for whom wondering and working things out for themselves seem never to be part of their lives. So, let us be clear: although research is simply common sense, it is not for everyone. To be involved in research, even to take it seriously, one needs to be prepared to wonder, to ask questions and to have the confidence in yourself, sufficient to believe that you can make a difference.

It is too easy to think that there must be someone out there who knows the answer to a question or that there are others who will sort out a problem for us. Research is for those of us who are prepared to question, prepared to believe that our views and our intellectual skills are valuable and that we can and should use these skills for the good of everyone.

It has already been made clear that you are not just anyone. In fact, you are a very special person. You are prepared to challenge yourself through your study and practice so that you can practise effectively and make a difference to people's lives. There are times in this process when you will simply absorb the knowledge that other people possess. However, your profession is not just a job; it is made up of people with a 'professional' orientation, which in part means that they accept an obligation to make a unique contribution to your discipline. In other words, you are a wondering, questioning person. You already possess the confidence to know you can make a unique contribution to your discipline. You respect those people with more experience and knowledge than yourself, but at the same time you believe you can contribute to the knowledge base of your discipline, improve it, make it better; importantly, you intend to do just that in the years to come.

If you are someone who just wants to 'do the right thing' and practice the same way as everyone else, then knowing about research is still useful. When people talk about research, you will want to understand them, when research comes up in a course you are doing, you still want to do well. So, don't put this book down and don't feel disheartened or angry. You will make your contribution in your own way and practise the way that is right for you. Healthcare is a very broad practice area and there will always be room for people who know how things are done. However, you still need to know about research.

It is important to understand the points made here, because in this chapter we will begin the search that is 're-search'. In doing this we will not ask ourselves why we should bother or why we can't simply ask a more experienced person to tell us the answer to our question.

Searching the existing literature is near the beginning of the research process. Here, we want to find out what has already been written on the subject. We want to understand what is already understood by others and what research has already been completed on the subject in question. In searching the literature, however, we are not content to find out what that literature contains. Rather, we intend to use this knowledge to create more knowledge through research. We are motivated to do this for one very simple reason: we wish to contribute to that body of knowledge, to add to it through our own intelligence and endeavour. We are determined to make a difference.

Why look at the existing literature?

Research is a significant investment. Most research projects cost money and take a considerable amount of time to complete. It is necessary to make sure that we do not waste our time by, for example, conducting a study that may already have been done by someone else.

There is more than one way of conducting a study. Research techniques, or methodologies, are developing all the time. It makes sense to look at how other people have conducted their studies in order to find out which methodologies are most successful in different circumstances.

Research is designed to do just one thing, to build on the discipline's body of knowledge. This building should be cumulative and organised. If we were building a house, it would be no use building the ground floor before we had built the foundations, and so it is with research. So, we need to know what research has already been done, so that we can build on it in a logical (common sense) and ordered manner.

It is sometimes necessary to find out what is *not* known and what has *not* been researched so far. Sometimes, people have a new idea and they wish to initiate a completely new line of enquiry. Even here, the researcher will need to search the literature in order to be sure that his or her idea really is new. It is in the nature of things that this is a relatively unusual position to be in. However, practice has made use of qualitative research to explore new understandings of the experiences of patients and clients (Bathe *et al.*, 2013). In fact, healthcare practice is quite good at using novel and flexible approaches in research. Healthcare practitioners seem also to be good at focusing their research on the lived experiences of patients and clients and even other staff (Haahr *et al.*, 2013). In these situations, it is not uncommon for whole new lines of enquiries to be initiated. Even here, it is still important to be aware of what (if any) research has been completed on the subject in question and to be aware of the methodologies used to achieve both the collection and the analysis of data. All this requires a search of the existing literature to take place.

What is 'the literature'?

We need to recognise that there is a difference between the content of most webpages and what exists as the professional literature. Let us be clear about what it is that constitutes the professional literature (see Happell, 2008).

Professional literature:

- is written using an accepted standard of language that is respectful of other professionals, even when criticising their work;
- employs language that is non-emotional and is objective rather than subjective;
- is focused on the subject in question;
- contains both analysis and synthesis. The result is an objective and systematic exploration of the matter in question. Synthesis is to accept the challenge set by conflicting sets

of information. It is never sufficient, for example, to write that one research project suggests one thing, and another suggests something else – somehow, coherent sense needs to be made of the conflicting information;

- is made subject to peer review. No professional material is published without being judged by the author's peers. This peer review process is anonymous, the reviewers do not know the identity of the author and, in responding to the reviewers' comments, the author is not aware of the reviewers' identity. It is in this way that the written material is judged on its own merits and not on the past achievements or reputation of the author.

All professional literature complies with the criteria listed above. In confining our search to the professional literature, we rule out:

- many books, especially those that are aimed at telling us how to do things (that is, they have a prescriptive style);
- most of the magazines you can find in a newsagent's shop;
- most webpages and most of the material that can be found by an Internet search engine, except where the material is written by or (especially) for people who work in healthcare.

However, finding the professional literature has never been easier, at least for university students with access to online databases such as Medline® and Cinahl®. In the UK, all NHS staff can access the online databases at www.nice.org.uk/

At this point, we need to note that there are essentially two kinds of professional literature. The first is sometimes called 'anecdotal', which simply means that it is not research. This is not a lower class of literature; it is just that professionals and academics write about all manner of things and do not confine their work to research. This anecdotal literature complies fully with our criteria, but it isn't research. It follows that the second kind of professional literature is that based on research. Typically, when a research project is completed, the research team will publish the research, so that others can read it and be aware of the results of the study. It is important for us to be able to distinguish between anecdotal and research literature. Here, we are interested in research and the knowledge and evidence that research produces. We may use the anecdotal literature for ideas and for background reading, but most of our attention will be confined to the research literature.

It is easy to tell the difference between anecdotal and research literature. One is not research and the other, is research. However, people do sometimes confuse the two. A single journal may publish both kinds of material. Anecdotal literature can be, and often is, searching, critical and analytical, and it may consider existing research. Sometimes students confuse a published literature review with research because the authors have researched the topic. Real research, however, involves collecting new data or at least performing a new analysis on data.

Anecdotal literature is not less worthy than research literature. Anecdotal literature performs an essential role in professional life. However, it does represent a lower level of knowledge than does research. In practice, when we search the literature to inform a research project that we intend to undertake, we are interested mainly in the research literature – that is, what research has been done before, how it was done, how successful it was and what new information it produced.

Embedded in these criteria for professional and research literature are the foundations of science itself. These criteria are so important that they have created what we know of as 'science'. However, this is not 'rocket science', what distinguishes professional literature and scientific literature (which is much the same thing) from other forms of writing are criteria that can be readily understood and that are common sense.

So, if this is science, what is art? In what way is the study of English literature, for example, different from scientific writing? The distinction between science and the academic study of art does seem quite unclear. Perhaps it is not for nothing that English literature and science can both be studied at university; they are both intellectual disciplines. Perhaps the distinction between the academic study of art and that of science does not really add up to much. So, perhaps the use of the term 'professional literature' rather than 'scientific literature' is appropriate. It is certainly the case that academics who write professionally about Dickens' books, for example, will employ the criteria listed above. Perhaps science itself is something of a distraction; certainly, there seems to be confusion about what exactly it is. However, what is important here is that we are clear about the meaning of the term 'research'. Both the arts and the sciences conduct research, and the criteria they use for what they write is much the same. This point is salient to the healthcare professions. Nurses, for example, do often find that they are more interested in the softer side of science. It is not surprising that nurses are often interested in human experience, of pain, grief, psychiatric illness, parenting, illness and a thousand other interesting topics. We can perhaps now see that the distinction between art and science is not very useful.

Some might argue that 'science' deals with objective truths, the things that we can measure, like body temperature. Body temperature is what it is, it is not something else, it is not heart rate, for example. We can measure body temperature and it is what we have measured it to be, it is 38° Celsius and not 37°. The trouble is that art deals with objective truths too. Did the painter, John Constable, paint randomly with random colours? No, there are objective truths about colours. Is a horse drawn cart painted with steam coming out of its funnel? 'Art' is stuffed full of objective and measurable facts. By the way, are you sure about that temperature value you just measured? Taking a core body temperature reading could be more accurate and might give you a different reading. Some things can 'look' objective, when they are not. Are you sure about those lab results? Why are you so sure? Numbers on a sheet of paper look objective but if the machine that analysed the blood is faulty, then your numbers might be no more use to your patient than a painting by Constable.

Even if we were clear about what constitutes science, we could still not say that healthcare is a science. Medicine is a practice discipline, and the word 'practitioner' seems to suit the doctor better than the word 'scientist'. Medicine is a field of practice; it is not a science, even if it uses the information that science makes available. However, science can be and often is found in medicine. Medicine becomes scientific whenever a doctor seeks to address a topic using the criteria of objectivity, focus, and the collection and analysis of new data, and when that doctor seeks to publish his or her work by subjecting it to peer review. In other words, medicine is a science, when it undertakes research.

So, perhaps we can begin to see the value of the professional literature. The professional literature is not just writing or published stuff. Actually, it has a value commensurate with

the adoption of the criteria identified above. The adoption of these criteria sets professional literature aside from, if not above, much of everything else that is written. Much that is written in books and on webpages is both good and useful, but the professional literature is different. Furthermore, the research literature represents what is science in each discipline; in Medicine, Nursing, English Literature and the History of Art.

How do I trust the literature?

There is a hierarchy of quality in the professional literature. Books are usually at the bottom of the hierarchy because they tend to limit their content to description. In practice, there is very little research to be found in books. The research that does exist in books is usually limited to brief description of what research is available. This can come as a surprise to the new student because those outside professional life often consider books to be clever things. Maybe they are clever, but sadly very little research is found in books and so books seldom meet our purpose. Books are useful when it comes to describing things, such as when you are learning about anatomy. However, for evidence of real research, we almost always have to look to journals and to a subset of journals that are regarded as academic.

It is not uncommon for the whole notion of research to be dismissed by undergraduate students. After all, you will be aware of conflicting research. One study tells us one thing, and another study tells us something that conflicts with the first study. It is not unnatural to see this as evidence that research is untrustworthy. Let us look at the argument that research is valueless because of the way that one study so often disagrees with another study. Well, it's true: studies do often find evidence that contradicts earlier studies.

Research is not an infallible endeavour. Researchers are human beings; they may be clever, but they are not perfect. Researchers don't always get everything right. More usually, however, researchers do manage to do the best they can with the resources available to them. It is just that some things are very difficult to research. Researchers usually do their best in such circumstances, but sometimes the circumstances defeat them.

BOX 2.2 EXAMPLE FROM PRACTICE: IS A GLASS OF WINE A DAY, GOOD FOR YOUR HEART, OR BAD FOR YOUR HEART?

In 1999, Scholl (1999) wrote a letter to the *Lancet*, arguing from the research evidence, that middle-aged people who did not drink alcohol at all, should be encouraged to drink a glass of wine each day on the basis that wine increases coronary artery blood flow, a position confirmed later by de Gaetano *et al.* (2016).

In the same year, Ernst (1999) again, argued from research evidence, that wine was good for the heart and that it was therefore okay for middle-aged people to drink a glass of wine each day. Ernst did however stop short of recommending that those who did not drink should be encouraged to take up the habit.

Again, in the same year and referring to research evidence, Bradley and Merrill (1999) argued that it was better to avoid alcohol completely. Bradley and Merrill made the point

that much of the research was 'observational' (p. 1815) in nature and that double-blind trials were needed. Here, Bradley and Merrill make a valid point, indeed many of the arguments about the relative benefits or otherwise of wine, butter and chocolate from studies still published today are from 'observational' or more correctly 'epidemiological' studies which are not experiments and so are unable to fully control for variables. These studies take people who already drink one glass of wine a day (or claim that they do) and compare them with people who don't drink wine (or claim that they don't). The studies then look at how many of these people sustain a heart attack. These 'epidemiological' studies are conducted partly because an experiment, which would involve monitoring people over years and feeding some of them alcohol, would be both unethical and expensive. Nevertheless, only a double-blind trial, an experiment, would give us the real truth on the matter.

I will always welcome an epidemiological study that finds chocolate is good for me, but being honest with myself, I know that non double-blind trails will never tell me the whole truth and may be telling me no truth at all. Nevertheless, our pro-chocolate (or whatever) study may well be interesting, and may, in time, lead to a better-quality study being conducted. Understanding research, helps us to interpret research knowingly.

Research should be, and usually is, a cumulative endeavour. One research project builds upon another. It is not at all unnatural that, at one point in time, the available research appears to be contradictory. In the fullness of time, we are able to see that the research was progressing towards a known goal. When that goal is achieved, the progress can be seen in perspective and it can be seen that the research was pushing forward the front line of knowledge. With each push, however, there often comes a backlash of evidence as areas of knowledge defend the onslaught. There are winners and losers and there are reputations at stake. Researchers are human and they will, and indeed they should, try to defend their position against the advance of new knowledge. New research, producing new knowledge, should not have it easy. Such new knowledge should be challenged and challenged again until there is nothing left to challenge, until we can be certain that the new knowledge is right, correct, certain and that it should therefore replace the old knowledge. The point is that there is friction and challenge here, which does release energy. We should expect this and welcome it. For such friction is part of the advancement of new knowledge. Nothing else would be right; new knowledge should be challenged and then it should be challenged again. We must be sure that what we know is correct and that it should rightfully replace the knowledge that has gone before.

So, we are not going to be put off by conflicting research and disagreement. However, there is such a thing as poor-quality research. It is often difficult for the student to judge what is good or not-so-good research. After all, most students have little or no experience of actually doing research. To expect students to judge the quality of research is like asking them to judge the performance of a neurosurgeon or a deep-sea diver. Until one has gained experience of doing a job, one is not in a very good position to judge it. What makes this matter worse is that the research literature can be very difficult to understand, and

inexperienced students will often deal with this by confining their search to the less academic (popular) journals. The inevitable consequence of this is that they stumble across the less good research literature. It can be better to confine the search to the more academic journals. While this can yield up research papers that can be difficult to understand, at least one can be assured that the quality of the research is better than poor. The message is clear: don't shy away from the more academic, less popular journals. Rather, try to read them, and then read them again until they begin to make sense. This is not easy, but it is better to grasp the nettle rather than settle for less.

Most online databases such as Academic Search Elite (EBSCO Host®: <http://search.ebsco-host.com>) will enable you to tick a box next to your search term to indicate that you are only interested in peer-reviewed articles. However, with some databases (Web of Science, at <https://apps.webofknowledge.com>) it is also possible to choose only those journals with an impact factor. The impact factor measures the number of times that articles in a particular journal are cited – that is, referenced within other publications. In this way, the impact factor is a measure of how 'used' are the articles published within a particular journal. So, the impact factor is a measure of the quality of the journal, not the individual papers published by that journal. If you wish to take this route, you can decide to confine yourself to journals that have an impact factor, or you can look at those journals with the highest impact factor. It can be useful to know which journals have the highest impact factor but, other than that, the baseline of peer-reviewed journal is sufficient. If you want to know more about impact factors, find the *Journal of Citation Reports* on your university library webpage.

Where do I find the professional literature?

Most people are used to using the Internet and are adept at using search engines such as Google®. Google can be used to find information about almost anything, and it is a great resource. However, it isn't a good idea to use Google to search for literature, as there are better ways of doing this. Google Scholar® is good at finding articles but often one has to pay to read the whole article. Instead of using Google, try the variety of online databases that are purchased by your university and that are available on the Internet (online) and are usually accessed via university library webpages.

If you are a university student or if you are an NHS employee in the UK, you will have easy access to these electronic journals and to online databases that do a great job of tracking down the material you are looking for. Things are much more difficult if you do not have this 'free' access to the online journals. It is probably not enough to subscribe to just one journal. Today, there are so many journals that one journal cannot hope to publish all the best research. If you are not a university student or an NHS employee, there are some free options left for you. The Cochrane Library of randomised controlled trials and Systematic Reviews is completely free to anyone in the UK. Some access is available at the Web of Science (<https://login.webofknowledge.com>) and Google Scholar is certainly worth trying. Today, the average librarian possesses a wealth of knowledge about which online journals are available and which ones are best for which purposes. The librarian has become an

expert in the use of computers to access good-quality material via online databases and online journals. So, the message is clear: use your librarian. This often involves meekly entering the ivory tower of the library, searching out a busy-looking librarian and admitting to being lost. Don't worry, we have all been there.

Now, the impatient librarian does exist. Today, the average librarian has degrees to spare. However, where a little respect is shown, the librarian will be keen to whisk the average student off his or her feet and wrap that poor student in arms of benevolent guidance. Being a student (and we never stop being one of these) is an exercise in resource management. Most students don't have much in the way of resources, and so the good use of what resources are available is much required. The librarian is the student's best birthday present, a free, knowledgeable and willing resource, a positive fountain of knowledge, there just to serve you. Use your librarian.

So, searching for and finding published research is easy. Increasingly, the databases to which university students have access contain the downloadable electronic version of published material. There is no good reason for not using these online databases if you have access to them.

Google Scholar is getting better all the time although it does tend to find the Open Access literature, some of which is very good. It is still much better to use one of the Web-based databases that are specifically designed to hold professional and research literature. As a student of a UK university (and most non-UK universities), you will not have to pay to use these databases. It takes no more than half an hour to become relatively proficient at using these databases. So, while the rest of the world is happily using Google, you should be surfing elsewhere.

Note that if you have found what you want in the Web of Science or in Cinahl, you may find that the system wants to charge you a fee for seeing the full text of the article. If this is the case, make sure you log in through your university library website or with your NHS credentials and you will probably find that the material is offered for no fee.

BOX 2.3 NEW WORDS

Systematic review collects together all the best research on a particular topic and attempts to make sense of the resulting collection of studies. Often, a Systematic Review will pool the data from several studies and run an analysis, known as a 'meta-analysis', on the pooled data. Where successful, this effectively increases the sample size and can offer up new information that was not available by looking at each individual study. As such, a Systematic Review can constitute new research. Full access to the Cochrane Library will probably be available via your university library webpage and is free within the UK.

Randomised Control Trial (RCT) An experiment or prospective research study that has at least one control group and where randomisation is used to control bias. Blinding is also used in RCTs; this is where the participant and perhaps the researcher, are not aware of which research group the participant has been allocated to. Blinding helps to reduce the risk of bias. The RCT tries to mimic the archetypal laboratory experiment by controlling any variable that might impact on the research.

The Cochrane Library is becoming the single best source for research literature. However, it tends only to hold good-quality quantitative studies. It may be necessary to look elsewhere for more explorative or qualitative work.

For the student who is starting out on their journey into the research literature, the sources Cinahl or the Web of Science and the Cochrane Library should prove sufficient. Between them you can find hundreds of thousands of research papers.

Making sense of published research

Research is easy to understand. Although it often looks complex, underneath all the apparent gobbledegook is something essentially very simple. So, when you look at your first research paper, you could be forgiven for thinking that this claim has been overstated. It is true that research does often look very complex. This is due in part to the language used by researchers and in part to the huge variety of research methods in use. Healthcare students are often more bewildered by research than are students of other disciplines such as medicine. The healthcare disciplines, like nursing and physiotherapy are not pure disciplines, as are psychology or geography; rather, they are eclectic and diverse. Because of this, the healthcare disciplines employ a huge range of research methodologies, embracing as they do, both the qualitative and the quantitative paradigms.

BOX 2.4 NEW WORDS - REMINDER

Qualitative - Essentially, explorative research that deals with words rather than numbers.

Quantitative - Essentially, research that deals with numbers.

Part of the problem here is that a complicated research paper can make the average student feel inadequate, perhaps even stupid. It is a good idea to read the paper through several times and to get help from your tutor or lecturer. Be prepared to find research papers difficult to understand, especially at first. Try not to be put off by this. Take your research paper to a nice quiet place such as a library and try to understand it. It might not be easy. You will probably need a dictionary to look up all the new words - but do it all the same. Don't worry if it takes you all day or all week - it will *not* mean that you are stupid. There is a learning curve here: you have to climb the steep edifice of that curve before it begins to flatten out a little. If you expect the task to be difficult, then you will not feel quite so threatened when it proves to be difficult.

You may need to read the paper several times, but eventually you will make progress and it will become clearer. Now take it to your lecturer. Whatever excuse you gave yourself for not doing so is just that: an excuse to protect your self-confidence. Understand that this will take courage - but do it all the same. Go with a list (written down) of things that you do understand about the paper and a list of things you don't understand. Tell your lecturer what you think you understand about the paper and then the things you don't understand.

The point here is that it is easy to feel overwhelmed by the apparent complexity of the average research paper. This is a normal reaction. It does not prove that you are stupid; it proves only that you are human. Treat the paper like an invading army, something to be both attacked and defeated. Have courage, know that your mind is as keen as anyone else's, be prepared for a struggle and for setbacks, but be determined to conquer that research paper. By the end of this process the research paper will be lying exhausted at your feet. It will be defeated, its complicated language will have been translated into plain English, its methodology will be exposed as nothing more than a common sense way of finding an answer to the question at hand, and the analysis, that array of frightening numbers and words, will be seen for what it is – the result of a clear and logical exploration of the data.

The chapters following this one will guide you through the process of making sense of research papers. For now:

- Make sure that you are looking at a research paper. The paper should contain an analysis of data. The data may be numbers (quantitative) or words (qualitative), but there should be new information there, derived from a data collection. Don't confuse research with a literature review, even where this reviews previous research.
- Try not to use secondary papers (reports of other people's research).
- You will be used to critiquing things; however, try to go beyond criticising the researchers for what you think they have got wrong, because:
 - the people who published the research know more about it than you are likely to do; in criticising them, you may simply be exposing your own lack of understanding;
 - the main reason for research being imperfect is that some things are just very difficult to research. It is often impossible to use the most robust methodologies. For example, qualitative research is sometimes criticised for not coming close to the standards for a double-blind controlled trial, as used in most medical drug research. However, there are times when only the explorative nature of qualitative research will yield up the information that is being sought. Students new to research often fail to understand the real-world difficulties and constraints of research. People new to research often criticise researchers for failing to do what is, in fact, impossible. Such criticism is likely to do nothing more than expose the student's lack of understanding.
- Be sure that you report what the study found – that is, the results and not just the methodology (how the study was done). Make sure that you understand the results. If you are not sure how to interpret the results, read the paper again and then read it again, looking up all the words and phrases with which you are unfamiliar. If you still don't understand the results, ask your lecturer to interpret them for you.
- Make sure that you comment on the implications (as you see them) of the study. There will be implications for further study and for practice.

It is easy to be too descriptive when reviewing a research paper. You need to go beyond summarising it. Your report should have your ideas in it. There will need to be some description in your work, but there should also be an account of your ideas. Your section on the implications of the study is an excellent place in which to document some of your own ideas, your own thoughts and your own arguments.

BOX 2.5 ANOTHER THOUGHT - WHY DO STUDENTS WRITE SO MANY ESSAYS?

Let us understand this – students do not write essays so that they can be tested on the amount and depth of their knowledge. There are better ways of testing knowledge and it would be unforgivable to cause so many hours of work and the use of so many trees (paper) just to test students' knowledge and understanding. If we wanted only to test students' knowledge and understanding, we could simply talk to them, as in a viva, or give them a written examination with short-answer questions. Just think of the time and paper that would save. No, the rationale for the use of essays lies elsewhere.

An essay is an exercise in professional communication. An essay is the student's version of a published paper. It is about the same length as a published paper and it has the same characteristics as a published paper. These characteristics are that the essay:

- is written using an accepted standard of language;
- uses a discussion and arguments that are non-emotional and objective rather than subjective;
- is focused on the subject in question;
- 'tells a story': it contains a thesis – that is, a logical and integrated set of ideas that have a purpose, perhaps to inform the reader of something new or to enable the reader to see something in a new light. In achieving this, there is evidence of analysis and of the synthesis of existing and new ideas. In this way, the essay is a communication that goes way beyond summarising what already exists in other people's work. The essay is all about the student's own ideas;
- is made subject to assessment.

You have seen this list before, in the criteria for professional literature. So it is that in writing essays the student learns about writing professionally. Communication (sometimes in writing) is a requirement of professional life. Writing professionally is a vital component of both practice and research. There would be no point in improving practice or in conducting research if we then kept this new information hidden from others. We have a duty to publish our efforts, so that others can examine them, judge their worth and, where appropriate, incorporate the new knowledge into their own research and their own practice.

The use of analysis in the literature

Taken literally, the term 'analysis' means to break something down into its component parts for the purpose of understanding them better. In practice, analysis is the sense that we make of things. It is often the case that when we examine something, we have to pare away the irrelevant material so that we can see the relevant stuff more clearly.

Let's use the example of individualised care and the difficulties that exist in implementing it. Let's say that we want to examine the degree to which individualised care is something that is seen as positive and useful by patients and clients of the NHS. Let's look at some of the component arguments:

- patients appreciate a healthcare service that adapts to their own needs;
- patients are irritated by a service that seems to be more about the needs of the institution than their own needs;
- the public expects higher standards of care than in the past. As part of this, people expect their individual wishes and needs to be accommodated by the staff;
- healthcare practitioners provide care to individuals. Such a one-to-one orientation is fully something that practitioners should be encouraging.

These arguments are pretty convincing. However, do these arguments present the whole story? Can you think of some reasons against the use of individualised care? List them here:

- 1 _____
- 2 _____
- 3 _____
- 4 _____

Here is what you may have written:

Individualised care is well and good, *but* it is just not realistic because:

- staff are too busy;
- staff don't have the time to modify every procedure for each individual;
- patients should be grateful for what is being offered - the NHS is a charity after all (actually, the NHS is not a charity, although it may manage charitable organisations and funds);
- if people want individualised care, they should obtain private treatment;
- staff don't work for individual patients: in practice, they work for a ward or unit. Staff work as a team. Their orientation to the ward, unit or department means that they work together with other people and so can't make individual exceptions to their care with every patient.

So here we have two sets of arguments in mutual opposition. We can't leave it like this, because we have to do something, we have to operate in one direction or another, we have to practise individualised care or generalised care.

We are not short of evidence; we have all the evidence here. What we are short of are analysis and synthesis. In analysis, we separate out the various arguments or components. In synthesis, we create a new position. By collating the various arguments and by categorising them (in this case, into 'for' and 'against' groups) we have achieved an analysis; in short, we have broken down the issue into its component parts for the purpose of understanding them (analysis).

BOX 2.6 NEW WORDS. SYNTHESIS

Synthesis? What synthesis? No one has ever asked me to put synthesis into an essay.

The word 'synthesis' is often subsumed by the word 'analysis'. In this way, when people use the word 'analysis', they often mean analysis and synthesis. Synthesis is in a sense, a summary, or the creation of a new argument from old ones. It is the conclusion we come to.

Doing this analysis has made things clearer. We have two groups of people - staff and patients - who have a quite separate orientation to the provision of healthcare. Indeed, patients and staff are not working together; even their aspirations for what the NHS can provide is in conflict. However, let's firm up our analysis to make it clearer, more succinct and more focused:

- Patients are interested chiefly in themselves; they want care that is focused on their needs. Patients appreciate that other patients also have needs, but their own core role is to obtain the healthcare provision that they need in order to get well. That is why they are in hospital or are receiving care. When well, these same patients may fill their life with helping others. Now, though, it is time for them to receive care. It is a question of focus and priority. The purpose of being in hospital is to receive the care that they (themselves) need.
- Staff are loyal to their ward or unit and to the team of people with whom they work. They are conscious of patients' individual needs but are chiefly orientated to the generalised care that is provided (to all patients) on their ward or unit. This is good-quality care and is made better through it being a team activity. This provides a system in which all patients receive a fair percentage of the time the staff have to offer and, in a situation, where resources are often short. To be clear, staff work for their ward or department; they do not work for any one patient.

So, this is an analysis of the situation. It is an analysis with which you are free to disagree. An analysis is not necessarily the truth. You may have a different analysis, but in forming this you would have to assemble some more evidence or identify where the analysis here has been illogically construed.

So, perhaps this is interesting, perhaps it even sheds new light on your understanding of individualised and generalised care. Perhaps you have been practising for 1, 2 or 3 years but only now feel that you understand this issue. Well, if so, you will understand the use and the power of analysis.

So, what about synthesis? Perhaps you have written an essay that presents all the available arguments but does not come to a conclusion, except perhaps to say 'Here are all the available arguments'. Consider a student who has reviewed the available research on a particular topic and found that some of the research evidence is conflicting. Our student summarises the available research but fails to come to a conclusion because the research itself is contradictory. The world is full of contradictory evidence, but when it comes to the practice of healthcare, we have to synthesise all of this conflicting evidence so that it makes

sense, so that as practitioners we know what to do. Synthesis is to take separate elements and to create a new whole from those elements. Theory, as in ‘a theory of child development’, is constructed largely from synthesis. Let’s have a go at synthesis with our individualised care issue:

We cannot deny that nurses practising generalised care have done a good job over the years. Such a system is efficient and makes good use of resources. In addition, staff like it; they like working for an institution (the ward or unit) rather than for individual patients, and they like being part of a team. However, times change and the public’s expectation for healthcare has changed. Not only do patients want individualised care; it is also good for them because they get from the system just what they need. When, for example, they are fit to be discharged home, they go home and do not have to wait until their take-home drugs come up to the ward with all the other drugs, tomorrow lunchtime or teatime or maybe not at all. There are those who would like to see staff achieve a more professional orientation to their work. From this source has come care-planning, problem-orientated records and the many graduate and post-graduate courses that now exist for health professionals. We have to decide whether healthcare is still institutionalised, whether it exists to serve the hospital or NHS trust, or whether it exists to serve the patient.

Tick only one box in Table 2.1. When you were younger and anticipating your career, did you see yourself primarily.

So, in synthesising this issue, we find that we have to make a decision. We have to decide whether our core priority is to the sick person or to the NHS. We understand now that we cannot be wholly orientated to both the NHS and the patient. With this synthesis we have a new ideology, one that is wholly orientated to the care of just one individual, where responsibility cannot be diffused among the whole team and where the practitioner must always be clear what healthcare provision she or he is dealing with. The old-fashioned nurse, working for the ward, where patients are either compliant or a nuisance, is (in our synthesis of this issue) a dinosaur in a passing age.

Just as with our analysis, this synthesis is something with which you can disagree. However, in order to challenge it, you must bring more evidence or demonstrate that the synthesis here has been illogically construed.

So, we analyse something by separating out its component parts in order to better understand them. We use synthesis to generate new ideas, to make new sense of the issue or phenomenon in question. This is how it is with your essays and that is exactly how it is with the analysis we see being used in research. It makes little difference whether research uses words or numbers; the data (the words or the numbers) are subject to analysis, just as the ideas in your essays are. So, you already understand analysis. When you write an essay, you question the material contained in your essay. In exactly the same way, when we collect data in research, we subject the data to questioning - that is, we analyse the data.

Working for a hospital or NHS trust	
Working for an ill person	

Sometimes, research does not only tell us something we did not know before; sometimes it also helps us to build a new kind of understanding. We use this new kind of understanding to synthesise new theory. Perhaps you have already achieved this in your essays. Perhaps you have begun to add to what is already known with new ideas of your own. Such is synthesis and so it is that you may already be skilled at it.

However, just like your essays, research does not always result in a new synthesis; often we have to be content with knowing better what we already knew reasonably well before. Just like your essays really, new ideas – those that have not been thought of before – are rare and the process of producing new theory is a gradual one.

How to review the literature

Here is a step-by-step guide to reviewing the literature:

- 1 Identify a clear objective – what exactly do you want to find in the literature?
- 2 Identify the best source of literature – where shall you look?
- 3 Identify what kind of literature you are looking for:
 - a research;
 - b anecdotal (non-research literature);
 - c an existing review of the literature;
 - d books.
- 4 Identify what resources you have available, especially for time.
- 5 Identify the academic level of journal you are aiming at.
- 6 Get help if you need it, librarian, library guides etc.
- 7 Make notes on everything you read, consider keeping electronic notes.
- 8 For the research literature, try to identify:
 - a What was the aim of the research?
 - b What was planned to be done (the research method)?
 - c How it was done (the intervention or techniques such as interviews or questionnaires)?
 - d What was found?
- 9 For anecdotal literature:
 - a What was the focus of the paper?
 - b What was described?
 - c What was the author arguing?
 - d How was the argument supported?
 - e Is their argument credible?
- 10 Be prepared to read and re-read your literature.

- 11 Summarise the main points in the literature you have read.
- 12 When you write your own account, you will be making your own arguments, based on the literature. So plan:
 - a your introduction to the topic;
 - b what arguments you will try to make;
 - c how you can use the literature you have found, to support and to refute your arguments;
 - d what your conclusion will be.
- 13 Try to use description (in your introduction), analysis and synthesis.
- 14 Try to make your discussion flow logically.
- 15 Note that editing your essay can take longer than writing the first draft.
- 16 Ask yourself:
 - a Is my account clear, is it understandable?
 - b Is my English clear?
 - c What am I arguing?
 - d Are my arguments logically ordered?
 - e Have I provided an analysis?
 - f Where the literature is complex or where it suggests different things, have I synthesised these?
 - g Is my account interesting?
 - h Does my account add something to the literature I have read?

Let's go through this list in just a little more detail.

Identify a clear objective - what exactly do you want to find in the literature?

When you review the literature, you need to know exactly what we are looking for. It is not usually a good idea to review all the literature on 'asthma'. Whether you are conducting the literature review with a view to conducting research or just to write an essay, you will need to have a tighter focus than this. If you haven't decided on a tighter focus at this point, it can be reasonable to 'eyeball' the literature, to see what topics relating to 'asthma' have been covered. Doing this will also give you a reasonable idea about what aspects of asthma are most often dealt with and the depth of knowledge that already exists.

Identify the best source of literature - where shall you look?

It is almost always best to locate the literature using one of the online databases provided by your university. Your librarian will help you choose the best one(s) for your subject area. Do make your search systematic (see the next chapter for a discussion of 'Systematic Literature Reviews'). Make notes on the search terms you have used. Looking at these notes will often lead to the use of other potentially useful search terms.

Identify the type of literature

You will find the following types of literature:

- research;
- anecdotal (non-research literature);
- an existing review of the literature;
- books.

It is unlikely that books are going to prove useful here but there can be exceptions to this. Other, more pure, disciplines such as sociology and psychology make much more use of books for their academic and research literature than do the healthcare disciplines. In healthcare, books tend to reflect 'knowledge', as in a summary of what is known on a particular subject. As such, books can sometimes provide useful background reading.

Our clearly defined focus for the literature review will tell us whether we need to be looking at the research or the anecdotal literature. In practice, the anecdotal literature should not be overlooked as it often contains non-research forms of evidence such as benchmarking and clinical experience. This level of evidence should be taken seriously but we do need to be aware that research generally provides us with a superior level of knowledge about a given topic.

An existing review of the anecdotal or research literature can be very useful. Such a review never 'does the job for us' but, rather, it takes us on to a new level of enquiry. An existing review of the literature may well point to areas that still need to be explored and as such can provide the impetus to further refine what we want to achieve with our own review of the literature.

BOX 2.7 EXAMPLE FROM THE LITERATURE

Laplante-Lévesque and Thorén (2015) were concerned that people with hearing problems might find Internet-based information too difficult to understand. They found 78 articles on the readability of Internet-based audiology health material. Of these, eight met the inclusion criteria for the Systematic Literature Review. These studies found the reading

age required to understand the Internet sources to be between 9-14, meaning that only those people with at least 9 years of education would be able to understand them. The authors concluded that the existing literature identified a need for clearer audiology material to be available on the Internet for people with hearing problems.

Identify what resources you have available

Whatever level and kind of literature review we are doing, we will be limited by the available resources. For UK university students, funding should not normally be an issue because students have access to a wide range of journals that will be free at the point of access. However, 'time' will tend to be a much more important issue. Available time is an issue both for students who have one semester to write an essay and for PhD students who have 3 years to write their thesis. Most students should be content to use the full text facility of their university's online or library databases. This will allow access to an incomplete, yet still vast amount of literature.

Identify the academic level of literature you wish to access

Anyone reviewing the literature should bear in mind the academic level of each of the journals in their discipline. There can be good articles published in the less academic journals but, as a general principle, the better-quality articles are found in the more academic journals. Your librarian will be able to help in identifying which are the more academic journals in your subject area. It is the case, however, that articles in the less academic journals do serve a useful function in professional life and tend to be written in a more 'accessible' language. If you are a new student, you may wish to limit your attention to these journals, at least for the time being.

Get help if you need it

Librarians are a great resource. Your tutor or lecturer should also be able to help. A typical university will have perhaps 20,000 students or more. It should not be necessary in such a situation for a student to have to struggle along on their own. Why not arrange to meet with other students, work together; share what you know.

Make notes on everything you read

It is easy to think that we will remember what we have read. We may also not want to have to do 'any more work' by writing notes on what we are reading. However, there isn't any way that any of us can remember everything we have read. If we don't make notes, we will find ourselves having to read the article again when we come to write the literature review. So, making notes on everything you read, will save time in the end.

It is no use making notes, if the notes are likely to get lost, or if they are so rambling that at a later date, we are not able to make sense of them. We all suffer from 'disorganisation' sometimes, but being organised with notes is important, because if we are organised, we will save time and get the job of doing that literature review completed more efficiently.

Some people prefer to write their notes manually. However, it can be difficult to 'file' paper notes in such a way that they can be found again easily. Let us be clear, there is no point in making notes if the notes are then going to get lost. In order to deal with this issue, some people use one big 'diary' in which they keep all their notes. Other people keep a card index file. For me, neither of these options would be suitable. For one thing, my writing is awful, I can hardly read it. Your writing may be better than mine, but when you are tired, you too may end up with some very untidy notes. A card index file is good if you like to spend your time cataloguing but it is bulky, and you won't have it with you when you need it. You may wish to keep your notes as word-processor files and in my experience, this works much better.

For me, however, the very best way of managing notes is to use 'reference managing' software. This is software designed specifically for managing references and for recording notes about articles. Such applications include Endnote®, it is very likely that your university provides access to Endnote or similar applications. I used one of these applications to organise my notes and my references for this book.

In Figure 2.1, you can see my references for the qualitative research chapters for this book. You can see that these references are organised according to their main focus. However, I can also search for any text in any of the references and I can assign a reference to several categories or classifications.

Clicking on one of the references will open a page on which I can detail the actual reference and make notes on it. In Figure 2.2 you can see my reference for the General Medical Council's text on *Good Practice in Research* which I used when writing this book.

Figure 2.3 shows some of my notes on the same reference. Applications such as Endnote® also allow for the references to be downloaded from the online databases and put directly (cited) into a word processor file. This produces an automated reference list that is always formatted correctly.

You can see that I am able to keep a link to the full text of the article, just in case my notes on it turn out not to be as good as they should be!

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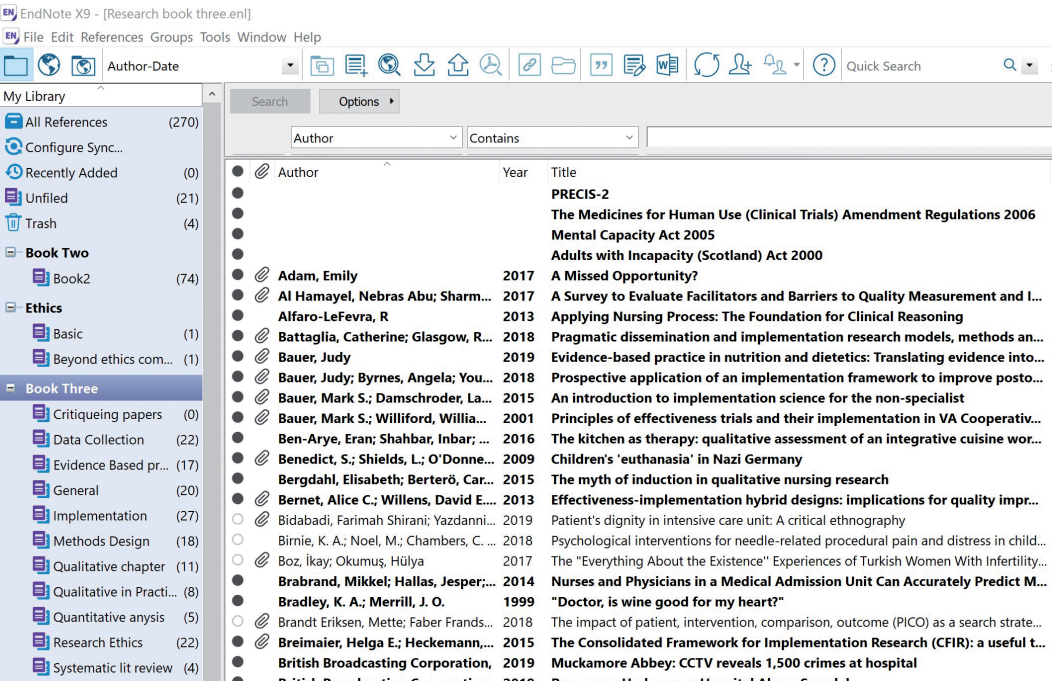


Figure 2.1 Endnote example (image of Endnote).

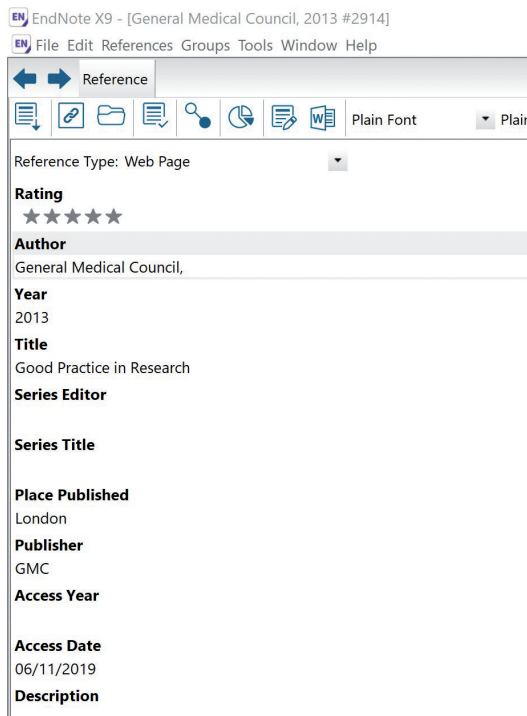


Figure 2.2 Endnote reference (image of an Endnote reference).

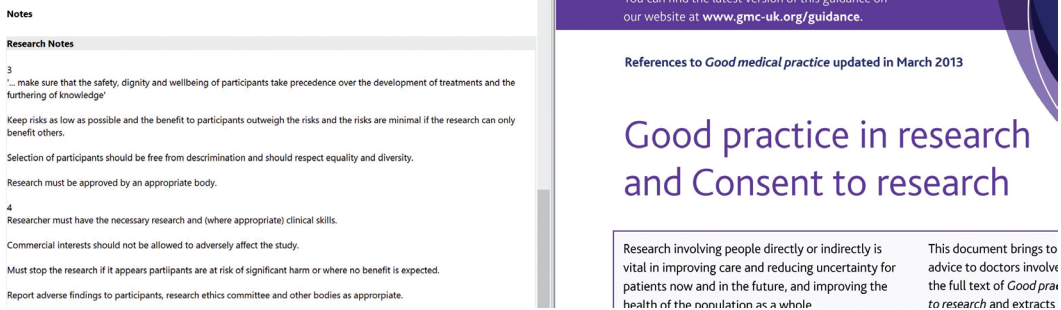


Figure 2.3 Endnote research notes (image of notes in Endnote).

BOX 2.8 HEALTH WARNING

Applications like Endnote® cannot be learned in 10 minutes. Learn to use it only when you have a couple of days to get used to it – that time will be repaid many times over in the course of your essay-writing career. However, you may seriously damage your health if you try to use referencing software for the first time while doing battle with an essay that is nearing its submission date!

It is much easier to write your literature review when you have your own notes available. If you try to write the essay using a large pile of the original articles, the following will happen:

- you will tend to end up with an overly descriptive account of the articles;
- your account will tend to be too 'close' to the content of the articles; there will not be a lot of 'you' (your own ideas) in your literature review. This is because 'notes' are in part used to develop your own ideas;
- it will take you much longer to write your literature review than if you were able to work from your notes.

What notes to make

For the research literature, try to identify:

- What was the aim of the research?
- What was planned to be done (the research method)?
- How it was done (the intervention or techniques such as interviews or questionnaires)?
- What was found?

For anecdotal literature:

- What was the focus of the paper?
- What was described?

- What was the author arguing?
- How was the argument supported?
- Is their argument credible considering the literature the author used to support the arguments made?

You should also note:

- anything interesting;
- any views you have and any ideas you may have about the development of a new argument.

Remember that you are reading the literature because you want to find out what has already been done, what existing knowledge already exists. However, you are also reading the literature because you want to develop plans for your own work. For this reason, you should record any developing ideas for your own work that may be 'sparked-off' by the literature you are reading.

Be prepared to read and re-read your literature

If you have ever re-read a novel, or seen a film for the second time, you will probably have been surprised at just how much of it you missed the first time. When you first read an article, you will probably be seeking to understand it, to develop a 'summary' of it inside your head. When you read it again, you do not have to do this, and so you are able to focus your mind on deeper aspects of the article.

Writing your literature review

Your literature review should be more than just a summary of the existing literature. Like a good novel, your own work should have a trajectory of its own. Your literature review should take the reader somewhere; you should be reviewing the literature for a reason, with a purpose in mind. In a research study, this purpose is usually to:

- be clear about what has been done before;
- lead the discussion towards where the literature takes us, what still needs to be researched.

When you write your own account, you will be making your own arguments, based on the literature. So, plan:

- your introduction to the topic;
- what arguments you will make;
- how you can use the literature you have found, to support your arguments;

- what your conclusions will be. These will be expressed in terms of your developing ideas about the research question and chiefly:
 - what still needs to be researched;
 - what, specifically, will be the proposed research question;
 - what will be the most suitable methods to achieve the desired result.

Try to use description, analysis and synthesis.

- Description to clarify what research has already been undertaken and to summarise the literature.
- Analysis to interpret or judge the 'worth' of the material and how relevant it is to your developing research question or the key trajectory of the argument you wish to make.
- Synthesis to deal with unanswered questions. In research, it is often the case that two or more research projects seem to have conflicting 'findings'; it is necessary to 'deal' with this and to make judgements on what may cause this conflict. In the same way, different ideas on an issue discussed in the literature, should be 'dealt with'. This involves weighing those ideas (arguments) in the 'balance' and coming to an overall conclusion (a synthesis) about them.

Try to make your discussion flow logically. The literature review is an exercise in communication. You are trying to communicate something that is very complex, in a manner that is coherent and logical. The literature review may be clever and technical, but it should nevertheless read like a good novel. It should have 'a beginning, a middle and an end', it should tell a story - a story of the development of your key idea or your research question.

Researching, designing and writing the literature review is a lengthy process. When it is written you will still have work to do. In fact, 'just' writing the literature review is the easy part of the process. Once written, the literature review must be read and read again. Read it to:

- identify faults in it;
- check that the discussion flows logically;
- check that your key arguments develop logically through the review and that they are pinned to the existing literature and are very clearly expressed at the end of the discussion;
- ensure that the literature review can lead logically to the development of the research question.

Conducting a literature review is very like writing an academic essay. The key difference is that the literature review has a clear purpose; it has a job to do. That job is to (1) identify what knowledge on a particular topic already exists, what has been researched before and how it has been researched (what methods were used) and (2) to develop a new key idea, an idea that is capable of growing into a research question; a research question that will itself be the motivating force for a brand-new research study.

Concluding remarks

The research and professional literature exist as an essential part of practice and of research. Not everyone likes to spend all their time reading. So, it is important to be able to search for the best literature quickly and to discern the salient points from that literature in a focused and efficient manner. In practice, the literature is the way in which both practitioners and researchers communicate their work to others. From the literature, we can see what is already known. Being informed of what is already known, we can begin the process of moving that knowledgebase forward. No professional can be satisfied with the way things are; all professionals have ideas about how to make things better. The literature is the starting block for those ideas to be tested by research and for them to lead to new insights and new practices in patient care.

Summary

The professional literature is different from less formal literature. Professional literature is written and published to a standard, where principally it is objective and made subject to peer review.

The literature review is an essential part of any research study. The literature review serves the purpose of (1) identifying what has already been done and (2) identifying what still needs to be done, what still needs to be researched.

The professional literature is not best accessed via Internet search engines, but rather exists in web-based databases such as that provided by Cinahl and in journals published online. It can also be found in university libraries where much expertise exists to help both the new student and the seasoned researcher to find information.

The professional literature can be hard to understand. However, you are not only well on the way to being able to understand it and use it effectively, you are also advantaged in that you are pretty good at creating professional literature. The essays you have been asked to write during your course of study are the beginning of your publishing career. If you can write an essay, then you can write a paper and seek to get that paper submitted for publication.

It is not enough to learn about your chosen discipline. No profession can survive on what people already know. It is necessary to make things better. You will want to have an active role in seeking out new knowledge. Having done that, you will want to tell everyone what you have found. Others will read what you have written because they will want to build on what you have achieved. They will look at the professional literature to find your work, and the result will be a profession that is always looking forward and always trying to improve what it can do for the people it tries to help.

Further reading

Note that it is usually best to access the following websites via your university library webpage. If you try to access these sites from your home computer, you may find that you are denied access or are asked for payment. In practice, you will probably find that you have free access from your university computers and that your university computer centre staff will be able to tell you how to get the same free access from your home computer.

If you are a university student or you work for the UK NHS and you are being asked to pay to download the full text of an article - you are doing something wrong - get help from your librarian.

Information about writing for publication in the RCN journals can be found here:

Royal College of Nursing. 2019. RCNi guidance on writing and submitting articles for publication [Online]. Available: <https://rcni.com/write-us/author-guide-downloads/rcni-guidance-writing-and-submitting-articles-publication-85606> [accessed 31 July 2019],

Journal databases

Ebscohost (for Cinahl and Academic Search Elite):

<http://search.ebscohost.com/Community.aspx>

The Cochrane Library (for randomised controlled trials and Systematic Reviews):

www.cochranelibrary.com/

Web of Science:

<https://login.webofknowledge.com>

In the UK, the NICE website offers access to a wide range of the best journal databases and to the Cochrane Library. You just need your NHS OpenAthens account:

www.nice.org.uk/

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Chapter 3

Reviewing the literature systematically

The Systematic Literature Review

CHAPTER OBJECTIVES

This chapter aims to:

- introduce the systematic literature review;
- identify the differences between a systematic literature review and the traditional or 'Narrative' review of the literature;
- illustrate how to make the literature search 'systematic', with the use of PICO (Population, Intervention, Comparison, Outcome), PEO (Population, Exposure, Outcome) and other tools.

Chapter outline

It used to be okay to do a literature just about anyway one liked, as long as there was a review of at least some literature, that the work had a continuous theme, and that the literature was exposed to analysis and discussion. Today, students, from BSc to PhD, are often required to conduct a Systematic Review of the literature, rather than 'just' a literature review. The systematic-ness of a Systematic Review differs from a traditional literature review only in that (a) the steps taken to search for the literature, (b) the identification of inclusion and exclusion criteria and (c) judging the robustness of studies, is documented clearly, and in a manner that could be repeated by someone else. The tools to do this are described in this chapter. Using these tools can seem a little 'over the top' at first, however, no one wants to be faced with a desk piled high with a random collection of research papers to review. The tools used in a Systematic Review can make the literature review more 'systematic' but arguably at least, easier to do.

Once upon a time ...

There was once a time when flared trousers had just been replaced by paper knickers and legwarmers. At this time, many years ago, people were perfectly happy writing 'literature reviews'. No one had even heard of a 'Systematic Literature Review'. Indeed, I recall writing my first 'proper' literature review when I was studying for my bachelor's degree. That literature review was a review of the literature contained in my university library. Actually, my library was in a medical school, so it was about as large as a seaside café, though with less cake and more books. I might have obtained a few articles by 'interlibrary loan' but not many because the process took too long. No one expected me to know what was outside my library. Indeed, the outside world probably contained just more 'seaside café' libraries containing much the same range of material, and perhaps even less cake. Furthermore, I could format my literature review however I wanted; after all, it was my literature review. Like all things written with a typewriter (for it was), my great work was supposed to have a common theme, just like a good novel, and to include analysis and synthesis of the literature; apart from that, however, I could format it just as I wanted, and I did.

As time passed inexorably on, paper knickers and legwarmers gave way to jeans and t-shirts; sadly, the 1990s had no time for childish frivolity. Typewriters gradually gave way to computers, though it would take another decade before most of these would be attached to the new Internet. For the time being, multi-media content came from things called CD-ROMS, silvery discs that mostly came stuck to the front of computer magazines. These discs of wonder often contained images and videos, games and information, from books to encyclopaedias. I was working in a hospital now and my hospital library had one or two of these CD-ROMS that people could peruse on the one library computer. I recall a CD-ROM containing the Nursing Standard Database. It was now possible to search for every single Nursing Standard article and see the actual abstracts! At the time, I did not see that this

technology could cause the 'literature review' to go the same way as paper knickers but that is what happened. One day, someone showed me a new CD-ROM contained a new kind of material, Systematic Reviews, from Cochrane (see www.cochranelibrary.com/).

The Cochrane Systematic Reviews were, well, 'systematic'. They all looked the same; they all had exactly the same format. They were easy to read even where the content was complex because the structure of the review was identical to all the others one had read. Cochrane Systematic Reviews were useful, they were clear, and Cochrane became the gold standard for Systematic Reviews. Cochrane had kudos, like leg warmers in the 1980s, and people wanted them (Systematic Reviews, not leg warmers). In time, people began to do their 'literature reviews' in the new, systematic way; the old-fashioned, do-it-how-you-want 'literature review' became a second-class literature review, like, well, like wearing legwarmers in the 1990s! CD-ROMS were eventually replaced by Internet-based databases like Cinahl[®] and indeed the Cochrane Library website with those squeaky-clean, Systematic Reviews.

1980s legwarmers and paper knickers aside, perhaps there is little reason for not doing a literature review systematically; after all, research is 'systematic'. It is also the case that a narrative review can be biased, it can look only at the literature that tells one particular story. Such a review may also be haphazard, looking at literature wherever the storyteller happens to travel.

There is just one aspect of the literature that fails to allow itself to be reviewed systematically and that is the anecdotal literature, the literature of thoughts and ideas that is arguably the bedrock of professional life. People still sometimes want to review the literature on ideas, arguments, care studies etc., and for such as these, the traditional, non-systematised literature review lives on. Today, the traditional literature review is somewhat condescendingly referred to as a 'narrative review'. 'Narrative' means 'story'. For me, anyway, a 'story of the literature' works just fine for 'ideas' in professional life. Indeed, I like a good story and healthcare needs ideas, imagination and vision, as much as it needs research. In practice, there is a place for both systematic, and traditional, narrative reviews. Let's face it, when all that is modern and new has passed away, there will still be a place for a good 'story', sorry, 'narrative'.

BOX 3.1 TERMINOLOGY

Narrative reviews are sometimes called 'critical reviews' and they may be given other names. A 'scoping review' is similar to a narrative review but is carried out prior to a Systematic Literature Review, especially by PhD students who may be less than fully clear about exactly where the focus of their research should be. The word 'protocol' is sometimes used in relation to a Systematic Review. It is not unusual for a team of academics to work on a Systematic Review, and they will sometimes publish a 'protocol'; this is essentially the planning for the Systematic Review, the proposed design of it. The published protocol gives people the opportunity to review and comment on it. However, a 'Systematic Review' (or 'a Systematic Literature Review') is always a Systematic Review, if it is called something else, it is not a Systematic Review.

What is a Systematic Review?

There are two main types of Systematic Review. The Systematic Reviews found in the Cochrane Library often contain an analysis of data pooled from a number of studies, this is called a 'meta-analysis'. The other main type of Systematic Review is perhaps better called a 'Systematic Literature Review', so named to make it clear that it is 'just' a literature review and that it doesn't contain an analysis of data. Here, we are only concerned with the latter, the Systematic Literature Review.

A Systematic Review doesn't choose a convenient source of literature, it aims to use the whole world's literature on a particular topic. This can only be achieved because today we have the Internet and Internet-based databases such as Cinahl® and Medline® available to us. Times were good when we needed only to use our university library and not bother with anything else, but times have moved on and we now have the Internet, so that's nice. Today, we can look everywhere for our literature, and so we have to do so.

Systematic reviews tend only to be used on good-quality research literature. In fact, Systematic Reviews usually incorporate a selection process designed to weed out poorer-quality studies. In the same way, Systematic Reviews are really only used to look at primary research papers (where the research is published by the researchers themselves). Systematic reviews are not used on the anecdotal literature. This systematic, auditable search and selection process means that bias in the review is less likely to be present. Bias may often be present in narrative reviews, although such bias is usually not something that is hidden. In this way, a healthcare historian might research the contents of a particular archive of material. Our historian will make it clear that the search has been confined to this one archive. Perhaps there are similarities here between the qualities of narrative literature reviews and qualitative research. Bias can be acceptable when it is made transparent.

Both Systematic Reviews and narrative reviews can be used with either quantitative or qualitative research. It may seem a little odd to do a Systematic Review of qualitative research, because no two qualitative research studies are the same. Nevertheless, qualitative Systematic Reviews are becoming more popular today, as the body of qualitative research is increasing.

Systematic reviews use a search strategy for the search of the literature. The search strategy will identify what sources of information are to be searched (which databases etc.) and what keywords and search terms will be used in the online databases to search for the literature on our chosen topic. These search terms should be designed to find everything on our topic that complies with our inclusion criteria. Inclusion criteria narrow down exactly what is our focus. So, for example, we may be interested not just in 'pain' but in pre-school child pain after surgery and perhaps only those studies that were randomised controlled trials and where data was collected in China. So, we have inclusion criteria for our search. Because we are being 'systematic', the steps we take must be auditable or repeatable by someone. For this reason, we need to record the search terms we use, all of them! Often, we will use the Boolean operators, AND, and OR to separate keywords, as in PAIN OR DISCOMFORT AND CHILD AND SURGERY AND CHINA. These Boolean operators need to be

recorded too and in exactly the way that they were used. Being systematic can be tiresome but it helps us to justify the search strategy we used. It also helps us to remember what search strategy we used. PhD students work on their research over, perhaps 3 to 5 years and they will forget what literature search strategy they used if they do not document it.

In both a Systematic Literature Review and a narrative review, the goal (for both) is to subject the literature to analysis and to fashion a synthesis of the literature.

Cochrane Systematic Reviews were designed to be updated regularly and to reliably reflect the current state of knowledge on a particular topic. This should mean that Systematic Reviews save us all the time it would take to look at individual research projects. In practice, however, Systematic Reviews are not always updated regularly, and more than one Systematic Review can be undertaken on the same subject, allowing us to consider a Systematic Review of Systematic Reviews. This is perhaps unfortunate, because being assigned to the scientific paradigm, the Systematic Review should be a perfect tool, a second Systematic Review on a particular subject should find exactly the same results and should thus not be worth doing. In practice, making a literature review 'systematic' does not assure us of perfection; sadly, such a thing never really happened. We will not say that there must be something wrong with science, it must therefore be the academics who are not quite perfect! In fact, of course, a Systematic Literature Review can be conducted badly. If you wish to find a good narrative or Systematic Review, it is a good idea to confine one's search to the better-quality journals. The Cochrane Library remains an excellent source of Systematic Reviews, some of which contain a meta-analysis of data as well as a Systematic Literature Review.

Writing a Systematic Literature Review

Selecting a topic

As with any piece of academic work, it is necessary to select a topic, a focus. This focus should be something that is objective rather than subjective or related to a question that is potentially answerable. In this way, a focus of 'a Systematic Review of the literature on the meaning of love and grief' would fail on two counts: (1) it is not sufficiently focused, love and grief are not the same thing, and (2) it is likely that the meaning of love and grief has not received enough scientific attention for there to be enough research out there to review. On the other hand, there may be sufficient qualitative research, for example, on 'the experience of sibling grief in 10-year-old children, on the death of a brother or sister'. If you are not sure, a scoping review can be a useful way to 'sound out' the literature before embarking on a full-scale Systematic Review.

Identify the question

It should be possible to identify the question to which an answer is desired. Remember, it should be a focused question, one that it will be possible to answer at the completion of the Systematic Review.

Set inclusion and exclusion criteria

It can be useful to make clear the parameters of the search. For example, one might search for research on childhood pain and exclude studies on adult pain. It might be useful to confine the search to randomised controlled studies or to state the standard of study required for the review.

Search for the literature

You are most likely to be using Internet-based search engines, like Cinahl® or PubMed®. Because we are being systematic, we need to record the exact search terms used in each database. Sometimes, the search terms are long and complex, but they need documenting. Searching the literature cannot be haphazard in a Systematic Review. Furthermore, it is necessary to search for everything, use every database or make a good case for not using a particular source. One should also look at non-English texts, PhDs and the grey literature, research that has not yet been published. However, if you are a BSc student, your teachers will probably understand if you don't have time to become fluent in Japanese in order to scrutinise the Japanese literature. Ensuring every source of literature is properly searched is not only an issue for undergraduate students, it can be challenging for even an experienced academic or research team trying to produce a Systematic Review of the literature. Arguably, this is a weakness of Systematic Reviews, for the objective must be more than 'to do a wider search than Jeremy did when he was an undergraduate student'. If the search does not include everything, then we do not know what has been left out. Being systematic about a few things but leaving other things out, simply isn't systematic. In reality, however, you and I are only going to be expected to be clear about how exactly we performed our search for the literature.

BOX 3.2 ACCESSING 'ALL' OF THE LITERATURE

The problem of twenty-first-century superbugs and bacterial resistance is well known. It is a problem that is becoming increasingly serious. Clearly, there needs to be more investment into new antibiotics. It is frightening that many of the antibiotics in use today have changed little, if at all, from those that were used when the author of this book was first in practice. Until recently, it had been thought that there was no realistic alternative to the antibiotic – but there is, and these substances are often used outside the UK, Mainland Europe and the USA. Viruses invade and damage human cells and cause diseases such as Encephalitis and Influenza. However, viruses also infect and kill bacteria. We have known this since Frederick W. Twort discovered it in the UK in 1915 (Twort, 1993). However, Twort was unconventional as a scientist and so was dismissed by the scientific fraternity, and his work forgotten. Twort did not fit the mould of an early twentieth-century scientist. However, Twort's work was apparently read by Russian sci-

entists, perhaps because they didn't rate 'being conventional' as a scientific attribute. If, during the twentieth century, the West had just looked open-mindedly at the Russian literature or indeed Russian clinical practice, it would have come across the use of Phages or Bacteriophages. These are viruses that are harmless to human cells, but that kill some of the bacteria that infect humans, including some of the bacteria that have become resistant to antibiotics. It is likely that the use of bacteriophages will become part of antibacterial practice in the West in the years to come, more than a hundred years after they were discovered! So, we should ask why our academics didn't take sufficient notice of an unconventional scientist in the UK and what was going on in Russia; perhaps they did not read the Russian literature when they did their Systematic Reviews, perhaps they had not studied their own history.

Acting scientifically or systematically is really only a process, it is the way we do things to avoid bias and other mistakes, it isn't really anything more than that. Being a scientist will not tell us anything about the Russian literature unless we are willing to look at it and unless we can read it. Nor will being a scientist tell us anything about our own history, unless we read it and unless we are not biased against it; there is more than one kind of bias. The good news is that now, eventually, the use of bacteriophages is beginning to be accepted in the West (see Verbeken *et al.*, 2014).

Science is not owned by any group of people, not even our own academics. We can be odd, different and unconventional but still make scientific discoveries. We ignore the unconventional at our peril.

Creating a record of each research paper reviewed

It is necessary to create a record of each research paper reviewed, even if the research turns out not to meet the inclusion criteria. The record of papers read needs to be, well, systematic! It needs to have structure. One way to give it that structure is to use one that already exists, like PICO, for example.

This way, you will be clear about what you are looking for in the studies you review, and your work will be auditable, someone could check it!

Table 3.1 PICO table

	Patient, Population, or Problem	Intervention, Prognostic Factor, or Exposure	Comparison or Intervention	Outcome measured or achieved	Result
Article 1					
Article 2					
Article 3					

You might wish to add T and S to your PICO (PICOTS):

- T - Timing, duration, data of publication.
- S - Study type, e.g. Randomised Controlled Trial.

For qualitative Systematic Reviews, you could use PEOT instead:

- P - Population (children with advanced asthma).
- E - Exposure (focus - children’s night-time cough, parents’ experience of).
- O - Outcomes or Themes, the themes developed by the researchers.
- T - Type of study, e.g. phenomenological.

It can also be useful to add another column indicating whether the article was included (met the inclusion criteria) or was excluded from the review.

A chart, such as the one based on PICO, above, is good for showing yourself or another person what you have read for your review. Such a chart is much better than just a reference list (though it is still necessary to include that). PICO was originally used to help clinicians focus on clinical problems. There have been some concerns about the effectiveness of PICO and similar tools as a literature search tool (Brandt Eriksen and Faber Frandsen, 2018). However, here, we are really only using them to help organise what we have already searched for. Arguably, it doesn’t really matter what format we use; our aim is to deal with the literature systematically and using the same process to scrutinise all of the articles we find, achieves that aim.

Table 3.2 CASP chart for qualitative studies

	Clear statement of the aims of the research?	Was a qualitative methodology appropriate?	Was the research design appropriate to address the aims of the research?	Was the recruitment strategy appropriate to the aims of the research?	Was the data collection in a way that addressed the research issue?	Has the relationship between researcher and participants been adequately considered?	Have ethical issues been taken into consideration?	Was the data analysis sufficiently rigorous?	Is there a clear statement of findings?	How valuable is the research?
Paper 1										
Paper 2										
Paper 3										

A PICO chart does not tell us how 'good' each research study is. The good news is that ready-made charts exist for this purpose too. The Critical Appraisal Skills Programme (CASP) website, at <https://casp-uk.net/casp-tools-checklists/>, has check lists for just about any kind of research article one may wish to review. Table 3.2 provides an example of the use of CASP for a qualitative study.

Some people will reference each article to the page in their Systematic Review where the paper was discussed. This deals with any temptation to include more references than are actually processed in the review.

You may be wondering if all this is rather 'anal' (see Fischer and Juni, 1982). Well it isn't anal, it is 'systematic', the two things are really quite different, probably.

Suggested contents list for a Systematic Literature Review:

Here is a typical contents list for a Systematic Review:

- Abstract
 - Background
 - Objectives
 - Search methods
 - Selection criteria
 - Data collection and analysis (only when a meta-analysis is included)
 - Main results
 - Conclusion
- Background
- Objectives
- Methods
 - Criteria for considering studies for the review
 - Types of studies
 - Types of participants
 - Types of interventions
 - Types of outcome measure
- Literature search methods
 - Electronic searches
 - Other searches
- Ethical considerations
- Data collection and analysis (only when a meta-analysis is conducted)
- Results
- Discussion
- Reference list.

You can see that the structure of the Systematic Literature Review is not really that different from the structure of a narrative review or even a PhD thesis. The 'systematic' nature of a Systematic Literature Review has mainly to do with the search for and the selection of studies; these are conducted systematically and in a way that is auditable

(capable of being repeated by someone else). I think we can see that this does make the literature review a much more 'scientific' process. Furthermore, while all of this is definitely time consuming, it is no more difficult than doing a literature review in any old fashion. The use of CASP and PICO can help one to organise the literature in one's mind and this can make it easier to properly analyse and discuss it.

I will end with one note of caution. The mode of operation discussed in this chapter is clearly one of being systematic. In pursuance of being systematic, the new researcher can get her or himself preoccupied with documenting everything into neat and tidy tables. I have known PhD students spend so much time on this activity that they have lost focus on the purpose of their study, to discover something. Operating systematically, and indeed scientifically is about the process we choose to use because it helps to avoid bias and other mistakes, but it is not the aim of our work; the aim of our work is to discover something. For the student undertaking their first Systematic Literature Review, the aim is not to produce tidy tables, but by analysis and synthesis, to discover something in that literature.

Conclusion

This chapter has seen us developing a traditional literature review (narrative review) into a Systematic Review. The latter is often required today and has the clear advantage of employing a systematic literature search strategy. Undertaking a Systematic Review, rather than a narrative review, can seem time consuming but in practice it does not need to be.

We have seen that the traditional narrative review still has its uses. Narrative reviews are still used for the anecdotal literature. The anecdotal literature will always play an important part in the life of any profession. It remains to be the case that it is possible to do a Systematic Review badly, just as it is possible to produce an excellent narrative review. We have also seen that the objective to include all of the world's research in our systematic search of the literature, is really not yet possible. Things have definitely moved on from the time I did my undergraduate dissertation within the confines of a single library. However, in practice, accessing all of the world's available literature remains a challenge.

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Useful web sites

The Cochrane Library:

www.cochranelibrary.com/

CASP:

<https://casp-uk.net/casp-tools-checklists/>



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Chapter 4

Evidence-based practice

CHAPTER OBJECTIVES

The objectives for this chapter are to:

- provide a clear definition of evidence-based practice;
- show the relationship between evidence-based practice and research;
- identify the various forms of evidence that can be used to help develop practice;
- consider the new emphasis on the implementation of research, research that is 'implementation-ready' and frameworks to guide the process of implementing evidence so that it becomes an integrated part of clinical practice.

Chapter outline

Having identified the meaning of research, we look now at the related concept of evidence-based practice. We will see that although research may provide the best form of evidence (the best form of knowledge), there are other forms of evidence that are often used to support practice. This chapter will also look at some of the ways in which evidence-based practice can be implemented in the clinical and setting.

What is evidence-based practice?

Put simply, the term 'evidence-based practice' needs no interpretation: it is what it says it is, that is, practice based on evidence. However, there are two ways in which the term 'evidence-based practice' can be understood.

Meaning 1: The use of research as one of many forms of evidence

It is possible to argue that there exists more than one form of evidence, with research being only one form of evidence. Research is arguably the best form of evidence, but there are reasons for the lack of availability of research in healthcare:

- Research is expensive. In Britain, there are no well-defined funding streams for research for healthcare disciplines other than medicine. Good-quality research is usually very expensive.
- It is not always possible to conduct research to a recognisable standard. In some situations, research with people would place them at risk or would infringe their human rights. Research with babies, for example, is problematic because it is not possible to gain their informed consent. So, research is sometimes difficult or impossible to do, and conducting good research, which meets the accepted standards of control and randomisation, is often impossible within the healthcare arena.

In some ways, the use of alternative forms of evidence is justified. Where research conducted to scientific standards of control and randomisation is impossible to conduct, we have little alternative but to accept less good forms of evidence. Clearly, however, we need to insist on research evidence when such research is both possible and desirable, and we need to fully appreciate the dangers inherent in accepting forms of evidence that may be prone to error and that may be misleading.

The use of the term 'evidence-based practice' in this context, relates to an acceptance that forms of evidence other than that generated by research can be used appropriately. There is no universal agreement on such use of non-research evidence. However, healthcare is replete with examples of practice based on non-research evidence, and so it is important to give this area some thought, if only with a couple of caveats:

- where research conducted to scientific standards remains achievable, other forms of evidence should always be seen as less than adequate;
- non-research evidence should be understood to be particularly vulnerable to flaw and error and to possess a capacity to mislead.

In short, research evidence is almost always the best form of evidence. However, other forms of evidence cannot be easily dismissed, may at least be interesting and may all too often present the best evidence available to us at the moment.

Meaning 2: the implementation of research

The fact that there is research out there is one thing, but this does not mean that that research automatically becomes part of practice. It can take real effort to look at the research and then put it into practice. Effort to replace one kind of practice with another will cause friction and energy, not all of it welcome. We are all creatures of habit; we prize what we know, and it is natural for us to resist attempts to label our knowledge as flawed. So, implementing research has a lot to do with the processes of 'change' and how that is managed.

It is also necessary that any proposed change in practice is considered carefully. Immediate questions relate to whether we should trust the research at a level of clinical practice. To do this might be expensive and might expose patients to risk.

Most health agencies such as the NHS in the UK have protocols for the implementation of research and the subsequent change in practice. This will involve a group of experts looking at the research and if it is to be implemented, a process of managed change and evaluation. In the UK, the organisation NICE (National Institute for Health and Care Excellence, 2019) produces guidance that is based on research evidence and updates this guidance regularly.

Non-research forms of evidence

Let's look at what other forms of evidence are sometimes used to support practice:

Peer review

Peer review processes are commonly used in medicine (Gandhi *et al.*, 2017), usually in the form of a discussion of new or unusual 'cases'. It is a way of getting others' views on aspects of clinical practice and of helping to ensure that one's own practice is in line with what others are doing.

A peer is someone like you, your equal. In this way, peer review for students would be undertaken by other students and not by academic or practice staff. Peer review for publication (Patterson, 2015) would be undertaken by people who are themselves health practitioners and researchers who regularly publish their own work. Peer review in clinical practice is undertaken by other practitioners.

Unfortunately, peer review as an exercise to improve the quality of clinical practice outside medicine seems not to have become well developed. It takes time and takes people away from the clinical area. This is unfortunate, because if we want to improve our practice, we probably need to start by talking with others about what we do.

Clinical audit

Arguably, clinical audit is a form of research. However, it tends to be concerned with the collection of descriptive (as opposed to experimental) data, related to existing standards of patient care. Audits can also be a form of descriptive research where staff are asked whether something is practised or where existing records are searched for evidence of a particular practice (see Sivertsen *et al.*, 2017). Audits are used widely where standards of practice already exist, and they do provide valuable feedback on measures of the quality of patient care.

Benchmarking

Benchmarking is a form of standard that is set by a community of practitioners, often by a local group of hospitals. A standard, or benchmark, is set and work takes place to cause practice to meet or exceed that benchmark. The power of benchmarking lies with the liaison that takes place within the community of practitioners. In the case of a local group of hospital staff, this community of practitioners might not have come together except for the purpose of establishing the benchmarking. So, benchmarking encourages liaison outside one's own workplace; it has the effect of first equalising the standard of care being practised in individual departments across a region or area and then improving that standard further. Benchmarking can be a mix of peer review and the development of standards or it can be used to practice in one geographical location against a national or international standard (see Breathnach and Lane, 2017).

Established clinical expertise

Healthcare practice is full of expert knowledge. Much of this knowledge has been acquired through experience. However, experience is best used when it is shared with others, debated in public and published. This offers the opportunity for other experts to point out possible flaws in relation to the practice in question.

Although clinical expertise falls short of what research is able to offer, it should be recognised that people know a lot of things that have never been subject to research. Clinical expertise is a valuable resource. However, knowledge can sometimes be more subjective than objective, and it is possible for lots of very capable people to believe that something is true when in fact it is not. There is a tendency for us to think that something must be right if everyone believes it, but it is possible for everyone to be wrong. For this reason, it is important that clinical expertise is made subject to close scrutiny and that it is evaluated objectively.

BOX 4.1 EXAMPLE FROM HISTORY

During much of the twentieth century, nurses did not allow parents to stay in hospital with their sick children. Sometimes, parents were not even allowed to visit their children, even when children were hospitalised for many weeks and when they were seriously ill (Jolley and Shields, 2009). It was thought by almost everyone, nurses, doctors and hospital administrators, that having parents in hospital with their children would cause the sick child harm (Duncombe, 1979). Only after the Second World War did people gradually come to appreciate that children had an important emotional bond with their parents and that having parents stay with children in hospital helped children considerably (Bradley, 2001). So, just about everybody had been wrong about parental visiting.

Tradition

Several years ago, Walsh and Ford (Walsh and Ford, 1989a, 1989b, 1989c) reported on the way in which much of healthcare (in this case, nursing) practice was based on a traditional way of doing things. The regular massaging of the skin of patients' sacral area to prevent pressure sores was one of many 'traditional' interventions for which evidence had never been sought. Certainly, it was sufficient for something to be recommended by the author of a book for it to be regarded as valid and true.

'We always do it this way'. Perhaps you have been frustrated by a senior practitioner's desire to stick to the way things have always been done. People should be open to new ideas, but so too do we need to recognise the wisdom of the past. If a particular type of wound has been dressed in a particular way for the past 50 years, then maybe there is good reason for continuing this practice. We may not have good evidence to support the practice in question, but neither may we have good evidence to abandon the practice. We have already noted that lots of people can be uniformly incorrect. Nevertheless, the more people who support a particular approach to care, the more likely it is that they are right. It is the case that they could all be wrong, and it is definitely the case that global assumptions for good practice should be questioned and objective data sought. Nevertheless, tradition should not be dismissed too readily. Practices do not become tradition overnight and, although the process that selects them may be less than scientific and less than rigorous, processes designed to identify flaws almost always exist in these cases. It follows that traditional techniques have stood the test of time and do therefore deserve to be taken seriously. This notwithstanding, every practitioner (including you and me) has the right to challenge tradition.

Experience

Experience is a little like tradition, except that it applies to only one individual. We should be careful before belittling experiences, and yet it is a long way from the evidence produced by research. We have probably all come across situations where patients are treated differently, even on the same ward, because two consultants have been trained using two

different techniques. It takes little thought to appreciate the need here to evaluate the two procedures, for one is likely to be superior to the other.

BOX 4.2 EXAMPLE FROM THE LITERATURE

There are many parts of the world where Western medicine has yet to develop or where it is in competition with traditional healing. The lack of evidence-based practice and research in traditional healing is often a cause for concern. However, the lack of evidence to support a particular practice does in no way mean that the practice is of poor quality. A lack of evidence for an intervention simply means that we don't know how well it works. Acupuncture has been considered a holistic medical treatment for some time but its efficacy has long been questioned. This is partly because from a Western medical perspective, we cannot easily understand 'how' acupuncture works. There is, however, increasing evidence that acupuncture can have a therapeutic effect (Franco *et al.*, 2019). It is easy to reject things that we do not readily understand (as acupuncture cannot be readily understood by the medical systems approach of nephrology, hepatology etc.) but we should always have an open and enquiring mind, and only with great care should we criticise the validity of 'experience'.

Individual experience is more credible if it is supported by others and especially if it is formally critiqued by peer review, as when someone attempts to publish an article promoting a particular practice. Publishing is important because the process opens it to peer review (all the articles in the professional press are peer-reviewed before being published). However, it is also important to communicate ideas with others, the people we know, people who work in another hospital. Setting up national or regional interest groups is one way of getting other people's views on what we think we know from our own experience.

Policy and guidelines

Many national governments develop health policy, and hospitals develop clinical standards of one sort or another. Mechanisms are often put in place to maintain practice within the parameters of the policy in question. In most cases, the policies are reviewed and audited to ensure that they continue to be appropriate and effective. Policies and the effectiveness of them can be compared between health institutions, even to the point where league tables can be formulated so that people can see which health organisations are performing best. These league tables are based on data, but even though the data are a form of evidence, they often fall short of scientific standards. An example of this form of evidence is the UK Government's criteria for waiting times in accident and emergency departments. In this case, the UK Government established a policy that hospitals should work to reduce waiting times (The Kings Fund, 2017). Accident departments were then audited to provide data on waiting times and the improvement or otherwise of waiting times. Using these data, it is possible to compare one accident department with other accident departments.

Policy formation can sometimes be politically charged. Clearly, the policies themselves relate to the prevailing political will (to reduce accident department waiting times). This is usually sufficiently transparent. However, the collection of data can also be politically motivated, largely because it is related closely to the interests of agencies such as Government and in the UK, the National Health Service (NHS) Trusts (Castledine, 2008). It follows that care needs to be taken to ensure that bias has not influenced the data or their analysis. It might be possible, for example, to record patients as having been discharged from the accident department even though it is known that they have not yet been admitted to a ward or been taken home. In research, mechanisms are set in place to ensure that bias is properly controlled. Clinical audit and the evaluation of policy decisions may fail to implement these controls. In any case, it is always necessary to be wary of any data, the collection of which may be politically motivated or may serve the interests of a person or agency.

Research that does not meet the standard of scientific criteria

Many studies are published that use methodologies that are inexpensive to implement but that fail to provide the best forms of control and randomisation. Such studies may suffer from the effect of bias or from one or more variables that have not been properly accounted for. It is debatable whether these studies add much to our knowledge and evidence base. Unfortunately, there have been studies published, even in well-regarded journals, with erroneous data and deliberately misleading results (Yentis, 2012).

Practice that is supported by anecdotal evidence and by the literature

Anecdotal evidence means non-research evidence. We have seen that the professional literature can be usefully divided into two categories, research and anecdotal. In common usage, anecdotal means unreliable or subjective; however, it really has neither of these qualities – it is just *not* research. A typical example of anecdotal literature is a nursing care study in which the author discusses the care given to a particular patient. The purpose of the study might be to tell the reader about a nursing initiative or to inform less-experienced nurses about the care in this case and the implications that care had for one patient.

It should be clear that there is nothing at all wrong with anecdotal literature; in fact, much of the professional literature is anecdotal and it serves a very good purpose. Indeed, the anecdotal literature can be seen as the backbone of professional life. It is here that practitioners write about their initiatives so that others can learn from them and for the express purpose of these initiatives being made open to critique by others.

BOX 4.3 EXAMPLE FROM THE LITERATURE

Emily Adam (Adam, 2017) provides a sensitive anecdotal account of the admission of a patient to a palliative care unit. The individual was admitted late in the course of her cancer journey, and she was dying. Her children had grown up with an ill mother who went to hospital and came back well, time after time. At this point, however, the patient's children needed to adjust to the fact that their mother was dying. In the event, there was no such adjustment and the patient was discharged to die in hospital a few weeks later.

The purpose of this article was to make the argument that people should be referred for palliative care earlier in their illness journey and not at the end of it. The author makes the point that 'Early intervention allows time for the patient and their family to open up to the idea of advance care planning and plants the seed for important discussions about end of life' (p. 1298).

This article is not research at all, it is simply and purely the reporting of one person's experience of one event. Is it useful? Yes, of course it is. If we practised according to the recommendations in this article and referred people earlier for palliative care, would we be practising 'evidence-based care'? No, we wouldn't. So, is this article useful? Yes, of course it is. Being aware of an idea, sharing ideas, doing something with the ideas we have, are all starting points for what one day may result in a research project. However, ideas and the sharing of them have quality and purpose in their own right. Ideas and the sharing of them is what makes us human and what makes human beings such great innovators; indeed, it is how we learn and why it is that we are so productive and useful; it is how we learn to help other people and to receive help. Research is a necessary underpinning of healthcare, but we should not make the mistake of thinking that other human qualities are not useful. Our other human qualities are indeed useful. We should use research, but we should always be open to other forms of knowledge.

The failure to use evidence

Intuition

Intuition is similar to the concept of an educated guess. We tend to use intuition when we don't have a complete set of information. A doctor receiving someone with a history of diabetes and who now has a poor level of consciousness may intuitively see this patient as being hypoglycaemic. This is fine, intuition is a great tool when all of the information we need is not at hand. The difficulty comes when we rely on intuition instead of seeking the additional information we need. We would expect our doctor to take a quick blood glucose reading before beginning treatment.

Intuition is a skill that is based on our past knowledge and is used where we have insufficient knowledge of the current situation that faces us. In this way, intuition is similar to experience but here experience is being applied to something new. People will always use intuition, but we should use data about the current situation (e.g. a patient) as soon as we

BOX 4.4 EXAMPLE FROM THE LITERATURE

Brabrand *et al.* (2014) found that nurses and doctors working in a cardiac unit were able to intuitively estimate, on admission, which patients would die and which would survive. Both nurses and doctors were very good at this, although when nurses and doctors agreed with each other about a particular patient, they were almost certain to be right.

are able to do so. We should not take the easy route and ‘rely’ on intuition, for our intuition will ultimately fail us. This is because new situations are, well, new, and are not necessarily the same as the situations we have seen before. Rather, we should collect as much information as we can before making a decision. In urgent situations, we may have to rely on at least some intuition, at least until specific information about the patient is available.

Too much reliance on intuition can work against the principles of evidence-based practice. The overuse of intuition is an important cause of poor-quality care and it can drive practice away from that which is based on evidence.

Trial and error

Trial and error is perhaps the worst possible way to improve practice. By definition, this approach lacks methodology or any form of systematic planning. Trial and error involves dealing with a problem by randomly selecting a possible solution. If this solution seems to work, then it is adopted, without seeing whether another solution might work better. If no success is achieved, then the next possible remedy is selected, and the process begins again. No attempt is made to see how other practitioners have dealt with the problem. The failure to do this often means that unworkable solutions to the problem are repeated in hospitals and other places around the country and around the world.

Trial and error is dysfunctional, resulting in wasted time and poor patient outcomes. It can never be fully successful. Even if one thinks that a good solution has been found, the possibility will exist that there is an even better solution out there somewhere. It follows that the best possible outcome of trial and error is a good-enough solution. Paradoxically, however, a good-enough solution can never be good enough.

Why is there not more published research in nursing and healthcare?

Lamphere (2018) laments the lack of research evidence for respiratory medical care on the one hand and the apparent plethora of studies that find evidence against the usefulness of traditional treatment options on the other. If medicine has issues with the lack of available evidence, then the situation for the other health professions is probably even more evidence challenged.

It is the case that the health professions cover a particularly broad area of expertise. Healthcare disciplines have a particularly broad focus. They are involved with modalities of

traditional care, treatment for those with ill-health and trauma across all age groups and in both institutional and community-based health programmes, the prevention of ill-health and the promotion of health, including psychological, physical and developmental health. Funding bodies naturally like to be clear about where they are spending their money. Medicine, with its tight focus on treating disease, presents an easily understandable image to the organisations with money to spend on research.

It is worth thinking about this a little more. Imagine the last time you came back from work, tired after a busy day caring for people. Imagine that you were asked what you had done that day, what you had worked on, what you had achieved. If your reply is something like 'Well, loads of things. I don't know *what* exactly, but I know I have been really busy'. Now imagine that everyone else in your discipline has had a day just like yours. Now ask yourself whether this image of your discipline is one that would attract research funding. Medicine has a clear focus, we all know what it does – it tries to cure illness and make people better. We all need to be clear about what we do. We need to achieve this clarity before we will be in a position to clarify what research still needs to be funded and carried out.

Perhaps the kind of evidence used to support and develop practice is less important than a willingness to use evidence. In the real world, and with resources that are often limited, it is sometimes necessary to accept evidence that is second best. This is true of all practice disciplines that deal with human beings. In the long run, however, what matters is a willingness to drive practice forward, to make things better and to expose new initiatives to our peers so that those initiatives may be appropriately critiqued and so that others can learn from what we have managed to do. This energy, this wish to take responsibility for the development of our area of practice, is what marks out a profession from other occupational groups, and it is what our patients and clients deserve.

The implementation of research

The amount of published research is increasing exponentially (Bauer, 2019). This is developing into something of a problem. The situation is perhaps made worse by the increasing number of universities and the requirement many of them have for their staff to publish research, at the expense of anecdotal material. Moloney *et al.* (2016) also blame the computer age for our easy access to a wealth of unfiltered research. This is an unhappy situation, resulting perhaps from a lack of professional control over the research that is being conducted.

There are indeed a number of difficulties with implementing research; you will know some or all of them already but here are a few that I can think of:

- It is insanely difficult to find where all the research is kept (journals, journal databases) and then wade through hundred of thousands of records, hoping to find good-quality research that would be good to implement.
- Clinical practitioners are busy people, identifying research and then implementing it is a big project.
- Staff are inherently, and perhaps even properly, resistant to change. We don't like people telling us that we could do our job better. Then, there is that 'routine', the method that everyone 'knows' works perfectly well.

- The clinical arena is complex, implementing almost any change in practice, and involves multiple professional groups as well as patients.
- Any change will cost money and time, and there is precious little of either commodity.

So, this is a real problem. Fortunately, there is currently a real impetus to deal with it; indeed, the World Health Organisation has called for a greater use of implementation studies (Peters *et al.*, 2013). Implementing research can be managed in two ways:

- Today, researchers are expected to build 'implementation' into their research design. Today's research (the good research) is 'implementation-ready'.
- Implementation frameworks exist to help guide the implementation process and to measure its success in ways that are scientific and indeed similar to research itself. This almost makes the implementation 'generalisable'. In other words, if one healthcare arena has implemented it, using one or more of these frameworks, then other places can use the same strategy and 'know' that it should be effective because the effectiveness has been demonstrated.

Implementation-ready research

Any cursory look at one of the article databases such as CINAHL® will tell us that generating research knowledge is not in itself enough. Research must actively instigate change in clinical practice for the good of patient care. However, there are an increasing number of research projects that are purposefully conducted in real-life healthcare situations, rather than in situations where variables can be optimally controlled. These 'close to real-life' research projects are much easier to implement because the research will have demonstrated the effectiveness of the intervention in a place similar to those where implementation may be considered. These studies will have been undertaken in areas with typical constraints on staffing, funding, with real patients and where the conduct of the research study offers genuine insight into the issues that implementation of the study would bring, including the likely effectiveness of implementation on patient outcomes. These studies come with names such as:

- action research;
- clinical effectiveness research;
- effectiveness trials;
- large simple trials;
- practical clinical trials;
- practice-based research;
- pragmatic clinical trials;
- pragmatic dissemination and implementation research;
- pragmatic research.

The above names really mean much the same thing. Such studies are fundamentally different from the Randomised Control Trials (RCTs) that have hitherto been seen as the gold standard in research design. RCTs are 'experiments', where the variables are tightly controlled. RCTs are sometimes called 'efficacy' trials or 'explanatory' trials in this context. RCTs seek to generate knowledge but not perhaps the kind of knowledge that will easily lead to advances in patient care. The term 'effectiveness' ('effectiveness trials') refers to implementation research. In this way, a researched intervention can have high efficacy but low effectiveness - because either it works in the lab but does not work in clinical practice or because the evidence-based practice, researched in the lab, has been difficult to apply in practice. In this way, we can talk of the 'efficacy-effectiveness gap', a term perhaps first used by Bauer and others in 2001 (Bauer *et al.*, 2001). Really, this is nothing more than the 'theory-practice' gap that we have been aware of ever since we were first year students. We can see, that pragmatic research and implementation studies, deal directly with the theory-practice (efficacy-effectiveness) gap.

Implementation-ready research attempts to address issues that are of interest to clinical staff, and also to administrators and, indeed, patients and clients; they are a 'ground-up' approach to research. These studies tend to use 'real-life' controls, so that instead of using a placebo, or 'no treatment', the intervention would be compared with a 'usual care' or 'other care' treatment. In this way the studies tell us what practitioners really need to know, namely, is this 'evidence-based practice', better than our current practice? Implementation-ready research is also collaborative. Not only must implementation be multi-professional, but it must involve patients too, and so 'power' is shared with participants. In fact, implementation-ready research is, in essence, an interactive process that requires the local staff from all disciplines and none, and patients, to work collaboratively on the study. Ultimately, participation-ready research does not only seek a better understanding of the world, it also change the world (Casey *et al.*, 2018).

According to Bauer *et al.* (2015), implementation-ready research differs from RCTs in that they focus on the impact of the implementation of an evidence-based practice, rather than on determining the effect of the evidence-based practice itself. Other differences are:

- In Efficacy Trials (Randomised Controlled Trials), the research does not change, it is invariant.
- In Efficacy Trials, the environment within which the participants exist is optimised, by, for example, making sure that they are all similar.
- In Implementation Trials, the environment must be true-to-life and sometimes changes; optimising it can be a threat to validity.
- Efficacy Trials emphasise Internal Validity (the result is true or valid).
- Implementation Trials emphasise External Validity, meaning that the result can be generalised, and others will be able to successfully use the same implementation strategy.

Hybrid studies

Hybrid means something that has a mixed or dual character. A hybrid car runs off both petrol and electricity. Hybrid studies are designed both to test the intervention, as in 'what

happens if I do this to people in a controlled environment', and at the same time to test the implementation, as in 'what happens if I do this thing in a real clinic with real staff, real patients and a real budget'. Hybrid studies come in three main flavours (see Bernet *et al.*, 2013, Peters *et al.*, 2013):

- Hybrid Type I. Here, data is collected on the implementation process in order to facilitate subsequent implementation. The study might use a conventional Randomised Controlled Trial design but might also address matters such as how many patients actually wanted the intervention, what were the problems in convincing staff to cooperate, even embrace the project, what changes needed to be made to enable the data collection, what permissions were needed, what staff training was required, how much did it cost and were there issues in maintaining the data collection over time.
- Hybrid Type II. These studies simultaneously test the impact of the evidence-based practice on health outcomes while also testing the effectiveness of the implementation strategy in implementing the evidence-based practice.
- Hybrid Type III. These studies primarily test how effective the implementation strategy was in implementing the evidence-based practice. These studies have a secondary aim of examining the patient effects of the intervention being implemented.

BOX 4.5 RESEARCH EXAMPLE

Shire *et al.* (2017) conducted a hybrid intervention study that tested a psychological intervention designed to help children with autism. The study compared children who were exposed to their 'normal' treatment with children exposed to Joint Attention Symbolic Play Engagement and Regulation (JASPER), an intervention that aims to improve autistic children's social functioning. The study was delivered in a community setting with the staff who normally worked in the areas in question. The children were randomly allocated to either the normal intervention group or the JASPER group. The children's attendance was recorded, to determine if the families continued to 'want' the JASPER intervention. There were no 'selection criteria' used; there was no attempt to actively select the most 'suitable' children for the study. This was a study grounded in a real community setting, a setting which accepted all children with autism. Additionally, the study simultaneously looked at how well the implementation of the JASPER evidence-based practice was implemented. The data collected, for example, included a staff questionnaire, teaching diaries and videos of the sessions with the children, which were analysed not only for the quality of the children's social skills but also for 'fidelity', the degree to which JASPER was being delivered to the specification for that intervention.

The study found that the children exposed to JASPER gained significantly in the developmental outcomes of Joint Engagement, Joint Attention and Play Skills. At the same time, it was found that JASPER could be delivered with fidelity, in a normal community setting for children with autism.

Models exist to assist in the design of research that is intended to be implementation-ready. These can help to steer the design towards research that will be more easily implemented. One such model is the PRECIS-2 framework.

PRECIS-2 (Pragmatic Explanatory Continuum Indicator Summary) is a development of PRECIS that was first published in 2009. PRECIS-2 is a validated implementation framework that is designed to steer research towards implement-ability (see Loudon *et al.*, 2015). PRECIS-2 has the following nine components, all of which are placed on a continuum that extends from 'Very Explanatory' (traditional research) to Very Pragmatic (implementation-ready research). For example, Eligibility criteria (who will the participants be?) would be close to the 'explanatory' end of the continuum if the participants were highly selected to maximise the potential for seeing an effect of the treatment on them. However, the same construct would be placed near the Very Pragmatic end of the continuum if participants were selected according to their real-life nature, for example, patients in a clinical area, whatever their age, level of illness or even whether they wanted the treatment - because this would reflect the real-life situation that any attempt to implement the results of the research would face.

Here are the constructs (adapted from Loudon *et al.*, 2015 p.4), remember, the researchers designing a study would place all these constructs somewhere on that Very Explanatory - Very Pragmatic continuum.

- Eligibility criteria - To what extent are the participants in the trial similar to those who would receive this intervention if it was part of usual care?
- Recruitment - How much extra effort is made to recruit participants over and above what would be used in the usual care setting to engage with patients?
- Setting - How different are the settings of the trial from the usual care setting?
- Organisation - How different are the resources, provider expertise and the organisation of care delivery in the intervention arm of the trial from those available in usual care?
- Flexibility (delivery) - How different is the flexibility in how the intervention is delivered and the flexibility anticipated in usual care?
- Flexibility (adherence) - How different is the flexibility in how participants are monitored and encouraged to adhere to the intervention from the flexibility anticipated in usual care?
- Follow up - How different is the intensity of measurement and follow-up of participants in the trial from the typical follow-up in usual care?
- Primary outcome - To what extent is the trial's primary outcome directly relevant to participants?
- Primary analysis - To what extent are all data included in the analysis of the primary outcome?

An easy-to-visualise PRECIS-2 illustration can be found at www.precis-2.org/.

It is easy to see how frameworks such as PRECIS-2 might help to steer traditional studies towards research that would demonstrate how the results would be played out in the real

world of healthcare practice. It can also be seen how studies identified to be near the Very Pragmatic end of the Explanatory-Pragmatic continuum might well be easier to implement.

Implementation frameworks

Bauer *et al.* (2015) suggest that 'implementation research is the scientific study of methods to promote research and other evidence-based practices into routine practice'. Perhaps, however, the very existence of 'routine practice' is the core of the problem; it is this 'routine' that evidence-based practice seeks to change for the good. Bauer *et al.* (2015) does, however, see the initiative to use evidence-based practice, coming from practitioners in clinical areas. Casey *et al.* (2018 p.1051) suggest simply that 'implementation science is a way to ensure that evidence is translated into practice'. Peters *et al.* (2013 p.19) put it even more succinctly 'Implementation research takes what we know and turns it into what we do'.

In the UK, the National Institute for Health and Care Excellence (NICE) can be seen as an attempt to put research into practice. NICE actively reviews the available research on a particular initiative and offers guidance on whether the underlying research is of sufficient quality to make implementation worth considering. In the USA, the Quality Enhancement Research Initiative (Department of Veterans Affairs, 2019) can broadly be seen to be doing the same thing. In this way too, the development of regional or national policies generally assist the implementation of evidence-based practice, although local and national priorities may not be the same. The increasing number of Systematic Reviews also help, in that they do the work of considering all the published articles on a single topic, rooting out poor-quality research and often conducting a meta-analysis on the combined data from the research papers included in the review.

Implementing evidence-based practice needs to be evaluated, both so that the effectiveness of the initiative can be determined and to facilitate the implementation in other areas. Bauer *et al.* (2015) points out that the evaluation can be carried out at three time points:

- during the existing use of an evidence-based practice (Process Evaluation);
- during the implementation process (Formative Evaluation);
- at the end of the implementation process (Summative Evaluation).

The evaluation of the implementation will test its effectiveness; this can be done by a variety of means but will usually involve the use of questionnaires, semi-structured interviews or the collection of quantitative data. Because data on a range of variables are likely to need to be collected, it is most common to use a mixed-methods approach, using both quantitative and qualitative elements. This may seem like 'researching the research' but it is really a process of measuring the effectiveness of the implementation; not only on how well the evidence-based practice has been implemented (its 'efficacy') but on its effect on patients and on the local context, including staff, budgets and resources. The degree to which an implemented evidence-based practice does what it is meant to do is known as its 'fidelity'.

BOX 4.6 NEW WORDS

Fidelity is the degree to which the implementation of an evidence-based practice is true to that evidence-based practice. For example, whether the evidence-based practice was fully implemented.

Efficacy Studies are traditional research studies designed to measure the effect of something. Efficacy trials, such as Randomised Controlled Trials, are not directly concerned with how the results of the study could be implemented into practice.

Effectiveness studies may also be designed to measure the effect of something, but they are also concerned with the implementation of any results. Such studies, may, for example, use a 'real-world' sample of patients rather than patients selected specifically to demonstrate an effect.

Frameworks

Implementation frameworks can simply be seen as implementation guides or templates. They point us in the right direction and help to ensure that we don't forget something important.

I use the word 'framework' here but in other texts you may see implementation frameworks being described as a 'models', 'theories' or 'constructs'. We could wax lyrical about the meaning of these words but instead, let's just take it as given that any of these words can be used interchangeably, because they are.

RE-AIM is an example of an implementation framework. Frameworks such as these, facilitate the implementation of research and in doing so help to reduce wasted costs associated with failed implementation.

The mnemonic 'RE-AIM' stands for:

- Reach
- Effectiveness
- Adoption
- Implementation
- Maintenance.

Today, when researchers seek a grant to fund their research, they will often be asked to identify those who are intended to benefit from the research (Reach), how their research is likely to prove 'Effective' in relation to real patient care, they will be asked to clarify how the results of the study could be 'Adopted' by practitioners and what obstacles to adoption are likely to be present. The researchers will be asked about how their study would be 'Implemented' as evidence-based practice and how that implementation would be 'Maintained' over the long-term. This is all evidence that researchers are expected to at least consider the pragmatic and likely practical impact of their study. When the study is completed, the researchers will want to publish the study. They will, however, find that they are expected to address the RE-AIM questions at this point too.

Research did get a bad name for being something just for academics, an accusation which carried some merit because traditionally, academics have not been much concerned with the theory-practice gap (Bauer *et al.*, 2015) or whether the results of their research could be widely anticipated ('researching the blindingly obvious'). However, those days are beginning to be behind us; academics are still often the people doing research and now increasingly implementing research, but research is at least increasingly focused on making a real change to patient care. In research language, there is a move from 'efficacy studies' to 'effectiveness studies'.

The Consolidated Framework for Implementation Research (CFIR)

This is a framework designed to guide the process of implementing and evaluating of evidence-based practice. It is, however, chiefly a 'Determinant Model', that is, it explains the many factors that often influence attempts to put evidence into practice (Nilsen, 2015). The CFIR was first published in 2009 and contains five domains:

- intervention characteristics;
- outer setting;
- inner setting;
- characteristics of Individuals;
- process.

The above list looks as mysterious as the contents of a conjurer's hat. Let's look inside the hat. What we will see in the dark gloom, will look like the result of 50 philosophy professors at a brainstorming meeting (see Table 4.1).

Although the CFIR uses concepts that seem a little unclear in places, we can easily see that it addresses a lot of the issues that need to be accounted for when implementing an evidence-based practice. The CFIR is just as good at indicating areas where the effectiveness of the implementation can be measured. Breimaier *et al.* (2015) has argued that while CFIR is useful, it may fail to account fully for stakeholder aims, wishes and feelings and that some of the concepts lacked a clear definition. It does seem that the CFIR downplays the role of the patient or client in all of this. Of course, the patient or client is a 'stakeholder'; nevertheless, the poor patient still looks a little sidelined. The CFIR website can be found at <https://cfirguide.org/>.

The CFIR does succeed in demonstrating the many factors that are involved in implementing an evidence-based practice. Arguably, it also indicates the need for an implementation framework (such as CFIR), to ensure that all aspects of the implementation planning and evaluation are implemented and to facilitate implementing the same evidence-based practice in other areas.

Table 4.1 The Consolidated Framework for Implementation Research (CFIR)**a Intervention characteristics (stakeholder perceptions)**

Intervention source	Has the evidence-based practice been developed internally, or external to the clinical or community area in question? If external, are the issues in relation to its applicability to the local area where its implementation is planned (implementation area).
Evidence strength and quality	Is this good research?
Relative advantage	Are there clear advantages in the evidence-based practice, over current practice?
Adaptability	Can the EBP be adapted to the implementation area?
Triability	Will it be possible to test the implementation to generate evidence of its local effectiveness?
Complexity	Will it be difficult to implement; cost, duration, scope, disruption etc.?
Design quality and packaging	Is the intervention presented clearly?
Cost	Issues with the cost of the EBP and its implementation.

b Outer setting (stakeholder perceptions)

Patient needs and resources	Are the needs of the patients or clients in the implementation area well understood?
Cosmopolitanism	To what degree is the local area networked with other areas?
Peer pressure	Is the implementation planned because of pressure from outside agencies or because of identified patient need?
External policy and incentives	Is this initiative a direct result of policy?

c Inner setting (stakeholder perceptions)

Structural characteristics	The social structure of the implementation area, its size, complexity, staff characteristics etc.
Networks and communications	The quality of communication within the implementation area.
Culture	Staff norms and values that may influence the implementation.
Implementation climate	How are the people (staff and patients) able to adapt to change and what could help them adapt?
Tension for change	The desire to change the current situation.
Compatibility	The 'fit' between the implementation area in relation to meanings, values and needs and the planned implementation.
Relative priority	The perceived importance of the planned implementation.

Organisational incentives and rewards	Are there any tangible incentives, such as awards, or increased stature or respect?
Goals and feedbacks	The degree to which goals are clearly communicated and the quality of the feedback.
Learning climate	Is there a positive climate for learning?
Readiness for implementation	What indicators exist that the area is ready to accept the implementation?
Leadership engagement	Commitment by managers and administrators.
Available resources	Are there sufficient funds, training space etc.
Access to knowledge and information	Is access to knowledge on the implementation readily available and accessible?

d Characteristics of individuals (stakeholder perceptions)

Knowledge and beliefs about the intervention	Attitudes to, and knowledge of the intervention.
Self-efficacy	Individual belief in the ability to implement the evidence-based practice.
Individual stage of change	How close is the individual to enthusiastic adoption of the intervention?
Individual identification with the organisation	Individual perception of the organisation and their commitment to it.
Other personal attributes	Other personal attributes, such as capacity, motivation, values that are seen to affect an ability to participate in the implementation.

e Process (stakeholder perceptions)

Planning	The quality of the planning.
Engaging	The process of engaging members in the implementation.
Opinion leaders	Identification of those with strong or widely voiced opinions on the implementation.
Formally appointed internal implementation leaders	Issues regarding capacity, enthusiasm, ability etc.
Champions	Staff who champion the cause of the implementation, their effect on the implementation.
External change agents	The impact of any external agencies or staff employed to assist the implementation.
Executing	Fidelity - the degree to which the implementation has had the intended effect - and how to measure it.
Reflecting and evaluating	Feedback and debriefing.

The Promoting Action on Research in Health Services (PARIHS) framework

Casey *et al.* (2018) suggests that of all the implementation frameworks, PARIHS is perhaps the first multidimensional frameworks which succeeds in capturing the complexity of implementing research into clinical practice. The PARIHS was first published in 1998 (see Kitson *et al.*, 1998), but has been subject to almost continuous development since that time.

The PARIHS framework contains three main concepts:

- Evidence (research or other forms of evidence-based practice);
- Context (the environment in which the research is to be implemented);
- Facilitation (the method in which the process is to be facilitated).

Each of the above concepts are considered to exist on a continuum of low to high. In this way research evidence would be towards the high end of the 'Evidence' continuum.

All of the three concepts are considered to be of equal value (whereas efficacy studies such as RCTs consider the first to be of primary importance). Successful implementation is considered to require all three elements to be in place and playing their part in the implementation. In this way, excellent research will be of no use, unless the implementation of it is well facilitated and unless the context, the environment, is receptive to the changes that the research will necessitate.

The Context concept relates to the notion of 'learning organisation' (Rycroft-Malone, 2004) as organisations that are open to new ideas and are willing to facilitate change. In the same way, an organisation where leaders inspire staff, transform clinical practice and have a shared vision with the staff, is one that is positive for 'Context'. A strong 'Context' is one where there is role clarity, decentralised decision-making, where staff are valued and use multiple sources of information when considering the appropriate intervention or policy change. Of course, this describes the place where we would all like to work.

The PARIHS framework does not see good evidence and a good working environment to be all that is required; good facilitation is also a necessary ingredient. It is the case that implementing evidence-based practice does not simply happen, even in the best of environments. It goes without saying, that a good facilitator is better than a poor one. Rycroft-Malone (2004) put this very simply; a good facilitator makes the changes associated with the implementation, easier. A good facilitator supports the staff to change their practice.

iPARIHS - the new PARIHS

Recently, Harvey and Kitson (2016) have developed a new version of PARIHS, which while similar to the original PARIHS framework, is also - different. The 'i' in 'iPARIHS' does not stand for Information technology or the Internet as is usual for a prefixed lower case 'i' these days, rather, it stands for 'Integrated', integrated that is, under the new bigger and better role of the Facilitator.

We still have same three core constructs, but they have been developed and built on, so they are greater in number and better in nature. These constructs are:

- Facilitation
- Innovation
- Recipients
- Context.

Facilitation is the new 'king pin', because it is the active element, active, that is, in making the other constructs live happily together and be productive. The facilitator's role is now central to the implementation and on that role rests the success or otherwise of the implementation plan. The facilitator is seen to need training and experience and, indeed, the framework now gives us novice, experienced and expert facilitators, and yes, even mentor facilitators.

The Context construct now has inner and outer layers, which reflect the local context and wider contexts such as that of the entire organisation and national health policies.

The iPARIHS framework rediscovers the patient and client with a new construct of 'Recipients'. Recipients are the people (both staff and patients) who are affected by the implementation, either positively or negatively.

Concluding remarks

In this chapter we have seen that research is not the only mechanism we have for producing new knowledge. In fact, there exists a wide range of other forms of evidence. This non-research evidence, such as an individual's experience, has value and we should respect it. We have noted, however, that research remains the gold standard and we should strive to ensure that at least the key areas of our practice are firmly built on an evidence base of research.

We have seen that research is the best form of evidence. Nevertheless, it should be clear that experience, expertise and even intuition are essential components of professional practice. Indeed, they are the very heart, the very soul, of professional practice. We need to appreciate, however, the central role played by evidence that is based in research. We should seek to base an increasing fraction of our work on research evidence. This involves us in 'implementing' research, putting research into our practice and ensuring that as much of our practice as possible can be justified through research evidence.

Most of us have experienced the implementation of something new in our practice. We will have felt the excitement of it or if we are a little older and stayed in our ways, that dreaded feeling of another 'initiative' wafting towards us on the wind of research or more likely 'policy change'. Most of us know how difficult it is to change practice; practice resists change, just as people do. We have felt the resistance, that routine is 'safe', safe for everyone. So, we know how difficult it is to facilitate change. The implementation frameworks described briefly above deal somewhat awkwardly with the hugely complex nature of healthcare practice; indeed, how can it be possible to define such a varied thing in a few constructs or with a simple diagram. To be fair, all of those who have struggled to develop the frameworks discussed here have been at pains to point out the complexity of healthcare practice and the challenges inherent in formulating an approach to implementation.

Indeed, there have been many theories, models and frameworks that have tried to deal with the issue of implementing change (see Nilsen, 2015). However, the fact that implementing evidence-based practice is so complex does beg the use of a strategy. These 'implementation frameworks' are still developing but they are already proving themselves to be useful.

For me, the simpler frameworks seem more useful, because when we create a model of something, simplifying the reality of it is the necessary goal. The model (the framework) isn't practice, it is a model of it. The framework isn't 'implementation', it is a model of it. We have to make the model 'fit' implementation, without making it as complex as implementing evidence-based practice necessarily is. Importantly, however, we see huge effort here, effort that is directed squarely at ensuring evidence-based practice gets where it was always meant to be - in practice. 'The times they are a changing' (Dylan, 1964) and the new emphasis is implementation; that must be a good thing.

Summary

It is a principle of evidence-based practice that the practitioner should always be able to defend their practice by identifying the degree to which it is supported by evidence.

Well-designed research studies provide us with best evidence with which to support and develop practice.

Good-quality, well-designed research studies are expensive and may be ethically problematic in a discipline that deals with vulnerable people. For this reason, it is often necessary to take recourse to research designs that are less than perfect and to forms of non-research evidence.

There are several forms of non-research evidence that can be used usefully to support and develop practice. These include such techniques as peer review, exposing ideas to publication and benchmarking.

Care should be taken in accepting all forms of evidence. Each should be examined logically. Non-research forms of evidence are particularly vulnerable to human error, to bias and to the effect of variables that may be unidentified or poorly understood.

Implementing research should be seen as a systematic activity that is in itself subject to audit and research. If knowledge should not be that of trial and error, then nor should the implementation of that knowledge be made subject to trial and error. Systematic strategies for implementing evidence-based practice do now exist, and we should use them.

Of central importance is the practitioner's enthusiasm for practice and the desire to make things better. Practice should be founded in evidence, and practitioners who are enthusiastic about their work will want to use evidence to support and to develop practice for the good of patients and for the good of the whole profession.

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Chapter 5

Research ethics

CHAPTER OBJECTIVES

- identify the need for research ethics today;
- briefly discuss the ethical principles that bear on research with human subjects;
- define the criteria that a research project must meet to be considered to comply with the current standards for research ethics;
- clarify the process which researchers must use to obtain ethical approval;
- identify the issues surrounding participant consent;
- review the rules around the storage of data.

Chapter outline

The acquisition of evidence, through research or other means, must be carried out within the established principles of ethical conduct. The chapter will look at the reasons why research is required to meet ethical standards and how this relates to some of the less ethical studies that were undertaken in the past. It will be seen that however important the research, the rights of participants to be protected remains paramount. The requirement that all studies meet ethical criteria means in practice that all studies, from those undertaken by undergraduate students, to those managed by multinational companies, must obtain approval from an appropriate Research Ethics Committee before the study can commence.

Background

The importance of research ethics was highlighted in the mid-twentieth century, when doctors working for the Nazi regime experimented on civilian prisoners (Lefor, 2005). Experiments included the use of surgery without anaesthesia and exposing people to extreme cold. These events remain today as evidence of the potential of members of the healthcare professions to cause deliberate harm in the name of research and science. In response to this, the Nuremberg Code (Control Council Law, 1949) and the Declaration of Helsinki, first adopted in 1964 (World Medical Association, 2013) established the core principles of research ethics. The Declaration of Helsinki reminds medical doctors and other health professionals that, although research is an essential element of professional practice, the primary responsibility must be to the welfare of the patient and this has to come before any concerns related to research, to government policy or to the furtherance of science. The Declaration of Helsinki (World Medical Association, 2013) states that 'It is the duty of the physician in medical research to protect the life, health, privacy, and dignity of the human subject'.

In medical history, researchers were often clinicians who indulged in research in their spare time. We owe much of what we know today to early research that was practised on patients' and (often) researchers' own bodies (Grossman, 2008). Although much has been learned from this research, so too has too much harm been done. To use one of many examples, the early researchers of Yellow Fever, suspecting that the disease was carried by mosquitoes, allowed the insects to bite both them and some paid volunteers. The researchers were correct in their beliefs, unfortunately, some of the volunteers and some of the doctors died of the disease (Pierce and Pierce, 2003). Sometimes, doctors have been rather too keen to try out their new ideas on patients, who were not always kept fully informed about the dangers inherent in the new technique. One of the worst examples of this was the practice of lobotomy, where 'difficult' patients in mental health settings had the nerve pathways from the frontal lobe of their brain cut, to cause them to become placid and compliant. This practice came to public awareness with the publication of the novel *One Flew Over the Cuckoo's Nest* (Kesey, 1962), which was made into a film of the same name in 1975

(Forman, 1975). However, much medical experimentation with new techniques was well intentioned at the time but would still not meet the current standards for research ethics. Grossman (2008) describes the first use of penicillin in the USA. The drug was sent by post from England. When the doctors opened the package, they did not know what to do with the brown substance in the vial, there being no guidance on the matter. The doctors decided to dissolve the contents of the vial in saline and pass the resulting mixture through an asbestos filter in the hope of purifying it. The recipient of the drug was a moribund patient who was suffering from a fulminating infection. The patient survived.

It is sometimes difficult to separate clinical practice, which has as its aim the welfare of one particular patient, and clinical research, which chiefly aims to help future patients. However, there is an important distinction between the two. If you were to go into hospital for treatment, then you would expect that treatment to be wholly directed to your welfare and not be compromised by any effort on the part of doctors to experiment on you. You may well be prepared to be the subject of an experiment, but you would expect to be made perfectly aware that that was what was going on. In practice, it is only too easy for a practitioner to 'just try something out' on a patient, but this is wrong on at least two counts: first, practice should be evidence-based and not 'evidence-generating'; and second, patients have a right to be treated as ill people and not as the subjects of an experiment.

Ethical principles in relation to research

The ethical principles upon which research ethics are based are probably already familiar to you.

Beneficence is the moral obligation to do good to others. In relation to healthcare, the professional is obligated to work for the welfare of her or his patient or client and to put the client's welfare first, above all other concerns. Where there is conflict between the patient's welfare and the practitioner's professional thirst for knowledge, the patient's welfare must always come first.

Non-maleficence is an obligation to avoid harming others. Any short-term harm (causing pain by taking blood), has to be justified by the medium or long-term good that it will do that person. We cannot justify doing harm to one person for the long-term good of others. Non-maleficence is often an issue in research because researchers do sometimes place participants at risk, by, for example, exposing them to a new drug. The duty to avoid causing harm is the principle reason for the existence of Research Ethics Committees (REC) and the requirement on every researcher, at every level of research, to seek approval from the REC before commencing a research study.

Dignity is the value individuals have and which they have in their own right. The dignity of individuals exists outside any usefulness they may have to society or to us as researchers; dignity is the right to be valued. We all have value. Research participants are not just there to be used by the researcher; research participants are people who have value that resides outside the research project and is unconditional. Because individuals have dignity and are valuable in their own right, they deserve our respect.

Respect for others is what ethics is all about. It is because we respect others that we are forced to consider whether what we are doing to them is right or wrong. We try not to harm people, partly because we respect those who would suffer. It is the 'dignity' of others that we respect, we respect others because they are inalienably valuable. By inalienable, we mean that the value we all have cannot be taken away by others and cannot be given away.

Autonomy is our right to make decisions, to be reasoning, thinking individuals. The word 'autonomy' means 'autonomous' or being able to make decisions for oneself. In order to make a decision, we need to have the necessary information, because any decision we make must be an informed one. The researcher provides prospective participants with information about the research, so that they can make up their mind on the matter requiring decision. We may not agree with the decision made by the individual, but we cannot choose to make the decision for them, we cannot do this because we recognise that the individual has autonomy. Young children, the unconscious, some people with learning difficulties may lack autonomy, or we may judge that they lack autonomy. We must be careful here, because we can be wrong. How many of us clever people can get inside the head of someone with learning difficulties and describe that person's ability to make a decision. I have always found 2-year-old children to be very capable of making up their mind on the matter requiring decision. When we judge an individual's ability in relation to autonomy, we must always do so while respecting their dignity. Such a judgement is a very serious matter and must always be approved by the Research Ethics Committee and sometimes by Courts of Law.

Privacy and confidentiality are ethical principles highlighted in a number of disciplines, including journalism, and healthcare. Privacy and confidentiality stem from the other principles we have just been thinking about, dignity, respect and autonomy. We might share our cat's secrets; we might tell the neighbour of our cat's recent misdemeanours, but we would not share the secrets of our best friend or of anyone we respected. However, ethics takes us further than this and requires that we respect all people, that we recognise their right to dignity and their right to make decisions for themselves. It follows that we must keep confidential the research participants' private details and keep their personal information safe. Such information continues to 'belong' to the individuals concerned and we can be required by them to stop using it and to stop storing it.

Ethical research standards

Ethical research standards reflect the accepted position of research ethics at any one point in time. These standards may be identified by the various health professions (Royal College of Physicians, 2007), the research funding agencies (Medical Research Council, 2012) and by global agencies such as the World Health Organisation (World Health Organisation, 2016). Research ethics, on the other hand, are always developing, both independently and in reference to the development of society and civilisation. Over time, the ethical research standards have changed and developed to reflect new thinking in the field of ethics and in response to societal views on, for example, the rights of children undergoing treatment. These developments in what society views as 'right and wrong' may eventually be

enshrined in law (for example, the Children Act 1989 which determines that children should always be consulted on their views regarding their medical treatment or social care, and at least by inference, their participation in research). However, the principles of research ethics cannot always be found in legislation and we may with some justification ask where the definitive standards are to be found. Because 'research' is not a discipline or an organisation, we have to look to organisations, such as the World Health Organisation or the Medical Research Council, to find current ethical research standards. A few years ago, most of the health professions produced their own guidance, but in recent years, the issues around research ethics have become complex and many professional organisations in the UK have pulled away from offering specific guidance. Such guidance as can still be found somewhere in the Internet may now be out of date. The good news is that every university and NHS Trust in the UK, has a REC. The REC will have guidance available on making an application to the committee for ethical approval of a study. One of the best ways to 'get to grips' with what is expected of a proposed study is to obtain this guidance and perhaps to ask permission to attend a REC meeting as an observer. Some research proposals are 'sensitive' perhaps from a business point of view, but PhD students, for example, will be too pre-occupied with other things to object you witnessing their REC application.

In practice, research studies in healthcare must comply with the following standards (General Medical Council, 2013; NHS Health Research Authority, 2017):

- The safety of each participant must be considered as paramount. Researchers invest a considerable amount of time, reputation and funding into their research project but the principle here remains clear, the safety of each participant must be the researcher's first consideration. Where the research requires health or social care intervention, that intervention must be justified. There must be a plan for continuation of care or treatment once the study has completed or if the participant withdraws from the study. In all cases, the patient remains a patient first and foremost. The research must be terminated if participants appear to be at greater risk than anticipated and both participants and the REC should be informed. The participants' care and treatment remain the responsibility of the healthcare professionals who must exercise a duty of care in the same way as if the patient was not a research participant.
- The researchers must be competent and appropriately qualified to conduct the research. The research study should be of such a quality that it is capable of producing the expected results.
- The research study should comply with current ethical principles. Where possible, there should be involvement of patients or service users and the public should be involved in the development and management of the study. The research study should be designed, reviewed and undertaken with integrity, honesty and transparency; concerns should be reported to the REC.
- The research proposal should identify the risks and possible benefits to participants.
- The research study must be approved by a Research Ethics Committee before being commenced.
- Risks should be kept as low as possible and should not outweigh the benefits to others.

- Research participants have a right to respect and to exercise autonomy. Consent from participants is normally expected and must be voluntary and informed. Where the participant refuses or withdraws consent to participation in the research, there must be no impact on the individual's care or treatment.
- Research participants have a right to expect privacy. Participants' data must be stored safely and confidentially. The storing of data must be managed transparently.
- The research study must be lawful. There must be insurance and indemnity cover in place.
- The findings of the study should normally be made available to the research participants on completion of the research.

Consent

Individuals must consent to become research participants. For consent to be valid, it must meet these conditions (NHS Health Research Authority and Medical Research Council (UK), 2019):

- the individual must have capacity to consent;
- the consent must be offered voluntarily;
- the individual must have been given sufficient information about what they are consenting to;
- individuals must be given a fair choice (standard care and treatment must be available as an option).

Children and vulnerable people present special difficulties, principally in relation to the capacity to provide consent. Young people over the age of 16 are regarded as adults where the research is offering medical treatment (Family Law Reform Act 1969) as in clinical trials. Children aged 16-18 are generally regarded as adults in other forms of research but obtaining consent from parents as well is usually advisable. Young children are not usually asked to provide consent themselves, but older children may well be able to do so. Importantly, children of any age must be consulted, and their views taken seriously (Children Act 1989). Children's 'assent' (informal agreement) should always be present. In practice, consent is obtained from the parents of children under 16 (formally, someone with Parental Responsibility as defined by the Children Act 1989), but it can be good practice to obtain written consent from older children too. Such consent must meet the requirements of being voluntary, informed (with age-appropriate information) and be obtained only where a fair choice of options is available. It may not always be ethically appropriate or legally possible for those with Parental Responsibility (Children Act 1989) to consent for children to be exposed to risk where risk of harm has been identified in the research proposal. To clarify, to deliberately place one's child in a position of danger may not be lawful and parents cannot lawfully consent for their child to be harmed. It can be seen that great care needs to be taken when considering consent for child participants of research. However, children in general may well come to harm if we have no research on them and research on child participants is certainly possible.

Much the same care should be taken with adults who do not have the capacity to give consent. Research on adults with learning difficulties should be confined to studies concerning that group of people, their challenges and experiences, for example. It is important to seek the views of those close to the adult. Legislation in this area includes the Mental Capacity Act (2005, England and Wales) and the Adults with Incapacity (Scotland) Act 2000. Research may sometimes be undertaken on very ill or unconscious people who are unable to consent for themselves. In these cases, a legal representative may be able to give consent but, clearly, such situations as these require expert guidance.

It is important to understand that consent is not a 'once and for all time' decision. Consent is an ongoing phenomenon and can be withdrawn at any time.

Consent must be voluntary. Care needs to be taken, especially with vulnerable people, that they are not pressured into consenting. Care needs to be taken of any 'power' imbalance that may exist. A patient admitted to hospital may be feeling scared and lost and may think that they should sign anything the 'great professor' asks them to sign. People often need time and space to consider whether to consent and this must always be provided to them.

The research information pack needs to be thought-through carefully and trialled with people similar to the prospective participants before being submitted for approval to the Research Ethics Committee. Special care needs to be taken of information designed for children and the elderly. Detailed information about what should be included in the information pack can be found in the document 'Consent and Participant Information Guidance' (NHS Health Research Authority and Medical Research Council (UK), 2019).

The storage of research data (and biological material)

The Declaration of Taipei (World Medical Association, 2016) states that the collection, storage and use of data and biological material must normally be subject to the voluntary and informed consent of research participants. Research participants normally have the right to withdraw their consent for the data or biological material to be stored and to require that it be withdrawn from storage. The Research Ethics Committee must approve plans to store data or biological material as part of the approvals process for research studies.

Any long-term storage of data should use an institutional facility designed for this purpose (not a personal computer). Research data should be stored, so that it is available to future researchers, but confidential material should be destroyed securely as soon as it is no longer required for the research or after a period agreed by the Research Ethics Committee. There are separate arrangements for data from clinical trials (The Medicines for Human Use (Clinical Trials) Amendment Regulations 2006); such data and related files are required to be kept for at least 6 to 10 years depending on the circumstances.

In the EU, the General Data Protection Regulations (GDPR) require there to be a named 'Data Controller' in charge of the stored data. Participants must normally be able to access any information that relates to them (see European Commission, 2016).

Summary

We live in an imperfect world, if that were not the case, then we would not need to discuss the ethics of anything. We wish to expand the boundaries of science for the good of future patients and for humanity but often, in doing so, we must place people at risk. There is the quandary, there the ethical dilemma.

While the world we live in may be imperfect, it is also full of courage and self-sacrifice. People come forward to help with our research because they want to be useful, knowing the risks and being prepared to accept them. Sick people come forward, people who should be expected to be thinking just of themselves, dying people come forward and people allow us to study their children, their most precious possession. People come forward to talk to us about their scariest moments, the times when they were most happy, most sad, when grief subsumed them. They come forward because they want to help, they care, they want to make the world a better place for others. These people can do this only because they trust us, trust that we are caring and professional. Beneficence and non-maleficence, they trust that we will work for their welfare, we will not seek to harm them. Dignity and respect, they trust that we will treat them as persons, the babies, those participants with learning difficulties, the unconscious patient, we will treat them as persons, like our brother, our sister, our mother, our father. Autonomy, they trust that we will see them as our equal, intelligent, thinking, feeling beings, capable of making decisions and free to do so, and doing so now. Privacy and confidentiality, they trust that we will keep their secrets, just as a best and valued friend would do, they trust that we will keep their secrets and honour their privacy. It is research ethics that ties us together and makes research with people a humane and shared experience.

Further reading

European Commission. 2017. *European Code of Conduct for Research Integrity*.

This document provides a short overview on the criteria for ethics-appropriate research:

<https://ec.europa.eu/research/index.cfm?pg=newsalert&year=2017&na=na-240317-1>.

General Medical Council. 2013. *Good Practice in Research*.

One of the very few, excellent guides to ethical research and consent:

www.gmc-uk.org/ethical-guidance/ethical-guidance-for-doctors/good-practice-in-research.

NHS Health Research Authority and Medical Research Council (UK). 2019. *Consent and Participant Information Guidance*.

This offers detailed guidance on consent for research and on the provision of information to prospective participants. Variations in law in the different UK countries are detailed:

www.hra-decisiontools.org.uk/consent/index.html.

NHS Health Research Authority. 2017. *UK Policy Framework for Health and Social Care Research*.

This document offers a succinct account of ethical principles as they relate to research on human subjects:

- www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/uk-policy-framework-health-social-care-research/.
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Chapter 6

Data and how data is collected

CHAPTER OBJECTIVES

The objectives for this chapter are to:

- distinguish between nominal, ordinal, interval and ratio levels of measurement;
- illustrate how different modes of questioning can lead to different levels of data;
- demonstrate how the levels of measurement are related to the proper choice of statistical procedure;
- introduce qualitative data;
- introduce the most commonly used methods of collecting quantitative and qualitative data.

Chapter outline

In this chapter we will look at data, what they are and how they are collected. 'Data' is a collective term for the stuff that is collected by research. In this chapter we will look at what form data exist as before they are made subject to statistical or qualitative analysis. The fact is, not all data are the same. Of course, there are data that exist as numbers and data that exist as written or spoken words. However, a quick look at the different forms of data will bear much fruit later on in terms of our understanding of analysis and our understanding of research in general.

Once we have spent a page or two looking at the different kinds of data, we will be able to relax a little and briefly consider the various ways in which data can be collected.

BOX 6.1 NEW WORDS

Datum - A single piece of data, like a single number. The word 'datum' isn't found much in the literature, but the plural form '**data**' gives rise to some rather odd sounding sentences such as 'the data are over there'. It's a bit like 'mouse' (datum) and 'mice' (data). In fact, if you are not sure how to frame a sentence with 'data' in it, simply substitute 'mice' and you will have it sorted in no time.

Raw data - Data before they are analysed - the actual stuff collected by researchers.

What are data?

Numerical data

Essentially, data are the stuff that are collected during a research project. It is the data that are analysed in a research project. Data can exist in the form of numbers (in quantitative research) or as words (in qualitative research).

So why are data important? Why not just look at results? We can just look at the results of a study but understanding the kind of data used will help us to make sense of the results. There are different kinds of data, and the kind of data used in a research study will determine the sort of analysis that is used.

Qualitative data usually exist in the form of words, sometimes written words, sometimes spoken words, but words in some form or another. We cannot easily use statistics with words. We cannot ask, for example, what is the average of 'happy' and 'sad', and we cannot easily add happy to sad. So, some forms of analysis fit with some forms of data and not with other forms of data.

There are some forms of analysis that do not work with some forms of numerical data. So, we can add up the number of males and we can add up the number of females. Let us say that there are 15 men and 15 women in our sample - so then the average sex is '15'? You already know that that doesn't make sense. So, there are some statistical procedures that cannot be used with some forms of data.

The sort of data we have must fit with the analysis that is required. Understanding this can help us to make sense of the analysis. When a research project is planned, the researcher will identify the kind of data that the study will produce and will then identify the appropriate analysis. This is important because not every kind of data can be analysed as we might want – remember, however big our sample, even if we were able to sample every male and every female in the world, it will always be silly to calculate an average sex.

This is more serious than it sounds; let's say that we want to measure the amount of pain experienced by patients after they have sustained a fractured femur. Foolishly, we ask 1000 patients: 'Do you have any pain?' We find that 999 patients say 'Yes' and one says 'No' (that patient had actually come into hospital for an eye test but had accidentally joined the queue of patients with a fractured femur because he couldn't read the signs well enough).

So, how much pain did the patients have? Well, we don't know; we asked them only whether they had pain. These kind of 'yes/no' data do not give us very much information, even though we have a sample of 1000 people. In circumstances like this, people say that the data are not sufficiently 'rich' or not 'deep'.

It is worth bearing in mind that if we collect 'shallow' data, we may not be able to do much with them. You may think that no one would choose to collect such shallow data, but you would be wrong to make such an assumption. When you read the research literature, you should question whether the data collected really were the best that could have been collected. Practitioners collect data all the time as they assess patients and clients and make decisions about them. Imagine that you can see a patient being admitted to an orthopaedic ward. Look at the nurse who kindly and sympathetically approaches the new patient and asks, 'Have you any pain?' Oops!

So how should we ask patients about their pain? You may have used a pain scale of some sort or another. This is a pain scale of the kind that is often used with children (see Figure 6.1).

So now we have a scale; in this case, the scale is quite short (0-5) but it still allows us to:

- determine a mean score for pain (but see the note, below);
- develop at least some idea of whether there is a little pain or a lot of pain;
- determine differences between groups of people in relation to pain; for example, we can determine whether pain worsens or improves with a nursing procedure.

BOX 6.2 NOTE

The mean should be used with care when the scale is not continuous. The mean in this case could be returned as 5.5 (for example) or a number halfway between 5 and 6. Yet, it is not possible for a patient to choose such a number. In practice, the mean or average is best used with a longer scale, such as 0-100.

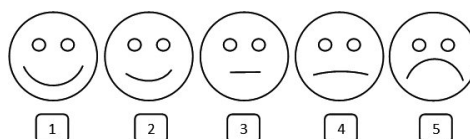


Figure 6.1 Faces pain scale.

Some scales are longer than 1-5. These longer scales can give us richer information. Imagine, for example, that your equipment for measuring blood pressure (BP), only gave readings between 1 and 5; that would not be a good thing. Sometimes a patient's systolic BP may be as low as 40mmHg (this patient is clearly not very well) or as high as 250mmHg (this patient is not very well either). That's quite a big scale. In fact, the scale on which we measure BP doesn't really have any ends to it; it can even be negative - like the pressure in the veins in your legs if you were to hang yourself upside down like a bat. Perhaps we could simplify the scale, but would you want to do that? It can be quite useful to know that the patient's BP has gone up from 40mmHg to 45mmHg - at least the patient is improving. Apparently minor moves up and down a scale can be important. So, sometimes long scales are useful, because they can offer seriously rich data.

We have seen that some forms of data give us more information than do other forms of data. Not all data are the same. We have used numerical examples here, but exactly the same is true of qualitative data. Here, we can ask someone whether they have pain, and we record the verbal response, 'yes' or 'no'; or perhaps the patient will say 'I have a little niggles' or 'My big toe really hurts when I walk on it'. These responses are qualitative data. Try adding up three little niggles and a big toe - it just doesn't work - but the responses are data all the same, they have meaning to us, meaning that is shared between the patient and ourselves. These data exist as a common understanding. However, the data are pretty shallow and most qualitative researchers would turn up their nose at such a form of enquiry. The qualitative researcher is more likely to ask, 'Tell me about your pain' or perhaps 'How do you feel when you have pain?' Such questions are likely to yield data that are rich (or deep).

Types of quantitative data

There are three main types of numerical data:

- Categories - called 'nominal' data.
- Small scales - called 'ordinal' data.
- Long scales - called 'interval' data.
- Long scales with no defined lower or upper limit - called 'Ratio' data.

These four terms, nominal, ordinal, interval and ratio, are sometimes referred to as 'levels of measurement'. They are really levels of data. Interval and ratio are deeper levels (rich in information), and nominal is a relatively shallow level, offering less depth of data. Here are some examples:

Nominal level of measurement - categories

- Yes/no questions.
- Discrete categories, such as are you male or female? Are you tall, middle-sized or short?

Sometimes, a range of categories can look like a small scale:

Normally, do you drink:

- a No alcohol
- b Up to two units of alcohol per day
- c More than two units of alcohol per day

In practice, however, a scale with fewer than five points is usually regarded as categorical (as discrete categories and not a scale). It would be possible to calculate a mean from the data produced by the alcohol question above, but the result would not be very meaningful. If we assigned numbers 1, 2 and 3 to the responses, we might find that our 'average' score was (for example) 1.5 - that is, somewhere between 'no alcohol' and 'up to two units per day'. However, we would need to bear in mind that no one would have given such an answer. In this example, the 'average' score does not really make sense.

However, nominal level data do have a range of statistical procedures available to them. An example of such a statistical procedure is the Pearson Chi Square, which can be used to test for differences between, for example, two groups of categorical data, in the form shown in Table 6.1

In this completely fictitious example, 17 males and 16 females were asked whether they wanted to wear a uniform or to wear their own clothes at work. We can see here that there is a relationship between the responses given by males and females. Males in this fictitious example were more likely to respond 'no' and females were more likely to respond 'yes'. The data here are categorical - that is, they exist in categories and are therefore at the nominal level of measurement. Perhaps the data here are not very rich or deep; we don't, for example, know why our fictitious males wanted to wear their own clothes at work or the strength of feeling they had on the matter. However, these data are useful here. Sometimes categorical data are all that we have available to use - red is red and yellow is yellow and that is that. Sometimes, categories do tell us all we need to know about something. Statistical procedures such as the Pearson Chi Square are available for use on categorical data. In fact, if we ran a Pearson Chi Square on the data here, we would get the result 5.155, with $p=0.0232$ (Chi Square with Yates correction, two-tailed). Don't worry about the numbers just yet; they mean, however, that the difference we see here between the responses of males and females is not likely to be due simply to chance - that is, it is not a chance finding. Some people would describe this result as 'significant'.

Table 6.1 Pearson Chi Square data table

Particular preference for wearing a uniform	Yes	No
Females	12	4
Males	5	12

So, Pearson Chi Square can work for nominal level (categorical) data. Not all statistical procedures work here though. Consider one of the most simple statistical procedures, the mean or average. Try to apply the average to the data in the preference for wearing a uniform box above; you will probably not make much useful progress.

Ordinal level of measurement - ranking and short scales

The ordinal level of measurement is so named because it is meant to be used with a list of possible responses that are placed in order - that is, they are ranked. Here is a list of things that the research participant could be asked to order:

What causes you most pain? Please place in order, with [1] at the top of the list causing most pain.

- Getting up in the morning
- Walking
- Running
- Having to bend down
- Having to move after a period of sitting or resting

Such ordinal lists can give us some quite useful information (data). In practice, however, the lists are usually quite short. Imagine having to place in order a list with 100 items on it. On the other hand, these ordinal lists are longer than those we looked at in the nominal level of measurement. In a way, these lists can sometimes form a short scale. This is important because a range of statistical procedures are available for ordinal lists that work just as well for any short scale.

Short scales are often used in research, largely because research participants find them easier to work with than longer scales. Perhaps the most commonly used short scale is a Likert scale. A Likert scale presents the research participant with a statement and then asks the participant to choose a response from a list. Here is an example:

I think that NHS dentists should be available to everyone:

- 1 Strongly disagree
- 2 Disagree
- 3 Neither agree nor disagree
- 4 Agree
- 5 Strongly agree

The data resulting from this short scale are probably best analysed using a range of statistical procedures designed for the ordinal level of measurement. This is the case, even though such short scales do not require ranking (placing in order).

Ordinal level data have a range of statistical procedures that have been designed just for them. An example is the Mann-Whitney U statistical procedure, which is used when we want to test differences between two groups of data, each produced using a short scale (ordinal level data) (Crichton, 2000).

Interval level of measurement – long scales

Student essays are often marked on a scale from 0-100. This is quite a long scale. In fact, it is so long that it is effectively continuous. It is true that students cannot be awarded a score of 55.789 per cent, but there are so many points in the scale 0-100 that points between any 2 numbers would be meaningless to most of us.

These longer scales provide richer data. If your academic work was marked on a scale of one to five, you might begin to be dissatisfied with the meaningfulness of the mark. You might, for example, want your university to distinguish between those people who got a 'lower three' and those who obtain 'nearly a four'. There is no correct length of scale for every purpose. We have to determine for ourselves what length of scale produces data that are meaningful to us and what length gives us the richness of data that we think is appropriate.

Degree classifications in the UK are usually of the form:

- first class;
- upper second class;
- lower second class;
- third class;
- pass.

This seems to work well for most people. However, the poor student who gets one mark under a first-class degree might well feel unhappy that the overall percentage mark is not printed on their degree certificate.

There is no perfect length for a scale. It is up to us to determine what length of scale is fit for purpose. However, it is always the case that longer scales give us more information. Interval level data have a rather larger range of statistical procedures available to them than is the case for either nominal (categories) or ordinal (short-scale) data. This reflects the increased richness of interval level data. We would probably not use the Mann-Whitney U procedure for two groups of data as we did for ordinal (short-scale) data; rather, we might use a procedure called the Student's t-test. Don't worry about all these statistical procedures just yet but do bear in mind that different kinds of data often require different statistical procedures. It is not important to be able to remember which statistical procedure fits with which kind of data, but it is useful to understand that not all data are the same and that at some point we will need to be sure that the most appropriate statistical test is used.

Ratio level of measurements – long scales without any ends

We have already come across ratio data. These are simply data that have no top and no bottom. We have noted that blood pressure can be below zero sometimes and can be as high as you like. You can't get more than 100 per cent for your examinations because those data are interval and have a known bottom (0 per cent) and a known top (100 per cent). However, data in the form of blood pressure, body temperature, bacterial counts and blood

alcohol have no limits. In practice, a bacterial count of -1 is a little difficult to construe, but at the top end it can be just about anything. Blood pressure over 500 mmHg is probably not compatible with life. However, there is a no practical real difference between these scales and the one used for your examinations. Ratio level data do exist. However, effectively, and in practice, interval and ratio level data are treated exactly the same. If we know interval level data, then we know ratio data, and the statistical procedures used for one can be used with the other.

Numbers – summary

Just a little effort with the question of the different types of numerical data (numbers) will help a lot with our grasp of research in general. Numbers can be confusing. However, let us review what we have learned here.

There are essentially four levels of data:

- Nominal: categories, such as yes/no.
- Ordinal: ranked data or short scales, such as a Likert scale.
- Interval: longer scales, where the middle ground between say 57 per cent and 58 per cent is effectively meaningless.
- Ratio: just like interval data but without a known top and bottom to the scale.

These levels are important because they relate to:

- the richness of the data;
- the choice of statistical tools available to us.

Researchers are sometimes limited to a particular level of measurement (such as ordinal) where the data only ever exist at that level. However, sometimes researchers can select data-collection tools that will yield data at a particular level of measurement. In this way, the researcher can ask the participant to respond with ‘yes’ or ‘no’ or can use questioning with a short or a long scale. In this case, the choice is important because it relates directly to the range of statistical procedures available to the analysis and the ‘amount’ of information that the data are able to yield.

Types of qualitative data

Qualitative data can be taken from interviews, manuscripts, books, drawings or really any of the many ways in which people communicate their thoughts and ideas. Some people will question the scientific nature of qualitative data, but it is suggested here that qualitative data can be and are handled in a rigorous manner (McBrien, 2008; Forero *et al.*, 2018). In addition, we have already noted that qualitative data are often used to explore situations that could not be explored quantitatively.

However, numbers can also be used to explore meanings. In fact, we have already come across an example of this:

I think that NHS dentists should be available to everyone:

- 1 Strongly disagree
- 2 Disagree
- 3 Neither agree nor disagree
- 4 Agree
- 5 Strongly agree

This is a Likert scale. It is being used here to obtain data on people's views on the provision of NHS dentistry. In this example, a number is being assigned to a notion, idea or viewpoint. This can work well when we know what the notions, ideas or viewpoints are. It probably works well here. We know what range of views exist about the provision of NHS dentists, or we can at least take an educated guess at what views exist. Both research participants and the researcher are likely to be speaking the same language; they understand each other. So, a whole range of feelings, emotions, experiences and all things human can be and often are explored quantitatively – using numbers.

Qualitative research comes into its own when, basically, we don't know what questions to ask and where a shared and meaningful communication with the research participant is not at all straightforward. Healthcare practitioners are often interested in the things that make their patients and clients psychologically uncomfortable. These things often exist as experiences that trouble the patient or client in some way. Consider, for example, the experience of having a child in the paediatric intensive care unit (PICU), or the experience of someone who is in grief or distress.

If we could know how parents feel about having a child in the PICU, then we might be better able to help them. The trouble is, most of us don't know what it is like. We can guess, but most of us would be conscious that we might guess incorrectly. We are often quick to suggest that we don't know how someone else feels. It can be difficult to 'get inside someone's head' and see things the way they see them. Qualitative research is good at exploring feelings, notions, experiences, etc. of others, which we don't know very much about.

Not only do we not know what the individual is feeling but also, we know so little about it that we don't even know what questions to ask. Structured questions seem particularly inappropriate. Consider the following questions asked by our fictitious nurse admitting a child to PICU. The questions are directed to the child's mother:

- How old is Benjamin?
- Is he on any special diet?
- Does he have any special words (e.g. for 'toilet') that we should be aware of?

And then:

- Are you 'not anxious' ☐, 'a little anxious' ☐ or 'very anxious' ☐?
- Do you think that Benjamin will die? Yes ☐, No ☐?

Of course, this is not appropriate: the nurse would not ask these questions, and neither would the researcher. There are two reasons for this:

- We do not know what the child's mother is experiencing, so we don't know what to ask her about.
- Even if we think we know what sort of things she is experiencing, we are uncomfortable about putting these into preconceived or artificial categories. In this example, we do not know whether Benjamin's mother is thinking about his possible death; she may not have construed events in this way. There may be other thoughts that are important to Benjamin's mother and that it would be useful to know about. In asking Benjamin's mother about death, the nurse is putting thoughts inside the mother's head. Here, the nurse is impacting on the mother's construction of reality. Usually, we want to know what the mother is thinking about, not what she is thinking about after ideas have been suggested to her by a third party.

We would not ask 'Do you think that Benjamin will die?' without suggesting to the mother that this is something she *ought* to be thinking of. Clearly, the researcher and the nurse should want to find out what is going on in the participant's head, not what the nurse or researcher can put there.

In practice, the nurse would be sensitive about his or her own lack of knowledge of what is going on in the mother's mind. Being so sensitive, she might ask:

- Tell me how you feel.
- Is there anything that you would like to say to me just now?

Questions such as these might enable the child's mother to communicate her feelings freely and without being constrained by artificially contrived questions. The nurse and the child's mother can potentially come to a shared understanding of what is being experienced. This is exactly the way it is with research. Of course, for this to be effective, there must be a trusting relationship between the child's mother (in this example) and the nurse, and between the participant and the qualitative researcher.

So, qualitative research does have a useful purpose. It is widely employed in healthcare, perhaps because practitioners often want to reach a better understanding of their patients' and clients' experiences. It follows that the data in qualitative research are usually focused on human experience. These data usually take the form of words, either spoken or written, but they can take any form from which interpretations can be discerned. For example, when Benjamin begins to get better, the nurse might give him paper and pencils and Benjamin might explore his own feelings through drawings (Dunkerly-Bean *et al.*, 2017; Jolley, 2010). Benjamin might find this easier than speaking because he still has an endotracheal tube in his airway or perhaps because, being only 4 years old, he's not so good at expressing the nuances of his experience in words. Once again, the researcher may well use the same approach - children's drawings have been used to help explore their experiences of violence, of war and of serious illness (Jolley, 2010; Jabbar and Betawi, 2019).

Ways of collecting data

When one begins to look at published research, it soon becomes apparent that data are collected using a variety of means. However, understanding this is easy because you are already aware of these different means.

Here are some of the most popular ways of collecting data. Note that, in each case, the method of collecting the data influences the kind of data that are obtained:

- questionnaire;
- interview;
- participant and non-participant observation;
- existing data and meta-analyses;
- historical data and records;
- audio, film and photographic records.

It is important to understand that although there are advantages and disadvantages associated with each type of data collection, there is no right or wrong way to collect data. As with every other aspect of research, there is no right or wrong way to do this, only the most appropriate way, considering what it is that the research project in question aims to achieve. It is worth emphasising this point because people new to research are sometimes too ready to criticise a research project on the basis that the use of interviews, for example, carries some disadvantages. Interviews *do* have disadvantages, but they may still be the best and perhaps the only way of collecting data in respect of what the research project is trying to achieve.

Let's look at each data collection method in a little more detail.

The questionnaire

You will probably be familiar with questionnaires. Most of us receive them in the post or online, or we get stopped in the street to answer questions. Almost by definition, a questionnaire is a written thing containing one or more kinds of question. The questionnaire may be presented on paper or increasingly may be available online. The questionnaire is simply a means of communication, often used because data can be collected efficiently and inexpensively. It is not difficult to post out thousands of questionnaires to people, who will then (we assume) sit patiently, complete the form and obediently post it back to us. In the same way, Internet-based questionnaires can easily reach many thousands of people. In this case, the data can be collected electronically and even analysed automatically. So, let's be clear about this: questionnaires can be very useful.

Questionnaires can contain questions designed to yield nominal (categories), ordinal (short-scale) or interval/ratio (long-scale) data. Here are three questions that deal with each in turn:

Q1 Are you male ☐ or female ☐

Q2 Place in order of preference the following activities:

- | | |
|------------------------------|--------------------------|
| Watching the TV | ☐ |
| Walking | ☐ |
| Playing your favourite sport | ☐ |
| Going to the gym | ☐ |
| Sunbathing | ☐ |

Q3 What is your yearly income (state amount) £_____

So, questionnaires are pretty good at eliciting data at all the levels of measurement discussed earlier in this chapter. Arguably, however, questionnaires can also be used to obtain qualitative data, as in:

Q4 What do you think would most encourage you to get more exercise?

Now, some people would regard this as merely an open-ended question. The term 'qualitative research' is probably best left to situations where meanings can be shared between at least two people. The question here is open-ended: the participant can answer as he or she pleases but the question does still have structure (the question could have said 'Tell me what you think about exercise') and, importantly, there can be no dialogue between the researcher and the participant. In qualitative research, it is important to achieve a shared understanding of what is being communicated. A questionnaire can never fully facilitate this because it is not possible for the researcher to probe the participant. Let us say that a participant has responded to question 4 as follows:

Q4 What do you think would most encourage you to get more exercise?

I hated sports and physical education at school and that has put me off doing any form of exercise now.

Now, it might be good to explore this with the participant, but a questionnaire does not make such an exploration easy. Arguably, questionnaires are best used to collect data from closed or structured questions or when achieving a common understanding with the participant is relatively unproblematic.

You may have had experience of a questionnaire that is hard to understand. It is important that the questions in a questionnaire are meaningful, both to the participant and to the researcher. Consider this question, included in a fictitious questionnaire to health-care students:

Q5 When did you last experience a period of praxis?

Praxis is a Latin word, meaning 'Practice', but it is a word that isn't used much in nursing. So, the question means 'When did you last have a clinical placement?' It is easy for words to be misunderstood and this can cause real problems in research. Imagine this: the poor researcher thinks the study will reveal all sorts of juicy information about clinical placements, but all the study reveals is that today's students tend not to have studied Latin!

The main disadvantage of questionnaires is that there is often no facility to interact with the participant. However, questionnaires can be used during face-to-face meetings. Sometimes these exist simply to ensure that all sections of the questionnaire are completed, and that the participant understands the questions being asked. When someone stops you in the street and asks you for a few minutes of your time to fill in a questionnaire, the chances are that the researcher will complete the questionnaire. There may be only a limited dialogue between the researcher and the participant, but it may be sufficient to ensure that the participant understands the questions.

There is another problem that is sometimes associated with the use of questionnaires; we cannot always tell whether the participants have been truthful. There are all manner of reasons for why people don't always want to tell the truth. An individual might not be too truthful about how much exercise they get each day, how much alcohol they drink or when they first had sex. In practice, participants can leave questions unanswered if they don't want to answer them, but all too often they may give us a response that is not true. Researchers don't usually talk about 'truth'; rather, they use the word 'validity'. There are ways in which one can test the validity of questionnaire data. One might ask the same question twice but re-worded slightly, or one might repeat a question on another occasion. Unfortunately, it is difficult to discern whether a participant lies reliably (consistently). This may be a problem with any kind of data collection, but it is perhaps more of a problem where the researcher and the participant are not working together, as in the case of a postal questionnaire.

Instead of mailing questionnaires, it is now relatively easy to deliver questionnaire's online. Facilities such as 'survey-Monkey'® are easy to set up and relatively inexpensive. Concerns for this approach include the fact that not everyone is happy using a computer and it isn't easy to ensure who exactly is responding to the questionnaire. Nevertheless, the ease with which online questionnaires can reach large numbers of people, the cost-effectiveness of online surveys and the fact that completed surveys do not need to be posted back to the researcher, have led to an increase in the use of this relatively new technology.

Questionnaires are useful and there are many occasions when they work well. However, as with any kind of data collection, one always needs to question whether there might be a better way of collecting the data. Whether there is or not will usually depend on what the research project in question is trying to achieve.

The interview

This one-to-one communication gets around a lot of the problems associated with the questionnaire. A one-to-one dialogue can ensure that what is communicated is understood by both parties - that is, that there is a common understanding. The interview also enables a less structured, more flexible and more in-depth gathering of data. The interview makes it possible to further the responses given by the participant. In the best interviews, the participant and the researcher share a goal of reaching a common understanding of the participant's views or experiences.

The main disadvantage of interviews is that they are time consuming and resource intensive. However, the interviews should not be dismissed just because they take time to do.

If the interview is the most effective way of collecting data, then interviews should be used. The real question is whether the data could be collected more easily or less expensively in some other way. As always, whether it can or not will depend on what the research study is aiming to achieve.

Focus groups are an 'interview' conducted with (usually) 6 to 12 participants at the same time. Focus groups are useful where the researcher wants to collect data where the participants have a similar and shared experience of something, or when the researcher is interested in the dialogue that may take place between the participants. Focus groups should not be planned simply in order to save time, but only where the particular quality of focus groups accords with the aims of the study. Focus groups may not work well when there is something preventing the issue in question from being discussed freely within the group, or where there are 'dominant' and 'submissive' individuals within the group.

The interview is probably best used where a shared understanding has to be worked at and where a shared understanding does not come naturally or easily (see Yon *et al.*, 2015). It is not surprising, then, that the interview is often used in qualitative studies. Having said that, interviews are often appropriate in quantitative studies too. Consider the admission interview or pre-admission interview often undertaken by nurses. Here, the nurse asks the patient questions about a range of things, from current health status to who will look after the dog when the patient comes into hospital. Now, it would be possible to send the patient a pre-admission questionnaire, but there are advantages in seeing the patient, not least because it allows any concerns or misunderstandings to be probed.

Let's emphasise this point one more time - there is no perfect method of collecting data, only the most effective method in relation to what the study in question aims to achieve.

Participant and non-participant observation

So far, we have looked at methods of data collection that rely on participants' accounts of something that has taken place or on their views or experiences of something. Sometimes, however, the researcher will want to make a direct observation of something that is taking place. So, for example, it is possible to watch healthcare staff washing their hands between procedures in order to take an objective measurement of the standard of handwashing.

'Participant observation' is a term used to describe a situation where the researcher is involved in the situation being measured; in this case, the researcher might be a nurse who would be washing his or her hands, along with the other staff. The nurse researcher might do this 'covertly' (secretly), although these days covert data collection raises a number of ethical concerns and does not tend to be practised. Usually, then, the staff being watched know that they are being watched and have agreed to it. Non-participant observation takes place when the researcher is not involved directly in the practice being measured.

Both participant and non-participant observation can raise concerns about something called the Hawthorne effect (or sometimes 'performance bias'). The Hawthorne effect is so named because it was first identified in studies that took place at the Hawthorne Works, a factory outside Chicago. The Hawthorne effect is where the behaviour of those being watched changes because they know they are being watched. In the case of our nurses, for example, we may find that they take extra care to wash their hands according to the hospital

procedure. There are a number of ways to counter the Hawthorne effect, the most usual being for the researcher to be present for some time before data are actually collected. In this way, the behaviour of the individuals concerned eventually returns to normal as they become used to (habituated to) the presence of the researcher(s). Cutler and Davis (2005) used this technique when measuring the quality of oral hygiene performed in intensive care.

Participant observation can take place within qualitative research. It is possible, especially in ethnographical research, for the researcher to play a role within the community being studied. In this situation, they can make field notes on what they observe, as one of perhaps several data collection methods, such as interviews.

There are ethical considerations in watching people and recording what they do, and today's media-sensitive hospitals do not always welcome researchers who wish to carry out these modes of data collection. On the other hand, the media has often been keen to be involved in the secret filming of staff. In 2019, the BBC reported on video evidence of staff assaulting patients in Muckamore Abbey Hospital, in Northern Ireland (British Broadcasting Corporation, 2019a). In the same year, the BBC reported on the video evidence they had acquired of abuse at Winterbourne View Specialist Hospital in the UK (British Broadcasting Corporation, 2019b). It is debatable whether these 'investigations' are properly 'research' although they certainly possess some of the characteristics of research. A key issue is whether they are systematic and objective. For the time-being, let's include these investigations into a broad category of 'research'. This does, however, mean that we are free to critique them. A participant observer counting the number of times the staff fail to wash their hands, will also count the number of times the staff do wash their hands. If researchers only told us the number of times staff had been observed to fail to wash their hands (let's say, 100 times a shift), we might think that to be pretty concerning. However, if the researcher then tells us that in the same shift, the staff washed their hands 2000 times, we might be slightly less concerned. For this reason, we should look for examples of good care (if such existed) and we should try to be objective and unemotional about what we see; clearly, this is not always easy. Research does sometimes concern itself with emotional issues, but research does at least deserve to be critiqued with a clear head; otherwise, we cannot claim to be practising 'science'.

Participant and non-participant observation remain useful techniques in healthcare research and where we want to study the behaviour or performance of nurses or patients. Again, let's make the point that it is not a case of which data collection type is 'best' but rather which mode of data collection is most appropriate, considering what the research project in question aims to achieve.

Existing data and meta-analyses

It has always been possible to take existing data and subject these data to analysis. Sometimes the data from existing studies are re-analysed, either to check on the original analysis or to run a different analysis. More usually, data that have not already been analysed will be used. An example of this is the analysis of census data (Office for National Statistics, 2011), which take place in various studies (Duthey-Magni and Moon, 2016). In this example, the researchers have not had to collect their data as such. This means that there are fewer

ethical issues with which the researchers have had to deal and, of course, they have not had to collect the data. Using existing data is not only a convenient route to data collection; it is also the most appropriate route in situations where the data already exist. It would be a waste of time collecting new data when existing data are available.

Systematic reviews often employ a 'meta-analysis' of data from previously published studies. In a sense, this is also a use of existing data. Systematic reviews have been mentioned in Chapter 3 and are a review of existing research on a particular topic, together with an analysis of the pooled data ('meta-analysis') from (often) several studies. We noted in Chapter 3 that a convenient source of Systematic Reviews is the Cochrane Library.

BOX 6.3 EXAMPLE FROM THE LITERATURE

Yang *et al.* (2018) conducted a Systematic Review of studies that had looked at the effect of acupuncture on hypertension. Four studies were sufficiently robust to be included in the review. The raw (original) data from the four studies was merged and a meta-analysis used to identify whether the data showed any effect on hypertension. It was found that there was no current evidence that acupuncture had a positive effect on hypertension. Note that this does not mean that acupuncture has no effect on hypertension, only that there is no current evidence that it does.

Historical data

All of the healthcare professions have a rich history. In part, it is the historical depth of the discipline that gives it its professional feel. Understanding the history of each profession makes it possible for us to put the present in perspective. Our understanding of history also helps to prevent us from making the same old mistakes over again and makes it possible for us to learn from what has gone before (Jolley, 2006). Apart from all of this, the history of healthcare can be a fascinating area to study.

Historical studies can involve searching through archives or they can involve speaking with older people to find out what kind of things happened in the past.

BOX 6.4 EXAMPLE FROM THE LITERATURE

Thaweeboon *et al.* (2011) conducted a historical study into the development of the first school of Nursing and Midwifery in Thailand. The researcher used both archived documents and interviews with older people.

Concluding remarks

So, we now know that there are different forms of data (levels of measurement). Numerical data exist as nominal (categories), ordinal (ranking or small scales), interval (long scales)

and ratio (long scales without ends). As we move from nominal through to ratio, the data become deeper or richer – that is, they contain more information. Researchers need to acquire data that are at least rich enough to be fit for purpose. We have also noted that different levels of measurement (nominal, ordinal, etc.) fit with different statistical procedures. All this needs to be taken into account when research is planned.

We have looked briefly at qualitative data and seen how they can be used to help us measure such things as experiences and feelings, even those that are private, troublesome or treasured.

From time to time, we have used examples of the way in which practitioners ask questions. We can use such examples to define research because there really isn't any difference between asking questions in practice and research. In clinical practice, the practitioner is always asking questions and working to solve problems. So it is with research: practice and research are simply two sides of one approach to care.

Summary

- Not all quantitative data are the same. The levels of measurement – that is, nominal (categories), ordinal (short-scale) and interval/ratio (longer-scale) – are important to understand because they determine both the depth of the data (potentially, how much the data tell us) and what statistical procedures can be used on the data.
- Qualitative data usually exist in the form of words rather than numbers. They are often derived from the researcher's attempts to explore feelings and emotions.
- There isn't a best sort of data. Sometimes qualitative data better suit the purpose of the research than do quantitative data. Whatever form the data take, the data should fit the overall aim of the research study.
- The kind of data generated by a study must be linked both to the planned analysis and to the specific objectives of the research. It follows that thought must be given to the sort of data that the study will generate at a time when the design and methods of the study are being decided.

Further reading

This is the current NHS policy on data collection requests. The document makes it clear that the NHS's primary purpose is patient treatment and that requests for data collection should be considered in this light and with regard to the potential worthwhile-ness of the proposed access:

Department of Health and Social Care (UK). 2016. *Data Collection for Health and Social Care: Burden Reduction Plan*. Available: www.gov.uk/government/publications/data-collection-for-health-and-social-care-burden-reduction-plan [accessed 9 September 2019].

This paper discusses the advantages of collecting data by smartphone:

Zhang, S., Wu, Q., van Velthoven, M. H., Chen, L., Car, J., Rudan, I., Zhang, Y., Li, Y. and Scherp-bier, R. W. 2012. Smartphone versus pen-and-paper data collection of infant feeding practices in rural China. *Journal of Medical Internet Research* 14(5):e119.

This is research that indicates online data collection from students can result in less missing data than the collection of data from students in a classroom:

Gregory, V. L. and Pike, C. K. 2012. Missing data: A comparison of online and classroom data collection methods with social work students'. *Journal of Social Service Research* 38(3): 351-365.

Here is another article that advocates online data collection and attempts to deal with some of the concerns, such as 'technophobia' in those being questioned:

Hunter, L. 2012. Challenging the reported disadvantages of e-questionnaires and addressing methodological issues of online data collection'. *Nurse Researcher* 20(1): 11-20.

This is a study that used focus groups:

Shelemy, L., Harvey, K. and Waite, P. 2019. Supporting students' mental health in schools: What do teachers want and need? *Emotional & Behavioural Difficulties* 24(1): 100-116.

This is an example of a study that used a questionnaire:

Jameel, S. S. 2018. Teacher's perception on social support for students with disabilities in higher education. *Indian Journal of Health & Wellbeing* 9(3): 419-423.

Systematic Reviews seek to collect and use the data in studies that have already been completed. To look at the way that data is collected in Systematic Reviews, take a look at a Systematic Review from the Cochrane Database and look at the section of the review that deals with the way that studies were searched for and what the selection criteria were. Here is an example of a Systematic Review that you could use:

Meekums, B., Karkou, V. and Nelson, E. A. 2015. Dance movement therapy for depression. *Cochrane Database of Systematic Reviews*. Issue 2. Art. No.: CD009895.

Here is example of a historical study, take a look at how the data collection was carried out:

Tesseyman, S., Hallett, C. and Brooks, J. 2017. Crisis at Guy's Hospital (1880) and the nature of nursing work. *Nursing Inquiry* 24(4):1-8.

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Chapter 7

Research methods and design

CHAPTER OBJECTIVES

The objectives for this chapter are to:

- discuss the need for research studies to be well planned and fit for purpose;
- identify those methodologies that are commonly used in healthcare research.

Chapter outline

This chapter is about how research is planned and designed.

By now, you will have developed an understanding in your own mind about how research fits with clinical practice. We should now be ready for the next challenge: to make sense of some of the most commonly used kinds of research design.

You have already come across the two most important kinds of research: quantitative and qualitative research. Now we will look more closely at the design of research studies, in order to identify some of the more important subtypes of research. It is not necessary to know about every kind of research design; but knowing some of the more important ones will be a great beginning and will allow you to make sense of other research methodologies as and when you come across them.

Design and method

Anything good needs to be well planned. Research often requires the investment of a considerable amount of time, and no one wants to waste their time on a badly conceived project. In this, research is just like any other project: for example, it is just like planning to build a new house. Get your house design wrong and you could waste a lot of time and money.

If you do wish to build your own house, you will need to spend some time planning the build. Houses don't just spring up by themselves. More than this, you might want the house to be just right for you and your family, especially if you are spending a lot of time and money on the venture. Building your new house will be quite a project for you and that is exactly what it will be – a project. You will need to design the house. You might want to build a carbon-neutral house, so that you can do your part to save the planet. If so, you will need to know how to 'design' such a house (see for example, Dollard, 2017). On the other hand, you might want to build a more traditional-looking house with an emphasis on good-quality materials, and that looks fabulous. If you have sufficient funds, you can design the house of your dreams, as long as the design is good. It wouldn't do to build a house that was 'green' or beautiful but that fell down during the first winter storm. There is more than one possible design, but whatever the design is, it needs to be good and fit for the purpose for which it is intended. In the same way, research needs to be designed, it needs to be planned; there are many available designs, but whichever is used, it needs to be good. Sometimes, researchers substitute the word 'robust' for 'good'. A research design should be robust. That is, it should be fit for purpose, just like your house, and it should withstand any criticism, just like your house needs to withstand the winter storms.

You can build your house using one of several available methods. After the Second World War people built lots of prefabricated houses because they needed to build houses quickly (Stevenson, 2003). You might wish to have your house hand-crafted from the best wood or you might choose to use bricks or concrete. You will build your house using the method of your choice. In the same way, research studies all employ a method; in other words, the design of the study is implemented, or carried out, using a 'method'.

So, the design of a study is 'what will be done' and the method of a study is 'how it will be done'. When you plan your new house, you will probably plan the design and the method of building at more or less the same time. In fact, that is a good idea. It is just the same with research; indeed, people often use the form 'design and method' together. Sometimes, they like to sound important, so they use the words 'design and methodology'; this sounds much more intellectual. However, we all now know that it means nothing more than the way the research is planned - that is, its design and the methods that are to be used to implement that design. The design and method together are the 'plan' for the research.

Once decided upon, the research will possess a plan (design and methodology), which is at that point a kind of road map of how the research will be executed. It is like the instructions that you will give the builders so that they can build your new house to your exact specifications.

If you had just built a lovely new hospital, would you throw away the plans? No, you would keep the plans nice and safe. You will need the plans if cracks appear in a wall somewhere. You would want to look at the plans and ask questions about the design of the wall and the foundations ('design') and you might ask questions about the materials used to build the wall and whether they were to specification (whether the right 'method' was used to build the wall). It is the same with research; we keep the plans nice and safe. The design and methodology of any study are of interest to those who may wish to critique the study. It is important that the design and methodology of the research are available because, unlike a house, which anyone can see, it isn't always possible to tell from data how those data were collected. So, design and methodology are about the planning of research. However, the design and methodology of a study are just as important *after* the study is completed because they allow others to judge the quality of the study.

The elements of research design

There are a range of things that need to be considered when planning any research. These fall conveniently into the following categories:

- Quantitative or qualitative: quantitative research tries to identify the facts about something, whereas qualitative research tries to explore and find meaning in something. Usually, quantitative research usually deals with numbers whereas qualitative research deals with conversations, experience and images.
- Descriptive, experimental and explorative: descriptive research tries to identify 'what is' or 'what has been'. Experimental research (experiments) is concerned with 'what if' situations to develop new ways of doing things. Explorative research is often qualitative and aims to provide a new insight into things. Sometimes, this is a first step to other forms of research but at other times it is sufficient in itself.
- The amount of control: control is arguably more of an issue for quantitative research. The researcher has to make decisions about the degree to which sampling, random allocation and blinding are used. It may be necessary to have only one group within

which data are collected. A survey often has only one body (group) of data. However, an experiment may involve having a control group in addition to the experimental group, for example for reasons of comparison. Designs can be very simple (one group) or they can be quite complex.

BOX 7.1 NEW WORDS

Sampling It is not always possible to collect data from everything or every person in which we are interested. In this situation, the researcher will sometimes collect data only from a sample. In this case, steps need to be taken to ensure that the sample is representative of the whole (the population).

Random allocation This is the process by which the researcher ensures that each participant has an equal chance of being selected in the study and allocated to a group (for example, the experimental group or the control group) within the study. It is a way in which an attempt is made to reduce the possibility of bias.

Blinding This is not as brutal as it sounds. Blinding is the process of ensuring that the individuals who provide, collect and interpret the data do not know which group they are in. For example, a patient in a drug trial might not know whether they have been taking the drug or a placebo, and a researcher collecting data from patients might not know whether each patient (participant) has been exposed to the treatment or is in the control group. Blinding is another means of reducing the possibility of bias or the unconscious interpretation of data.

Most of this is just common sense. It can seem complicated because there are a lot of ways in which research can be conducted. We need to have labels for all of these methods in order to communicate them. None of these research methods are difficult to understand, it is just that there are a lot of them. In addition, not all the terms are mutually exclusive; in this way, we can have qualitative descriptive studies but we can also have quantitative descriptive studies. Nevertheless, designing a research study is so common sense that you could design one now. The section below presents a research problem and asks you to design a suitable study. You will be given prompts so that all you need to do is tick a few boxes. So, let's see whether you can design your own research project.

Design your own study

This study is concerned with the choices made by nursing students at the end of their first year of study. You need to find out how many of them think that they have selected the right field (adult nursing, children's nursing, mental health nursing, learning disability nursing) and how many think that they would like to reconsider their area of specialism. You don't need to explore their feelings on the matter; rather, you simply want to know whether they are happy with their choice or whether they may decide to change to another field.

Now design a study that would be most appropriate. Here are some prompts – just tick the boxes:

BOX 7.2 DESIGN YOUR OWN STUDY (1)**Is the study quantitative or qualitative?**

Quantitative research tries to identify the facts about something, whereas qualitative research tries to explore and find meaning in something. Usually, quantitative research deals with numbers whereas qualitative research deals with verbal or textual material.

Quantitative ☐

Qualitative ☐

Is the study descriptive, experimental or explorative?

Descriptive research tries to identify 'what is' or 'what has been'. Experimental research (experiments) is concerned with 'what if' situations to develop new ways of doing things. Explorative research is often qualitative and aims to provide a new insight into things. Sometimes this is a first step to other forms of research, but at other times it is sufficient in itself.

Descriptive ☐

Experimental ☐

Explorative ☐

Will you take a sample or use all of the end-of-first-year students?

Take a sample ☐

Use all of the students ☐

What design will you use?

It may be necessary only to have one group within which data are collected. A survey often has only one body of data. However, an experiment may involve having a control group, for example for reasons of comparison. Designs can be very simple (one group) or quite complex.

One group ☐

Two or more groups to enable a control ☐

What controls will you design into the research?

Control is arguably more of an issue for quantitative research. The researcher has to make decisions about the degree to which sampling, random allocation and blinding are used.

Will you use randomisation (for selection and allocation to groups)?

Randomisation for selection (if used) of students ☐

Randomisation for the placement of students into experimental and control groups (if used) ☐

No randomisation ☐

Blinding - will you keep any aspect of the research secret from the participants (students) or the people collecting or interpreting the data?

- Blinding of participants (so they don't know which group they are in) ☐
- Blinding of data collectors or those interpreting the data (so they don't know which group the participants are in) ☐
- No blinding ☐

So, how did you design your study? Here are some appropriate answers:

BOX 7.3 DESIGN YOUR OWN STUDY (2)**Quantitative or qualitative?**

- Quantitative ☒
- Qualitative ☐

We are collecting data about people's choices. We can do this quantitatively because we do not want to ask the students about their motivation or feelings about which branch to move to.

Descriptive, experimental or explorative?

- Descriptive ☒
- Experimental ☐
- Explorative ☐

This is a descriptive study: it is describing 'what is'. The students have made their decision (or have decided that they are unsure) and we simply need to find out what it is they have decided.

Use a sample or use all of the end-of-first-year students?

- Take a sample ☐
- Use all of the students ☒

We could take a sample here, but we probably want to know what each actual student wants to do.

Which design?

- One group ☒
- Two or more groups to enable a control ☐

We need only one group of students. We don't have a group for each branch. We have one group of students who will tell us which branch they wish to enter. We don't need a control group, because there is nothing to control.

Randomisation?Randomisation for selection of students ☐Randomisation for the placement of students into experimental and control groups ☐No randomisation ☒*There is only one group of students and we have used the whole cohort – so randomisation is not needed.***Blinding?**Blinding of participants (so they don't know which group they are in) ☐Blinding of data collectors or those interpreting the data (so they don't know which group the participants are in) ☐No blinding ☒*There is only one group of students. The students can't be blinded because they already know who they are. As there is no control group, blinding cannot be used in relation to the researchers' knowledge of which students are in which group.*

The chances are that you either made the same decisions as those listed above or you have good reason for making other decisions. Perhaps you chose a qualitative study because you wanted to explore the students' thinking behind their choice of branch. Indeed, this might make a very interesting study. You may have chosen to use a sample. Sampling may be necessary if the population of students (that is, all of them) is very large.

So, you have just designed your first research study. You did it with common sense, intelligence and analysis. Whatever we know about research, whatever experience we have, it is most important that we use those very same qualities when designing a study. Knowledge is never enough. The most experienced researcher needs the skills that you have just employed here.

Types of design

One of the reasons why research can seem complicated is the multiplicity of available designs. House building is complicated in the same way: there are just so many designs for houses. Questions inevitably arise as to which design is best, most fit for purpose, most robust, etc. It is not necessary to learn about all the research designs ever conceived. Most professional researchers are familiar with just a few designs that are relevant to their area of research, so it would be unfair to expect you to know more than they do. Rather, it is better for you to learn just one or two designs. Learn these well and they will provide a good foundation for a solid understanding of research. In time you may come across other designs, but these will make more sense, more easily, because you will be able to compare them with the one or two designs you learn now.

Research designs, just like the design of a house, are logical and systematic; they are plain, black-and-white, straight-talking things. You wouldn't want any 'grey' areas in your house design, any places where questions could arise about what exactly you wanted. In the same way, the research design is a deeply practical thing. The design is logically contrived; this means (just about) that it is drawn up using a lot of common sense and a little bit of knowledge.

We have already seen that you could design your own research study, just by using your common sense. However, there are a few kinds of research design of which you need to be aware. Most research will be planned using one of the designs below:

- Qualitative: usually purposed to 'explore' a human experience.
- Quantitative: there are three main groups of quantitative designs.
- Descriptive (or 'non-experiment'), identifying 'what is' situations. Sometimes descriptive studies have just one group of data, and sometimes there are more than one group so that differences can be identified. However, descriptive studies are retrospective; they measure 'what is' (what has been).
- Experimental, identifying 'what if' situations. These are sometimes called prospective designs because they are testing out new situations, such as the effects of a new drug.
- Correlational, epidemiological studies. These studies tend to be related to the incidence, distribution and possible control of diseases (that's 'epidemiology').

Correlational studies identify the 'association' between two variables, for example, excessive alcohol consumption and diagnosis of cirrhosis of the liver (Jiang *et al.*, 2014). We might expect that excessive alcohol intake and cirrhosis would be 'linked'. 'Correlation' is just a statistical word for 'linked'. Much of the research around the benefit or otherwise of certain foodstuffs, alcohol, red meat, even chocolate, are correlational in character. Research might demonstrate a correlation between alcohol consumption and development of cirrhosis. However, we need to be very cautious with all of this research because correlation does not imply causation. Let's put this really simply; child weight and child age are strongly correlated (linked). Heavier children tend to be older, lighter children tend to be younger. However, child weight does in no way CAUSE children to be a certain age, only time can do that. So, does excessive alcohol consumption cause cirrhosis, even though the two may be correlated? Even where one variable correlates with another, we cannot be sure that one variable 'causes' another. Correlational, epidemiological studies are often conducted simply because it is impossible to conduct a 'proper' double-blind trial of the sort to which new drugs are exposed. Such a trial on alcohol and cirrhosis would be (1) seriously unethical (feeding people alcohol and waiting to see if they develop cirrhosis) and (2) very expensive (might have to wait a lifetime for people to develop cirrhosis). Correlational, epidemiological studies may be interesting, but they do not tell us if one thing causes another.

We should be clear that there is more than one way to design studies that use one of these main design groupings. However, it is far more important to understand the difference between an experiment and a non-experiment, for example, than it is to understand the several different forms an experiment can take. There is no 'best' design, although some designs do tend to suit some disciplines and some situations. Medicine tends to use

BOX 7.4 NEW WORD

Variable Something that varies. A variable can be the thing that is being observed and tested in research. In an experiment, the *independent variable* is the treatment, the thing that is designed to cause an effect on the dependent variable. The *dependent variable* is the thing that reacts to being experimented on. It is the thing in which the effect of the intervention is witnessed and measured.

the experimental design whereas sociology tends to use surveys and descriptive studies. Most healthcare disciplines are eclectic in nature and as such uses a wide range of designs. This does make it really quite difficult to get an overall hold on non-medical research. Medical doctors are more fortunate, once they have understood a Randomised Control Trial, they will have learned all they need to know about research. Nurses, on the other hand, have a much harder time of it: there is barely any type of research design that is not used in nursing.

Deductive and inductive research

To deduce something is to reach a conclusion about a question by drawing on one or more general principles. We may, for example, attempt to explain an adolescent's behaviour by using Piagetian theory of human development (Piaget, 1952; Piaget and Inhelder, 1972). Researchers sometimes do the same thing with their research: they allow existing theory to guide the research (Regan and Howe, 2017). Deductive research is more commonly found in disciplines that have well-developed theories. If you were to ask a psychologist to explain their work, they might say that they were a Freudian psychologist, a cognitive psychologist or a behavioural psychologist. These terms represent major theoretical streams of thought (theories). It is not surprising, then, that a behavioural psychologist might want behaviourist theory to guide each stage of the research process. Researchers are explicit about the theory that has underpinned their research and sometimes write a section of their research report on the theoretical underpinning or the theoretical model that has been used.

Students are sometimes asked to plan a potential research study. Sometimes, they are asked to include a chapter on the theoretical model that has been used to guide the research. This is unfortunate because most healthcare students will find that they can't think of any theories, or that those they do know about simply don't seem to fit their proposal. This comes about because some people think that healthcare should have lots of theories. Psychology and sociology have theories, so healthcare practitioners should have some too. However, medicine, and the healthcare disciplines are chiefly practice disciplines, they 'do' things, using evidence from multiple academic entities but without getting tied up in the theoretical position that drive those disciplines.

Consider 'medicine' for a moment. Now take pharmacology, histology, psychology, cytology and bacteriology away from 'medicine' - just for a moment, because they are

disciplines in their own right. Now what is left of 'medicine', indeed, what even is it? However, this isn't important, because medicine is a practice discipline; it 'uses' whatever knowledge is useful and with a clear focus on patient illness. Now we can understand why medicine, nursing etc. do not have many theories and why much of their research is not deductive. This has not prevented many academics yearning for some of the theories that characterise pure academic subjects, such as philosophy (Bergdahl and Berterö, 2015). Don't be surprised if you find yourself expected to consider 'nursing theory' for example, even if you can't even think of a single theory.

Healthcare disciplines are rightly pragmatic and practice focused. Healthcare disciplines use a unique mix of knowledge from many different disciplines and arguably do not have theories of their own. If you asked nurses to explain their work, they might tell you what sort of ward they work on but it is unlikely that they would explain their work by making reference to a nursing theory. We should not worry about this: it doesn't make us any less clever or any less academic. In fact, medicine is in much the same position: there are no real theories of medicine. Medicine, too, simply uses a unique mix of knowledge from other disciplines such as pharmacology, histology and even nursing.

Nursing and medicine tend to use inductive research (Ben-Arye *et al.*, 2016). To reason inductively is to draw general principles from detail. In this way, we might look at an adolescent's behaviour and come to a new understanding of adolescence, which we might then use to help us understand the behaviour of other adolescents. Inductive research is a bottom-up approach: it deals with questions about the particular (about practice) and aims to create a new understanding. Indeed, inductive research is often the way in which theory is developed. Healthcare practitioners and doctors tend to be interested in details about practice. They ask questions such as 'How can we better control procedural pain?' and 'Why do these children appear to be so afraid of injections?'

Qualitative designs

The term 'qualitative' is a little misleading because quantitative methodologies are often employed to look at the quality of something. It is better to consider qualitative methodologies as those that explore feelings, personal interpretations and experiences. It follows that qualitative studies only ever involve people (not planets, motor cars or animals). Also, it is usually the case that qualitative studies collect verbal or written data rather than numbers. This is simply because feelings, personal interpretations and experiences are usually best explored using language rather than numbers. The key here is 'exploration'. We could ask someone to rate their level of happiness on a five-point scale but to explore their perception of happiness using a numerical scale would be difficult, the numerical scale would be too crude a measure. So it is that qualitative studies are associated with some kind of verbal dialogue between the researcher and the participant.

The purpose of qualitative studies tends to be different from that of quantitative studies. In the former, the researcher usually wants to know about one or more people and there is little if any attempt to argue for these people being representative of a population. It is

because of this that it is sometimes said that qualitative studies are rather less scientific than quantitative studies. In addition, qualitative studies usually fail the normal criteria for robustness that are applied to quantitative studies. There is no random allocation, no blinding and no means to ensure accurate sampling. However, such concern is misguided, for research is simply a systematic enquiry and qualitative studies are both an enquiry and they are systematic. To criticise qualitative studies for not having random allocation is like comparing cars with horses and criticising horses for not having somewhere to put a suitcase. Qualitative studies are logically determined (well planned) and are focused. Furthermore, qualitative studies address important areas of human existence that could simply not be addressed by quantitative research.

In the past, you will probably have been given a questionnaire like this one:

Module evaluation

How would you rate the module overall?

- | | |
|---------|--------------------------|
| Poor | ☐ |
| Average | ☐ |
| Good | ☐ |

Perhaps you look at this and think, 'Well, it was somewhere between average and good'. Perhaps you look at it and say 'But what *is* average? What *is* good?' While you can respond to questions like this, you probably value the opportunity to discuss the module with the teaching staff. Such a discussion is more likely to enable you to express just exactly how you feel about the module. The question above is essentially quantitative; the discussion you have with the module leader is essentially qualitative.

Healthcare practice deals with many issues that are better communicated using the rich language that we all possess and which helps to define us as human. In this way, qualitative research often deals with people's experiences that are sensitive, emotive and valuable. It would often be inappropriate to try to put these experiences into prelabelled boxes - and if we did such a thing, we would discern only a limited view of reality.

Qualitative studies are just as focused as any other kind of research. These studies clearly identify the research problem (the focus of the research) and the way in which participants were selected. However, qualitative studies do not usually deal with a sample because there is no population to be sampled. This is because most qualitative studies do not claim that their data are representative of that which might be obtained from other people. In any case, the number of participants (the 'sample size') tends to be quite small, often fewer than ten people. Such studies are a systematic enquiry into those ten people. Nevertheless, it is important to recruit participants carefully. If the research is focused on patients' experience of pain management, then there would be little point in recruiting patients who had not experienced pain. Because qualitative studies often focus on difficult and traumatic experiences, the search for and recruitment of suitable participants can be a protracted process and one that requires a professionally mature and sensitive approach.

The number of participants recruited in the study is often determined by data saturation. This means that when one begins to obtain the same information from subsequent participants, there is little point in continuing with the data collection. At this point, the data are said to be 'saturated' and the recruitment of new participants is stopped.

There are no experimental and control groups in qualitative studies. Usually, there is just one group of participants, although sometimes two or more groups can be established when a degree of comparison is warranted. Most qualitative studies, however, have only one group of participants.

Most planning decisions for qualitative studies relate to how participants will be questioned. For example, it may be better to interview participants one at a time or to enable a group of participants to discuss questions together (a focus group). It may be necessary to conduct only one interview or several interviews, even many may be needed. As always, the planning for this should be based on what makes most sense in relation to what the research is geared to explore.

With almost any research, the researcher hopes to summarise the data and to make the data understandable. In quantitative studies, the researcher might use statistical analysis, which in part works to provide a succinct summary of the data. In just the same way, the qualitative researcher will try to summarise what often amounts to many hours of interview data. In most cases, a form of content analysis is used to create themes or commonalities in the data. These themes may then be presented to the participants as a way of asking them 'Does this summarise what you told me?' Sometimes, the participants will respond, 'well, no, not really' or 'well, partly', in which case the researcher will have to do some work on the themes until the participants are happy that they reflect what they said in the interviews. Perhaps you can see that the data collection and the analysis can become merged into one process in qualitative research. This is because the process of providing the data is a learned experience. Participants' understanding of what they have experienced (the focus of the research) can and often does change as they go through the process of communicating that experience. The researcher, too, often becomes part of this process. There is at least a sharing of responsibility for the data between the researcher and the participants, with all parties being committed to producing information that meaningfully reflects what has been experienced. Much of the planning for qualitative research is focused on these aspects of the study, namely the collection, re-collection and ongoing analysis of the data.

Some common types of qualitative research

Qualitative research will be discussed in more detail in the next two chapters. However, it is useful here just to note the most common forms of qualitative research.

Phenomenology

Phenomenology attempts to describe individuals' lived experiences. Phenomenology can look to the outsider as if it deals with the subjective world. However, phenomenologists take

the view that what people perceive as real is in fact real and therefore objective to that person (in 1928, sociologists William and Dorothy Thomas argued that 'If men define situations as real, they are real in their consequences' (Thomas and Thomas, 1928 pp. 571-572)). Phenomenology seeks to identify the meanings that people find in their experience, for example of being hospitalised or of giving birth. It is necessary for this meaning to be shared with the researcher, and thus a common understanding is reached.

BOX 7.5 EXAMPLE FROM THE LITERATURE

In a phenomenological study, Underhill and Dickerson (2011) interviewed nine women who underwent regular breast surveillance because of a hereditary risk of breast cancer. The study found that the women understood their condition. The women had often had family members with breast cancer. The women wanted healthcare staff undertaking the surveillance, to have at least their level of understanding and to be able to discuss their condition with them. The study determined a possible need for the better training of healthcare staff engaged in breast surveillance.

Grounded Theory research

Grounded Theory was developed by Glaser and Strauss (1967) and is inductive in nature ('grounded' in the data). Unlike other forms of qualitative research, Grounded Theory has what can be thought of as a standard 'method'. Grounded Theory is characterised by the use of a 'Constant Comparative Method' where data collection and analysis take place concurrently. 'Theoretical Sampling' is conducted, where the researcher allows the incoming data to guide what prompts are used during subsequent interviews. 'Theoretical Sensitivity' relates to the way in which the researcher is part of the research, which is guided by the researcher's experience and sensitivity and insight in the area being researched.

The data collected in Grounded Theory is analysed in a specific way, which essentially involves assigning textual 'codes' to the interview transcripts. The main messages coming from the transcripts are identified in what is known as 'Open Coding'. 'Axial Coding' then seeks to identify the 'relationships' between the codes. For example, a code for 'pain', may be related to a code for 'distress'. In the last stage 'Selective Coding' is used to identify the key concepts identified from the coding exercise.

Grounded Theory research aims to generate new 'theory' on the aspect of human experience being examined, however, a new 'understanding' might be a better term.

Grounded Theory is replete with unintuitive terminology and appears to be very complex at first glance. However, the concepts that underlie the approach are simple. Additionally, Grounded Theory provides a 'structure' to the research process that is lacking in any other form of qualitative research. If you are the sort of person who just wants to know 'how to do' qualitative research - then this may well be the approach for you.

BOX 7.6 EXAMPLE FROM THE LITERATURE

Matheson *et al.* (2016) conducted a Grounded Theory qualitative study with 18 men with testicular cancer. It was found that the participants had either a constructive and positive way of dealing with their experience or that they developed a negative adjustment, characterised by (a) failure to gain a sense of coherence in relation to what had happened to them, (b) concealing their negative feelings of the disease, (c) a loss of their sense of identity and (d) being generally fearful of the future. There are clear implications of this study in relation to helping individuals use the more constructive and positive forms of adjustment exhibited by some of the participants.

The study is an example of the benefit of researching individual's experiences. It is the very subjectivity of these experiences that is useful. The study also demonstrates the truth in the statement that 'If (people) define situations as real, they are real in their consequences' (Thomas and Thomas, 1928).

Ethnographical research

Ethnographical research developed from Anthropology. 'Ethno' means 'people' (as in 'ethnic') and graphic means 'drawing' or 'picture'. Ethnographic research focuses on culture (a particular culture or an aspect of culture) and examines peoples' behaviour within that culture or the differences between two cultures. Just like anthropologists, ethnographical researchers will immerse themselves in the culture being examined and will seek to become accepted by the people they wish to study. The researchers will then identify participants who are willing to talk about the aspects of their lives that are central to the culture in question. Ethnographic research concerns itself with such diverse cultures as those of remote tribes or children's nursing (see Livesley and Long, 2013).

BOX 7.7 EXAMPLE FROM THE LITERATURE

Using an ethnographical approach, Livesley and Long (2013) researched the lives of 15 children in a nephrology ward. It was found that the children often felt disempowered and without a voice – the staff didn't listen to them or taken them seriously. When their parents were with the children, the parents were able to speak for them. Those children without parents with them, suffered the most and were most likely to receive only basic care.

Qualitative research can be particularly interesting and does have the advantage (for some) that it rarely involves any statistical analysis. The output of qualitative research can be easier to understand than that of quantitative research. In many ways, qualitative research seems to suit the healthcare professions, which after all, have a focus on care and on human experience.

Quantitative designs

In some ways, quantitative designs seem harder to understand than qualitative designs because there are so many of them. However, we need not worry about identifying every type of design. Instead, let's look at the main forms that quantitative designs take. You will gradually learn about new designs as you read more about research and as you begin to put this into practice.

The survey

A survey has a single group of participants, such as a sample of people eligible to vote at an election. A survey is also descriptive, it aims to describe one or more aspects of the sample. For example, a survey may aim to describe how people claim they intend to vote at the next election. A survey is not an experiment because there is no independent variable. Our survey would become an experiment only if, for example, we showed one group of participants a film (the independent variable) of how poor university students were, before asking them whether they intended to go to university. We might then compare the results from this group with those from a control group who had not been shown the film about impoverished university students.

A survey may be simple, but sometimes it is exactly the right choice. At some point, you will have been asked to evaluate a module or course of study at your university. In this case, the university simply wants to know what its students think of the course; it wants to use standard questions with closed, multiple-choice-like responses. For this, a survey is both simple and perfect.

Module evaluation

How would you rate the module overall?

- Poor ☐
- Average ☐
- Good ☐

The survey design is so simple that you might wonder why one should ever use anything more complicated. However, on the whole, we can only analyse survey data descriptively. This means that we can calculate descriptive statistics such as counts and percentages but we cannot easily determine differences or correlations between two groups of data. So, a survey is good for describing what is, usually from one group of data. If this is what we want to do and we are sure we won't want to do anything else, then a survey is perfect.

Although a survey usually has only one group of data, it is sometimes possible to split the data into two or more groups. For example, a survey of potential voting behaviour could look for the existence of differences between male and female voters. This may be reasonable where we are simply attempting to describe 'what is' in relation to the sample as

BOX 7.8 NEW WORDS

Differences and correlations Often we want to consider the difference between one set of data and another set of data; most statistical procedures are designed to do this. Sometimes, however, we want to determine the degree to which one set of data agrees with or matches (correlates with) another. For example, as children grow older, they tend to grow taller; indeed, age and height in childhood do correlate positively.

whole. However, we may quickly run into problems with the sample size for males and females if we do not select the sample with a view to studying the variable sex. Also, we would really need to ensure that the sampling procedure we used was capable of selecting an unbiased sample of both men and (separately) women. In practice, it would be a good idea to have deliberately set out to study the voting patterns of men and women, rather than to decide to do so after we have generated the data.

Planning is important. Of course you could design and build your house with three bedrooms and then decide to add another bedroom later. However, people will always know that the new room was added later; you will never get the colour and style of brick to match that used in the rest of the house. It is just like that with research. It is rarely possible to get away with bad planning. If we want to look at the voting behaviour of men and women and how men and women vote differently, then we should design our research for this purpose - and if we did, we would probably not choose a survey.

The descriptive design

The word 'descriptive' is used here largely for want of a better word. However, what is meant here is a design that is not a survey because it has more than one group designed into it but it is not an experiment because it seeks only to describe 'what is'. A descriptive design does not have an independent variable because it is not seeking to test out something new. Some people call this sort of design 'retrospective'; this is another label meant to indicate that such studies aim to look at 'what is' (or, really, 'what has just been') situations. Descriptive research does not manipulate situations to study them; experiments do.

Descriptive studies lack some of the controls that can be put in place for experiments (prospective designs). In this way, there is no randomised control study for the descriptive design. It is not usually possible to have such controls in a situation where the researcher is studying what has already taking place, perhaps by obtaining data from patients' medical records. Perhaps, for example, we wish to look at two different surgical procedures in respect of how much pain patients had. In this situation, the surgical procedures have been carried out. It isn't possible to set up a control because all of the patients in this situation have now got better and gone home - it is the medical records that are supplying the data. However, some controls can be put in place. We may be able to provide a degree of randomisation in relation to the selection of participants and allocation to groups. We could ensure that the person collecting the data is not aware of which procedure the patient had (blinding). In practice, however, these controls can sometimes be difficult to apply to descriptive studies.

There may be a tendency to criticise descriptive designs for the lack of control they are able to apply. However, randomisation, blinding and control groups may all be quite impossible to apply here. In practice, few if any research studies that involve human participants can ever be perfect. It is perhaps important only to make each study as robust as possible. The material that descriptive studies concern themselves with is the 'what is' situations of life as they are being played out today (or yesterday). It is often important that we research what happens today in clinical practice. Such studies sometimes lead in time to further experimental studies that can offer better control and that can develop new practices for the future.

The experimental design

We are all familiar with the notion of an experiment. It conjures up images of white-coated scientists messing about with test tubes over a Bunsen burner. This is a rather useful image because it is in the laboratory that experiments are most easily undertaken.

BOX 7.9 NEW WORDS

Control group A group exposed to no treatment at all in order to determine what effect the treatment has.

Experiment Formally, an experiment is said to exist where the researcher introduces one or more independent variables to determine their effect on one or more dependent variables. However, the experimental design is also associated with studies that require a high level of control and with measures designed to ensure objectivity and freedom from bias.

Retrospective This means 'in the past'. In practice the term is often used in relation to a descriptive design, perhaps because descriptive designs often look at past events. The opposite to 'retrospective' is 'prospective', a term used for experiments (something that is planned for the future).

In the laboratory, it is possible to have control over everything that happens. We can put mixture *a* into test tube *b* and do whatever we want with it. A high degree of control is one of the factors that characterise an experiment. Unfortunately, it is not usually possible to acquire the same level of control when conducting research with people.

The other main characteristic is that an experiment is dealing with novel situations. The researcher will be asking 'what if' questions such as 'what will happen if I mix substance *a* with substance *b*?' So, an experiment is associated with a high degree of control and it deals with new situations. An experiment is trying to discover things about future possibilities; in other words, it is prospective.

It is one thing to run an experiment in a laboratory but quite another to experiment with people. Healthcare practitioners tend to be interested in people more than they are interested in the content of test tubes. Human beings are difficult to control. We can imagine all kinds of interesting experiments with people, but the people concerned may not be prepared to be

experimented on or may have views about their role within the experiment. Another major issue with experiments on people is that people are inherently variable. They change from day to day and from moment to moment. The laboratory scientist can control all or most of the variables so that they vary only when the researcher wants them to; this is rarely possible when working with people. For this reason, experiments with people are rarely perfect.

BOX 7.10 NEW WORDS
Randomised Control Trial A form of experimental design characterised by a high degree of control of the variables and of the data. As the name suggests, a Randomised Control Trial (often abbreviated to RCT) will employ random allocation and at least one experimental and one control group.
Experimental or independent variable In experiments (quantitative studies), the experimental or independent variable is the thing that is thought to affect another variable. So, for example, if we measure the effect of giving or not giving a drug for pain, the giving or not giving the drug would be the experimental or independent variable. The resulting pain level would be the dependent variable.

Medicine often uses experimental designs. However, medicine’s experiments often involve drug trials. Here, variables are relatively easy to control. It is probably fair to say that outside drug trials, medicine has the same problem with experiments as do the other healthcare disciplines.

Examples of quantitative research designs

Let’s look at the variety of designs available in quantitative studies. We will start with the simplest designs and gradually begin to look at some more complex ones. The more complex designs tend to offer better control and are therefore more robust. However, bear in mind that sometimes a more simple design may be perfectly appropriate. If there were a best design, then everyone would use it and we would have to learn only that one design. When planning research, it is important to use the most appropriate design, whether that is simple or complex.

In this example, there is just one group. Let’s assume that this is a group of people who drive a car. Let’s assume, that we want to know how tired people feel when they have driven for 2 hours on the M1 motorway (see Figure 7.1).

So, this is our design. The x stands for ‘treatment’, which is research language for the intervention to which the research participants are exposed. In this case, it is the recent experience of driving for 2 hours on the M1 motorway. Remember, ‘treatment’ in this context, is a research term. It does not mean to give someone paracetamol or to take their appendix out.

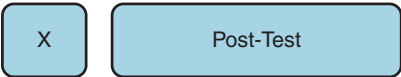


Figure 7.1 Post-test only design.

The Post-Test box signifies the collection of data. Perhaps the research will involve the administration of a questionnaire that asks the participants to rate how tired they feel. Perhaps a psychologist will measure their reaction time to a set of stimuli. In any case, 'Test', in this context is the collection of data (like a teacher collects 'test' papers completed by students).

This design is similar to that of a survey. First of all, it is descriptive; this is not an experiment. The reason that it is not an experiment is that we are measuring only what is already there. We are not introducing a new variable. Second, we have only one group of participants. However, we have selected participants who have recently driven down the M1 motorway. Surveys often use selection procedures, which can be quite focused and sophisticated. After all, there is no point in asking non-drivers to drive down the motorway.

Let's remind ourselves of what this study aimed to achieve - a measure of how tired people are after driving down the M1 motorway for 2 hours. This simple design should be sufficient. However, there are some things that this design would *not* enable the researcher to do. Think about it now and list below some limitations of this design. You don't need to know the answer to this question; you can use reason and analysis to work it out.

This design will not enable us to work out:

- whether these participants were tired before they started driving;
- whether their tiredness level before the drive was the same as after the drive;
- whether the tiredness was made better or made worse by the drive. It is possible that a tired person might be really woken up by having to drive down a busy motorway;
- It is also possible that the 'Post-Test' (being asked lots of questions) might have made the drivers tired; after all, students get tired after doing a classroom test.

However, our design is arguably still fit for purpose. Indeed, we could simply ask the drivers if they feel more tired than they did before the journey. Simple designs can be used to achieve simple outcomes. Indeed, it would be wasteful of resources to use a design that would tell us more than we needed to know.

More complex designs

Let's look at that list above again:

- whether these participants were tired even before they started driving;
- whether their tiredness level before the drive was the same as after the drive;
- whether the tiredness was made better or made worse by the drive. It is possible that a tired person might be really woken up by having to drive down a busy motorway;
- it is also possible that the 'Post-Test' (being asked lots of questions) might have made the drivers tired.

It is often the case that we want to find out whether an intervention makes a difference. Clearly, we could do this by adding a pre-test group. If we test the drivers before and after their 2-hour drive, we will be able to determine what effect the intervention (the driving) has on the participants' tiredness (see Figure 7.2).



Figure 7.2 Pre-test, post-test design.

Remember, $\times$ is the intervention (syn. 'treatment'), the effect of which we are examining. Exposure to $\times$ (the 2-hour drive) is the independent variable. 'Tiredness' is the dependent variable. So, the above design should do it. Now we are testing the participants' tiredness both before and after the 2-hour drive. This should enable us to determine the effect of the drive on tiredness. Now, it will not matter whether or not the participants were tired beforehand. This is sometimes called a 'pre-test-post-test' design. This design may be perfectly adequate. It will tell us:

- how tired the participants were before the intervention;
- whether their tiredness before the intervention was the same as the tiredness after the intervention;
- whether the tiredness was made better or made worse by the intervention.

BOX 7.11 EXAMPLE FROM PRACTICE

Tambag (2018) used a Pre-test-Post-Test design to study the effects on mental health awareness of providing an introductory course on mental health. It was found that the course was useful, participants' scores on the standardised 'Beliefs Toward Mental Illness Scale' increased after the course.

But research needs to be robust and resistant to criticism. Take another look at our pre-test-post-test design and see whether you can see a potential flaw in it.

Perhaps it is possible that the pre-testing might have the effect of tiring the participants. Perhaps, the pre-testing might have the effect of sensitising the participants to tiredness by making them aware that they might get tired. After all, they haven't even done the driving yet and someone is already asking them whether they are tired. In clinical research, the mere presence of someone spending time with the participant and asking about their welfare might cause them to feel cared-for and have more confidence in the staff. This effect could enable them to cope better with the procedure.

So, perhaps our design would be better if we had another group of participants who were not exposed to the pre-testing. Then we could be sure that the pre-testing was not influencing the results.

So here we go, now we have a group of participants who do not have the pre-testing (see Figure 7.3).

We probably now expect to see a difference between (a) and (b), but there should be no difference between (b) and (c). If there is a difference between (b) and (c), then we would suspect that the pre-testing has had an undesirable effect on our data. We should note, however, that this design is more expensive, because this design will need twice as many

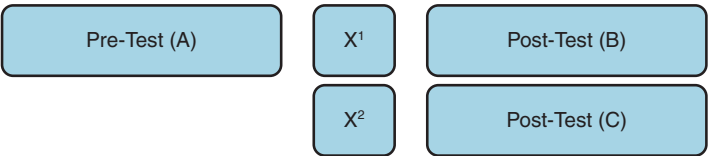


Figure 7.3 A design that controls for pre-testing.

participants and a third more testing. We should also bear in mind that we may simply not have sufficient participants available to be able use of this design.

However, we are not through yet because we can think of another problem with our design. You may be wondering where the control group is. You are right: there could indeed be a problem with our design.

But why would we need a control group? After all, we can tell what happens between pre-testing and post-testing; surely whatever difference exists must be due to the intervention (the drive). Perhaps so, and there may be times when a control group is not warranted. A control group is going to be expensive and we shouldn't use one if we can make a convincing argument that it isn't needed.

Anyway, let's look at what a design with a control group can look like. This design is sometimes known as the 'Solomon four-group design' (Chapman and Richman, 1998); it can tell us:

- a** what difference exists before and after the intervention (experimental group1);
- b** whether pre-testing is influencing post-testing scores (experimental group2);
- c** whether the difference found in (a) would have occurred even without the intervention (control group1);
- d** whether the effect found at post-testing was simply due to the passage of time (control group 2) (see Figure7.4).

If our researchers think that they do not need to test for an effect caused simply by the passage of time or of the effect of pre-testing, then a more simple design may be appropriate. Here is a design sometimes referred to as the 'Classic Experimental Design' (see Figure7.5).

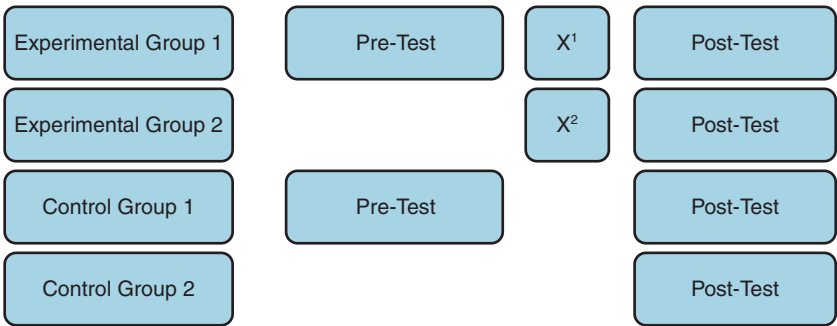


Figure 7.4 The Solomon four-group design.

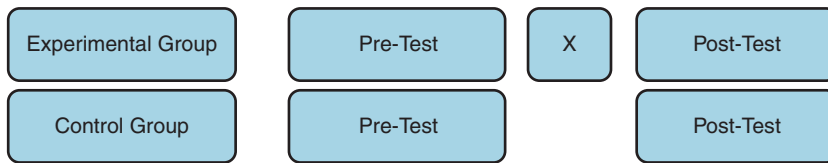


Figure 7.5 The Classic Experimental Design.

There is no hard and fast rule about whether one needs to test for a particular effect, such as the passage of time or of pre-testing. With each research project, it is necessary to make informed choices about what should be tested. Sometimes a more simple design is perfectly appropriate, and at other times a more complex and costly design is necessary. Perhaps the Solomon four-group design, with its ability to test for just about everything, is as close to perfection as we can usually get. However, it may test for things that are surplus to requirements and in so doing may make an unwarranted use of other people's time and money. Both time and money are often precious resources. A great deal of health research is funded by charitable income, and researchers have a duty to use the available funding wisely. For this reason, there is no perfect design, just the most appropriate one in a given situation.

Concluding remarks

This chapter will probably have presented you with some new material to get your head around. If you have found this chapter a little difficult to understand in places, read it again. A good understanding of the material in this chapter will serve you well when you come to look at other aspects of research.

The designs outlined here are in common use. However, when planning a research study, it is always necessary to create a design that is specific to the needs of the research study in question. There is no best design; nor should we choose a design just because it happens to be popular. When you design your house, you will not choose the most popular design, for you will want your house to be just as you want it to be. Your house may have to be energy efficient or it may have to withstand storms or floods. Perhaps your house will need to keep out the heat of the day and be capable of collecting every last drop of rain. There is no best design, only a design that is fit for purpose and that does the job intended of it.

Summary

- Research needs to be well planned. The planning is called the 'design and methods' of a study.
- The plans need to be available after a study is complete, so that others can see how the study was undertaken and judge its quality.
- There are many designs used in clinical research, and these can look complex, largely because there are so many of them. This simply reflects that healthcare is a broad area of study. The many research designs in use reflect the fact that practitioners have

become interested in a wide variety of phenomena and the many different ways in which patients' lives can be improved. There is no perfect design, only a design that is most fit for purpose in relation to the aims of any one particular research study.

- In determining the most appropriate design, the researcher needs to think carefully about what is to be achieved, what constraints exist and the degree to which any proposed design will produce a robust study.

Further reading

This is a qualitative study where the 'data' exist as drawings created by people with chronic pain. The drawings are the participants' graphical interpretation of their pain. The drawings are analysed qualitatively. This study shows that research does not have to be about numbers, or even words:

Phillips, J., Ogden, J. and Copland, C. 2015. Using drawings of pain-related images to understand the experience of chronic pain: A qualitative study. *British Journal of Occupational Therapy* 78(7): 404-411.

Phenomenology is directly concerned with the way individuals see things, their private interpretation of their world. Phenomenology refutes the position that there exists an objective world that can be measured in a way that is meaningful to everyone. This is a study about what being transgender means to 15 transgender adults:

Burdge, B. J. 2014. Being true, whole, and strong: A phenomenology of transgenderism as a valued life experience. *Journal of Gay & Lesbian Social Services* 26(3): 355-382.

Descriptive studies simply seek to find out something. In this study, the researchers sought to find out what the health literacy levels were in children in residential care. We all need to be able to understand health literacy, for example, we need to understand the instructions on a packet of tablets. The study found that children in residential care may often lack the ability to understand even essential health literature:

Trout, A. L., Hoffman, S., Epstein, M. H., Nelson, T. D. and Thompson, R. W. 2014. Health literacy in high-risk youth: A descriptive study of children in residential Care. *Child & Youth Services* 35(1): 35-45.

This is an example of a Randomised Control Trial. The study aimed to identify if providing guidance to people with hypertension would improve their compliance with medication. The study found that the guidance had no effect. This is unusual finding, most often, guidance and information do effect compliance positively. It might be useful to consider why no effect was found in this study; perhaps we should look at the quality of the information and instruction provided to the participants:

McKinstry, B., Hanley, J., Heaney, D., McCloughan, L., Elton, R. and Webb, D. J. 2006. Impact on hypertension control of a patient-held guideline: A randomised controlled trial. *The British Journal of General Practice: The Journal of the Royal College of General Practitioners* 56(532): 842-847.

This is one of many surveys published by national governments, in the case the Scottish Government. This survey looks at many different aspects of life in Scotland, for example, to what extent private households have access to the internet and what play facilities are available for children:

Scottish Government. 2016. Scottish Household Survey 2016: Annual Report'. Available: www.gov.scot/publications/scotlands-people-annual-report-results-2016-scottish-household-survey/ [accessed 4 September 2019].

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Chapter 8

Quantitative analysis

CHAPTER OBJECTIVES

The objectives for this chapter are to:

- introduce quantitative data analysis without the use of any maths;
- provide the reader the opportunity to practice doing some data analysis;
- illustrate the ways in which qualitative analysis is objective and rational;
- introduce the analyses used in Cochrane Systematic Reviews.

Chapter outline

This chapter will look at the use of analytical tools to describe data and to demonstrate the effect that one variable may have on another. The notion of probability will be introduced using familiar examples. In fact, you will find that you are already fully conversant with the notion and use of probability. Using practical examples, this chapter will demonstrate the use of probability within research. The notion of proof will be examined, and it will be suggested that research seldom proves anything but merely determines the degree to which the results can be trusted.

Many people find statistical analysis to be the scariest aspect of learning about research. However, this chapter will show that very few mathematical skills are needed in order to perform statistical tests.

Analysing numerical data

Let's make it clear straight away that you do not need to know how to calculate a statistical analysis. In the same way, you do not need to know how a cardiac monitor produces its display or even how your smartphone plays music. They work and that's all you need to know. There are people who spend their lives developing the electronics inside your cell-phone and the maths inside statistical procedures. Our happy lot is to use the tools that these people devise for us. So, you can put your paper and pencil away now. Researchers do not calculate statistical analysis with a pencil and paper; they use a computer and they use programs on the computer that have been designed to produce statistical output.

Statistical analysis is 'analysis'; it is used to help us clarify the nature of the data and to find things that might be hidden there; to find new information that is not clear without the analysis. For this to be successful, we need to know what it is that we want to find out. This is very similar to the problem solving you use at work. We have to identify the problem before we can work out what intervention is needed. In analysis of numerical data, we need to be just as focused and just as clear about what we are looking for. It is considered very poor practice to run a series of randomly selected statistical analyses and then step back and see what happens.

There are two kinds of statistical procedure, 'descriptive' and 'inferential'. Descriptive statistics serve only to summarise data. The mean or average is a descriptive statistic, as is the sum or total. In order to understand our age in years, we add up the years, so I am 23. This is my total, the sum of my years. One simple number summarises all of my numbers.

Inferential statistics are designed to determine the degree to which we can be sure about the correlation or difference between sets of data. In practice, we want to know whether any difference that exists is due simply to chance or whether it is due to the effect of the variable that we think may be causing the difference (causing the effect). This is a rather long-winded way of saying that inferential statistics are all about identifying whether an effect is significant. Let us look at significance in a little more detail because it is worth understanding this well; after all, showing us the 'level of significance' is the main purpose of all inferential statistical procedures.

BOX 8.1 NOTE

Before we get any further with numbers, we need to recognise that we tend to regard numbers as being always true. The numbers that the pathology lab reports to you about a patient's red blood corpuscle count, those numbers always look true to us, numbers are dependable things. Which would you prefer to believe, a verbal report of your patient's red blood cell (RBC) count, or the numbers printed on a piece of paper?

However, numbers are not always correct. It is as easy to make a mistake with a number as it is with the spoken word and it is as easy to mis-represent the truth with them. Mark Twain (Twain, 1906) famously suggested that 'There are three kinds of lies: lies, damned lies, and statistics'. Really though, there is just the human condition; we make mistakes, and we do not always tell the truth, about how much money we owe, how much we drink, whether we have really given up smoking completely, and how old we are. So, I should tell you now, that I lied, I am not 23 years old, my real number is a lot bigger than that!

BOX 8.2 NEW WORDS

Inferential statistics Literally meaning to draw inferences from the data. Inferential statistics are used to give us a measure of significance, to tell us the likelihood that a measured difference (between two groups of data) could have occurred by chance. In contrast, descriptive statistics, such as total and mean, merely describe or summarise the data.

Probability

It may come as a surprise to you to hear that statistics never prove anything. It follows that, to a large extent, science doesn't prove anything either. This may come as a surprise because most of us have a notion of science that has to do with objectivity and facts. After all, surely science is all about the discovery of known things rather than things that are about opinion and belief. In truth, statistics are often at the core of what we know of as science. Science is about teasing out from everything we don't know the one or two things that we might know or that we think we know. Science recognises the world as an uncertain place but tries to tease out which bits of the world we can be more certain about. Statistics deal with this uncertainty by identifying exactly how certain we are.

'Probability' is a word that is used to indicate the degree to which we are sure about something. However, probability reflects the fact that we never allow ourselves to be 100 per cent certain about anything. In fact, there are only a few things that we are certain about; these things are called 'laws' in science. I am as certain as I can be that if I held an apple in my hand and then dropped that apple, it would drop and not float off into the atmosphere. The behaviour of my apple is predictable and is related to Newton's Law of Gravity (Cook *et al.*, 2019). So, we do think we know some things, but there are very few such laws and very few that can be said to relate to healthcare practice.

'Theories' are a step or two down the knowledge ladder from 'laws'. A theory, such as psychoanalytical or Freudian theory, is a collection of closely interrelated ideas that have some empirical referents, meaning that the theory relates in at least a few ways to what we regard as known facts. However, theory is always evolving. A theory, such as psychoanalytical theory, is in fact a law that is still growing up and still making mistakes.

So, to understand both science and statistical analysis, we must appreciate that the world is a very, very uncertain place. We do know a little about our world, but there is a great deal that we still do not understand. As we apply research to push back the barriers of knowledge, our ignorance of the world takes the form of apparently chance findings. There are things, or variables, in our world that behave unpredictably, because we don't fully understand them. There are other variables of which we are not yet even aware. These partly or completely unknown variables influence our research. It sometimes seems that as soon as we think we know about variable *a*, variable *b* comes along and proves us wrong. It may even be that we don't know what variable *b* is and that for the moment we have to refer to it as 'chance'. Chance is that part of the world that we do not understand but is still active and may impact on us and on our research.

The world of science is unpredictable and changing. However, we do have a way of measuring the impact of what we don't yet know. We call this 'probability'. The purpose of almost all inferential statistical analyses is the measurement of probability - that is, the measurement of the risk that the effect we are looking at may be due solely to chance. Probability informs us of the effect that unknown variables (or chance) may be having on our work.

Let us say that we have tested a new analgesic drug against a placebo. We have tested the drug by asking participants to rate their pain after taking the drug or the placebo. We now have one set of data for the placebo and one set of data for the new drug. The two sets of data look different and we suspect that the new drug has worked better than the placebo. However, we need to make sure that our result could not have occurred by chance, so that if we ran the research again, we would get a different result, perhaps one that supported the placebo. So, we have run a statistical analysis on the data because we know that this will tell us the probability of the result being due only to chance.

Inferential statistical procedures (statistics) are designed to produce a value for probability, which tells us what risk there is that the result of the research was due just to chance. This value is indicated by the letter *p*, followed by a number. Take a look at some examples here:

$p = 0.05$ - There is a 5 per cent risk that the result is due only to chance.

$p < 0.001$ - There is a less than 1 in 1000 risk that the result is due only to chance.

Both these results could be regarded as significant. The word 'significant' is used when we think it is safe to assume that chance did not play a part in the result of the analysis. However, it is up to us (you and me) to decide what is significant. A probability of 0.05, meaning a risk of 5 per cent (5 in 100), is generally regarded as the minimum level for significance. However, for drug trials, we might want to be much more certain that chance has had no part to play in our research.

BOX 8.3 EXAMPLE FROM PRACTICE

Imagine that you are due to drive across a bridge that spans a wide, deep river. You have been told that the bridge is safe. The designers of the bridge are sure about this and their research was significant to $p = 0.05$ (5 per cent).

Would you drive across this bridge? I think that I would want that 'p.' to be a much smaller number.

Statistical analysis is a real help in determining the risk that the result of our research is due only to chance. However, it is important that we understand that the calculation of probability, and indeed research and science in general, can never, ever prove anything. We can never, ever be that certain about any of our research. Even if we have a very small p. value (as in $p < 0.0000000000001$), there will always be a 1 at the end of the zeros. That 1 is the necessary acceptance that we can never be wholly sure. It is an acceptance that we can be wrong, that we are fallible and ignorant of many of the factors that play a part in what we are seeking to research. Perhaps this is the ultimate irony of the scientific age, for indeed we have demonstrated here that we can never be sure. In searching for truths and facts about our world, we have discovered something quite disturbing: that we can never be sure about anything. This should not worry us too much. Knowing that we are uncertain means that it is important to measure that level of uncertainty in our research – that is what probability does and it is chiefly the reason for us using statistical analysis in the first place.

When your tutor tells you that your essay needs a little more analysis, he or she is really saying that your essay needs a little more of 'you' in it, more of your own thoughts, your effort to make sense of the content that you have found in books and journals. It is just the same with research: the analysis is something that goes on inside the researcher's head. Statistical procedures cannot think; rather, they are tools to help us discern what the data contain. In essence, statistical procedures tell us whether a particular finding (a result) may have occurred by chance or whether it is likely to show a true difference or correlation between groups of data.

Let's look at an imaginary research project on patient pain. Here, we have two groups of patients; both groups have pain. We give one group an analgesic drug and we use the other group as a control – that is, we don't give them anything, or we give them a placebo. Let's say that these are the resulting data (pain scores) (see Table 8.1).

Each patient has scored their pain on a scale of 1–10, with 1 being little or no pain and 10 being a lot of pain. If we look at the average (mean) score for each group, we see that we have a pretty conclusive result in favour of the analgesic group. This seems to show that the patients who received the analgesia experienced less pain (see Table 8.2).

So, there we have it; although we need a larger sample size to be certain of this effect (the result), it looks to be quite clear that giving people analgesia will reduce their pain. However, let's just look at the other numbers to make sure. The total score seems to agree with the mean scores: the control group scored higher (had more pain) than the drug group (had less pain). Now let's look at the standard deviation. This is a measure of the dispersion

Table 8.1 Example data

Control group	Drug group
1	1
2	2
1	2
2	1
1	2
2	1
1	2
2	1
1	2
2	1
2	2
10	7
10	7
10	7
10	7
10	7
10	7
10	7
10	7
10	7
10	7
107 Total	80 Total
5.35 mean	4.0 mean
4.33 standard deviation	2.81 standard deviation
Mann-Whitney test = 159.5 (p = 0.257) SPSS v16	

Table 8.2 Example results

Control group average pain score	5.35
Drug group average pain score	4.00

around the mean. This is nothing more than a technical term for how spread out the values are. Note that the standard deviation for the control group is quite large, meaning that the data are quite spread out around the mean. Look at the data for the control group: some scores are low, while others are high. The average value is 5.35; what do you think about this?

- Do we expect the mean to reflect or summarise the data?
- In this case, does the mean accurately reflect the data?
- Did any single participant (patient) give a score on or near 5.35?

The mean should reflect the data, but here it doesn't. The mean does not reflect the data because the data vary a lot. In fact, there seem to be two groups of patients in the control group – some have a lot of pain and some don't seem to have much pain. Their pain scores vary a lot – in other words, there is a high level of dispersion around the mean and, consequently, the standard deviation (which measures the dispersion around the mean) is relatively high for the control group.

Now let's look at the result for the Mann-Whitney test. This is an inferential statistical procedure, designed to show whether the difference between two groups of data could have occurred only by chance – that is, had nothing to do with whether the patients were given analgesia or not. The probability result from the Mann-Whitney test is 0.257. To be considered significant (not due to chance), the result would have to be less than ($<$) 0.05. The number we have (0.257) is much bigger than ($<$) 0.05. So, there is a difference between the scores given by the two groups of patients, but that difference is not significant. In other words, we have no reason to believe that the difference as represented by the mean values was related to the use or otherwise of the analgesic drug.

The Mann-Whitney procedure does what most inferential statistical procedures do: it measures the variance *within* each group of data and then it measures the variance *between* the (two) groups of data. In general:

If the *between-groups* variance (difference between the groups of data) is greater than the *within-groups* variance (difference in numbers within each group of data), then the result will be significant.

If the *between-groups* variance is less than the *within-groups* variance, then the result will be non-significant.

BOX 8.4 NOTE

Read the above again, if it doesn't make sense straight away. It is really useful to understand this.

So, statistical procedures tell us whether a difference that exists (between two or more groups of data) is likely to be due to a chance event or to the thing that we are trying to measure.

What statistical procedures tell us about data is actually quite limited. We need to be careful how we use and how we interpret the results of statistical procedures. All the time, we need to engage our mind when looking at data and the results of any statistical analysis. Indeed, if you look at the data in our example again, you will immediately spot the problem: It is now obvious that the variation in scores within each of the two groups is not expected and this warns us that something is wrong. You have learned a lot. Now you can look at data and provide at least an educated guess at whether the result will be significant or not. Know about statistics? You already know them so well that you can anticipate what the result will be.

Using the right statistical procedure

There are a lot of statistical procedures (you may know them as statistical tests). Some procedures are appropriate in some situations and some in other situations. So, the first thing we need to know is how to choose the most appropriate statistical procedure.

BOX 8.5 REMINDER

Correlation The word ‘correlation’ is similar to ‘association’. We deal in correlations when we want to know whether one set of data behaves synchronously with another. Children’s weights and ages do this. There are lightweight, older children and heavyweight younger children, but on the whole, as children grow older (one set of data) their weight increases (another set of data). In determining this, we do not conclude that weight and age are the same thing; they are not the same thing but these two different things (variables) are correlated.

The fact that two sets of data are correlated does not mean that one variable causes the other. Weight is associated with age but being heavy does not cause one to be old.

If you are reading a research paper, you will want to check that the statistical procedures that were used were the appropriate ones. However, there is an important caveat here. If you have selected your research paper from a good-quality journal, then the paper will have been peer-reviewed. In this way, it will have been checked by someone who does not know the author. The person who did this checking will have more knowledge of statistical analysis than you are likely to have (today). So, what does this mean? In practice, it means that you can be fairly sure that the proper analyses were conducted and that you only really need to document (in your essay) why it was appropriate.

So, what do you need to know? It would be useful for you to know a little about how statistical procedures are chosen, so let us look at a small range of commonly used statistical procedures.

Correlations or differences?

There are two fundamentally different questions that we can ask of data: are groups of data correlated or are they different? Remember: we have to be clear and focused about what we are looking for in the data. Sometimes we want to find out whether one group of data correlates with another group of data, and sometimes we want to find out whether one group of data is different from another group of data.

We might want to know whether children's weight is correlated with their age. Of course, children's weight *does* correlate with their age. As children grow older, their weight tends to increase. This stands to reason, doesn't it? This is an important point: whatever analysis we choose should be logically derived from what we want to find out; indeed, it should always stand to reason in this way. Would we want to know whether children's weight is different from their age? No, such a question does not make sense. The questions we ask of the data should always make sense. This is always sense that absolutely anyone can understand.

Now let us think about the other main question we can ask of data, is one group of data different from another.

Let us assume that we have a sample of patients who are all in pain. We divide this sample into two groups. We give one group an analgesic drug and the other group we give no intervention.

We then ask the whole sample to tell us how much pain they have. Do we want to find out whether the two sets of data (the pain scores) are correlated? No, of course not; we want to know whether the two sets of data are different. This is often the question asked of experiments - that is, does the experimental variable (the intervention) cause an effect on (make a 'difference to') the dependent variable (the pain score)?

We need to note here that different statistical procedures are used where we look for evidence of correlations, and where we look for evidence of differences. We will look at some of these procedures later in this chapter, but for now let's just note that correlations and differences are important ways in which we look at data.

Identifying the correct statistical tool: key questions to ask

BOX 8.6 NEW WORDS

Univariate One variable, for example the effect of providing analgesia on pain perception.

Multivariate More than one variable, for example the effect of providing an analgesic drug on (a) pain, (b) anxiety and (c) contentedness with treatment.

How many groups are contained in the analysis?

It is easiest to think about data analysis as just involving two groups of data. In fact, all researchers would probably like to be using just two groups of data. Unfortunately, it is sometimes necessary to analyse data from more than two groups at the same time. For example, we might need to compare the effect of two analgesic drugs against a control; this would give us three groups of data. Sometimes, we know that there are lots of variables that might be causing an effect and so we need to include them all in the analysis.

There are two important considerations here. The first is that the number of groups of data will help to determine which statistical procedure we use. The second is that statistical analyses become more complex as the number of groups of data increases. No one wants this to happen, it is seriously undesirable. An analysis should always teach us something new about the data; it should never confuse us. Laboratory researchers will go to great lengths to reduce the number of variables with which they have to deal at any one time. They will ensure that they have only one chemical in their test tube and not a mix of chemicals. Unfortunately, those of us who wish to research human beings often find that we can't squash them into test tubes, they usually won't fit. All too often, we are interested in the complex mix of variables that is human life, and so our analyses tend to be 'multivariate', composed of several or even many variables.

We need to be clear about the relationship between a 'group' of data and 'variables'. We already know that there are two broad categories of variable; that is 'independent variable' and 'dependent variable'. The independent variable might be 'treatment type' and the dependent variable might be 'recorded pain level'. However, although this study might have only one independent variable ('treatment type'), this might be divided into three groups or 'conditions' (when these are categories, they are sometimes called 'factors'). These conditions might be 'drug-A', 'drug-B' and 'control' (no drug). So, here we have one independent variable with three groups (three conditions). These three 'parts' of the independent variable are going to produce three sets of data (groups of data).

A study might have more than one independent variable (each with its own conditions or groups) and it might have more than one dependent variable. We might, for example, want to measure the effect of two independent variables, 'treatment type' and 'sex', on two dependent variables 'recorded pain' and 'days in hospital'. We might want to do this because we think there might be an interaction between these variables. Figure 8.1 shows this graphically.

Correlation studies do not (really) have an independent or dependent variable, they just have two variables. We might want to see if child age and child height correlate for example.

What is the level of measurement?

This is easy; we have already worked it out. We have noted that numerical data exist within one of three levels of measurement. We noted that each of these levels of measurement has a separate collection of statistical procedures associated with them. These are:

- nominal (categories);
- ordinal (items placed in order or any short scale);
- interval or ratio (a long scale).

You can now select the appropriate statistical procedure

It will have occurred to you by now that we have been looking at statistics without actually mentioning many of them by name. This is because statistical procedures all do pretty much the same job, but there are different procedures (different statistics) for different kinds of data and where we want to ask different questions about the data, for example whether the data contain correlations or differences.

Believe it or not, you are now able to select the appropriate statistical procedure for a range of commonly used research designs. Even if some of this chapter has been a little difficult to grasp, you do now have the skills to select the right statistical procedure from quite a range of statistics that will fill a whole page. Take a quick look at this graphic of commonly used statistical procedures, be suitably awestruck at the sheer number of statistical procedures, and then read on to discover that you already do understand how to select the right statistical procedure for a variety of research designs (see Figure 8.2).

In 1 minute you will have:

- been horrified by the number of statistical procedures available;
- decided that it is too complex for anyone to understand.

In 2 more minutes you will have:

- demonstrated to yourself that you do understand it and that you can select appropriate statistical procedures for a variety of research designs.

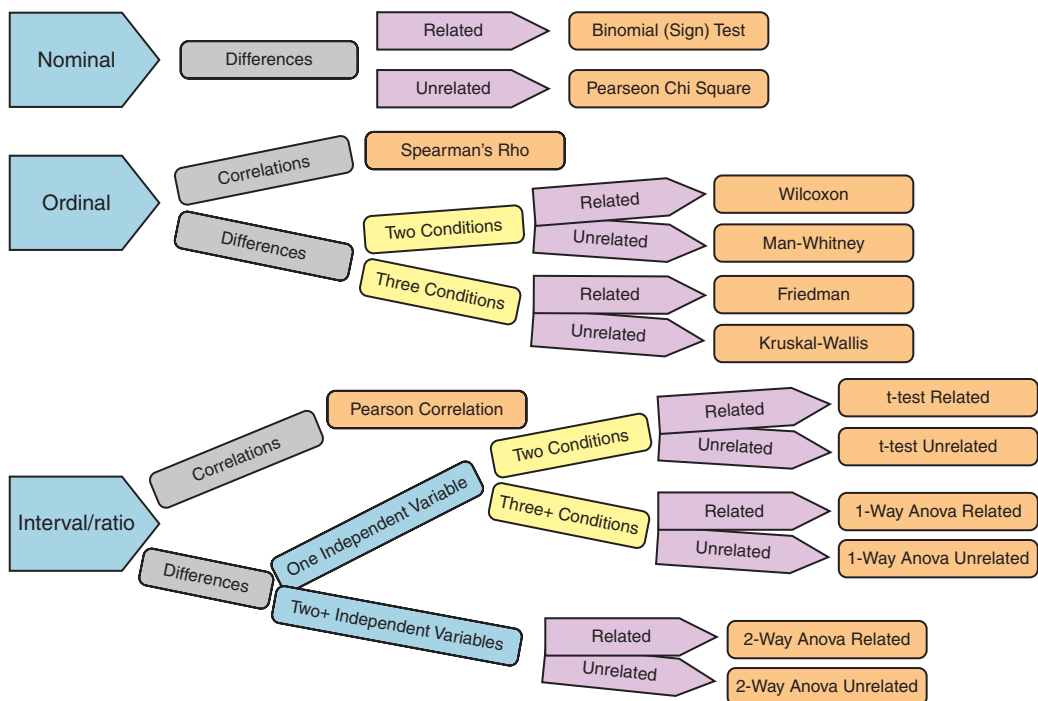


Figure 8.2 Commonly used statistical procedures.

Now select the most appropriate statistical procedure for the following research designs.

Design 1

This study looks at the difference in 'regard' for the NHS between a sample of people aged 20-30 years and a sample of people aged 65-85 years. The participants are asked 'Do you trust the NHS to care for you when you are ill?' The participants are asked to answer simply 'yes', 'no' or 'not sure'.

The data produced by this study are *nominal* (the categories are 'yes', 'no' and 'not sure').

It is hypothesised that there will be *differences* between the responses from the younger and the older group of participants.

The design is *unrelated* because the two groups of participants have nothing to do with each other (the design would be related if the study asked younger people about the NHS and then waited until years later, when they had become older people, before asking them the same question again).

Look at the information above and write down the name of the statistical procedure that should be used for this study _____.

Correct! You did it: it is Chi Square. Let's do that again with something much more complicated (I am sure you will get this right too).

Design 2

We want to run an experiment to see whether anti-hypertensive drugs, increased exercise or both anti-hypertensive drugs and increased exercise have the best effect on the blood pressure of people being treated for hypertension.

The data collected by the study will be blood-pressure recordings. Blood pressure will be measured in mmHg on a scale that (theoretically) can be zero (or less) and that is continuous (it is possible to have a systolic BP of 120.3456 mmHg, should we wish for that degree of accuracy). So, the level of measurement is *interval/ratio*.

The study hypothesises that there will be *differences* between the data collected from the three groups of patients.

In this experiment, there is *one independent variable* - the type of treatment. This independent variable has *three conditions* - the three groups of patients, i.e. anti-hypertensive drugs, increased exercise and increased exercise together with anti-hypertensive drugs.

The design of the study will be *unrelated* because we will be using different people for the three conditions (if we used the same people, exposing them to each condition in turn, then the design would be related).

So, look at the information above and write down the name of the statistical procedure that should be used for this study _____.

Awesome! The most appropriate statistical procedure is the one-way ANOVA (unrelated).

Well done! Statistics ARE easy. The research design tells us which one to use. We run that one-way analysis of variance (unrelated) in a statistics application such as SPSS®, just like we use a word processor to process words.

In 1 minute, you have:

- been horrified by the number of statistical procedures available;
- decided that it is too complex for anyone to understand.

In 2 more minutes, you have:

- proved to yourself that you do understand it and that you can select appropriate statistical procedures for a variety of research designs.

What does a one-way analysis of variance do? It does what all inferential statistical procedures do: it looks at whether the within-group variance is greater or less than the between-group variance (whether the difference in BP scores *between* the three groups of hypertensive patients is greater or less than the degree to which the scores *within* each group vary). In doing this, it will tell us to what degree we can be sure that any difference between the groups is due to the effect of the independent variable or whether we should deduce that any such difference is due merely to chance. The one-way analysis of variance will give us a probability value (p.), which will tell us what risk there is that any differences between the groups is due just to chance. If you understand the meaning of the p.value in a one-way analysis of variance, you understand its meaning in all inferential statistical procedures.

An example from the literature: data analysis using Pearson Chi Square

Yildirim *et al.* (2010) used Pearson Chi Square to determine whether there was a difference between medical and nursing students in relation to their perception of the usefulness of Complementary and Alternative Medicine (CAM).

Yildirim and her colleagues simply asked nurses and medical students questions about their impression of the usefulness of CAM. The responses were categorised as ‘agree’, ‘undecided’ and ‘don’t agree’. So, the data elicited from the participants was ‘nominal’, that is they existed as ‘categories’. If we look at the results in the table below, we can see that they form a two-by-three grid that looks like Table 8.3.

Table 8.3 A Chi Square data table

CAM practices should be integrated in my school curriculum			
	Agree	Undecided	Disagree
Nursing students	61.3	23.4	15.4
Medical students	37.9	22.3	39.3
Pearson Chi Square p.<0.001			

Don't worry about the Chi Square statistic for the moment. Just look at the figures, that is 'eyeball' them. When I look at them, I can see that nursing students were more likely to agree that CAM should be taught to students, than were medical students. However, in order to convince others of this result, the researchers needed to demonstrate that this result was unlikely to have occurred by chance. To do this, they subjected the numbers in this two-by-three grid to statistical analysis using Pearson Chi Square. The result ($p < 0.001$) indicated that the risk of this result being due to chance alone was less than 1:1000. We can therefore, be reasonable certain that the result which we can see in the table, was in fact, caused by what we think did cause it, that is, a difference between nursing and medical students on the perceived value of CAM in the curriculum.

So far, we have introduced a whole tranche of everyday statistical procedures. It would now be good to take a quick look at two other groups of statistical procedures that you will probably come across in the literature. The first group of statistical procedures, deal with prediction and 'survival' (as in time to death, or time to reoccurrence of a disease). We will then take a quick look at the forms of analysis used in Systematic Reviews.

Prediction and survival

You may come across this group of statistical procedures in the medical research literature. Here is a brief outline of this group of statistics.

Regression Analysis

Regression Analysis can be considered to go beyond correlation. We have already seen that correlation is where two variable move together (the age and weight of children), these two variables are 'co-related', that is, they are related to each other, when one moves, the other moves, when the child gets older, (typically) the child's weight increases. We have also seen that 'causation' is not implied in correlational studies; a child's weight does not cause age.

Now, we might want to argue that the dose of an anti-hypertensive drug is not only related to its effect on hypertension but also that it causes that effect. This is when we would use Regression Analysis, i.e. when two variables are related and where we do want to test the effect that the one variable has on the other. Just as with the statistical procedures we have already looked at, which Regression Analysis we select will depend on the level of measurement of the Dependent Variable. Sometimes, in Regression Analysis, the independent variable (the one that is hypothesised to have an effect on the other variable) is called the 'Predictor Variable' and the Dependent Variable is called the 'Criterion Variable'. The types of Regression Analysis for each level of measurement are listed in Figure 8.3.

Survival Analysis

Survival Analysis is used where we want to know how long something will last. In Engineering, it is often useful to be able to predict how long a building will stand or how many years it is likely to be before a bridge fails. In medicine, we often want to know for

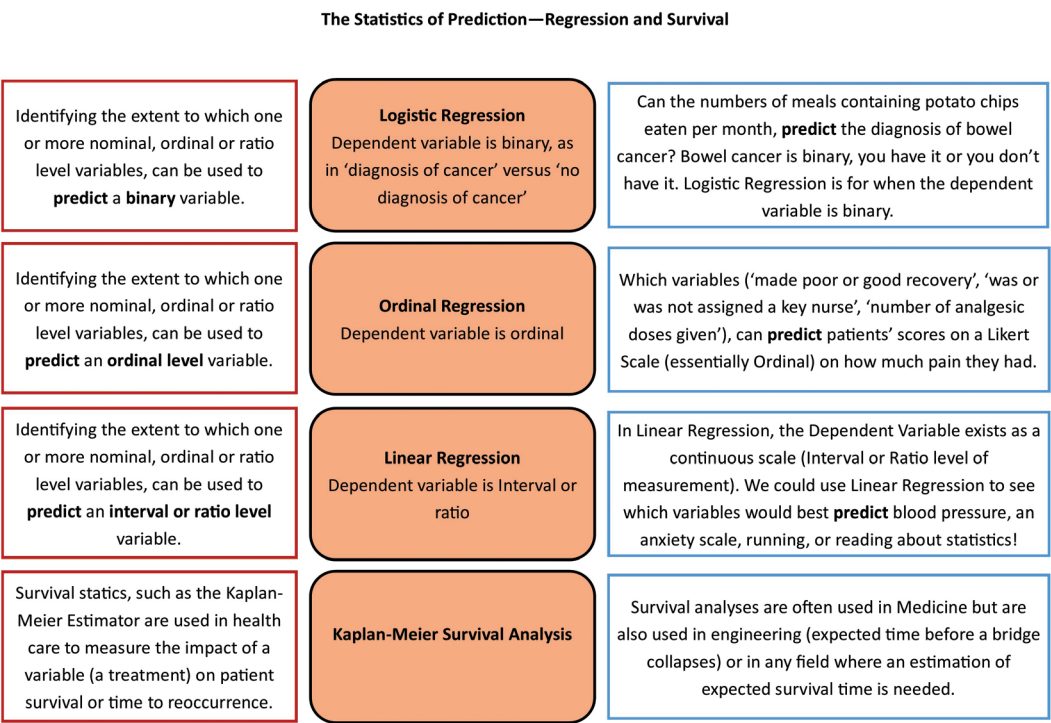


Figure 8.3 The statistics of regression and survival.

how long a drug is likely to be effective. Survival Analysis can be performed on anti-cancer drugs so that we have an estimate of how long their use will enable to patient to, well, survive. The Kaplan-Meier procedure is often used in medicine.

Statistical procedures used in Cochrane Systematic Reviews

Systematic Reviews look at all the research on a particular subject. In this, they are similar to systematic literature reviews. However, Systematic Reviews sometimes go much further, in that they collect all the raw data from the studies included in the review. The data is then put together and analysed; this is referred to as 'meta-analysis'. This process can identify those studies that add most to the analysis and those that do not. In practice, this deals effectively with the problem of two (or more) studies having conflicting findings. The statistical tests used in Systematic Reviews are presented in a rather unique, graphical format. This is designed to make the statistical analysis easier to understand. Figure 8.4 shows a typical example from a Systematic Review by Derry *et al.* (2012).

The vertical line is the line of no effect, if a blob or the line of a blob touches or goes through this line, the result is non-significant. We can see two horizontal lines with small blobs; these are significant results supporting the Control (indicating that the Control has

Forest Plot of the the type used in the meta-analysis of Systematic Review data.

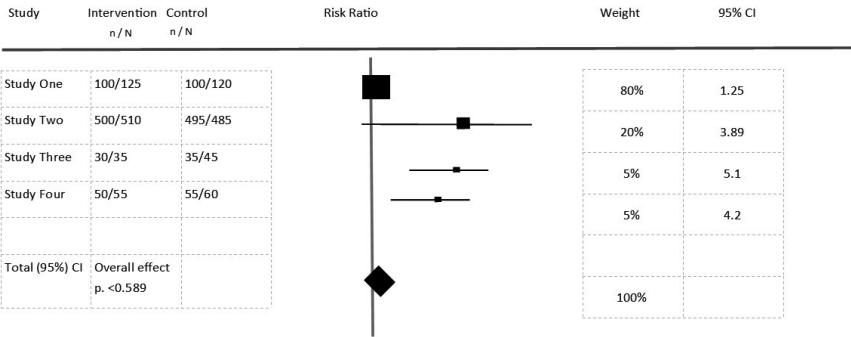


Figure 8.4 A meta-analysis Forest Plot.

had an effect)). However, because these have only small blobs, they have not contributed much to the analysis. They also have quite long horizontal lines, this means they have quite a high confidence interval values and so should be trusted with caution. Finally, we see the big blobby diamond shape, firmly sitting on the vertical line of no effect, so we can be sure that the overall result in non-significant, the overall meta-analysis of the combined data from all four studies, fails to support either the intervention or the control (see Figure 8.5).

Forest Plot of the type used in the meta-analysis of Systematic Review data.

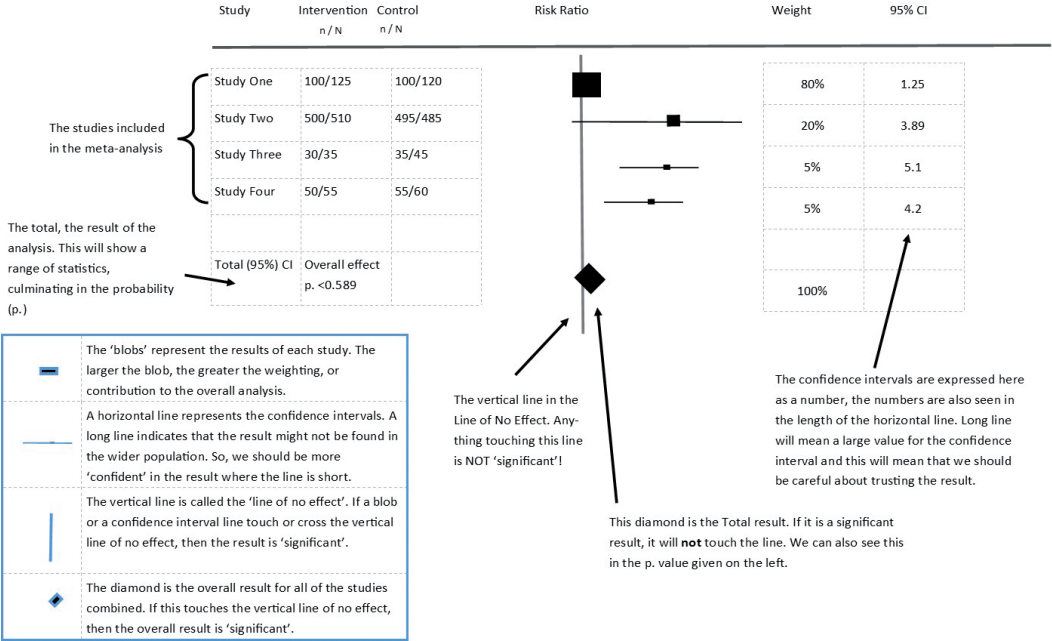


Figure 8.5 A meta-analysis Forest Plot (labelled).

The charts used in Cochrane Systematic Reviews are called Forest Plots (they contain a 'forest' of lines). The charts are sometimes called 'Blob Charts' because of the square and triangular 'blobs' they always contain. The statistics used in the Forest plot are Odds Ratio for categorical data and Risk Ratio for continuous data. However, the really good thing about Cochrane charts is that the chart will look the same whatever statistical procedure has been used.

Forest plots always have a vertical line (the line of no effect) with 'blobs' shown on one or other side of the line. One side of the line is designated the 'control' and the other side is designated the 'treatment (intervention)'. In this way, a result (a blob) will do one of three things:

- 1 It will sit in the control area (on the right in the above chart), showing that the result supports the control (often a placebo, or 'normal care').
- 2 It will sit in the treatment area (on the left in the above chart), showing that the result supports the intervention.
- 3 It will sit on or touch the vertical line of no effect, or the blob's confidence interval (the horizontal line that goes through the blob) will touch the line of no effect. This means that there is 'no effect'. The result of the study neither supports the intervention or the control.

You can see from Figure 8.5 that each study has its own result, we can see each result in relation to the other results. However, you will also see that there is a summary result, the summary results are diamond shaped. In this way, Cochrane charts show us a meta-analysis of all the results, together with one final summary result. The meta-analysis is a way of dealing with conflicting results. The analysis does not just calculate an average score from all the individual ones; rather, the process works out the contribution that each study made to the analysis, called the 'weighting'. We can see the weighting for each study, reflected in the size of the blob. Studies that were able to contribute more, perhaps because they had a larger sample size or a clearer 'result', have a bigger input into the summary result. In this way, the meta-analysis used in Cochrane Systematic Reviews is an effective way of summarising many individual studies, concluding as they do, with one single summary measure which can always be seen to (1) support the control, (2) support the intervention or (3) show no effect at all.

Concluding remarks

Data analysis of any kind exists to serve two purposes. The first purpose of analysis is to discover things (effects) within the data, effects that might not be at all obvious from looking at the raw data (sometimes called 'eyeballing the data'). The second purpose is to summarise the data in order to make them more understandable and to make it possible to communicate the data in a way that will be both succinct and meaningful. However, even the most complex statistical analysis is only a tool. Analysis does not remove from the researcher the responsibility to consider the data carefully and to critically evaluate what

the analysis has shown, together with any weaknesses inherent in that analysis. As professionals who may be asked to integrate research findings into practice, healthcare practitioners are free to criticise an analysis and to suggest alternative interpretations of the data.

Data analysis, especially when it is quantitative and statistical, probably scares many people away from research. However, we have seen here that data analysis really can be easy to understand. We should bear in mind that no one knows everything about data analysis and that even the most accomplished researchers tend to be familiar only with the kinds of analysis used in their own field of work. Of course, there are many forms of data analysis that have not been covered in this chapter, but the principles of data analysis, as those principles affect almost any kind of data, have indeed been covered here. That's a great start and one that will allow you to develop your understanding further.

Summary

- In statistical analysis, a knowledge of mathematics is not needed. Researchers use computer applications, not a pencil and paper.
- Inferential statistical procedures (tests) do not prove anything; rather, they demonstrate the degree to which chance may have had an effect on the research.
- It is up to you and me to decide whether the level of probability (as in $p = 0.05$) is acceptable. We are free to suggest that a higher level of significance would be desirable.
- Selecting the correct statistical procedure is not usually difficult, even though there are many statistical procedures available.
- A secondary purpose of statistical analysis, especially where descriptive statistics are used, is to summarise the data and to extract from the data, information that is often not otherwise readily apparent.

Further reading

A great way to learn more about statistical analysis is to explore the computer application known as SPSS. This is an expensive product, but most universities make it available to students. SPSS originally stood for Statistical Package for the Social Sciences. More information on the SPSS suite of applications can be found at www.spss.com. SPSS is shipped with some example data files; your university computer centre will show you where to find these. Try loading in some data and simply play with the application. There are several good books that can help you get to grips with SPSS and with quantitative data analysis, including these:

Pallant, J. 2016. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows*, Milton Keynes: Open University Press.

Field, A. 2017. *Discovering Statistics Using IBM SPSS*, London, Sage.

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Chapter 9

Qualitative research

CHAPTER OBJECTIVES

This chapter aims to:

- 1 define qualitative research;
- 2 explain how the subjectivity of qualitative research is a particular asset;
- 3 introduce Ethnography, Phenomenology and Grounded Theory.

Chapter outline

This chapter will introduce qualitative research. At first sight, qualitative research can seem a lot easier to understand than its quantitative sibling. Qualitative research papers are written in easy-to-understand English; they have a 'friendlier' style and describe the research without (usually) using any statistics at all. However, qualitative research can lure the new researcher into a false sense of security. The 'results' of qualitative studies are indeed easy to understand; unfortunately, the philosophical background to the various approaches to qualitative research, are rather dense. However, we will not let this put us off any more than not knowing how our mobile or tablet works puts us off us from using them. Let me guess that there were two subjects you never really liked at school or university. My guess is that one of those subjects was maths, and the other was philosophy. In this chapter we shall leave maths and statistics behind, only to fall into a dark and muddy pit full of philosophy. Do not despair! You have got this far with your sanity intact and you will succeed with this chapter too.

In previous chapters, we dealt with statistics in the same pragmatic manner that health-care practitioners deal with most things. We found that we could understand statistics and their use without having to wallow in any mathematical theory. In this chapter, we will examine qualitative research without needing a degree in philosophy. Qualitative research is an inherently practical and pragmatic undertaking (ask any PhD student). It must then be the case, that even the muddiest recesses of qualitative methodology can be seen in ways that are practical and pragmatic; in this chapter we will be seeing things in just this way.

Let's just remind ourselves of the differences between quantitative research and qualitative research:

Quantitative research

Quantitative research usually deals with numbers that can be tested in some way with statistical procedures. Quantitative researchers almost always know what questions to ask. When we ask, 'how much pain do you have?', we know what pain is and we know that we want to ask questions about it. When we test a new drug, we know what variables to measure; if we are testing a new anti-hypertensive drug, we know that we will want to record the participants' blood pressure. In quantitative research, we know what questions to ask and we can be focused and objective.

Qualitative research

Qualitative research usually deals with spoken or written language. Qualitative research usually starts with a question like 'how do people experience this particular health problem?' Qualitative research is used when we know so little about a human experience that we do not know exactly what questions to ask. In fact, qualitative researchers don't usually use 'questions', they normally use prompts: 'tell me about your pain', instead of

'how much pain do you have?' Klopfer (2008) suggests that we should use qualitative research when:

- there is little known about a topic;
- the research context is poorly understood;
- the boundaries of a domain are poorly understood;
- the phenomenon in question is not quantifiable.

According to Frank and Polkinghorne (2010 p. 52), qualitative research is 'the method of choice to understand the complexities of being human'.

What is qualitative research?

Those who are looking at research for the first time are often put off by the apparent complexity of quantitative research. When they stumble across qualitative studies, they think that they have found a much more 'approachable' form of research. Qualitative research rarely uses numbers or statistics; instead, the results are reported in textual form, often in a manner that can be readily understood. Qualitative researchers usually reject the passive voice in their writing and are happy to refer to themselves as 'I' and to refer to participants by their (fictitious) first names. This alone makes reading the text a much more 'human' experience. Indeed, qualitative research does seem to be in touch with the feminine side of human nature. It seems to exist in a 'softer' and more 'sensitive' contrast to quantitative research.

However, qualitative research can be quite difficult to do; its methodology is tied up with some very complex philosophical ideas. It is also the case that data collection and analysis can take a considerable amount of time. One should not adopt qualitative research out of a mistaken belief that it is 'easier'; nothing could be further from the truth. In any case, neither quantitative nor qualitative research should be adopted for any other reason than that they are the right choice for what the researcher is trying to find out. Quantitative and qualitative approaches do not compete with each, rather, they should be seen as complementary; two different approaches which are available to the questioning practitioner.

Qualitative research is sometimes criticised for being too subjective (see Povee and Roberts 2014). However, this subjectivity is an intentional aspect of qualitative research and is not some kind of flaw in the methodology. Qualitative research is designed to deal with the subjective world, and it elects to view that world subjectively. It might be worth a couple of minutes to look at the converse argument, that quantitative research is too objective.

Quantitative research is closely aligned to the notion of 'science' and of the world being an objective and measurable place; this is sometimes called the 'positivist' view of the world. There are certainly aspects of the world that are measurable. We can measure body temperature for example; this gives us a number (37° Celsius). This number is meaningful to us; we can compare it to other people's body temperature. Values such as body temperature have a consistent nature and are reliable. So, let us be clear, an objective world does exist, and quantitative research is well placed to measure it.

BOX 9.1 REFLECTION POINT

Pause for a while to reflect on what 'science' means to you. Pretend you are lying on the psychiatrist's couch and you are asked to think of words relating to 'science'.

I came up with 'laboratory', 'Bunsen burner', 'lab coat' and 'safety glasses'.

Medicine claims to be a science – the next time you visit your GP, why not ask to see his/her laboratory (the word 'laboratory' has to be pronounced with a Germanic or Russian accent). You may then be surprised that your GP doesn't actually have one. So how can medicine be a science? If medicine is really a science, medics must be 'scientists' and scientists surely must have a laboratory.

Now take yourself to the main entrance of your university and look at the signpost there. You will probably see directions to the Faculty of Arts and the Faculty of Science. Now ask yourself, 'what is the difference between the two?' It must be a big difference for every university to be divided into Art and Science.

That's right, the Faculty of Science has a laboratory and the Faculty of Arts does not (we were right about the laboratory). But can the existence of Bunsen burners and lab coats really be the defining characteristic of science?

Perhaps Science deals with facts and Art doesn't. No facts in Arts then. Perhaps Science is objective and methodological. So people who study History and English Literature don't deal in facts and go about their study in a more or less random and uncoordinated way. In fact, both History and English are studied methodologically, facts are dealt with and it is possible to do a PhD and to research both History and English Literature.

So, what is 'science'? Perhaps it is nothing but an over-arching construct with no truly objective meaning; a bit like 'love' and 'God'. Perhaps 'science' does not exist at all.

The problem comes when we begin to think that everything that matters is measurable. The behaviourists in the early twentieth century, thought, for example, that it would ultimately be possible to know exactly how to bring up children (see Watson, 1928; Hardymont, 1995). I suspect that most of us who have tried to bring up children are aware that the very complexity and individuality of children makes it impossible to see them objectively, as simply a collection of facts and figures. Children, like all human beings, are hopelessly complex, variable and inconsistent. You will recall from your own childhood that you would be well behaved and compliant one day and a true monster the next. We are simply not reliable ('consistent'), and we are so complex that even our parents never really understand us. In fact, most people would probably claim that they do not even fully understand themselves. This is a real problem for both science and quantitative research, which can only deal with an objective, measurable and consistent world. In fact, the whole point of statistical analysis, so much a central part of quantitative research, is to determine the likelihood that the results obtained might or might not have occurred by chance. To the quantitative researcher, 'chance' is that part of the world that is not yet understood and which may, therefore, vary and change in ways that are unpredictable. Quantitative researchers aim to design their studies, so that 'chance' is kept out of their data. It follows that quantitative research has a real problem when 'everything' is unpredictable (like people).

So, science and quantitative research has a problem with phenomena (things) that are inconsistent or unreliable, and that can't be measured with numbers. Now this is not a problem, as long as healthcare practitioners only deal in an objective, measurable world. We have no problem with body temperature, the size of an infant's chest shown on a radiograph, a blood count showing anaemia - all these are measurable and reliable indices of an objective world. The trouble is that healthcare practitioners spend at least part of their time with something that is not objective, is often too complex to measure and too poorly reliable and consistent, something that is often very poorly understood - the person, patient, client; the human being. So it is that health care practitioners find themselves asking such questions as:

- What is it like for a patient to experience my operating theatre?
- What sense do young children make of the physiotherapy I provide?
- What is it like to have schizophrenia?
- How do dying people experience the largely secular health service?

In other words, we often want to know about human experience. It is here that qualitative research has a useful role. In these situations we cannot give people a questionnaire because we don't know what questions to ask; instead, what we have to do is ask questions that are little more than prompts, such as, 'tell me what it is like to have schizophrenia?'

Qualitative researchers sometimes talk of human experience yielding 'deep' or 'information-rich' data. Human experience exists as a complex 'weave' of interrelating experiences, all of which are understood in different ways and at different levels, with our understanding of our experiences changing over time. In this way, human experience is not one reality but a 'multiplicity of realities' (Campbell and Roden, 2010 p. 114). Furthermore, there are a number of ways of interpreting this reality. Context is important, we see things differently in different contexts and our experiences change over time (see the reflection point in Box 9.2).

BOX 9.2 REFLECTION POINT

You know what a policeman is. There is an objective (positivist) truth about policemen. They exist, we can count them, we can measure their height and the size of their feet and plot these on a chart. Policemen exist in the positivist world and we all know that. We all know what a policeman is. We know what their role is. We can hypothesise (deductively) that good citizens will view policemen differently to criminals. These are fixed and unchanging facts (truths) about policemen.

- 1 Someone has just run into the back of your car. You are not physically hurt but you are shaken by the incident. You are alone and you don't want to talk with the other driver because you are afraid that he might be aggressive. Fortunately, a police car stops close by. The policeman comes over to you and you sense the reassuring calm of someone in authority taking over the situation. He checks that you are okay and then

goes over to speak to the other driver. In that moment and in that space, you view the police very positively.

- 2 You have spent the day shopping. You are very tired, and you are looking forward to going home. You return to the car only to find a parking ticket on the windscreen. In the distance, you see a policeman checking parked cars. You find yourself thinking how stupid it is when you had only parked for half an hour too long. Why don't people know that you have had a busy day? The policeman, on the other hand, seems to have nothing better to do with his time than saunter about giving innocent people parking tickets. Policemen, you think, should be chasing criminals.

Is the 'truth' (what is known) about policemen, a fixed, measurable and unchanging (context independent) thing? Or is it the case that we cannot understand 'policemen' until we examine people's experience of them?

As healthcare practitioners, we deal with people first and with thermometers second. We are interested in how our patients and clients feel, what it is they are experiencing. We are interested in these things because we care about people; we want to know how they feel so that we may better be able to help them. It is in these situations that qualitative research has a part to play. Qualitative research is largely 'inductive'. This means that we start from an acknowledged position of ignorance rather than from a pre-existing field of understanding. Klopfer (2008) suggests that inductive research starts with an acknowledgement that we do not know about the phenomenon in question. Nicholls (2009 p. 587) suggests that '... humans are self-determining. This means that each of us interprets our world in our own unique way, and what comes to be considered 'real' is entirely idiosyncratic'. Quantitative research and traditional science simply can't deal with phenomena such as this, qualitative research, can.

The different approaches to qualitative research

Qualitative research is not just 'one' approach. In fact, there are a number of apparently different 'approaches' or 'methodologies' such as 'Phenomenology' and 'Grounded Theory'. All qualitative research is pinned to one of these approaches (no qualitative research is allowed to be just 'qualitative'). A great deal has been written about the various approaches to qualitative research, however, let's be clear about a couple of things:

- 1 The difference between qualitative research and quantitative research is huge.
- 2 The difference between the different approaches to qualitative research is so small that you might miss it.

People often look to 'Ethnography' or 'Phenomenology' to try and find a 'method', a particular way of doing qualitative research; however, for the most part they are disappointed. It is important to understand that these different approaches are not 'methods' (ways of

BOX 9.3 THE THREE MAIN APPROACHES IN QUALITATIVE RESEARCH:

Ethnography is derived from Anthropology, it focuses on cultural meanings, on how the organisation of society is achieved and the meaning people find in their culture or society.

Phenomenology focuses on the interpretation of 'lived experience'.

Grounded Theory focuses on generating theory on social processes by inductive examination of human experience. It is characterised by a close examination of the data together with reflection on the way it is being coded (Constant Comparative Analysis). In practice, it is a relatively structured form of qualitative research that arguably comes closest to being a 'method'.

doing research). In fact, they more clearly reflect the different groups of people who practice qualitative research and their different academic fields. We do need to know about Ethnography, Phenomenology and Grounded Theory because people talk about them all the time and we want to be able to understand what they are talking about. Once this is done, we will be able to look at the practical ways in which qualitative research can be carried out.

To really 'understand' qualitative research we need to appreciate how the research is done and why it is done in a particular way. It is at this point that qualitative research begins to look a little complicated. Qualitative researchers usually 'pin' their research to a particular philosophical position on the nature of knowledge. These philosophical positions just begin to point to a way of collecting and analysing data (to a method) – but they only 'begin' to do so. There is really no clearly defined 'method' (way of doing) qualitative research.

One might imagine, then, that there would not be much point in wallowing too deeply in the nuances of Phenomenology or whatever. However, qualitative researchers seem to love nothing better than wallowing in their respective philosophical backgrounds. This contrasts markedly with quantitative research where very little time is spent debating or examining the various methods and where it is usually simply a case of choosing the best method. There is one simple reason for this disparity and that is that there are no clearly defined qualitative methods. Because of this, it is much more difficult to justify the means chosen to 'do' a particular qualitative study. Qualitative researchers are just trying very hard to make their research look legitimate. In almost perfect contrast, in quantitative research, method and methodology are often used interchangeably, because there is not a lot of theoretical underpinning to the method chosen. Basically, the methodology is just common sense (it's 'logical'). In this way, a Randomised Control Trial is randomised and controlled because this 'works' to control the variables in question and to reduce the effect of bias.

Qualitative research in use today, rests on a more or less philosophical understanding that developed within Anthropology, Sociology and Philosophy (Astin and Long 2009). This can make it seem quite hard to understand, especially as much of the original philosophical work is now quite old and was written in a deeply philosophical style, and in 'dense' German (McConnell-Henry *et al.* 2009). The philosophers in question were also prepared to invent their own terminology where they felt it necessary, and this further complicates their work.

Some qualitative researchers claim that we should adhere rigidly to the qualitative methodologies (the theoretical background) from which modern qualitative research is derived (Frank and Polkinghorne 2010). However, I will attempt here to provide a purposefully pragmatic overview of the core philosophical (methodological) approaches used in qualitative research. I do suggest that we take a pragmatic view of this material for healthcare practitioners are rightly pragmatic and practice-focused people and it follows that their research should be pragmatic too. Nevertheless, it is important to understand something of the background to qualitative approaches to research and the core methodological principles to which qualitative research still holds. This is the case, not least because researchers will make reference to this in their writing.

Arguably, there are three main types of qualitative research: Phenomenology, Ethnography and Grounded Theory (Campbell and Roden 2010). Our story begins with a German philosopher called Edmund Husserl (1859-1938) and his one-time student, Martin Heidegger (1888-1976). It was the work of Husserl and Heidegger that first gave rise to Phenomenology and arguably, to the whole area of qualitative research.

Phenomenology

Phenomenology attempts to explain or reveal human experiences. The word 'Phenomenology' simply means 'the study of a phenomenon'. In practice, however, Phenomenology is the study of the lived experience of a particular thing, or 'phenomenon'.

There are two key approaches within Phenomenology, the Husserlian approach (Edmund Husserl, 1859-1938) and the Heideggerian approach. There are also two key, later developments of Phenomenology, namely Ethnography and Grounded Theory.

BOX 9.4 NEW WORDS

Positivist Paradigm:

The notion that the world is chiefly an objective and measurable place. Positivism reflects our notion of 'Science' as it developed from the reformation. Quantitative research largely accepts this positivist perspective.

Constructivist (interpretive) Paradigm:

The notion that much of the world is 'open to interpretation', that there is no objective truth or measurable facts and that, instead, 'truth' is something that we perceive to be there. In this way, we all see things differently, and what is true for one person may not be true for another. Qualitative research largely accepts this interpretive approach.

Husserl developed Phenomenology because he was dissatisfied with the traditional and positivist (quantitative) ways of describing the world (see Figure 9.1). He found that much that was human experience ('lived experience') could not be described or researched using a traditional positivist approach. Husserl rejected the positivist notion that the world only

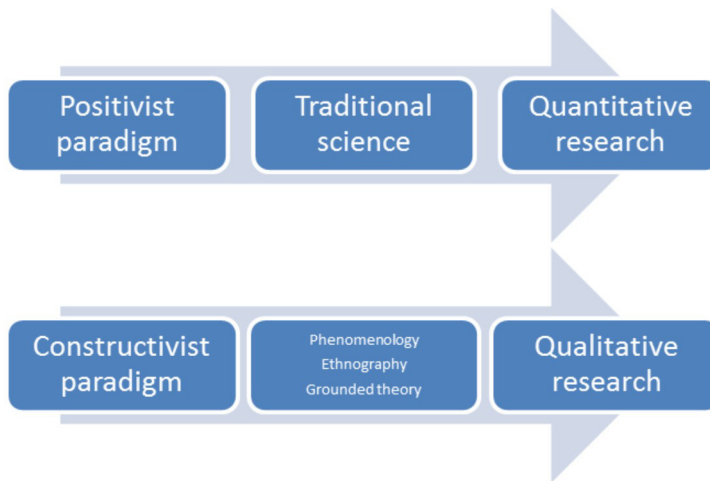


Figure 9.1 The relationship between the perspectives of positivism and constructivism, and the two forms of research in use today.

consisted of objective truth (facts). Husserl argued from the perspective of Cartesian Duality (René Descartes 1596-1650) that there was a separate mind and body ('duality') and that it was therefore legitimate, even within a positivist paradigm, to study the experience of the mind. In this, Husserl never abandoned a belief that (in a Cartesian sense) at least half the world was factual and objective (McConnell-Henry *et al.* 2009).

Focusing on 'the mind', Husserl developed Phenomenology in an attempt to explain or reveal subjective experience. Husserl referred to his work as 'Transcendental Phenomenology' to indicate that it 'transcended' the traditional view of the world as positivist (subject to quantitative research). Despite Husserl's position that his new Phenomenology 'transcended' the traditional positivist view of the world, he remained keen that his new approach be accepted by the scientific fraternity. For this reason, he maintained that phenomenological research should be open to objective scrutiny. An important distinction between Husserlian Phenomenology, and later developments (chiefly that of Martin Heidegger) is that in Husserlian Phenomenology, the researcher will try to hide his or her own feelings and experience (put them aside or 'bracket' them) so as to remain objective.

Phenomenology was further developed by Martin Heidegger (1888-1976), who referred to his version of Phenomenology as 'hermeneutic', from the Greek 'hermeneuo', meaning 'to interpret' or (in practice) 'understand by interpretation'. This is quite a useful word because it (1) differentiates Heidegger's ideas from those of Husserl who maintained an emphasis on there being a degree of objectivity in phenomenological research and (2) reflects the notion that 'truth' as we experience it may not have an objective (measurable) equivalent and that therefore it is legitimate for the researcher to place his or her own 'interpretation' on qualitative data. In Heidegger's version of Phenomenology, interpretation is legitimate and there is no pretence of 'objective' analysis of the data. Koch (2006) suggests that researchers should accept and be open about their values and preconceived ideas on the phenomenon being researched and that these values, rather than getting in

the way of an objective analysis (which is not in any case the goal), actually make the research meaningful. Koch suggests that (2006 p.92):

One of the basic tenants of philosophical hermeneutics is that a dialogue takes place between researcher and participant ... acknowledging that the researcher ... brings to the analysis her or his own preconceptions.

However, it is always necessary that the researcher makes explicit the thinking that has led to the interpretation of the data. The reader does not have to share the researcher's perspective or their interpretation, but it should be possible to see how the researcher came to his or her conclusions.

Heidegger rejected the notion of Cartesian Duality (a separate mind and body, separate objective and subjective world). Heidegger insisted that there was no such thing as an objective world; only a world as it is understood and experienced by people. To Heidegger, the world cannot be measured objectively and there can therefore, be no such thing as interpretation-free research (McConnell-Henry *et al.* 2009). To Heidegger, the researcher is an active participant where his or her own experiences are made explicit during the data collection and analysis stages. Consequently, Heidegger rejected the idea that the researcher should 'bracket' (put aside) experience, beliefs and presuppositions (be objective) but suggested instead that the researcher should embrace these feelings and take them into the research. Heidegger suggested that the researcher's prejudices, values, beliefs etc. legitimately exist as an interpretation of reality and are not an obstacle to research. Koch (2006 p.92) suggests that 'we take value positions with us into the research process. These values, rather than getting in the way of research, make research meaningful...'

Heidegger's Hermeneutic Phenomenology has probably had the greatest influence on the development of qualitative approaches and its influence can be seen in every qualitative study today, even those otherwise labelled as Ethnography, Grounded Theory etc. McConnell-Henry *et al.* (2009) make the point that all qualitative researchers seek to explore 'lived experience' and it is this notion, free from the constraints of positivism, that most clearly characterises Heidegger's contribution to the development of qualitative research.

BOX 9.5 RESEARCH EXAMPLE: PHENOMENOLOGICAL RESEARCH IN HEALTHCARE

In their study Larsson *et al.* (2010) used a phenomenological approach to describe physiotherapists' views on client participation. The study found that physiotherapists had to use three different modes of practice in their interaction with clients; these were collaboration, guidance and expertise.

Ethnography

Ethnography literally means 'people-painting'. It developed from the early anthropologists who would research primitive tribes and other communities by living with people and immersing themselves in their culture and traditions (known as 'fieldwork'). Typically, this would be a lengthy process, collecting data over months and years. Naturally, the anthropologists would analyse their data on a continuous basis, because it was collected over such a long period of time. The combined process of data collection and analysis would be terminated when new data no longer added anything to the analysis, a stage often called 'data saturation'.

Ethnography is related to 'Interactionism', a term introduced by Herbert Blumer (1900-1987). Interactionism is an approach to fieldwork which (Gobo 2011):

- focuses on 'meaning' in the context of behaviour;
- takes the actor's (participant's) point of view;
- studies the actor in their own cultural situation;
- focuses on process instead of structures;
- avoids seeing behaviour in term of stereotypes of behaviour, class, race etc.;
- generalises from descriptions to theory (is inductive).

Ethnographers attempt to build a picture of language, relationships and social meanings etc. Ethnography involves being physically immersed in the natural setting of the participants. Ethnography usually attempts to build a picture of the language, relationships and social meanings used by a group of people sharing a common cultural identity (such as 'theatre staff'). As is the case with Phenomenology, the researcher may seek to minimise the effect of their own beliefs etc. (called 'critical ethnography') or may choose not to do so.

Like anthropologists, ethnographers will tend to have an active role in the data collection process (Fieldwork). This is typified by their frequent use of 'participant observation' in which the researcher takes on a similar role to that of the participants included in the study. Ethnography has become more popular recently, though perhaps not so much in healthcare. One can see popular ethnographies produced for television and which involves television presenters living or working with particular groups of people such as A/E staff, fire-fighters etc. Ethnography is also about 'observation in the natural setting' (Gobo 2011 p. 25). As such, Ethnographers tend to avoid using interviews because the actor (participant) is not in their natural setting when they are communicating with the researcher. In this way, techniques that take place outside the natural setting are said not to be ethnographic.

Perhaps the key difference between Ethnography and Phenomenology is that the former is a very sociological process. Because of this, ethnography is more interested in social groups, culture and society than it is in the individual. Ethnography could be used in healthcare to study the 'culture' of healthcare, for example, but Ethnography is certainly less used than are Phenomenological and Grounded Theory approaches. It should not surprise us that healthcare researchers tend to be more interested in individuals than they are in culture.

Nevertheless, we come close to Ethnography when we ask questions such as ‘how do nurses think about (this issue)?’ or ‘how do limbless soldiers view their disability?’ Here, we are chiefly interested in building up a picture of ‘nurses’ or ‘soldiers’.

BOX 9.6 RESEARCH EXAMPLE

In an ethnographic study, Kelley *et al.* (2019) used participant observation of people with dementia who were receiving hospital care. The data collection, using participant observation, took place over 9 months. It was found that patients with dementia spent much of their time alone or not communicating with anyone. Where family members were active in caring for their relative in hospital, the quality of care was increased. Unfortunately, the study found that involvement of family members in care was not routine and that the involvement of family members in care was often not sought by the staff.

Grounded Theory

Grounded Theory was developed by Barney Glaser and Anselm Strauss (Glaser and Strauss 1967). Glaser and Strauss looked at the then implementation of Ethnography and Phenomenology and created from this a qualitative ‘method’, that is, a structured approach to qualitative research. Grounded Theory kept the emphasis on inductive research but did so while including a new ‘aim’ which was to develop theory. Grounded Theory seeks to create theory from interpretation of human experience of a particular phenomenon. This theoretical position can then be used to guide future research, thus providing a mechanism for generalising the results of qualitative research. Today, there is arguably less emphasis on the ‘theory development’ and ‘inductive’ aspects of Grounded Theory. Like any other research today, Grounded Theory research tends to build on existing knowledge and so is not purely ‘inductive’. The theory development ‘aim’, that was an essential part of Glaser and Strauss’s work, today exists in most Grounded Theory studies as a conceptualised summary of the study. Certainly, if every Grounded Theory study generated a theory, we would be awash with the stuff!

In practice, Grounded Theory has the following characteristics:

- The literature is reviewed only after the analysis has been commenced. This is so that the researcher is not influenced by existing knowledge; this is meant to be compliant with the inductive nature of the research. Today, however, most researchers do review the literature before planning their study. In reality, no one wants to spend 3 years conducting a study, only to find out that 100 other researchers had already done the same thing.
- Sampling is determined as the data collection progresses (known as ‘theoretical sampling’) and ends when there is ‘data saturation’ (when new data does not add to the developing theory).
- Data collection and data analysis are concurrent, enabling a ‘Constant Comparative Analysis’ where the researcher moves between the data and the analysis, constantly developing the analysis and re-checking the data to ensure the analysis reflects the data.

- It has stages that are more closely defined than is the case with other qualitative approaches. The analysis of data involves:
 - open coding - to identify 'categories' (broad terms that summarise parts of the data);
 - axial coding - to identify links between the categories;
 - selective coding - to find the core (or main) category into which the other categories link.

The purpose of Grounded Theory is to produce theory from data. In practice, however, Grounded Theory research seldom produces anything close to a 'theory'. It is more usual for the research to produce constructs (ways of viewing things) that can at least loosely be applied to future research and to practice. However, this does not really go beyond what other qualitative research will tend to do. Similarly, while Glaser and Strauss's (1967) original work did suggest a fairly structured 'method', Grounded Theory in healthcare research has often been conducted in ways that have allowed ideas from other qualitative approaches to be used. The modern development of Grounded Theory has seen it more or less merge with other qualitative approaches. Even Grounded Theory's focus on social interaction and social processes is now hard to discern in the research literature with many Grounded Theory studies clearly borrowing Phenomenology's focus on participants' 'experience'.

Glaser and Strauss's main contribution is that they provided a methodological structure to what had previously only existed as complex philosophical positions, chiefly of Husserl and Heidegger. The freshness of Glaser and Strauss's work, the fact that it was published in English, that it had 'methodological structure' and that therefore it seemed more legitimate to the largely positivist and developing healthcare professions, all had the effect of making it popular. So, the term 'Grounded Theory' became popular but the detail of Glaser and Strauss's methodology did not. In practice, there are two interpretations of the term Grounded Theory, a purist one that adheres to the characteristics cited above, and a 'popular' one, where Grounded Theory is just a general term for mainstream qualitative research where there is Constant Comparative Analysis and a structured coding of the data. If only by misadventure, Glaser and Strauss's work has popularised and legitimised qualitative research in healthcare. This occurred despite that fact that Grounded Theory was always meant to be a sociological thing, focused on interpreting culture and society rather than individual human experience. Nevertheless, without this seminal work, qualitative research in healthcare might never have achieved acceptance.

A history lesson: It might come as a surprise even to seasoned academics that qualitative research has existed for millennia. Qualitative research is often assumed to be no older than its 'first' proponent, Edmund Husserl, 1859-1938. Most people think that it is quite a new approach. However, we should note that historians have been analysing text for just about as long as people have studied history - that's quite a long time. As far as I am aware, no one ever used statistics to analyse the ancient Egyptian papyri or the Dead Sea Scrolls. These were examined and analysed using historical research methods that are remarkably similar to the qualitative methods used in healthcare research. Historians will sometimes interview people using a technique known to them as 'oral history'; this too is very similar to the interviewing techniques commonly used in qualitative research. So, qualitative research is not new, but its use in healthcare is new.

Medicine has only existed as a 'scientific' discipline since about the seventeenth century. A medical text by Thomas Phayre, published in 1540 (Bowers 1999), gives examples of charms and semi-precious stones being used to treat disease. Since the seventeenth century, medicine mostly concerned itself with 'hard science' and published little about patients' feelings and concerns. For many years, nursing and the other healthcare disciplines took their lead from medicine. However, something happened around the 1970s that would change all that; nursing, and the other non-medical health disciplines, became more 'academic'. University courses began to materialise and were led by practitioners with degrees (mostly) in the social sciences. After all, it was not possible to study nursing at university, before the courses had been set up.

A good number of nurse academics in the 1970s had studied sociology. These people became familiar with social philosophy and with notions that challenged the positivist view of the world. In most cases, this material (from which ideas central to qualitative research were derived) got no further than their pencilled lecture notes. However, these budding nurse-sociologists also came across some 'new' work by Glaser and Strauss (1967), called 'Grounded Theory'. This was refreshingly easy to understand and was written in clear English. Nurses had always been interested in patients' experience and much less with their bacteria, anaemia and histology. Here was a new form of research that was exciting in that it could enable nurses to research things in which they were really interested. The fact that these students became Britain's (essentially) first nurse academics, leading new degree courses in nursing - had the effect of 'spreading the word' about qualitative research. However, these people were still nurses, they kind of liked 'procedures', they were people who needed to know that there was a 'procedure'! Grounded Theory by Glaser and Strauss had a 'procedure', a 'way of doing it', almost a 'method'. Those early nurses, studying sociology at university, had at last found something that made sense. Qualitative research in nursing was born and the message spread to other healthcare disciplines as they too brought their training courses into the universities.

From the beginning, healthcare researchers viewed qualitative research pragmatically. Nurses were not 'precious' about the philosophical history of Grounded Theory; they were not concerned with where Grounded Theory 'had come from' philosophically, they were just concerned with what practical use could be made of it. So it is that to the sociologist, Grounded Theory is a distinct form of qualitative research and one that has to be delineated from other qualitative perspectives. To many healthcare practitioners, Grounded Theory is 'qualitative research', the new, the refreshed, the legitimate, qualitative research. To healthcare practitioners, it is perfectly possible to claim to be using Grounded Theory, while actually using methods which Glaser and Strauss never described. This can cause much concern among purist sociologists - but there is little evidence that this concern is shared by healthcare academics or practitioners. Ironically, it is the healthcare disciplines that are truly 'inductive', concerned, as they are, with the practical nature of patient and client experience. So, it can be argued that while Grounded Theory came from academic sociology, its proper home is with inductive and pragmatic healthcare researchers.

BOX 9.7 RESEARCH EXAMPLE

Using a Grounded Theory approach, Lin and Tsao (2018) interviewed people who had had bariatric surgery for obesity. It was found that the participants were forced to modify their eating after the surgery and that they found this challenging. It was found that those participants who saw the surgery as part of their ideal to lose weight did better, while those participants who saw their surgery negatively, did less well. The researchers conclude that those having bariatric surgery need continuing support after discharge.

Mixed and pragmatic methods

Mixed methods can mean the use of a mixture of quantitative and qualitative approaches, sometimes seen in 'triangulation' studies where two or more different methods are used to access the same phenomenon. Mixed methods can be used to adopt some of the positivist principles of quantitative approaches, as in the inclusion of a hypothesis or the use of a deductive approach.

Mixed or pragmatic approaches are arguably a lot more common than they appear to be. We have seen that researchers often feel the need to justify how they designed their study and how they analysed the data. They do this by making reference to what they argue is the study's philosophical underpinning, usually relating their study to Phenomenology, Grounded Theory or Ethnography. Sandelowski (2010) suggests that researchers often claim to use methods from Phenomenology, for example, when in fact their study fails to use phenomenological principles or methods. Sanelowski (2010 p.78) suggest that:

Methods are re-invented every time they are used ... there can be no execution of any method that perfectly conforms to any textbook description of it ... indeed, there is no 'it'; there is no bounded entity constituting a pure method.

Mixed methods may be used within a pragmatic approach. In a pragmatic approach (pragmatic paradigm) the research question is paramount and there is little or no strict adherence to a particular qualitative approach. In this way, a researcher may use ideas in both Phenomenology and Grounded Theory and even input some positivist ideas at the same time - to develop a methodological approach designed to address the research question. Pragmatists will argue that a method is good if it works. In this way MacInnes (2009 p.589) suggests that 'what works determines the method'. Smith, Bekker and Cheater (2011) argue that there has been a pre-occupation with philosophical theory in qualitative research and that healthcare researchers should focus their efforts on meeting their study aims, rather than complying with a particular philosophical approach.

In qualitative literature, there is an uneasy relationship between the qualitative purists and those who advocate that mixing up qualitative approaches can be a good thing. It is probably the case that qualitative approaches used within sociology tend to be purist in nature and regard Phenomenology and Ethnography etc. as essentially philosophical

positions rather than methodologies (McConnell-Henry *et al.* 2009). However, healthcare practitioners tend to be much more open to flexible interpretations of some of the methodological approaches discussed in the chapter. This is, perhaps, not surprising given the pragmatic nature of their work. Certainly, the pragmatic approach is well legitimised and well used in healthcare research. MacInnes (2009) goes as far as suggesting that the 'pragmatic paradigm' should be considered alongside purer qualitative and quantitative approaches, to create a 'third' approach to research.

BOX 9.8 RESEARCH EXAMPLE

The term 'mixed methods' is commonly used where a study has used both qualitative and quantitative approaches. For example, it is quite common for a study to use both interviews and a questionnaire. The former is used where the researchers want to explore something with the participants and the latter is used where they simply want answers to well-understood questions.

Rainbow and Steege (2019) looked at the challenges faced by both first-career nursing students and second-career students in their first year of practice. The study used both interviews and questionnaires. The study found that while all the nurses found transition to practice challenging, the two groups of nurses had different ways of coping with the challenge. The use of both questionnaire and interviews allowed the researchers both to explore the nurses' experiences and to ask more direct questions about aspects of the nurses' work that were more readily identifiable.

Figure 9.3 shows a qualitative design that is close to the principles of Heideggerian philosophy but that adopts the analytical techniques associated with Grounded Theory (the researcher probably wanted a bit more structure in her life). We should bear in mind that healthcare is chiefly a pragmatic process; it is seldom guided by theory but is orientated towards the practice issues it faces every day. The choice of approach reflected by this chart would seem heretical to some purists, especially those from Sociology where Ethnography and Phenomenology were first described. However, the healthcare practitioner will not be surprised by the approach used here. In this situation, we know what we want to do, we know why we want to do it (because it will 'work') but we have, in practice, to work out what qualitative approach is most closely associated with what we have chosen to do. Practitioners are pragmatic people who deal in pragmatic things. Not only is their practice pragmatic, but the way they deal with theoretical approaches to qualitative research is pragmatic too. Research is always practical.

Qualitative descriptive research

The words 'qualitative' and 'descriptive' almost seem a contradiction in terms. Surely, qualitative research is always about rich data, explorations of meaning and experience. It seems untenable that there should be such a thing as 'qualitative descriptive' research. On the

What's My Theory

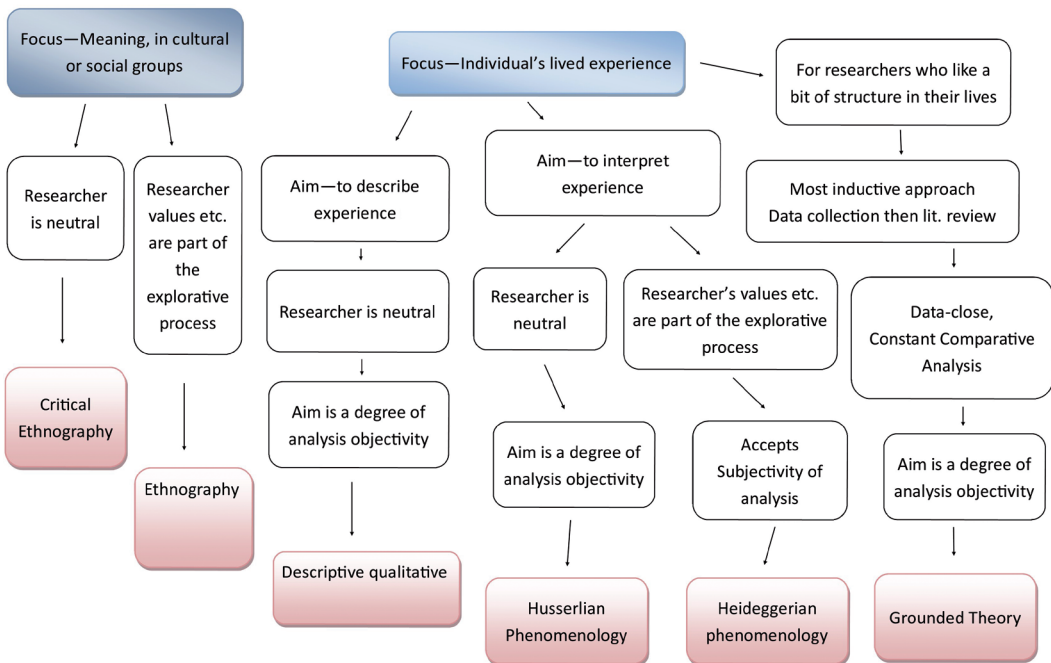


Figure 9.2 What's my theory?

What's My Theory

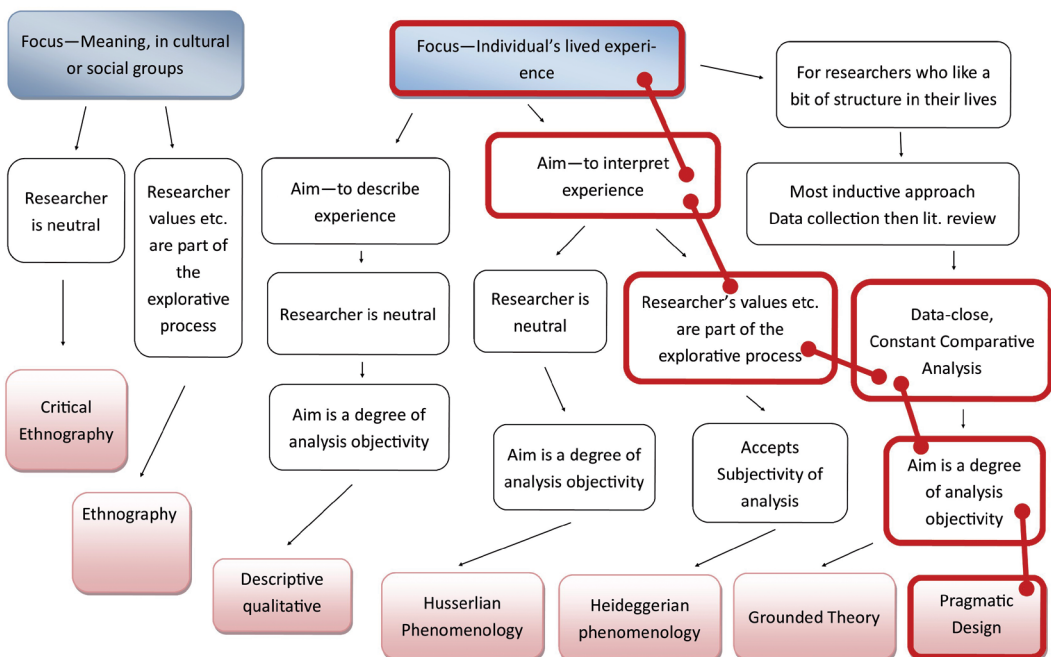


Figure 9.3 What's my theory? (pragmatic design example).

other hand, it is surprising how 'descriptive' qualitative studies can sometimes be; it is not unusual to find that the analysis of a qualitative study merely summarises what was said in the interviews. Indeed, what is wrong with such a thing? Why not seek to accurately summarise what was said. Sometimes, we do simply want to know what people have to say for themselves.

According to Kim *et al.* (2017) Qualitative Descriptive research has the following characteristics:

- 1 The phenomenon is examined in its natural state.
- 2 It is less dependent on the philosophical underpinning of the three main qualitative perspectives described above. However, methods from other qualitative approaches, such as Constant Comparative Analysis from Grounded Theory may be used.
- 3 Data collection is usually through the use of interviews or focus groups, just as is often the case in Ethnographic, Phenomenological and Grounded Theory research.
- 4 In common with other forms of qualitative research, researchers generally use Purposeful Sampling techniques. In other words, the researchers will often spend much time and resources seeking out those people who can best tell them about the experience being investigated.
- 5 Content Analysis of the data is often used. Content Analysis is low on inference; in other words, the researchers try simply to summarise the transcripts and to reflect what was said. Where appropriate, quantitative analysis may be undertaken, for example, on describing the sample.
- 6 The findings of the study are presented in more or less straightforward description.

BOX 9.9 RESEARCH EXAMPLE

van der Kluit *et al.* (2019) conducted a Qualitative Descriptive study, which looked at the goals of older, hospitalised patients. The patients were interviewed. It was found that the participants had hopes for a variety of outcomes but which were categorised as (p. 6): 'wanting to know what the matter is', 'controlling disease', 'staying alive', 'improving condition', 'alleviating complaints', 'improving daily functioning', 'improving/maintaining social functioning', 'resuming work/hobbies' and 'regaining/maintaining autonomy'. If you have chance to look at this journal article, you will see that it is particular clear and straightforward, demonstrating that qualitative research can be theory-free, practical and clear.

Concluding remarks

This chapter has presented the theoretical underpinning of qualitative research. We have seen that this underpinning comes from some pretty strange sources. We did not begin our career in healthcare expecting to be studying Heideggerian philosophy. We have seen, however, that much of this material exists to provide a rationale for a subjective stance on

research. This argument for subjectivity should be seen in a situation where traditional science has sought for centuries to be objective. Nevertheless, it does seem right to question the positivist view of truth and it does seem right to try and find truth as it is understood and experienced by individuals. Certainly, there is a place for qualitative research, founded as it is on the notion that people's experience is centrally important and that the world of human beings cannot be understood by looking at the world but only by looking at the human beings who are experiencing that world.

Summary

- At first glance, qualitative research can seem easy to understand but just under the surface things become quite complex. This complexity exists largely because 'methods' (how to do qualitative research) are still developing and becoming accepted.
- Qualitative research sees the world as it is experienced by individuals. It is not the phenomenon that is important but how that phenomenon is experienced.
- Ideas presented in this chapter see everyone as different and people as too complex and variable to study using traditional scientific methods.
- The differences between Ethnography, Phenomenology and Grounded Theory are minor and, in practice, largely unimportant to healthcare researchers. Nevertheless, it is necessary to be familiar with the different approaches discussed in this chapter, not least so that we can discuss qualitative research with other people.
- Healthcare researchers often design qualitative studies that take a pragmatic view of the underlying philosophies. In the final analysis, all that matters is that the research 'works'.

Table 9.1 Summary of the most common approaches to qualitative research

Approach	Philosophical underpinning	Practical characteristics
Ethnography	• Roots in Anthropology • Aim is to describe and explain social function within a social or cultural group, the experience of belonging to a social group	• Data is collected through immersion (continually being a part of) with the people being studied. Uses 'participant observation'
Phenomenology	• Philosophical roots in Husserlian and Heideggerian social philosophy • Aim is to explore the lived experience of individuals and to see the 'truth' as it is experienced by individuals	• Data is collected using mainly interview and focus groups • Data can be analysed by using a structured approach (codes and themes) or by a less-structured, immersion/crystallisation approach but which always involves interpretation and reflexivity

continued

Table 9.1 *Continued*

Approach	Philosophical underpinning	Practical characteristics
Grounded Theory	• Philosophical roots in Ethnography and Phenomenology • Focus is the social processes that occur in human interactions • Aims to develop theory inductively	• Interviews and focus groups are often used for data collection • Data is analysed at the same time as (more) data is collected (constant comparative analysis) • A relatively strict and prescribed method is used to code the data
Qualitative Descriptive	• None, except a background in all of the above. There is a greater emphasis on simply describing the data • Specific aspects of other forms of qualitative research may be employed, for example, the coding of data used in Grounded Theory	• There is little or no 'interpretation' of the data but rather an emphasis on description and accuracy. • It is still the case that Qualitative Descriptive research is focused on human experience

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Chapter 10

Qualitative research in practice

CHAPTER OBJECTIVES

This chapter will:

- provide a simple step-by-step approach showing the stages in the qualitative research process;
- outline the way that recruitment (selection), data collection, transcription and analysis are undertaken in qualitative research;
- discuss ways in which we can judge the trustworthiness of qualitative research;
- provide a simple checklist for use when judging the trustworthiness of qualitative research.

Chapter outline

In the last chapter, we looked at the theoretical underpinning of qualitative research. This chapter will look at how qualitative research is done and how we can begin the review or judge the quality of qualitative research.

Doing qualitative research

One of the first questions people ask about qualitative research is 'how does one go about doing it?', or, 'what are the stages in the qualitative research process?' Campbell and Scott (2011) make the point that there is no 'recipe' for qualitative research. It is the case that the design and method in qualitative research is certainly 'softer' and less easy to describe than it would be in a quantitative double-blind trial. Unlike quantitative research, qualitative research does not possess a universally accepted and coherent methodology. This is one reason why qualitative research doesn't suit everyone. However, we need to bear in mind that the data (human experience) is also softer and less easy to define, so perhaps we do need a soft and flexible design approach to best deal with the nature of qualitative data.

Klopper (2008) suggests that any qualitative study is designed by conducting it and that qualitative design has 'an emergent nature' (p. 63). In addition, we have noted in the previous chapter that many healthcare researchers adopt a 'pragmatic' approach to method and therefore do not stick rigidly to any methodological roots which may exist. In this way, they may happily 'mix' ideas from Grounded Theory, Phenomenology and Ethnography. This 'mixing' of methods is especially common in healthcare research, perhaps because healthcare researchers tend not to come from a purist background and as a result are not 'precious' about theory. Indeed Nicholls (2009 p.586) suggests that 'It is theoretically possible to imagine that we might devise as many methodological approaches as there are researchers'.

This mixing of methodological approaches occurs despite some authors' (Frank and Polkinghorne 2010) call for researchers to adhere more closely to the philosophical roots of their chosen approach rather than develop their own methodological stance. On the other hand, some would argue that to allude to 'a way of doing' qualitative research is to disdain the very nature of it. The trouble is, this eclectic or even laissez-faire stance makes it almost impossible to discern 'how to do' qualitative research by simply looking at existing studies.

Yet somehow, we need to move from this position to one where we can at least know how researchers 'do' qualitative research. Figure 10.2 provides a simple 'to do' list. You may be surprised at how simple it is and how much it seems 'just common sense'. However, this should not surprise us, for all good research is simple and all good research is, indeed, just common (logical) sense.

How qualitative research is planned

- 1 The research question is identified, e.g. 'how do people with a deformity experience the healthcare system?'.
- 2 Answers to the following questions have implications for which qualitative approach should be employed (see Figure 10.1).

The answers to these questions point to particular approaches in qualitative research, or to an eclectic mix of more than one approach. In practice, the qualitative approach used often reflects the researcher's own orientation, values and interests. However, it is still the case that the approach used (Ethnography, Grounded Theory etc.) should always fit with the aims of the study.

- 3 A literature review is undertaken, even if an inductive approach is considered appropriate. There is still no point in being purposefully ignorant of the existing literature. The researcher needs to find out whether the subject has been researched before and, if so, how it has been researched. *Note:* the purist Grounded Theory researcher will want to leave the literature review until the data analysis commences.
- 4 The means of collecting the data is identified. If the research is concerned with 'lived experience', interviews are likely to be used. Other means of data collection include focus groups, diaries, participant observation etc.
- 5 The means of recruiting and selecting participants is chosen.

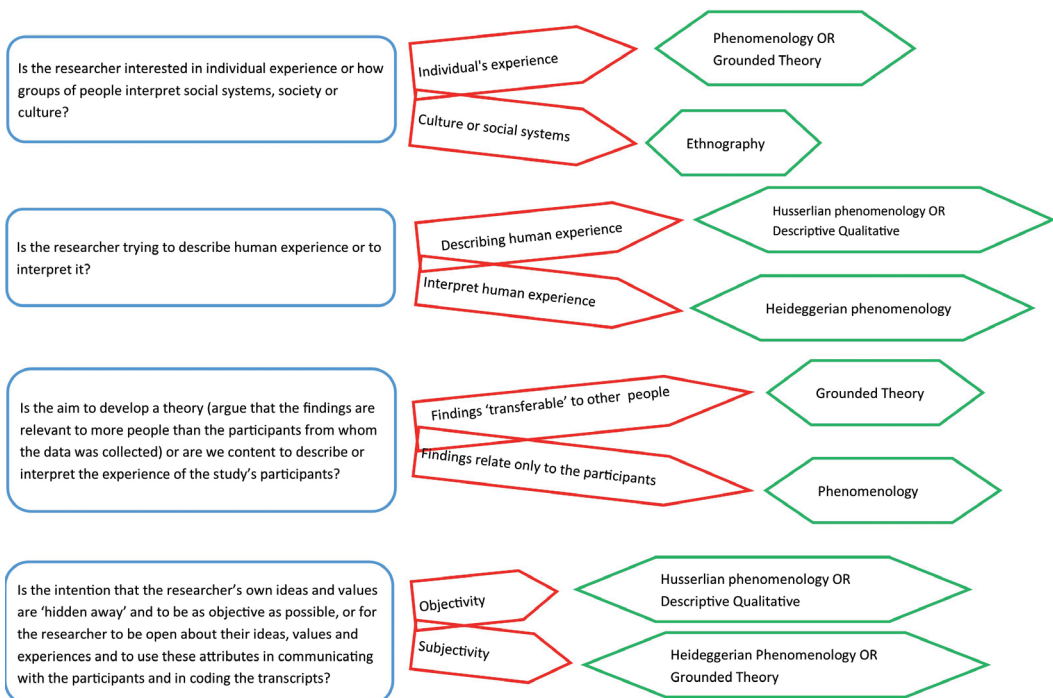


Figure 10.1 Selecting a qualitative approach.

- 6 The exact method of data analysis is chosen.
- 7 Ethical implications are identified.
- 8 The plans for the research are discussed with others (peer review), modifications made and ethical approval obtained from the relevant Research Ethics Committee.
- 9 Data collection begins.
- 10 Data (transcripts) are analysed as they come in.
- 11 An 'initial reading' of the text is carried out, followed by a closer scrutiny of the text.
- 12 Content in the text that is interesting is identified, anything which seems 'key', typical, different, odd etc.
- 13 The text is coded according to the form of analysis identified in the design of the study. The researcher tries to use labels that summarise the text somehow, however, these labels will evolve and change as the texts are re-examined and as more texts are available. Note that some labels will be descriptive while others will be conceptual.
- 14 Purist Grounded Theory researchers will at this stage search the literature for existing theory (theoretical sensitivity). This may give new insight and cause further analysis to be required.
- 15 The texts are searched for 'negative cases', data that seems to disagree with the developing codes, categories or themes. These 'negative cases' should be fully explored.
- 16 A journal (log, diary) is used. Every single thought, decision and change of label is documented in the diary.
- 17 The researcher regularly reviews the codes (categories, themes), and re-examines each text in the light of new codes.
- 18 Codes that can be grouped together to form higher-level conceptual labels are identified.
- 19 Associations or patterns that may exist between codes and groups of codes are identified.
- 20 Broad categories of labels that effectively and accurately (or insightfully) reflect the data (proto-theories) are identified. It is these that will exist as the summary of the analysis and which will be communicated to others when the research is published.
- 21 Every stage in this analytical process is a cognitive exercise. The qualitative researcher must always 'think', and never let the 'process' or the 'task' take control. The qualitative researcher must be reflective and must always be asking questions such as: what is this, what is going on here, are my labels (codes, categories) really reflecting the text, are there any patterns here?

The above is a simple and logical list. With what amounts to (arguably) quite minor changes, the list applies to almost any form of qualitative research.

The following sections will look at key stages in the qualitative research process:

- recruitment (sampling);
- data collection;
- analysis.

Recruitment (sampling)

Qualitative research is interested in the lived experience of individuals. Qualitative research sees everyone's experiences as unique and conditional upon the contexts of time and space (our experience is not a static thing). In practice, this means that there is no 'population' of which we want to sample. We are not looking for a small number of participants who will represent everyone. Most qualitative researchers are happy to argue that their research has been the study of (for example) ten participants. There is no need for a nice big number of participants, indeed qualitative studies can be 'biographical' and have only one participant.

BOX 10.1 NOTE

Although qualitative studies do not 'sample' a population, the word 'sample' is in such common use that qualitative researchers will sometimes use it. Normally, however, the word 'recruitment' is used. So, participants are 'recruited' to a study.

Participants are recruited using a wide variety of means. It is not uncommon for qualitative researchers to research people they are familiar with. A ward sister interested in patients' experience of oncology diseases might already know the participants she recruits to the study. It is possible to advertise, asking for example for people who have a particular health problem to come forward to share their experiences. Another technique is called 'snowballing' (see Geddes *et al.*, 2018), where one participant contacts others known to him or her and asks them to consider being part of the study.

Magilvy and Thomas (2009) point out that participants in qualitative studies must meet the following criteria:

- have experienced the phenomenon under examination;
- are able to communicate their experiences to the researcher;
- are willing to communicate their experiences.

It can certainly be difficult to locate suitable participants and to find people who will agree to talk about issues that are important to them. It can also be difficult to retain participants in a study, especially if it is a more longitudinal study. While there is no need for the 'sample' to be representative of a population of similar people, researchers usually want to be able to argue that the conclusions to their study have relevance to other studies and to practice generally. Nevertheless, there are few of the sampling issues found in quantitative studies. We do not need to worry about a biased sample, we do not need to estimate what size of sample we will need and we certainly do not need a 'large' sample to convince others of the worth of our study.

Data saturation

Prior to the data collection stage, qualitative researchers cannot usually determine what number of participants will be required or for how long the data collection should last. Instead, the researcher will carry on collecting data from participants until a point is reached where no new material is being added to the analysis. This is called the data saturation point and it should signal the completion of the data collection.

Data collection in qualitative research

This section looks at the most commonly used data collection methods, namely:

- in-depth interviews;
- focus groups;
- qualitative diaries;
- observation.

In-depth interviews

The interview is a key approach within qualitative research. The interview is especially useful in providing rich data that can successfully reflect the lived experience of the participant. The interview is useful where we do not know much about the participant's experience and where we are chiefly interested in exploring the participant's own version of things; the participant's lived experience.

Conducting a good interview takes practice and experience. It can be hard to keep the participant appropriately focused. There is a skill in achieving this. If this focus is not achieved, one can easily spend 2 hours or more talking about nothing much at all. Additionally, the process of 'prompting' the participant for further or deeper information is an important one if the researcher is not to be left with nothing more than a collection of 'Yes', 'No' responses.

Interviews can be emotionally exhausting, both for the participant and the researcher. Qualitative research often deals with emotionally challenging material and it is not uncommon for participants to find themselves revealing thoughts that they had never considered deeply before. In this way, the interview has the potential to cause anxiety and even be distressing. There needs to be time allowed for silences and pauses, allowing the participant to reflect, perhaps for the very first time, on his or her experiences. Pauses are also useful to provide a brief but essential 'rest' from the proceedings. Interviews may be distressing for the researcher too. It is not uncommon for qualitative researchers to be investigating matters that are close to their own heart. Smythe and Giddings (2007) state that:

Qualitative research is risk taking because you face-up to 'you' in practice. You face-up to the patients as well, not as the person with liver cancer but as Joe, not as the Parkinsonian patient, but as Mary...

(p.43)

Interviewers need the following skills (Banner, 2010; Bulpitt and Martin, 2010):

- can communicate clearly;
- have adequate knowledge of the focus area (need to be able to understand what the participant is communicating and be able to share an understanding with the participant);
- can actively listen to the participant;
- can sensitively clarify and probe;
- have empathy with the participant, the researcher needs to feel what the participant is feeling;
- can be reflexive; that is, for the researcher to 'know themselves' and where they stand on the issues central to the research.

Anyone who researches an emotionally sensitive subject (and health researchers often do) needs to have 'come to terms' with the emotionality of that subject before they start researching it with others. A researcher needs not only to be able to 'deal with' emotive material, they also need to be able to deal with other people dealing with it. Reflexivity also helps to reduce researcher bias by making the researcher aware of his or her own values etc. However, all this is not easy and the developing nature of qualitative research can make it hard for the participant and the researcher to fully 'know' what emotional challenges may be just around the corner.

The type of questioning used in an interview can be structured (unusual), semi-structured or non-structured. Examples are:

- Structured - How long have you worked in intensive care?
- Semi-structured - How do you feel when a patient gets better and is able to go home?
- Unstructured - tell me about your time with oncology patients.

In practice, interviews often contain a mix of question types. Nevertheless, researchers often like to cite the main style of their interviews using one of the above classifications. Qualitative research seldom uses a fully structured interview. Most qualitative interviews in healthcare research use a mixture of semi-structured and unstructured questions. More structure is used when we know what questions we want to ask, less structure is used when we accept that we don't know much about the participant's experiences and so we don't know what questions to ask, we are only familiar with the 'area' we want to explore. Usually, interviews have some structure, where prompts are used to ensure rich data is collected. Prompts can look like this:

Interviewer (prompt):

Tell me about your time as a nurse?

Interviewee:

I worked from the mid-1950s, having training at St. Paul's hospital. I remember my first job was on an orthopaedic ward. I recall being terrified on my first day (laugh).

Interviewer (probe):

Tell me about your first day.

It is important to avoid using leading questions, like 'were you nervous on your first day because you lacked confidence?' Leading questions have two main problems, they reflect the researcher's ideas, not the participant's ideas, and they can 'throw' the participant, causing him or her to focus on what is believed to be the researcher's interest and to think that their own experiences are not valued.

Whiting (2008 p. 38) discusses the use of different types of probes;

- Silence - allows the participant to think.
- Echo - the researcher repeats what the participant has said in order to encourage elaboration.
- Verbal agreement - as in, 'yes, I understand, go on...'
- Tell me more - the interviewer directly asks the participant to tell more.
- Leading - asks a question which leads in a particular direction.
- Baiting - gives the impression of being aware of something the participant is referring to - tends to encourage further discourse on the matter.

The most common approach taken by qualitative researchers is to have an interview plan containing prompts rather than questions. The prompts serve to keep the interview focused rather than to seek answers to particular questions. It is important to both stay focused towards the research question and to elicit data that reflects the interviewee's experiences in a reasonably full (or rich) manner. In pursuance of this, the interviewer may well have to review his or her list of prompts both within an interview and for subsequent interviews. This is often needed when it becomes apparent that the interviewees have a key experience not originally anticipated by the researcher. Interviewers need to be both focused and flexible and need to have the skills to vision where the dialogue is going, to perceive the nuances of conversation that might be hiding a key experience and to probe carefully, sometimes incisively, while always having care for the interviewee's welfare. It takes experience to be a good interviewer.

To be in a position of talking with people about their key experience is a great privilege. It is necessary to respect the participant, their experiences and the information that is communicated. In any case, for people to be really open about their experiences they will need to trust the researcher and a rapport will need to have been established. The environment will need to be both safe and physically and emotionally comfortable.

The interview has four key stages:

- 1 The interviewer and participant get to know each other. Any questions asked at this stage are non-threatening and non-emotive. The interview format is introduced, with the researcher explaining:
 - a the purpose of the interview;
 - b the anticipated length of the interview;
 - c how confidentiality will be managed;
 - d permission to record the interview;
 - e assurance that it is okay to refuse to answer questions (and that the participant can ask questions).

- 2 More in-depth questions can be asked. The interviewer is listening and learning all the time. During this stage, a sense of trusted sharing develops.
- 3 The interview becomes more 'comfortable'. Both parties feel they know each other, they feel they can say things to each other without causing upset or offence. Mutual trust exists. This can be a time for clarifying points and for prompting in directions that may be more sensitive. If the interview goes well, there will be a sharing of interest, just as two people who shared the same experience might communicate together. The interviewee may guide and teach the interviewer.
- 4 The interviewer begins to close the interview, allowing it to come to an end over a period of time. Here, simpler, non-emotive questions are often re-introduced, as a way of carefully pulling away from the emotive aspects of the discourse. Closing the interview can be difficult for the participant, especially if it is to be the last interview. It is an unusual experience to be able to talk about an important life event and to someone who actually wants to listen. This can be quite therapeutic and individuals can come to feel that they do not want the interview(s) to end.

Interviews – practical issues

Practical considerations include:

- The location of the interview: The location of the interview needs to be somewhere which will allow the participant to relax. This may be in the participants own home, in their workplace or somewhere else. Often, the participant is encouraged to choose the location. However, the researcher needs to be aware that participants sometimes get upset during an interview and that because of this it is sometimes better for the interview to be in a neutral place, like a room at the university. There may also be distractions at home, from the postman calling at the door to children demanding attention.
- How the interview will be recorded: Researchers usually want to record the interview, not least because the recording allows them to examine the interview over and over again. Video recording has the advantage that it will show the non-verbal communications. Often, a lot can be gained from being able to see the participant's facial expressions. However, participants are often reluctant to be recorded and they will at least need to know that the recording will be kept safe and confidential. Sometimes, the participant will ask for the recorder to be turned off in the middle of the interview.
- Transcription. The recording will need to be transcribed (written down). This is very time consuming. A 1-hour interview will take the average researcher at least a day to transcribe.
- English quality and transcribing. The quality of spoken English is seldom as good as written English. There is a tendency to 'convert' the transcript into good English and to remove local dialectal words and phrases. However, it is better to keep these in the transcript. In fact, much of the original richness of the data is lost when it is written down on paper and it can be better to do the analysis with both the transcript and the recording at hand.

Interviews - ethical issues

One might suppose that most qualitative research would be risk-free. We are used to thinking of research ethics being mostly concerned with new drugs and interventions that have the capacity to cause bodily harm. It is true that no one ever got killed by being interviewed. However, qualitative enquiry can be damaging. This is partly because of the emergent and unpredictable nature of qualitative research - we never really know where the research will take us, and so it is more difficult to plan for and anticipate difficulties. Qualitative research often seeks to examine experiences that are deeply personal and traumatic. It is sometimes the case that participants find themselves in the research interview, talking about things they have never discussed before, even with themselves. It is not at all unusual for participants to get upset during the interview. This raises the issue about how participants can be supported and who should do the supporting. Certainly, qualitative research has ethical issues that need careful consideration whenever a qualitative study is planned, and while it is in progress.

Confidentiality is a particular issue in qualitative research. This is because the participants' data is in audible or textual form and is very 'accessible'; someone coming across the data would immediately understand it. The data tends to be sensitive, relating to matters that are deeply personal. It is often the case that researcher and groups of participants already know each other and will continue to know each other after the research is complete. Aspects of interview data may well relate to other participants. Participants may tell the researcher something that raises professional issues. Sometimes, research can deliberately focus on professional issues, a research study into 'healthcare worker's experience of unsafe practice' for example. Situations like this need to be managed very carefully.

There is often a power relationship between the researcher and the participant. Interviews can be used, wrongly, to coerce participants to talk about things they do not really want to discuss. Bulpitt and Martin (2010 p.14) refer to the 'seductiveness' of the qualitative interview. Here, the opportunity to talk to someone who is ready and eager to listen and to understand, an opportunity often much valued by the participant, 'seduces' him or her to say things that would not normally be disclosed. Participants may want to retract and remove from the record something they have said. It may seem a simple thing to do this (and it should be), and yet, what the participant requires to be retracted may be important data for the researcher. The relationship between the researcher and the participant is a fluid one and the researcher needs to be aware of how it is developing.

The interview can also be therapeutic for the participant; just talking about something to someone who wants to listen can be a significant experience (Jack 2010). However, this close association between research and therapy is something that researchers in other fields try to avoid, arguing that we need to be clear about whether we are performing the role of researcher or practitioner (Bulpitt and Martin, 2010). Such clarity is sometimes hard to achieve in qualitative research but it is important that the researcher constantly bears these issues in mind as the research develops, and always puts the participant's welfare above all other concerns. This requires a continual process of reflection.

The research interview can be a significant experience in its own right. It can expose the researcher to the participant's positive and negative emotions, their dreams and their

nightmares. The interview is an immensely useful tool but it should be handled carefully. Training in research interviewing technique can be invaluable. Within the research process, the ability to de-brief and to access peer review and mentorship are useful, perhaps even necessary. Qualitative research takes us to places to which we did not imagine going, however, this is as it should be and it indicates the value of interviews.

Focus groups

A focus group is a group of individuals, essentially interviewed together. However, the focus group is not a short-cut to doing lots of interviews at once. Material can be elicited from the discussion between members of the group. In this way, a focus group approach can sometimes elicit material that would not be easy to obtain during a one-to-one interview.

To facilitate discussion, members of the focus group can be encouraged to ask each other questions or to tell the group about their experiences. The role of the researcher is not so much to ask questions but to keep the group's discussion focused and to manage whatever group dynamics may arise. It is not uncommon to have one person who wants to talk all the time and another who doesn't want to talk at all. Situations like this need careful management. Rothwell (2010) suggests that a good focus group leader (sometimes called a 'moderator') attempts to lead the group but with minimal involvement and yet in a way that will lead to maximum interaction from the group members.

Recording a focus group and transcribing the content can be a real challenge. An audio recording will not make it clear who is speaking. A video recording on the other hand will show who is speaking and it will also show the non-verbal communications and group dynamics (that is, 'how' the group is interacting). However, focus group members often do not like to be video-recorded and the video equipment can inhibit dialogue. People are often conscious of 'how they look' on video, even though this may be of no interest to the research. Video needs to be done well if it is to be of any use and, in practice, this can be a challenge.

It takes some experience to manage a focus group well and people new to the task should ensure they have support available to them. The key benefit of focus groups is that they enable interaction between participants and in a situation that is potentially less affected by the power relationship in a one-to-one interview.

BOX 10.2 EXAMPLE FROM THE LITERATURE

Skomakerstuen Ødbehr *et al.* (2015) conducted a study looking at nurses' views on talking to patients with dementia, about their religion. The study used focus groups because it was felt that nurses would more readily talk about their views in a group than they would at interview. It was found that the nurses' lack of understanding of the patients' religious views and the discomfort they felt when talking about religious views with their patients, fractured their attempt to provide person-centred and holistic care.

Diaries

Qualitative researchers have always been prepared to consider written material as a source of data. Historians, anthropologists and ethnographers have all accepted the use of written material as legitimate. However, to most researchers, it seems natural to study 'lived experience' by communicating with people at interview. Nevertheless, diary and other written material can be useful where participants find it easier to write things down, rather than talk to someone, and where data needs to be collected over a long period. Diaries are also used alongside data from interviews.

Consider, for example, a researcher wanting to collect data from children aged about 12 years. In an interview situation, it would be difficult to get away from a power differential between the adult researcher and the child participant. On the other hand, 12-year-old children can feel quite uninhibited when writing a diary. Nicholl (2010) makes the point that interviews require the participant to recall experiences and, although the main body of those experiences are likely to be remembered, the detail of them is often lost. Diaries, however, can be maintained 'as things happen' and in this way can be more accurate. Diaries can contain both factual information and reflections on events.

BOX 10.3 REFLECTION POINT

We may tend to think that we can remember all the important things that happen to us, but this is often not the case.

Think of the way that people use old photographs to help them remember past events. The photographs or videos seem to have the effect of causing memories to 'flood back' to one. When we watch an old family video, it is surprising just how many 'facts' our memory has distorted.

Diaries can contain 'prompts' by having different sections, labelled, for example:

- when it happened;
- what happened;
- what you thought about it.

Diaries don't just have to be written on paper. These days diaries often take the form of computer 'blogs'. This use of electronic diaries is well understood, especially by teenagers and young adults. Keedle *et al.* (2018) developed a smartphone application so that participants could write their diary accounts with their mobile phone.

Diaries can be used alongside interviews; the interview can even be designed to probe aspects of the written diary. The interview(s) can also act to provide encouragement for the participant to continue writing the diary. Dialogue about the diary will have the effect of assuring the participant of the diary's value.

BOX 10.4 EXAMPLE FROM THE LITERATURE

Boz and Okumuş (2017) undertook a qualitative study, looking at the experience of Turkish women undergoing fertility treatment. The researchers asked the women to keep a diary and to record what they were feeling. The women kept the diaries for 8 months and the diary content was analysed by identifying themes (thematic analysis). The diaries provide a fascinating insight into the lives of these women over a relatively long period of time. It is doubtful that one or more interviews would have secured such rich data. Consider this excerpt:

I'm checking my underwear every day. I'm so scared. Thank God, I didn't see any blood this morning ... but tomorrow? This will destroy me.

(p.272)

Observation

Direct observation can take the form of either participant or non-participant observation. Ethnographers and anthropologists often consider it best to share the time and space of the participants as a key way to understanding the social processes in which they are involved. In recent years there have been an increasing number of ethnographic studies in healthcare. Indeed healthcare staff are in a favourable position to undertake Ethnography, with its focus on the direct observation of human interaction, because they are often already part of the micro-culture in question. We should understand that the micro-culture found in the operating theatre, children's ward or accident department can be unlike anything found in life outside hospital. The social interactions that take place in these areas is often of interest to anthropologically minded ethnographers. Such studies can give a real-life insight into the part that micro-culture plays in the lives of patients and health staff.

BOX 10.5 EXAMPLE FROM THE LITERATURE

Laerkner *et al.* (2019) undertook an ethnographic study using direct observation and interviews. The study looked at the nurse-patient interaction during the mobilisation of patients in an intensive care unit in Sweden. It was found that patients and nurses had a different perspective on mobilisation (the nurses were more keen on it than were the patients) and that nurses attached themes of recovery and progress to patient mobilisation to encourage cooperation.

It can be seen that there are a number of ways in which qualitative data can be collected. In practice, the interview is by far the most commonly used technique. Each technique requires both careful planning and at least a degree of experience. Lastly, it is important that the data collection process does not harm anyone and that we understand that the

potential for harm is present. It can be seen that the data collection methods available to us are capable of providing much richer data than can usually be collected using quantitative techniques. Qualitative research has been significantly effective in providing insight into the lives of patients, family members and practitioners.

Transcribing the data

While not strictly necessary, interview and other oral data are likely to be converted into written text. This is because it is easier to analyse text and it is quite difficult to analyse an audio or video recording directly. Occasionally, interview data is not recorded at all, instead notes are made during the course of the interview. However, this is unusual and normally, the data collection is recorded and then transcribed into text.

It is important that the transcript is accurate and reflects what was actually said and not what the transcriber thought the participant 'meant' to say. It can be difficult to transcribe language that is often regional and is almost always grammatically imperfect. Sentences that make perfect sense when they are spoken sometimes make less sense when they are written down. People often make much use of non-verbal language and it is possible to make notes to record these.

Transcribing interviews always takes a considerable amount of time. Unfortunately, it is not usually a good idea to give the job to someone else, which in any case would be expensive. It is better for the researcher to transcribe the recording and for that to happen shortly after the interview itself. Transcribing the audio recordings is often when one really begins to get a feel for the data.

Analysis in qualitative research

Those new to qualitative research often have difficulty working out just how they are supposed to analyse textual or interview material. It would be fair to say that looking at published research papers is unlikely to clarify much, for qualitative researchers are often less than clear about the exact procedure they employed to analyse their data. All too often, the researcher simply fails to communicate the method used to analyse the data. In such situations, it is fair to surmise that the analysis has been as clear to the researcher as it is to the reader.

We can be sure of one thing; qualitative analysis takes a very long time (Jirwe 2011). It is not at all uncommon for a PhD student to take a year to analyse their qualitative data, while those with quantitative data have sometimes completed their statistical analysis in just a few days.

It would be good if we could say that a particular qualitative analysis is exactly 'this' or 'that', as a quantitative analysis might use Analysis of Variance or a t-test. However, the situation with qualitative analysis is not at all clear. It is perhaps because an author will cite 'thematic analysis' as the form of analysis used in his or her study that we think we need to know about 'thematic analysis' and indeed that it must exist as a discernible entity. When a

lot of researchers say they used thematic analysis, we become sure that thematic analysis must be something real and discernible. However, we would be wrong. What in practice is going on here, is that each researcher feels the need to legitimate his or her method of analysis by referring it to the literature, and so they use what Rapley (2011 p. 273) calls a 'tag':

Above all, whatever you read, you realise that it is *de rigueur* to have some kind of tag. You need the right kind of label in your methods section, ideally, one that positions you as competent, so that your work can be nicely categorized.

While methods of analysis are often described as separate entities, the methods each use are very similar, even arguably, and in practice, the same. 'Interpretive Analysis' can be contrasted with 'Content Analysis', which indicates a more descriptive analysis but even this is debatable. The term 'qualitative analysis' is broadly understood although it almost immediately becomes necessary to communicate the exact method used, and that is a little more difficult. In practice, each qualitative analysis is different, and that 'difference' is greater than the difference between one method of analysis and another. So, we don't need to worry about what is thematic analysis and what is framework analysis. For they are no more different than a laugh and a giggle, a street and a road.

However, this doesn't help you much, does it? So, here is a little list in which I shall courageously ascribe the whole body of qualitative analysis:

Main approaches to qualitative analysis

- interpretive analysis;
- Grounded Theory analysis;
- content, or descriptive analysis.

Interpretive analysis

In this category, the 'interpretation' of the messages contained in the transcripts is an essential part of the qualitative analysis and is inevitably subjective. Here, the researcher places an interpretation on what they are reading, what is read is defined somehow, and tentatively. This interpretation is open to challenge as the next paragraph or the next transcript is read. These 'interpretations' are then modified as the researcher very gradually gets to know the transcripts. These interpretations are those of a single researcher; you or I might interpret the texts differently. This last should not be a concern because the analysis is appropriately that of the researcher. Another researcher, or you or I, might interpret the transcripts differently. It is only necessary that the researcher analysing the transcripts be able to communicate how and why the given interpretation was achieved. Researchers often do this by providing examples of how given pieces of text were interpreted.

The interpretation of any message within the transcript is usually identified in the form of a code. Here, conceptual codes (such as, 'happy', 'sad') are discerned from the transcripts as they are read. The transcripts are coded by assigning textual labels (codes) to the interpretation discerned from the text. The researcher then tries to use these codes

with the next transcript to be coded, usually, the codes are added to and modified. The researcher then goes back to the first transcript and attempts to apply the newly modified codes. As new transcripts are read and re-read, the codes are allowed to evolve until a definitive set of codes are identified. Codes are always allowed to develop as the analysis proceeds. The codes are then grouped into categories or themes in order to develop higher-level concepts which reflect major themes in the transcripts.

Analysis in Grounded Theory

Grounded Theory uses the technique described above but in order to satisfy its label as the nearest thing qualitative research has to a method, it carries out the interpretive process, well, methodically. Grounded Theory uses a progressive hierarchy of coding to analyse the transcripts, called:

- codes
- concepts
- categories.

The first step in this methodical process is to code the transcripts. These 'codes' are the lowest or most grounded level of interpretation; a code might be 'pain', or 'funny' or 'awareness of danger' for example. On their own, they are not likely to mean much except that they summarise the key issues in the text. This stage is called 'Open Coding'.

The Grounded Theory researcher then tries to collect together groups of conceptually similar codes. For example, 'fear' and 'trepidation' might be put together in one 'Concept' of 'fear and anxiety' or perhaps 'the surgery'. In practice, the researcher looks at the relationship between codes and ways in which they are meaningfully connected. There may have been lots and lots of individual codes, although seasoned qualitative researchers will try and keep these to a reasonably number. PhD students (bless them) often end up with thousands of codes. It is usually the case, that all of these codes can be put together into a much smaller number of 'Concepts'. It is important to understand that this is an interpretive exercise that begins to create a new understanding of the messages contained in the transcripts. This stage is called 'Axial Coding'.

The next step is to look at the list of Concepts and try to place them into broader 'Categories'. Categories are just a higher-level conceptual grouping. There are usually just a few Categories. This stage is called 'Selective Coding'. In Grounded Theory, the Categories are meant to indicate the meaning the researcher finds in the transcript; they exist as the researcher's interpretation of the main or key messages (themes) contained in the transcripts.

In Grounded Theory, the interviews are analysed soon after the transcripts are ready and before the next interview. The researcher will then re-review the codes with every new interview. This process is called Constant Comparative Method. In this way, data collection and data analysis are concurrent.

Content or descriptive analysis

In content or descriptive analysis, the researcher usually tries to remain objective. Often the goal in this form of analysis is to simply record what were the main messages in the transcripts. It is sometimes the case that research is interested in experiences that can easily be communicated and that do not need much, if any, interpretation. In this case, the main goal is to summarise and communicate the main messages contained in the transcripts.

These three main approaches are not mutually exclusive, and you would have to borrow someone else's glasses to get an impression of just how blurred the boundaries are between them. Nevertheless, and in practice, most forms of analysis used in qualitative research can be put into one of the three categories outlined here.

Qualitative analysis software

Software is available to help with qualitative data analysis. However, while just about every quantitative researcher will use statistical software, many qualitative researchers will choose to do their analysis by hand. Qualitative researchers may tend not to enjoy technology much, or as Banner and Albarran (2009 p. 25) politely put it, 'may sometimes suffer from technological conservatism'. Certainly, the benefits of software for qualitative researchers are less clear than is the case for statistical analysis. Software does allow data to be kept all in one place and for several researchers to be working on them at the same time. Large amounts of data can be coded, and coding structures can be changed on the fly without having to recode everything manually.

Software in use today, includes:

Ethnograph, used for coding data:

www.qualisresearch.com/

Nvivo and Atlas.ti, used for both coding data and theory building:

www.qsrinternational.com/products_nvivo.aspx

www.atlasti.com/

It might be useful here to consider again the following data analysis 'to-do' list:

Analysis in practice (any paradigm)

- 1 Look at your data as it 'comes in', rather than when you have collected it all.
- 2 Conduct an 'initial reading' of the text, followed by a closer scrutiny of the text.
- 3 Identify anything in the text that is interesting, seems 'key', typical, different, odd etc.
- 4 Label (code, categorise) the above. Try to use labels that summarise the text somehow but bear in mind that these labels will evolve and change as you re-look at the text and look at more text. Note that some labels will be descriptive while others will be conceptual.

- 5 Grounded Theory researchers will at this stage search the literature for existing theory (theoretical sensitivity); this may give new insight and cause further analysis to be needed.
- 6 Look for 'negative cases', data that seems to disagree with the developed codes, categories or themes. Ensure these are fully explored.
- 7 Keep a journal (log, diary). Record every single thought, decision and change of label. What you thought, what you did, why you did it.
- 8 Regularly review your labels, re-read text you have already labelled and review the labelling.
- 9 Identify labels that can be grouped together to form higher-level labels.
- 10 Identify what association or patterns may exist between labels and groups of labels.
- 11 Identify broad categories of labels that effectively and accurately reflect the data (proto-theories). It is these that will exist at the summary of the analysis and that will be communicated to others when the research is published.
- 12 Lastly, this is a cognitive exercise, so always 'think'. Never let the 'process' or the 'task' take control. Always think, what is this, what is going on here, are my labels (codes, categories) really reflecting the text, are there any patterns here? Always question 'am I getting this right?'.

Whatever form of analysis is used, there is an ever-present danger that the participants' accounts will be interpreted in terms of the researcher's own values to the point where the participants would not recognise the interpretation. It should be possible to 'see' the transcripts within the interpretation provided by the researcher. However, this does not help the reader of qualitative research papers because neither the data nor the lengthy analysis will be there. This does tend to mean that we have to accept the researcher's interpretation of the data. A full 'audit' of the research would in any case be very time consuming. In practice, researchers need to be able to make it clear how exactly the analysis was performed. Even where that analysis is heavily 'interpreted' it should be possible for the researcher to explain what mechanisms were made to enable the interpretation.

There is a position that opposes itself to the 'everything should be clear and auditable' argument. This position argues for the usefulness of insiderness and iteration. Insiderness is where the researcher shares social attributes with participants, come from the same social group, has the same health issues etc. or is open about the fact that they are seeing the data from a particular perspective (perhaps from the perspective of someone from an ethnic minority background). This 'insiderness' allows the researcher greater insight into what is communicated by the participants, and their resulting analysis of the data may be quite different than one undertaken by a non-insider.

Iteration is a process of getting to a result via a process of repeated cognitive operations that eventually converge to form a conclusion or summary. Iterative analysis is much less structured than any form of coding, but it can be more insightful and less mechanistic. Certainly, new researchers often become so subsumed by their coding strategy that they fail to see what messages are shouting out from the transcripts.

BOX 10.6 EXAMPLE FROM THE RESEARCH LITERATURE

Keikelame (2018) discusses how the alarming appearance of a tortoise during an interview in a South African home came to make her think of how she interpreted her interviews and what meaning she found in them. Her alarm at seeing the tortoise caused the interviewee to reassure her that everything was all right, and that the appearance of the tortoise meant that her ancestors were happy with the interview. Such a divergent analysis (in this case, of the tortoise) easily hides the meaning in participants' dialogue. This experience led the researcher to reveal herself to her research, her sex, race and age, the meaning she now finds in tortoises. In this way, the researcher's analysis is necessarily dependent on their background, experience and cultural knowledge and is a reflection of both the researcher as a person and the participants.

Evaluating qualitative research

Trustworthiness is a qualitative term that means the overall quality of research. Curtin and Fossey (2007 p. 88) define trustworthiness as 'the extent to which the findings (of the research project) are an authentic reflection of the personal or lived experience of the phenomenon under investigation'.

We can examine the quality of quantitative research in relation to internal and external validity and reliability.

- Internal Validity (truth, have we correctly measured the thing we set out to measure).
- External Validity (is the study generalisable).
- Reliability (if we did the study again, would we get the same results?).

However, these terms do not relate well to qualitative research. Qualitative research tends to accept the participants' accounts as inherently valid and seeks not to be generalisable because people are seen to be individuals. Qualitative studies don't really have 'reliability' (replicable) because each study is different.

A quantitative study can be communicated succinctly to a journal audience, but this is not the case with qualitative studies. The analysis, in particular, would take up too much journal space. For this reason alone, there is currently no effective means by which we can judge the quality of qualitative research except through audit. This is not something the reader of journals can do, for an audit must have the whole research project, data, researcher's log etc. available for scrutiny. So don't be surprised if you find it difficult to properly judge qualitative research as it is published in journals, for we all do. There is just not enough information there for us to make a judgement. Clearly, this is a problem, for we want qualitative research to be used in relation to 'evidenced-based practice' and for that we need it to be capable of being judged. Fortunately, there are aspects of Trustworthiness that we can look out for in published qualitative studies and these are outlined below.

Validity (truth)

We have already seen that 'truth' (internal validity) is not seen to exist in positivist terms but only as it is experienced by a person in one time and place. Qualitative studies largely regard material acquired at interview to be inherently true. To the qualitative researcher, internal 'validity' is, instead, seen as the degree to which the interpretation of the data can be seen in the data itself. However, we have already seen that this interpretation can be quite subjective, with this subjective interpretation viewed as being perfectly legitimate. Before we become too despondent, we should note that 'truth' is pretty hard to measure in any kind of study. Quantitative studies will tend to accept that 'truth' exists when the variable is measured the same way on two occasions. In this way, a questionnaire can include some questions that are repeated. If the participant is being truthful (and not just ticking boxes randomly) they will answer the repeated questions in the same way. However, consistency does not equal truth. One can imagine a defendant at a police station consistently telling the police he did not commit a crime. The police question him again a week later and he denies the crime again. Does this mean that our defendant is telling the truth and is innocent? Perhaps not. So truth in research is a pretty illusive commodity. Truth is a very slippery phenomenon and we should not fool ourselves into thinking that it can be identified in any study, however it is done. In fact, qualitative studies have some advantage over quantitative studies, for the former tend to claim only that they are interpreting what the participants choose to tell the researcher. What *is* true, is that the participant told the researcher the things that the participant told the researcher. These things are recorded and transcribed, and we know at least 'what' we are measuring. Conversely, quantitative studies are often less than sure of what it is they have measured. Consider, for example, the use of a simple pain scale, used to record a patient's perceived level of pain. Let us say that we have a score of '5'. Two questions now present themselves, (1) what exactly does '5 pain' mean (does our measurement of pain actually make any sense, even to us), and (2) how sure are we that we are not measuring 'anxiety' instead, or a mixture of pain and anxiety? In an important sense, qualitative research does at least get its information from the 'horse's mouth', our data is first-hand data, not a measure of a measure of a measure. Additionally, we do at least know how the participant has interpreted their experience or at least how they have chosen to report that experience to us, using their own language and without having to convert their experience to a number.

External validity (generalisability, transferability)

Qualitative studies do not seek to generalise their results (external validity) because they are chiefly concerned with the experience of (usually) a small number of people. To the die-hard qualitative researcher, each person is unique and is not like other people, or indeed even like him or herself across time and space (our understanding of our experience changes over time). This causes Barusch *et al.* (2011) to argue that generalisability is the very antithesis of qualitative research. However, the results of qualitative research can give us insight into others' experience. Indeed, Grounded Theory (Glaser and Strauss 1967) fully

embraces this argument and makes theory construction its very aim. On balance, we can see that qualitative research is designed to give us insight into participant's lived experience. This insight can be useful when we turn to look at other individuals. What qualitative research achieves is a new 'insight' into people who are, for example, physiotherapy patients, parents on a children's ward or people who have had a stroke.

Lastly, qualitative studies do not seek to be 'reliable' in a quantitative sense (meaning that a study conducted again would achieve the same results). Indeed, it is largely accepted that even if the same data were to be analysed by two different researchers, it would be legitimate for them to interpret that data differently.

Generally, qualitative research does not use the same evaluative terms as quantitative research, for example, the terms 'reliability' and 'validity' are not used. Instead, different terms are used; see Table 10.1.

It is the case that every qualitative research study is different. However, rigour in qualitative research is said to exist where an individual would be able to audit the data collection and analysis. In other words, it should be possible to see exactly how the researcher conducted the research and how they interpreted the data. This interpretation is essentially subjective; however, it should still be possible for the researcher to explain how and why their interpretation was made.

Despite the difficulty in measuring the quality of qualitative research, there are a number of ways in which researchers try to enhance the trustworthiness (overall quality) of their studies. These are summarised in the list below:

- triangulation;
- external audits;
- member checking;
- method triangulation;

Table 10.1 Measures of trustworthiness

Measures of trustworthiness (research quality)	
Qualitative term	Meaning
Credibility	Similar to 'internal validity'. The degree to which the researcher's interpretation of the data can be justified in the data itself.
Transferability	Similar to 'external validity'. The degree to which the concepts, constructs or theory generated by the analysis can be applied elsewhere.
Dependability	Similar to 'reliability'. If the study was repeated, similar results would be obtained.
Plausibility	The degree to which the researcher's interpretation of the data is likely to be realistic given our existing knowledge.
Confirmability	The degree to which it is possible to assess whether the findings flow from the data (is the study 'auditable'?).

- negative case analysis;
- peer debriefing;
- peer review;
- prolonged engagement/persistent observation;
- reflexivity (openness about researcher biases).

Triangulation

Triangulation is the use of more than one method. The term comes from a technique used by surveyors to identify one point in space by relating it to two or more other points whose position is known. Triangulation in qualitative research simply means using more than one technique. Triangulation can be achieved by collecting data from different sources. For example, data could be collected from paediatric staff and from parents of children. Their accounts will be different, but it should be possible for the two accounts to be related in a way that makes human sense to us. We could seek to collect data from the parents, at interview, using a qualitative approach but, in addition, we might be able to use a questionnaire to ask questions related to the focus of the research. Again, the data will be different, but it might be possible to relate the two sets of data in a meaningful way. This would help to give us confidence in both sets of data. We might choose to collect data both from interviews with participants and also by direct observation of them or perhaps by asking participants to keep a diary of the experiences. Method triangulation can work to give us confidence in the data.

External audits

Qualitative research should leave behind it an 'audit trail' that allows others to look at each step of the research in detail and judge its quality. However, the world of research has very few mechanisms for doing these audits, at least outside PhD programmes. For the present time, qualitative research is only 'HD Ready'; good research leaves an audit trail but often there is no one currently present to do the audit.

Member checking (participant data validation)

This is not about counting fingers and toes; rather, it is a process whereby one or more aspects of the data or the analysis are shared with the participants in order to obtain their views on it. At its simplest level, each participant can be given the transcribed interview for them to check that it accurately reflects what was said at the interview. This can be an opportunity for them to add new material or to comment further on things that were said. Often, a summary of the interview or the preliminary results of the analysis of the interview data is given to the participants for their comments. This technique rests on the assumption that results of the analysis should be reflective of the participant's experience as it is understood by the participant. The problem with sharing the analysis with the participant is that it would be legitimate for them to disagree with it. It is, after all, the researcher's analysis. Even here, however, the participants' views on the analysis are likely to be useful.

Negative case analysis

Researchers often get quite excited when they are able to see a pattern of findings in their data, that is, they begin to see what is 'really going on' in the data. However, it is at this time that other emerging patterns, which do not agree with the main one, sometimes become apparent. It is sometimes easy to ignore or not give sufficient weight to these 'negative case', parts of the data that do not agree with the researcher's emerging conclusion. Negative case analysis is a deliberate attempt to focus on those aspects of the data that do not comply with other ideas emerging from the text. In this way, negative case analysis can be seen as 'thoroughness' in the analytical process.

Peer review

Peer review can involve the researcher reporting the planned research or the research in progress to one or more other individuals who are not directly involved in the study. This enables the research to be considered with 'fresh eyes' and for difficulties and researcher biases to be made explicit and examined. Planned Systematic Reviews are sometimes published as 'protocols' in order to obtain feedback on them.

Prolonged engagement with participants/persistent observation

It is a characteristic of qualitative research that the researcher will spend a lot of time with participants. This is particularly true of Ethnography where data is collected from participants in their natural environment. In any qualitative study, the data collection takes a long time. This is generally seen to be a good thing, for the more time one spends with participants, the richer the data will be and the more the researcher will tend to understand the data as the participants understand it.

Reflexivity

Jootun *et al.* (2009 p. 42) calls reflexivity 'one of the great pillars of qualitative research'. While in quantitative research, most of the 'thinking' goes into the planning stage, in qualitative research that thinking is present from the beginning to the end of the study. Reflexivity is characterised by constantly asking oneself the questions 'what do I know?' (of the data) and 'how do I know it?' (what interpretive process is going on here). Jootun *et al.* (2009) make the point that while qualitative research and analysis are essentially subjective in character, the mapping of the reflexive process can at least make the research open and transparent. For this reason, qualitative researchers often keep a log or diary of the analysis.

Reflexivity is similar to the notion of 'reflective practice', often used by healthcare practitioners to question their own practice and construe ways of improving it. In exactly the same way, a qualitative researcher will continuously question the approach they are using and their interpretation of the data. The researcher will keep a record of this reflective

activity and so is able to report a summary of it. Such a summary can tell the reader how the researcher's ideas on the data developed over time. This helps to make the research process transparent.

Thick description

Thick description is a detailed account of the data and analysis. Often researchers will use quotes from the data to illustrate how the summary of their analysis can be related back to the original data. Lovatt *et al.* (2015) looked at the experience of healthcare assistants working in the community with people who were dying. The families of the dying person were often very grateful for the care that was offered; they especially appreciated the way in which they would get to know the care assistants who attended regularly and often for a whole shift. In this study, thick description is used to show how the data was interpreted; for example (p.275):

They emptied my washer and my tumble drier and folded it all up. I could have kissed them, I think I probably did. Because they said 'well we are here all night if he's asleep we can do whatever' and they emptied my dishwasher and did strange things like that which I would never in a million years have asked anybody to do, but it was lovely that they did it.

The above was used as an example of the way the healthcare assistants worked hard to 'fit in' with the family situation; this was not an inevitable outcome but something the healthcare assistants actively pursued.

Audit trail

Qualitative research is essentially a subjective process. However, even this subjectivity needs to be open to scrutiny because it should still be possible to communicate the rationale for the ideas being communicated in the analysis. For this reason, qualitative researchers log every 'step and turn' of the research. This will include a description of the cognitive steps the researcher took while interpreting the data. Such an audit trail helps to make the study open, transparent and auditable by others.

Conclusion

When we judge the quality of a qualitative study, we ask two main questions (Koch, 2006):

- 1 Are the researcher's conclusions firmly grounded in the data (can we relate the conclusions to the data)?
- 2 Are the conclusions explained by the researcher's interpretive scheme (do they make sense, bearing in mind the researcher's explanation of their interpretive strategy)?

We would all like the methodologies employed in qualitative research to be clear, universally accepted and readily amenable to scrutiny; much as the way the statistical mean is understood by everyone. However, qualitative research in healthcare has taken huge strides in the last 20 years and is now accepted as legitimate by every practitioner and academic who does not have his or her head in a bucket of sand. We need to understand how patients feel, and for that we need qualitative research, flaws and all.

It is interesting to note that in the past 10 years or so there has been an explosion of meta-analyses of qualitative research (see for example Grimston *et al.*, 2018); studies that look at multiple qualitative studies on a particular subject and which seek to identify commonalities among them. Arguably, it is in these meta-analyses of qualitative research that 'generalisability' - that holy grail of quantitative double-blind trials - is achieved for qualitative research. Arguably, in the meta-analysis of qualitative studies, the analyses break free from those small groups of participants with their one or two researchers and their 'subjective' analyses, and become generalisable to our own patients, our own field of work.

Evaluating qualitative research - a checklist

Now we know what qualitative researchers 'do' when they conduct their research. We also know what we can expect to be present in a study in relation to its 'trustworthiness'. The checklist shown in Table 10.2 can help us to make a judgement on the quality or trustworthiness of qualitative research.

Table 10.2 Evaluating trustworthiness

A	Thick description (clarity)	Comments	YES	NO
A-1	Does the study have a clear focus and goal? Is the research problem clearly stated?	It is important, even with qualitative research that the research has a clear focus. However, the focus may well be in the form of 'how do a group of epilepsy sufferers experience health care intervention?'.		
A-2	Is there evidence that the research has considered the existing literature, either at the beginning of the study or at some point in the course of the study, in order to ensure that the study 'builds on' existing knowledge?	Qualitative research is usually inductive. As such it sometimes tries not to be influenced by existing ideas, constructs and theories that may be present in the literature. However, it is still always necessary to build on and add to existing knowledge and the existing literature should therefore be used at some point in the study.		

continued

Table 10.2 *Continued*

A	Thick description (clarity)	Comments	YES	NO
A-3	Is the method of recruitment clearly identified?	The study should make it clear how participants were selected, what were the inclusion and exclusion criteria. While the 'sample' need not be strictly representative of any 'population', there is usually a desire to be able to apply the findings to other people, situations or future studies.		
A-4	Are ethical issues clearly identified?	Support mechanisms in place in situations where participants might experience emotional distress.		
A-5	Is the data collection procedure (e.g. interviews) described clearly? Is it clear, what was done and is there a clear rationale provided for what was done?	Both the process and the rationale should be clear and should be compliant with the research question.		
A-6	Is there evidence that data saturation was reached?	This is the point at which new data is not adding anything to the analysis. Data collection should not stop before data saturation is reached.		
A-7	Method - general: Is there reference to a method or philosophical underpinning?	The research may refer to Ethnography, Phenomenology, Grounded Theory etc. or to an eclectic mix of methods but the method should always be clear.		
A-8	Method - focus: Does the research make it clear whether the focus is on individual lived experience or to group, culture or societal function?	There is a fundamental difference between trying to interpret lived experience (as in Phenomenology) and trying to examine or interpret the meaning in social groups (defining the social group by the meaning individuals have in it), as in Ethnography.		
A-9	Method - bracketing: Is it clear whether the researcher tried to be neutral (bracketing) or to be open about values and other attributes?	We need to be clear about whether the researcher tried to be neutral (as in unbiased) or whether she or he openly accepted his or her values, experience, assumptions etc. and used these (purposely) to influence the research.		

Table 10.2 *Continued*

A	Thick description (clarity)	Comments	YES	NO
A-10	Has the researcher used one or more of these? • Analysis triangulation • External audits • Member checking • Method triangulation • Negative case analysis • Peer debriefing • Peer review • Prolonged engagement/persistent observation • Reflexivity (openness about researcher biases)	At least one should have been used. There should also be a rationale for their use or for not using each or most of the procedures in the list.		
A-11	Has the researcher left an audit trail?	The researcher should have kept a log of each stage in the research process and each stage in the interpretation (cognitive) of the data.		
A-12	Analysis method: Is the exact method of analysis detailed?	It should be possible to be clear about how exactly the data were analysed. For example, were codes, themes or categories developed from the data?		
B	Summary measures of trustworthiness		1-5	
B-1	Credibility	Similar to 'internal validity'. The degree to which the researcher's interpretation of the data can be justified in the data itself.		
B-2	Transferability	Similar to 'external validity'. The degree to which the concepts, constructs or theory generated by the analysis can be applied elsewhere.		
B-3	Dependability	Similar to 'reliability'. If the study was repeated, similar results would be obtained.		
B-4	Plausibility	The degree to which the researcher's interpretation of the data is likely to be realistic given our existing knowledge.		
B-5	Confirmability	Is the study 'auditable'?		

Concluding remarks

This chapter has cut through some of the very confusing terminology used to describe qualitative research. The list at the beginning of the chapter on 'how to do qualitative research' really does indicate that it is actually quite easy to do and to understand. You now understand qualitative research quite well. However, out there in the intellectual wilderness there is still a lot of confusion and a notable lack of clear, widely accepted qualitative methods. There really are about as many ways to do qualitative research as there are published qualitative research papers.

We should bear in mind that quantitative methods have been developing at least since the seventeenth century and that qualitative methods are still comparatively new. We have already noted that qualitative approaches in healthcare are really not much older than Glaser and Strauss's publication of Grounded Theory (Glaser and Strauss, 1967). Grounded Theory provoked much excitement at the time, and we are still within that first exciting period. This is a time when qualitative research in healthcare is still new and still developing. It is a confusing time, because so much is happening; qualitative research in healthcare has barely had time to stand still since the late 1960s. It is, however, a time with enormous opportunity. Eventually, we will have at our disposal both properly validated qualitative research methods and a better understanding of patients and practitioners.

The key value of qualitative research is that, quite simply, health professionals are often interested in their patients' feelings and experiences. Our greater understanding of how both illness and intervention are experienced by patients and clients will surely help us to provide better care.

Summary

This chapter has looked at how qualitative research is done and how we are able to judge the quality of completed research. In looking at how research is done, we have seen that qualitative research requires a degree of 'people' skill. Such skills are needed, for example, when we interview people about things that are key experiences for them. Researchers need these skills to keep the interview focused and to probe the participant for the deeper information which qualitative research always seeks. However, we also need to achieve empathy so that we have some insight into what the interview is doing to the participant. We need to be caring and careful and to know when to pull back, to pause the interview or stop it altogether. Such skills are not easily found in the general population but are found among healthcare professionals. It has already been suggested that the inductive nature of qualitative research suits the pragmatic healthcare professional well. So we should not be surprised that qualitative research has blossomed to the degree that it has begun, at least outside medicine, to marginalise traditional scientific approaches to healthcare research.

Further reading

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Appendix

Statistical tests and procedures

Analysis of variance (ANOVA)

A general term for a range of parametric statistical procedures designed to be run on interval and ratio data and which are generally used to identify the effect of one or more independent variables on one or more dependent variables in a manner that we would be likely to see in an experiment or clinical trial. Different forms of analysis of variance have been designed for different research designs. In this way, a 'One-Way ANOVA' is used where there is one independent variable with three conditions (groups) and where there is one dependent variable.

Chi Square (χ^2 , Pearson Chi Square)

Pearson Chi Square is used for nominal data (categories) where associations are hypothesised.

In this example, we can see an analysis run on fictitious data about male and females' declared favourite colour. You can perhaps see that males are more likely to choose 'blue' and females are more likely to choose 'pink'. We can see that there is an association between the variables 'sex' and 'colour choice'. In other words, there is a difference between males and females in relation to their colour choice. We can also see, using Pearson Chi Square, that this result is significant, that it is unlikely to have occurred by chance.

Sex * Colour Crosstabulation

Count		Colour		Total
		Pink	Blue	
Sex	Male	4	24	28
	Female	20	1	21
Total		24	25	49

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact. Sig. (2-sided)	Exact. Sig. (1-sided)
Pearson Chi-Square	31.469 ^a	1	.000		
Continuity Correction ^b	28.313	1	.000		
Likelihood Ratio	36.901	1	.000		
Fischer's Exact Test				.000	.000

Cronbach's Alpha

Cronbach's Alpha is used to test internal consistency or reliability. It is most commonly used to test that a questionnaire is 'reliable'. This is generally done by including questions in the questionnaire that ought to be answered in the same way as other questions.

Reliability Statistics

Cronbach's Alpha	N of items
.971	4

Item–Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total correlation	Cronbach's Alpha if Item Deleted
Italy	59.4907	32.201	.949	.963
South Korea	59.0810	32.513	.929	.964
Romania	59.8700	31.680	.934	.964
France	59.0210	33.146	.931	.966
China	59.9377	33.285	.942	.965
United States	59.1397	30.183	.924	.965
Russia	59.8230	20.273	.917	.965
Enthusiast	59.4713	32.666	.660	.981

In this example, the scores from eight judges were analysed to test for internal consistency (reliability, agreement). The Cronbach's Alpha score is very high, indicating that there was a high level of agreement amongst the judges.

Friedman

The Friedman test is a non-parametric equivalent of the One-Way Analysis of Variance for a related design. The Friedman test can be run on ordinal data, or interval / ratio data which fails to meet the criteria for the use of a parametric test such as the One-Way Anova.

The Friedman test is run where there is one variable that is measured on more than two occasions. For example, a physiotherapist tries to improve the evaluations of a patient fitness regime by getting each patient to undergo three fitness sessions in turn:

the first one with rock music playing;

the second session with country music playing;

the third session with classical music playing.

The physiotherapist asks the patients to evaluate each session on a scale of 1-10.

The data look like this:

Rock	Country	Classical
1.00	4.00	7.00
2.00	5.00	8.00
3.00	6.00	9.00
2.00	5.00	9.00
1.00	4.00	7.00
2.00	5.00	8.00
2.00	6.00	8.00
2.00	6.00	9.00
1.00	5.00	8.00
2.00	4.00	7.00
1.00	4.00	8.00
2.00	5.00	9.00

And here are the results of the physio's analysis:

Descriptive statistics

	N	Percentiles		
		25th	50th (Median)	75th
Rock music	64	2.0000	2.0000	3.0000
Country music	64	4.0000	5.0000	6.0000
Classical music	64	8.0000	8.0000	9.0000

Friedman Test

Ranks

	Mean Rank
Rock music	1.02
Country music	1.98
Classical music	3.00

Test Statistics^a

N	64
Chi-Square	126.031
df	2
Asymp. Sig.	.000

a. Friedman Test

Because the data is ordinal, mean rank has been computed (instead of mean). We can see that the mean rank for classical music has the highest value. In the 'test statistics' box we can see (under 'Asymp. Sig') that the result is significant – so the three music groups do differ in a manner that would not have occurred by chance. We can see that the classical music group was evaluated best here. Sometimes, however, the result is less clear, and we have to run 'post hoc' tests to determine which group is most different from the others.

Kruskal Wallis

The Kruskal Wallis test is a non-parametric equivalent of the One-Way Analysis of Variance for un-related groups. The Kruskal Wallis can be run on ordinal data, or interval / ratio data which fails to meet the criteria for the use of a parametric test such as the One-Way Anova. For this statistical procedure, we would expect to have one independent variable with more than two conditions.

A doctor wants to test a new analgesic drug. However, a new form of intensive care is designed to enhance the effectiveness of the drug. Our doctor also wants to test the drug against a control group that would have no treatment (no drug and basic care only). So, there are three conditions in the treatment variable:

- (1) new drug
- (2) new drug plus intensive care
- (3) control group.

The dependent variable is 'reported pain' which exists on a 1-10 scale.

Here is what the analysis looked like:

Kruskal–Wallis Test



Ranks			
Treatment		N	Mean Rank
Pain score (1–10)	1–New Drug	21	32.07
	2–New drug and special care	21	11.17
	3–Control	22	53.27
	Total	64	

Test Statistics^{a,b}

	Pain score (1–10)
Chi-Square	55.949
df	2
Asymp. Sig.	.000

a. Kruskal–Wallis Test
b. Grouping Variable: Treatment

We can see that there are quite large differences between the mean ranks for the three conditions. The new drug+intensive care gets the lowest score, reflecting lower patient pain scores.

The analysis (Kruskal Wallis) shows a significant result, meaning that the groups are in fact different and to a degree that would not have occurred by chance.

The results seem pretty clear here. However, often it is necessary to run post-hoc tests to clarify what exactly is the difference between the three groups.

Mann Whitney

The Mann Whitney test is a non-parametric equivalent of the t-test for unrelated groups. The Mann Whitney test can be run on ordinal data or interval/ratio data that fails to meet the criteria for the use of a parametric test such as the t-test.

In a Mann Whitney test, we would have one independent variable with two conditions. Let us say that we wish to test a new analgesic drug against a control. Our ‘treatment’ variable has two conditions:

- (1) new drug
- (2) control.

The dependent variable will consist of the patients’ recorded pain levels, using a scale of 1-10.

Here are the test results:

Mann–Whitney Test

Ranks				
	New drug versus control	N	Mean Rank	Sum of Ranks
Pain Scores – two conditions	(1) Control	33	47.94	1582.00
	(2) New Drug	31	16.06	498.00
	Total	64		

Test Statistics^a

	Pain scores – two conditions
Mann–Whitney U	2.000
Wilcoxon W	498.000
Z	–6.926
Asymp. Sig. (2-tailed)	.000

a. Grouped Variable: New drug versus control

We can see that the mean rank for the control and for the new drug are quite different, with the new drug being associated with lower pain scores.

The result is significant (see the figure of 0.000 for Asymp Significance). This means that the difference we observe between the two groups is very unlikely to have occurred by chance.

Multivariate analysis of variance (MANOVA)

MANOVA is an extension of ANOVA and is principally different in that it can deal with more than one independent variable and more than one dependent variable. MANOVA is often used in psychology research and in other situations that are essentially 'multivariate'.

In multivariate analyses, the researcher will be aware that there are a number of variables interacting with each other and that it would therefore not be desirable to study each effect in isolation. Not surprisingly, multivariate analysis of variance can become very complex.

In this analysis, we are seeking to find out whether field of practice (nurse, physio etc.) and sex (male, female) have an effect on the degree to which participants claim they like classroom study and clinical experience. We also want to find out if there is an interaction between field of practice and the participant's sex in relation to their preference for clinical practice or classroom study.

Here are the descriptive statistics (e.g. mean scores) for each field of practice, broken down in terms of participant sex.

Descriptive Statistics					
	Field of Practice	Sex	Mean	Std. Deviation	N
Score for practice experience	(1) Nurse	Male	78.4000	15.22571	10
		Female	78.1429	11.11198	7
		Total	78.2941	13.29363	17
	(2) Physio	Male	73.7692	17.24410	13
		Female	78.0000	8.36660	5
		Total	74.9444	15.17146	18
	(3) Radiographer	Male	69.8182	12.97550	11
		Female	73.2857	12.27076	7
		Total	71.1667	12.45817	18
	(4) Medic	Female	79.7273	7.90052	11
		Total	79.7273	7.90052	11
	Total	Male	73.8529	15.29930	34
		Female	77.5667	9.70490	30
		Total	75.5938	13.01735	64
Score for practice experience	(1) Nurse	Male	41.6000	16.14655	10
		Female	32.1429	16.68761	7
		Total	37.7059	16.55583	17
	(2) Physio	Male	35.1538	16.84659	13
		Female	43.4000	19.03418	5
		Total	37.4444	17.32126	18
	(3) Radiographer	Male	44.2727	10.18912	11
		Female	34.7143	19.93083	7
		Total	40.5556	14.97536	18
	(4) Medic	Female	41.9091	16.10872	11
		Total	41.9091	16.10872	11
	Total	Male	40.0000	14.89560	34
		Female	38.2000	17.34717	30
		Total	39.1562	15.98632	64

From the above chart we are able to see that there is a clear preference for clinical practice across all fields and across both sexes. However, there does not seem to be any difference between the scores for fields of practice and for sex.

Descriptive Statistics

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Score for practice experience	788.626 ^a	6	131.438	.758	.606
	Score for classroom study	1211.769 ^b	6	201.961	.773	.594
Intercept	Score for practice experience	359224.031	1	359224.031	2071.019	.000
	Score for classroom study	96979.735	1	96979.735	371.279	.000
Field	Score for practice experience	467.783	3	155.928	.899	.447
	Score for classroom study	261.409	3	87.136	.334	.801
Sex	Score for practice experience	73.480	1	73.480	.424	.518
	Score for classroom study	153.913	1	153.913	.589	.446
Field*Sex	Score for practice experience	46.046	2	23.023	.133	.876
	Score for classroom study	796.003	2	398.001	1.524	.227
Error	Score for practice experience	9886.812	57	173.453		
	Score for classroom study	14888.669	57	261.205		
Total	Score for practice experience	376398.000	64			
	Score for classroom study	114226.000	64			
Corrected Total	Score for practice experience	10675.438	63			
	Score for classroom study	16100.437	63			

a. R Squared = .074 (Adjusted R Squared = -.024)

b. R Squared = .075 (Adjusted R Squared = -.022)

The multivariate analysis of variance results are necessarily rather complex. However, if we look at the rows for field, sex and the interaction between field and sex, we can see that the results are non-significant. So, we can deduce that while all these people clearly prefer practice to study, there is no difference between them in terms of field of practice or their sex. It's quite simple; they all prefer practice to sitting in a classroom.

Normality tests (Kolmogorov-Smirnov test and Shapiro-Wilk)

Let us say that a teacher wants to run a parametric statistical analysis on exam results data. The data are interval (a scale of 0-100). The data look like this:

Result
30.00
40.00
50.00
40.00
30.00
25.00
25.00
40.00
35.00
68.00
45.00
50.00
64.00
52.00
12.00

However, in order to be sure that the data meets the criteria for a parametric test; our teacher has to ensure that the data are normally distributed. So, she runs the Kolmogorov-Smirnov and Shapiro-Wilk tests (these two are run together in most statistical software packages). Here are the results:

Descriptives			
		Statistic	Std. Error
Test Result	Mean	54.3281	2.24106
	95% Confidence Interval for Mean	Lower Bound 49.8497	
		Upper Bound 58.8065	
	5% Trimmed Mean	54.0694	
	Median	53.0000	
	Variance	321.430	
	Std. Deviation	17.92848	
	Minimum	12.00	
	Maximum	98.00	
	Range	86.00	
	Interquartile Range	21.75	
	Skewness	.316	.299
	Kurtosis	.000	.590

Tests of Normality						
	Kolmogorov–Smirnov ^a			Shapiro–Wilk ^a		
	Statistic	df	Sig.	Statistic	df	Sig.
Test Result	0.089	64	.200*	.976	64	.259

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance

Along with some useful descriptive statistics for the data, we have results from the normality tests, both of which are NON-significant, showing that the data IS normally distributed.

So, our teacher can now happily run her parametric tests on her data.

One-Way ANOVA

This is used where differences are hypothesised and where there is one independent variable containing more than two conditions. The groups of data must be unrelated. One-Way Anova is a parametric test and as such, the data must meet the criteria for a parametric design (see Glossary: Parametric Statistics). The Kruskal Wallis test is the non-parametric equivalent of the One-Way Anova.

In this example, a drug at two separate dose levels is being used - along with a control group - to examine what effects they have on the blood levels of seroptinine (fictitious). The independent variable has three conditions:

- (1) dose A
- (2) dose B
- (3) control group

The dependent variable is the recorded blood levels of Seroptinine.

Descriptive Statistics

Dependent Variable: Blood results

Treatment	Mean	Std. Deviation	N
1-Dose A	75.2381	16.06208	21
2-Dose B	76.2381	13.37126	21
3-Control	75.3182	9.57868	22
Total	75.5938	13.01735	64

Tests of Between-Subjects Effects

Dependent Variable: Blood results

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13.046 ^a	2	6.523	.037	.963
Intercept	365589.039	1	365589.039	2091.551	.000
Treatment 3	13.046	2	6.523	.037	.963
Error	10662.392	61	174.793		
Total	376398.000	64			
Corrected Total	10675.438	63			

a. R Squared = .001 (Adjusted R Squared = -.032)

We can see that the mean values look much the same for the dose A, B and control groups. It does not look as if either dosage has made any difference to the blood levels of Seroptinine. If we look at the analysis of variance table, we can see that the effect for 'Treatment3' is non-significant. So, it looks like we will have to try another dose!

One-Way ANOVA (related)

This is used where differences are hypothesised and where there is one independent variable and where participants are exposed to the testing on more than two occasions. The design must be ‘related’ (e.g. the same participants are tested on more than two occasions). If testing takes place on only two occasions, a related t-test is used. One-Way Anova is a parametric test and, as such, the data must meet the criteria for a parametric design (see Glossary: Parametric Statistics). The non-parametric equivalent is the Friedman Test.

In this example, we have males and females who undergo three patient education sessions. We wish to see if there is a difference between the males and females in terms of their knowledge at the end of each session (tested on a 1-100 scale).

Here are the descriptive statistics:

Descriptive Statistics				
	Sex	Mean	Std. Deviation	N
Session One	Male	12.1471	6.76951	34
	Female	11.3333	5.74356	30
	Total	11.7656	6.27351	64
Session Two	Male	53.5588	6.77975	34
	Female	21.2333	5.25674	30
	Total	38.4062	17.16282	64
Session Three	Male	80.3824	8.57768	34
	Female	37.9000	5.61003	30
	Total	60.4688	22.57402	64

We can see that as the sessions progress, the male participants are increasing their knowledge (their score). However, the sessions do not seem to meet the needs of female participants; their score does increase but not by as much as does the score from the male participants.

Tests of Between-Subjects Effects

Measure: Class_scores
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Intercept	249135.136	1	249135.136	8058.697	.000
Sex	30380.177	1	30380.177	982.698	.000
Error	1916.734	62	30.915		

If we now look at the test results for the One-Way Analysis of variance (repeated measures), we can see that the effect for ‘sex’ is significant. This tells us that the difference in male and female scores that we see in the first table is unlikely to have occurred by chance. It looks like we will need to change the teaching sessions so that they better meet the needs of female participants.

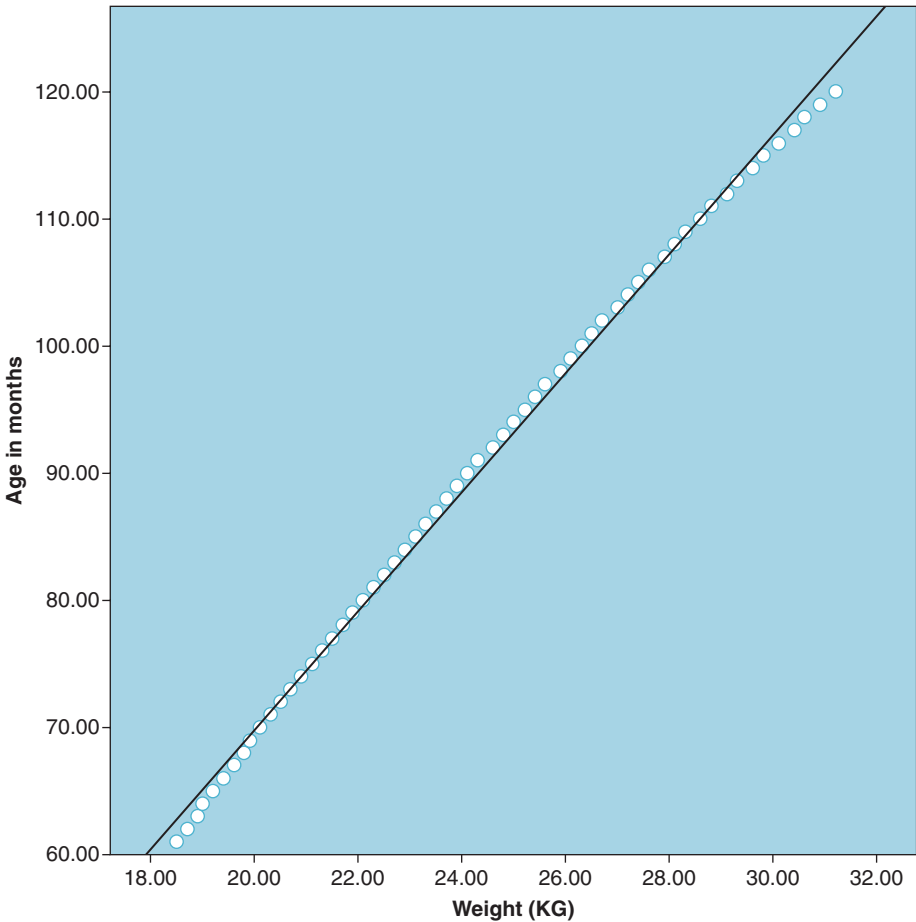
Pearson Rho (ρ)

The Pearson Rho (Rho is the Greek letter ‘r’) is a parametric correlation test. It is used to identify correlations between two variables where the data are at the interval or ratio level of measurement.

Let us use the example of children's age in months and weight. These two variables should correlate because we know that as children grow older, they tend to get heavier. The data looks like this:

	Age	Weight
1	61.00	18.50
2	62.00	18.70
3	63.00	18.90
4	64.00	19.00
5	65.00	19.20
6	66.00	19.40
7	67.00	19.60
8	68.00	19.80
9	69.00	19.90
10	70.00	20.10
11	71.00	20.30

If we draw a scatter plot of the values and draw in a 'line of best fit', it will look like this (the values here are rather less scattered than one would expect in practice):



We can see that there is almost perfect correlation between age in months and weight.

Correlations			
		Age in months	Weight (KG)
Age in months	Pearson Correlation	1	.999**
	Sig. (2-tailed)		.000
	N	60	60
Weight (KG)	Pearson Correlation	.999**	1
	Sig. (2-tailed)	.000	
	N	60	60

** . Correlation is significant at the 0.01 level (2-tailed).

The Pearson Correlation result is (as we would expect) significant. This means that we can be reasonably sure that these results did not occur by chance.

Post hoc tests

Post-hoc is Latin for ‘after this’. Post hoc tests are run after analyses involving more than two conditions. This is because the main inferential statistics such as Anova will only tell us that there is a difference between the (three) groups, it will not tell us which group is most different from the other two. Examples of post hoc tests include Scheffé’s and Tukey’s tests.

Shapiro-Wilk

Like the Kolmogorov-Smirnov test, the Shapiro-Wilk test is used to test that data is normally distributed, this being one of the criteria for using parametric statistical tests. See ‘Normality tests’.

Spearman Correlation

This is a non-parametric equivalent of Pearson’s Correlation. It is used where it is hypothesised that two variables are correlated. Spearman Correlation is chiefly used for ordinal data but can also be used for interval or ratio data that is not normally distributed or which fails to meet the criteria for a parametric design.

Just to practice this, if we run a Spearman analysis on the same data as in the Pearson Correlation example (above), we find that this test too, finds the correlation to be significant.

Correlations				
			Age in months	Weight (KG)
Spearman’s rho	Age in months	Correlation Coefficient	1.000	1.000**
		Sig. (2-tailed)	.	.
		N	60	60
	Weight (KG)	Correlation Coefficient	1.000**	1.000
		Sig. (2-tailed)	.	.
		N	60	60

** . Correlation is significant at the 0.01 level (2-tailed).

t-test

The t-test is a parametric test used to compare the effect of two conditions (one independent) variable on a dependent variable and where the design is 'un-related'. The data must be interval or ratio and must meet the criteria for a parametric design (see Glossary: Parametric Statistics). The non-parametric equivalent of the t-test is the Mann Whitney test.

Let us assume that we want to see if the blood levels of Seroptinine (fictitious) are different between males and females. In this case we have one independent variable (sex) with two conditions (male, female). The dependent variable is the blood levels of Seroptinine.

Here are the results:

Group Statistics

	Sex	N	Mean	Std. Deviation	Std. Error Deviation
Blood results	Male	34	73.8529	15.29930	2.62381
	Female	30	77.5667	9.70490	1.77186

We can see that the mean value for males and females is quite similar. When we run the t-test (below), we find that the result is not significant. So, there is no evidence here that males and females have different levels of Seroptinine.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Blood results	Equal variances assumed	8.881	.004	-1.142	62	.258	-3.71373	3.25289	-10.21616	2.78871
	Equal variances not assumed			-1.173	56.573	.246	-3.71373	3.16605	-10.05467	2.62722

t-test (related) or Paired Samples t-test.

The t-test (related) is a parametric test used to compare the effect of the independent variable on the dependent variable as measured on two occasions. There must be two sets of data taken from the same participants (or matched participants) on two occasions. The data must be interval or ratio and must meet the criteria for a parametric design (see Glossary: Parametric Statistics). The non-parametric equivalent of this test is the Wilcoxon signed-rank test.

Let us take the example of blood cholesterol, taken from participants before and after a life-style change programme designed to improve diet. A blood test is taken at the start of the programme and again, 3 months later. Here are the mean results (mmol/L).

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Start of programme	7.1267	30	.55890	.10204
	End of programme	3.7767	30	.51306	.09367

It certainly looks as if the programme has been successful. There has been a big drop in the mean cholesterol level. Now let's check to see if the result is statistically significant.

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Start of programme – End of programme	3.35000	.86053	.15711	3.02867	3.67133	21.322	29	.000

We can see from the above output that indeed, the result is significant (look at the most right-hand box). This means that the difference we observed in the mean values are very unlikely to have occurred by chance but will have occurred as a result of the life-style change programme.

Two Way ANOVA

A Two Way Anova is similar to a One-Way Anova except that it can handle two independent variables. It is a parametric test and is used where there are two independent variables, each with one or more conditions (groups) and one dependent variable. If there is more than one dependent variable, a multivariate analysis of variance (Manova) should be used. There is essentially no non-parametric equivalent of the Two Way Anova.

Wilcoxon

The Wilcoxon signed-ranks test is a non-parametric equivalent of the related t-test. It is used where there is one independent variable with two conditions (groups) and where the design is related. In practice, there will be two sets of data taken on two occasions from either the same participants (on both of the two occasions) or from 'matched' participants. Let's run the test on the same data we used for the paired samples t-test, assuming here that this data did not meet the criteria for a parametric design (for example, that the data are not normally distributed). This is data taken on two occasions and we are interested in seeing if there is a difference between the two sets of data - in this case that there is a reduction in serum cholesterol levels.

Here are the descriptive statistics. Again, there is a good indication (see the mean and median values) of a difference between the data obtained at the start of the programme and at the end of the programme.

Statistics			
		Start of programme	End of programme
N	Valid	30	30
	Missing	0	0
Mean		7.1267	3.7767
Median		7.0500	3.6500

If we run the Wilcoxon signed ranks test, we find as expected, that the difference seen in the mean and median values for the two sets of data is statistically significant.

Test Statistics^b

	End of programme – Start of programme
Z	–4.786 ^a
Asymp. Sig. (2-tailed)	.000

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

This means that we can expect that the change blood cholesterol did not occur by chance.



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Glossary

Actor A term used by ethnographers to mean 'research participant'.

Assumptions (data assumptions) The criteria that data must meet in order for a test to be run on that data. For example, most parametric tests (e.g. ANOVA) require that:

- the dependent variable (recorded pain) is at the interval or ratio level of measurement;
- the dependent variable is approximately normally distributed;
- there is similar variance between the two groups (homogeneity of variance).

Statistical tests are available which can be run on the data to ensure that 'assumptions' are met.

Audit trail Clear documentation of each step in the research process - to enable a reviewer to trace each step - to make the research process transparent.

Axial coding Identifying relationships between the identified categories (or themes) assigned to qualitative data.

Axiology The study of values.

Between group (difference, variance, effects) The 'effect' (difference) found between (usually) the control group and the intervention group.

Where the variance (difference) between the control and intervention groups is greater than the variation (difference) within each of the control and intervention groups, the result of the statistical procedure will tend to be significant.

Where the variance within the control group and (separately) the intervention group is greater than the variance between the control and intervention groups, the result of the statistical test will tend to be non-significant.

Bias The unwitting misrepresentation of data that causes the results to lack validity (be untrue). Bias is generally dealt with by blinding and by randomisation.

Bivariate Two variables. Correlation studies tend to look at the degree to which one variable correlates with another variable (age and weight of children). Such studies are ‘bivariate’.

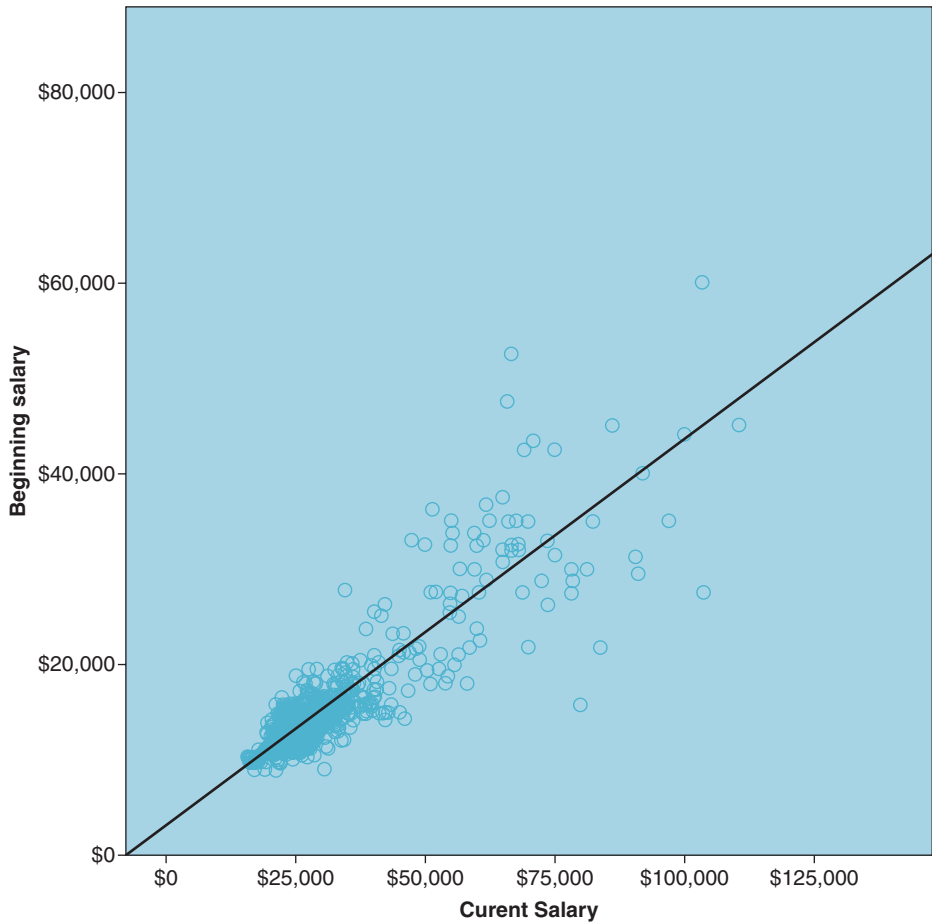


Chart showing the correlation of two variables, beginning salary and current salary.

Blinding Blinding is where the researcher and or the participant are unaware of whether they are in the intervention or the control group. Blinding is an important mechanism to reduce bias.

Categorical variable A variable in the form of categories. Syn. Nominal data. For example:

- blue, red, pink, yellow;
- yes, no;
- correct, incorrect.

Conditions Groups within an independent variable. For example, we may have the independent variable ‘Treatment’, which may contain two conditions: ‘New Drug’ and ‘Control’ (no drug). This is one variable with two conditions.

Confidence interval A confidence interval is a measure of how likely it is that a measure (e.g. the mean) taken from a sample would be found in the population. On the whole, long confidence intervals tend to be a bad thing, reducing our confidence that the sample is a valid representation of the population.

Statistics

			Statistic	Std. Error
Current Salary	Mean		\$34,419.57	\$784.311
	95% Confidence Interval for Mean	Lower Bound	\$32,878.40	
		Lower Bound	\$35,960.73	
	5% Trimmed Mean		\$32,455.19	
	Median		\$28,875.00	
	Variance		2.916EB	
	Std. Deviation		\$17,075.661	
	Minimum		\$15,750	
	Maximum		\$135,000	
	Range		\$119,250	
	Interquartile Range		\$13,163	
	Skewness		2.125	.112
	Kurtosis		5.378	.224

In this example, the confidence intervals give us an indication of how our measure (in this case, the mean salary) would be reflected in the population.

Confirmability Sometimes used in Ethnography, the degree to which it is possible to assess whether the findings flow from the data (is the study 'auditable').

Constant Comparative Method Where the researcher analyses the text on a continuous basis, as new data is brought in and by constantly examining and re-examining the text in relation to the developing themes or categories. This method is most closely associated with Grounded Theory but is often used in other forms of qualitative research.

Constructivist (interpretive) Paradigm The notion that much of the world is 'open to interpretation', that there is no objective truth or measurable facts and that, instead, 'truth' is something that we perceive to be there. In this way, we all see things differently, and what is true for one person may not be true for another. Qualitative research largely accepts this interpretive approach.

Content analysis An overarching term meaning any qualitative analysis. Is interpreted by some as indicating a more 'descriptive' (less interpretive) analysis.

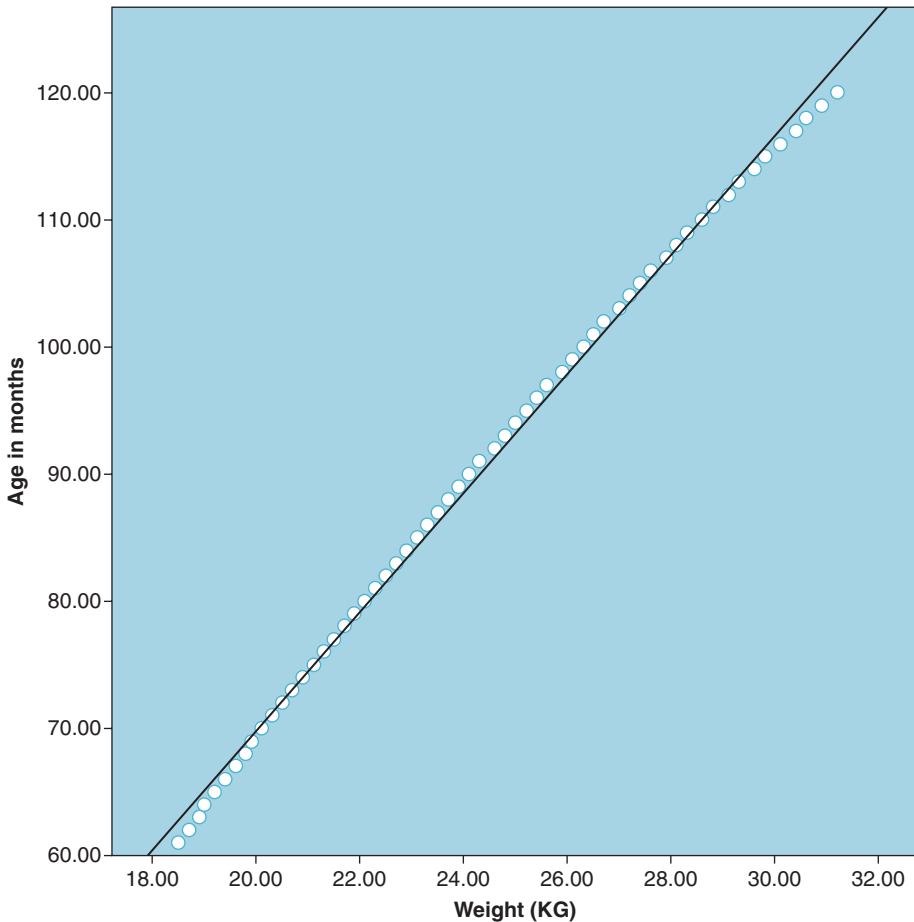
Continuous (data) Data existing as a scale or as ratio data with no end points to the scale (blood pressure, pulse rate). Synonymous with interval and ratio data. For example, the 1-100 scale used by examiners when they mark students essays.

The term 'continuous data' is used to differentiate the data from that obtained from (usually short) non-continuous scales such as the five point Likert scale. The Likert scale is not continuous because it is not possible to select '1.5' from the scale, even when that might be what we want to do (is meaningful).

Control, control group The group to which the intervention being tested is NOT applied. The group to which the treatment (intervention) is applied is usually called the 'treatment group', or 'intervention group'. The control group allows for a comparison to be made with the treatment group. This comparison helps to determine that the effect caused has been due to the 'intervention' and that it would not have occurred without the intervention.

Correlation (correlational study) The degree of interrelationship between two variables. The two variables – children's age in months and children's weight in kilograms correlate positively. As children grow older, they tend to get heavier. In this case, each variable has a linear relationship to the other.

The fact that children's age and weight correlate does not mean that one variable 'causes' the other, only that (in this case) they are linearly related (correlated). In most cases where correlation is used, the researcher will not be interested in determining causation. In this way, we would probably not be too interested in the notion that children's weight might cause their age.



However, we are often interested in taking correlations further, because we are interested in determining if one variable does has a causative impact on another variable. Regression procedures (such as 'Linear Regression') aim to determine if one variable (the predictor variable) has an effect on the other variable (the dependent variable).

Credibility Similar to 'internal validity'. The degree to which the researcher's interpretation of the data can be justified in the data itself.

Data saturation The point at which new data from participants fails to add anything useful to the analysis. The data saturation point signals the completion of the data collection.

Dependability Similar to 'reliability'. If the study was repeated, similar results would be obtained.

Dependant variable The variable that is being tested or acted upon by the independent variable. For example, in a Randomised Control Trial, a new drug is given to one group of patients to see if it

reduces reported pain levels. Treatment with the new drug is the independent variable and reported pain is the dependent variable. The independent variable (treatment) will probably have at least two sub-divisions or 'conditions', these might, for example be 'new drug' and 'no drug (control)'.

Descriptive statistics Descriptive statistics describe the data, rather than drawing inferences from the data. Mean, Mode and Median are examples of descriptive statistics.

Descriptive study The opposite of an experiment, a descriptive study seeks to describe what already exists. Sometimes referred to as retrospective (an experiment is 'prospective'). A survey is a good example of a descriptive study.

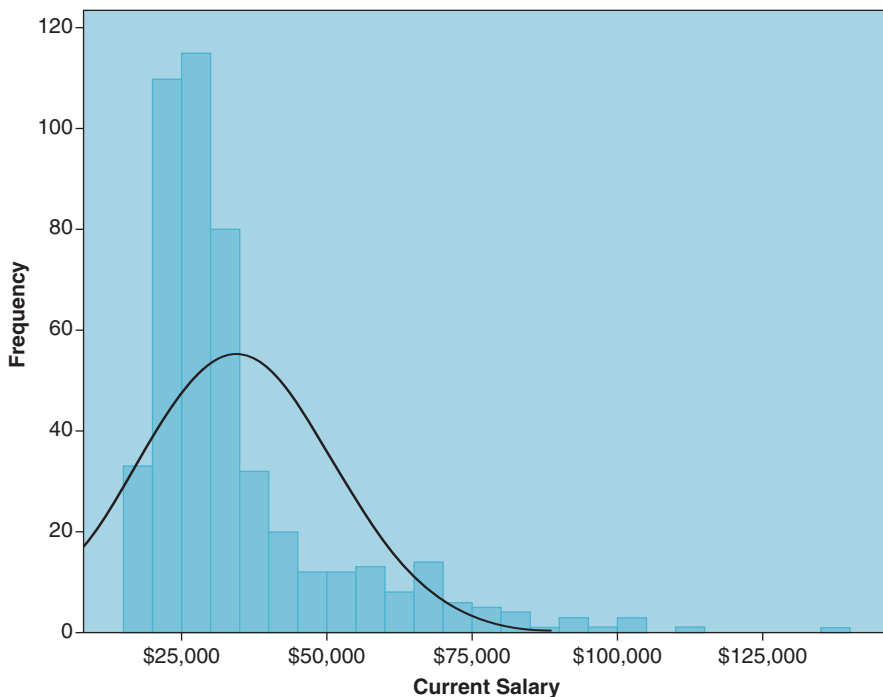
Design The plan for the study. Well-known designs include 'pre-test post-test' study and 'double-blind trial'. Design is often used with the word 'method', as in 'design and method'. 'Method' is the way the study will be carried out, for example, it might use questionnaires or a survey.

Differences This is not an 'official' research term. However, it is often useful to differentiate correlational studies from those that are designed to demonstrate an effect of one variable upon another. In the latter case, we are usually looking at 'differences' or what difference an independent variable might have on a dependent variable.

Discourse analysis The way language is used to represent social or cultural understanding of a phenomenon.

Discrete (data) Data that exist as categories. Synonymous with 'nominal' or 'categorical' data.

Distribution (normal distribution) Parametric statistical procedures usually require the data to be normally distributed. Non-parametric statistical procedures can work happily with data that is not normally distributed. If we want to run a parametric test, e.g. a t-test, on data, we should first check that the data is normally distributed. If we produce a frequency distribution of the data we should expect it to take the shape of a 'bell shaped curve'. Here is an example of data that does not quite do this. Here the data is 'skewed' to the left:



We can 'see' that this data is not normally distributed, simply by looking at the graph. However, we can also run statistical tests on the data to give us an objective assessment of the distribution.

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Current Salary	.208	474	.000	.771	474	.000

a. Lilliefors Significance Correction

Here we see two tests that confirm our suspicion that this data is in fact not normally distributed. In circumstances like this one, we might choose to use non-parametric statistics or we might try to remove outlying values to try and normalise the data.

Epistemology The theory of knowledge (contrast with ontology – theory of meaning).

Ethnography Derived from Anthropology – focuses on cultural meanings. How the organisation of society is achieved and the meaning people find in their culture or society.

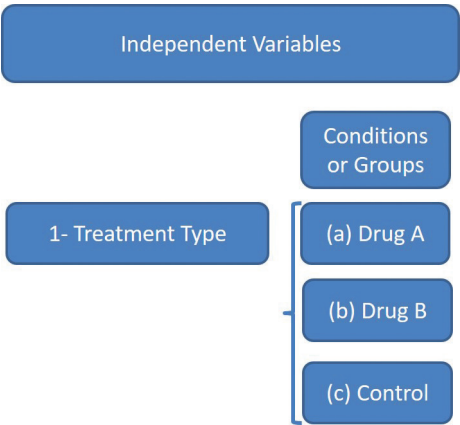
Experiment An experiment seeks to change something, that is, to cause an effect that can then be measured. An experiment is sometimes referred to as ‘prospective’ (a descriptive study is sometimes described as ‘retrospective’).

Factor A group or condition within an independent variable. Such groups are categorical. For example, an independent variable ‘treatment’ might have two conditions, ‘new drug’ and ‘control’; in some forms of analysis, particularly ANOVA and MANOVA, these groups or conditions are known as ‘factors’.

Framework analysis A process of managing the coding of qualitative data and which involves the mapping of themes to cases.

Grounded Theory Focuses on generating theory on social processes by inductive examination of human experience. It is characterised by a close examination of the data together with reflection on the way it is being coded (Constant Comparative Analysis). In practice, it is a relatively structured form of qualitative research that arguably comes closest to being a ‘method’.

Groups ‘Group’ is a rather loose term that usually refers to a condition or sometimes a dependent variable. A group always contains or will contain a set of data defined by a variable or by a condition. Usually, ‘group’ means the same thing as ‘condition’.



Hegemony Imperial dominance. Sometimes used by qualitative researchers to describe the dominance of quantitative research (the hegemony of positivism).

Heideggerian Hermeneutic Phenomenology From Martin Heidegger (1881-1976), a German philosopher who further developed phenomenology from his one-time teacher Husserl. Heideggerian

phenomenology fully accepts that truth can only be understood as a human or social understanding (there is no objective reality). Contrasts with Husserlian Phenomenology, which argues that the qualitative data remains essentially objective and measurable.

Accepts that the researcher is an active participant in the research, where his or her own experiences, values and beliefs are explicit.

Hermeneutic cycle (hermeneutics) Philosophically, a system of interpretation that attempts to link unknown material to known meanings. In practice, it is the Heideggerian notion that qualitative research should legitimately be about 'interpretation' of the participants' experience. The researcher's interpretation of the data is essentially 'subjective' (though open to audit).

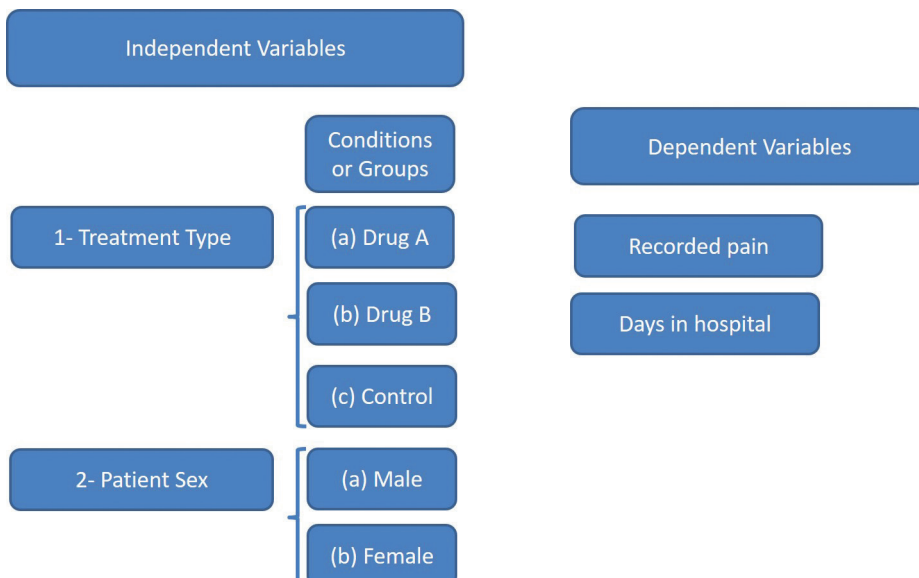
Husserlian Phenomenology (Husserl's Transcendental Phenomenology) After Edmund Husserl, 1859-1938. Arguably, the first form of phenomenology that (similar to quantitative approaches) saw the researcher's experience, values and beliefs as a potential source of bias. In Husserlian Phenomenology, the researcher tries to maintain a neutral position (known as 'bracketing') during the data collection and analysis. Usually contrasted with Heideggerian Hermeneutic Phenomenology.

Hypothesis A statement of the expected outcome of the research, what 'effect' will be found.

Traditionally, the hypothesis was expressed in negative terms, as a Null Hypothesis, which generally tended to state that an effect does NOT exist. In practice, an hypothesis is expressed as a way of stating exactly what the research is aiming to find out.

It is not strictly necessary for a researcher to state the hypothesis. Many researchers are happy simply to identify the research question.

Independent variable The 'treatment' variable. The variable introduced in an experiment to produce a change in the dependent variable. For example, in a Randomised Control Trial a new drug is given to one group of patients to see if it reduces their reported pain level. Treatment with the new drug is the independent variable and reported pain is the dependent variable. The independent variable (treatment) will probably have at least two sub-divisions or 'conditions'. These might, for example, be 'new drug' and 'no drug' ('control').



Inductive From data to theory.

Inferential statistics Inferential statistics are generally those statistical procedures that are NOT descriptive statistics (such as Mode, Median, Mean). Inferential statistics are so named because they draw inferences from the data. Inferential statistics are generally used to identify probability.

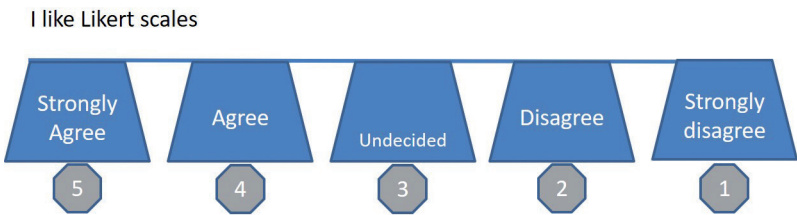
Interactionism A term introduced by Herbert Blumer (1900-1987). A form of fieldwork that can be seen to form the basis of Ethnography.

Interpretive Paradigm An acceptance that truth is subjective. Opposite of 'Positivist Paradigm'.

Interval data A continuous scale (as in a 1-100 scale).

Intervention (the intervention) The intervention is what is done to cause an effect. It is the effect of the independent variable on the dependent variable.

Likert scale A scale of 1-5, usually dealt with using non-parametric statistical procedures (as with 'ordinal' data). May sometimes be dealt with as categories (nominal).



Mean (arithmetic mean) A summary measure of interval and ratio data; the average value. It is important to bear in mind that the mean may not represent the data very well (the mean of 10,10,10,10,1,1,1 is 5.5). In general, statistical procedures are interested in the mean in relation to the dispersion around the mean, the variance, the degree to which the mean does reflect the nature of the data.

Report

Test Result				
Sex	Mean	N	Minimum	Maximum
Male	44.2059	34	12.00	68.00
Female	65.8000	30	32.00	98.00
Total	54.3281	64	12.00	98.00

Here is a report from a fictitious examination, showing the scores (marks) for males and females. The scale is 0-100. It looks like the females performed better than the male students!

Median Used as a summary measure of ordinal data. The median is the middle score of data placed in order of magnitude. The median of
12 23 34 45 56 67 78 99 100 is 56.

The median can be used with interval data to show whether the data is 'skewed' (not normally distributed). Many statistical tests for interval / ratio data need the data to be normally distributed.

Statistics

Test Result

N	Valid	64
	Missing	0
Median		3.0000

Example ordinal data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	11	17.2	17.2	17.2
	Disagree	12	18.8	18.8	35.9
	Not sure	17	26.6	26.6	62.5
	Agree	12	18.8	18.8	81.3
	Strongly Agree	12	18.8	18.8	100.0
	Total	64	100.0	100.0	

Here is a frequency distribution taken from data derived from a Likert scale. We can see that the Median value is '3' ('not sure').

Member checking The sharing of the summary or the analysis of the participant's data with the participant. Usually employed to achieve trustworthiness of the analysis.

Meta-analysis An analysis run on data from more than one study. Meta-analyses are most commonly seen in Systematic Reviews where data from all the studies based on a particular clinical research question are amalgamated into one data set and analysed, usually by 'odds ratio' or a similar statistical procedure.

Mixed methods The use of two or more methods to access the same phenomenon. Often seen in triangulation studies. Can be a mix of different qualitative approaches or a mix of quantitative and qualitative approaches.

Mode A summary measure of data. The mode is the most frequently occurring score in the set of data. Mode is most commonly used for categorical (nominal data).

Statistics

Field of Practice

N	Valid	64
	Missing	0
Mode		2.00 ^a

a. Multiple modes exist.

The smallest value is shown

Field of Practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(1) Nurse	17	26.6	26.6	26.6
	(2) Physio	18	28.1	28.1	54.7
	(3) Radiographer	18	28.1	28.1	82.8
	(4) Medic	11	17.2	17.2	100.0
	Total	64	100.0	100.0	

This is simply a frequency distribution of university health care students. The most frequently occurring value (mode) is '18', shared by physios and radiographers.

Multivariate Many variables (or generally, more than two). It is generally better to isolate the one or two variables we wish to study than it is to pull lots of variables into the analysis. Research works better if it has a tight focus on just one phenomenon. However, human beings are essentially multivariate things and we are often aware that we cannot understand one variable without appreciating how that variable interacts with other variables. So it is that much of the research in psychology uses multivariate designs. It is important to understand that statistical procedures designed to work with several variables at once are designed to identify the 'interaction' between the variables. Such designs necessarily lead to some of the most complex statistical models.

Negative case analysis A deliberate attempt to deal with aspects of the data that do NOT agree with the developing findings during the analysis of the data.

Nominal Categories, such as (yes, no), (blue, white, red).

Non-parametric statistics Non-parametric statistical procedures were mostly developed for ordinal data but they may also be used for interval and ratio data where they fail to meet the parametric criteria (assumptions).

Non-parametric procedures (for example, the Mann Whitney test) can be run on ordinal (non-continuous) data and where data is not normally distributed).

Odds Ratio Odds Ratio is used in Cochrane Systematic Reviews. It is used in the meta-analysis of data combined from several or many studies. Risk ratio is a related statistic. See Chapter 8 'Quantitative analysis' for an example of the use of these statistics.

One tailed, Two tailed The prediction of an effect in one direction only (one tailed) or in either direction (two tailed). Statistical procedures often provide a probability (significance) value for both one and two tailed analyses and it is up to the researcher to select the result that is most meaningful in relation to the hypothesis or research question. For example, we might hypothesise that the pain scores for those who received a new drug and those who did not (the control) would not just be different (two tailed) but that the drug group would have the lower pain score (one tailed).

Ontology Theory of meaning. Contrast with epistemology (theory of knowledge).

Open coding Categories (themes) in the data are identified.

Ordinal Originally meaning data placed in order but generally meaning data from a short scale or a non-continuous scale. For example, a 1-5 Likert scale. This is non-continuous because it is not possible to select '1.5', where 1.5 might be meaningful.

Parametric statistics Parametric statistics are a range of statistical procedures usually used on interval and ratio data. Examples of these procedures include, t-test, ANOVA and MANOVA. These are some of the most useful and powerful statistical procedures available. However, to use these statistics, the data has to have the following characteristics (often called 'assumptions'):

- the dependent variable (recorded pain) is at the interval or ratio level of measurement;
- the dependent variable is approximately normally distributed;
- there is similar variance between the two groups (homogeneity of variance).

Fortunately, it is possible to test the data to ensure these assumptions are met. It is also the case that many parametric statistical procedures can cope with data, even if it doesn't quite meet the above criteria. Where there is concern, a non-parametric analysis may be chosen.

Peer de-briefing and Peer review A process by which people not directly involved in the study are able to examine it. It is most usefully carried out when the study is being planned and during the course of the study.

Phenomenology Experience of a phenomenon. In practice, phenomenology focuses on the interpretation of 'lived experience'.

Plausibility The degree to which the researcher's interpretation of the data is likely to be realistic given our existing knowledge.

Population The population is the potential data set to which the sample relates. When people are sampled to take part in a pre-election voting-intention survey, the population is every eligible voter.

Positivist Paradigm (positivism) The notion that the world is chiefly an objective and measurable place. Positivism reflects our notion of 'Science' as it developed from the reformation. Quantitative research largely accepts this positivist perspective. Opposite of 'Interpretive Paradigm'.

Post-modern (post-structural) A belief that there is no coherent way of explaining phenomena in structural terms. Tends to oppose the categorisation of phenomena or the use of structured research methods.

Post-test The testing carried out after the 'treatment' (intervention).

Pragmatic Paradigm Where dealing with the research question is considered to be more important than adhering to a pure methodological approach.

Pre-test The testing carried out before the 'treatment' (intervention).

Pre-test Post-test design A study in which testing takes place prior to the intervention and after the intervention - in order to determine the effect of the intervention. A control group may also be used which helps to determine whether any effect may have been due to the passage of time or to engagement between the researcher and the patient.

Probability (p value) Almost all inferential statistics exist to identify probability. We need to understand that 'chance' is everywhere in science. Chance is that part of the universe or that part of the research study which we do not understand, cannot anticipate and which we may not even know exists. Whenever we try to demonstrate that one variable has an effect on another variable or that two variables are correlated, we need to be able to show what 'risk' there is that the result we have obtained was caused only by chance. Probability gives us a numerical figure for that risk. This is usually expressed as $p = \text{something}$. $p = 0.05$ means that there is a 5 per cent risk that the result was due to chance. $p = 0.01$ means that there is a 1 per cent risk.

Probability does not indicate the size of the effect but on how sure we are that the effect we see was not caused by chance.

The word 'significant' is used when we are satisfied that the probability of the effect being caused only by chance is too small to worry about. However, there is no absolute value for significance. A 5 per cent risk that the result may be due to chance may satisfy one person but not another person. It is arguably the case that research into treatments that are dangerous and life-threatening will (and should) be expected to achieve higher levels of significance than is the case in other forms of research.

Prolonged engagement An aspect of the quality of research (trustworthiness). The longer the time the researcher spends with participants the richer and more understood will be the data and the interpretation of it.

Q-Q plot The Q-Q plot is a graphical illustration of the degree to which data is normally distributed. Data needs to be normally distributed if parametric tests such as the t-test are to be used.

This chart shows a Q-Q plot from data that is not normally distributed. For the data to be normally distributed we would expect to see the plots close to the diagonal line.



Radical (critical) interpretivism A form of phenomenology that seeks not merely to describe experiences but to change them. Most clearly seen in research on feminism and social justice.

Random, Randomisation A process of recruiting participants or allocating participants to groups, where potential participants have an equal chance of being selected. Randomisation, with 'control' (groups that do not have the treatment) are central aspects of Randomised Control Trials. Randomisation is considered an important mechanism by which a study may be judged to be robust or of good quality. However, randomisation in some circumstances is not easy to achieve or may be impossible to achieve. This is especially true in health care research where the random allocation of an individual to a treatment or control group may be unethical.

Randomised Control Trial (RCT) An experiment (a prospective study) that includes randomisation, a control group and (usually) blinding.

Ranked data (ranking) Data that is put in order (as in 12, 23, 45, 67, 99) or that already exists as ordered data. Ranked (ordered, ordinal) data is generally analysed by non-parametric statistical tests.

Ratio A continuous scale with no end points (blood pressure, serum cholesterol). In practice, interval and ratio data are treated much the same in statistical analyses.

Realism Belief in a stable and objective reality.

Recruitment The process of including participants in a qualitative study. In quantitative studies, the word 'sampling' is used.

Reflexivity Researcher self-scrutiny-examination of the researcher's role in the research. Almost identical to the 'reflective practice' seen in health care today.

Regression analysis Regression procedures (such as 'Linear Regression') aim to determine if one variable (the predictor variable) has an effect on the other variable (the dependent variable). Regression analysis was originally developed as an extension of correlational analysis. These days, forms of regression analysis are available for nominal, ordinal and interval data and for situations where a linear relationship between the two variables is not expected.

Related (design) A related design is one where the same individuals (or matched, paired individuals) are tested on more than on occasion.

For example, a study may want to test the effect of a patient education programme on the advantages of adhering to diet in diabetes. The study is interested in how parents' attitudes to diet-adherence change over the time the programme is running (and perhaps afterwards). In order to achieve this, each participant has a diet-adherence attitude test each month for 6 months.

An unrelated design is one in which one group of participants is compared to another (separate) group of participants, in order to identify differences between the two groups.

Relativism Belief in a socially constructed reality.

Reliability The degree to which the same results would be obtained if the study were to be repeated.

Reliability can relate to data collection instruments. For example, a questionnaire might contain two questions that 'ought' to have the same answer. The degree of agreement between the two questions can be tested by using statistics designed to measure reliability.

Rigour The quality of research, how capably it is done. Rigour is a quantitative term and is usually substituted by 'trustworthiness' in qualitative research.

Robust A general term for the quality of a research study.

Sample The part of the population of cases (all possible cases) that is used within the research study. For example, we might want to measure the quality of hand-washing in orthopaedic wards. Instead of looking at every orthopaedic ward in the world, we 'sample', three orthopaedic wards in the UK and collect data on hand-washing just from those three wards. A sample should be representative of the population, although the researcher is often free to define the population (as just UK orthopaedic wards, for example).

Sampling The procedure (method) used to produce the sample.

Scale Any data that is distributed between two points; may be either ordinal or interval. Statisticians tend to use the word 'scale' to mean interval or ratio data (as in 'continuous scale').

Selective coding The process of identifying the 'core' or central category (theme) from those identified during the analysis of qualitative data. All or most of the other categories will link with the main category. Used in Grounded Theory.

Significance (level) Syn. Probability.

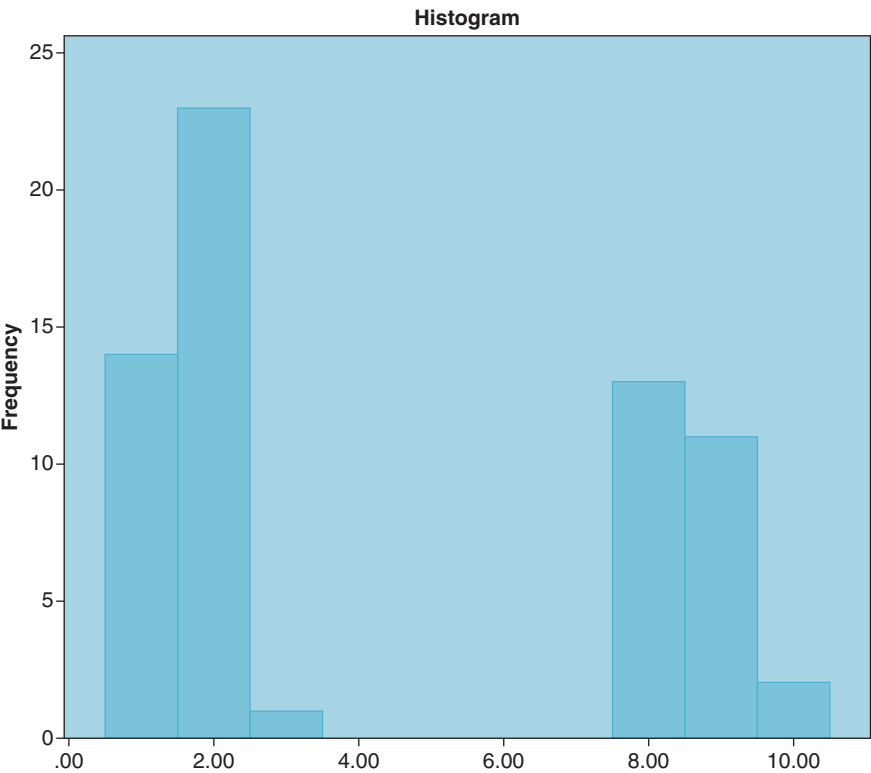
Standard deviation Standard deviation is a measure of dispersion around the mean, or the within-group variability. A large standard deviation tends not be a good thing. If data for one variable varies a lot, it may indicate that there are problems with the data; it will also increase the likelihood that an analysis using that variable will return a non-significant result.

Let's look at a data set containing pain scores from patients who received a new analgesic drug.

Here are the descriptive statistics:

Descriptives			Statistic	Std. Error
Standard Deviation	Mean		4.4688	.43414
	95% Confidence Interval for Mean	Lower Bound	3.6012	
		Lower Bound	5.3363	
	5% Trimmed Mean		4.3750	
	Median		2.0000	
	Variance		12.063	
	Std. Deviation		3.47311	
	Minimum		1.00	
	Maximum		10.00	
	Range		9.00	
	Interquartile Range		6.00	
	Skewness		.391	.299
	Kurtosis		-1.778	.590

We can see that the Mean for the data on this 1-10 scale is 4.4688. We might assume that this figure usefully summarises our data. We might think that 'most' patients score around 4.5. However, if we look at the Standard deviation, we see that it is quite large (3.47). This should alert us to the fact that something might be wrong with our data. Let's just take a closer look at actual scores:



Oops! In fact, our Mean could not have done a worse job at summarising this data; none of the data are anywhere near the mean.

Survey A descriptive study (is not an experiment), generally having just one 'group'.

Survival analysis These are a range of statistical procedures, including the Kaplan-Meier Survival procedure designed to identify the impact of an independent variable on 'survival'. The survival variable is time. In medical research, survival analysis is well named because such research does often look at the impact of a new drug on the length of time to patient death. However, survival analysis can look at the impact of an independent variable on any dependent variable that is measured in time (such as the length of time nurses stay in clinical practice).

Systematic Review (Cochrane Systematic Review) Systematic reviews generally involve a meta-analysis of research data from several studies. The process is able to deal statistically with the issue of conflicting results from a number of studies focused on one clinical issue. See Chapter 3 for more information on systematic reviews.

Text Sometimes used by qualitative researchers, meaning 'data'.

Thematic analysis The development of themes in qualitative analysis. A theme is a word or construct that represents part of the data. The words 'code' and 'category' have a similar meaning.

Theoretical generalizability The way in which concepts and theories derived from qualitative research can be generalised.

Thick description The production of a detailed description of the data and each aspect of the research process. Researchers will often use direct quotes from the data to illustrate how the conclusions to the analysis in the form of concepts, constructs or theory can be related back to the data.

Transferability Similar to 'external validity', the degree to which the concepts, constructs or theory generated by the analysis can be applied elsewhere.

Triangulation (triangulation studies) A technique where more than one method is used to collect data on one phenomenon (method triangulation) or to analyse data (analysis triangulation). Can be used to enhance the credibility or trustworthiness of a study or to access a more complete understanding of the phenomenon.

Trustworthiness The quality of research, how capably it is done. 'Trustworthiness' is the qualitative equivalent of the term 'rigour' used in quantitative research.

Univariate One variable. A univariate analysis is an analysis run on just one variable. Descriptive statistics, such as 'Mean' and 'Mode' are univariate statistics.

Unrelated (unrelated design) Data is collected from two or more separate groups of participants where differences between the groups are hypothesised.

Validity Literally 'truth'. There are generally considered to be two forms of validity:

- Internal validity: The degree to which the researcher's interpretation of the data can be justified in the data itself. The degree to which the data is what we think it is (that it is true or 'valid').
- External validity: the degree to which the results of the study can be generalised to the relevant population.

Variable Literally, something that varies. In practice, a variable is either the 'thing' that we are measuring (usually the dependant variable) or it is the 'thing' that we think will cause an effect on what we are interested in measuring (the independent variable).

Variable is a good name for these 'things' because it is the degree to which the data they represent vary within variables (within-group variability) and the degree of variation between variables (between group variability) that is measured by most inferential statistical procedures. Variability is almost the bread and butter of statistics.

We might consider 'variability' as 'change'. So, when we look at whether a new drug is impacting on reported pain levels, we are looking to see if the new drug 'changes' the reported pain levels.

GLOSSARY

If the variability between the treatment and control groups is great, and the variability within each set of data for the treatment and control groups (separately) is small, then we will tend to see the result returned as significant.

The standard deviation is generally used to measure the variation within a variable.

Within groups (difference, variance, effects) The amount of variation (difference) that exists within one variable.

Where the variance (difference) between the control and intervention groups is greater than the variation (difference) within each of the control and intervention groups, the result of the statistical procedure will tend to be significant.

Where the variance within the control group and (separately) the intervention group is greater than the variance between the control and intervention groups, the result of the statistical test will tend to be non-significant.

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