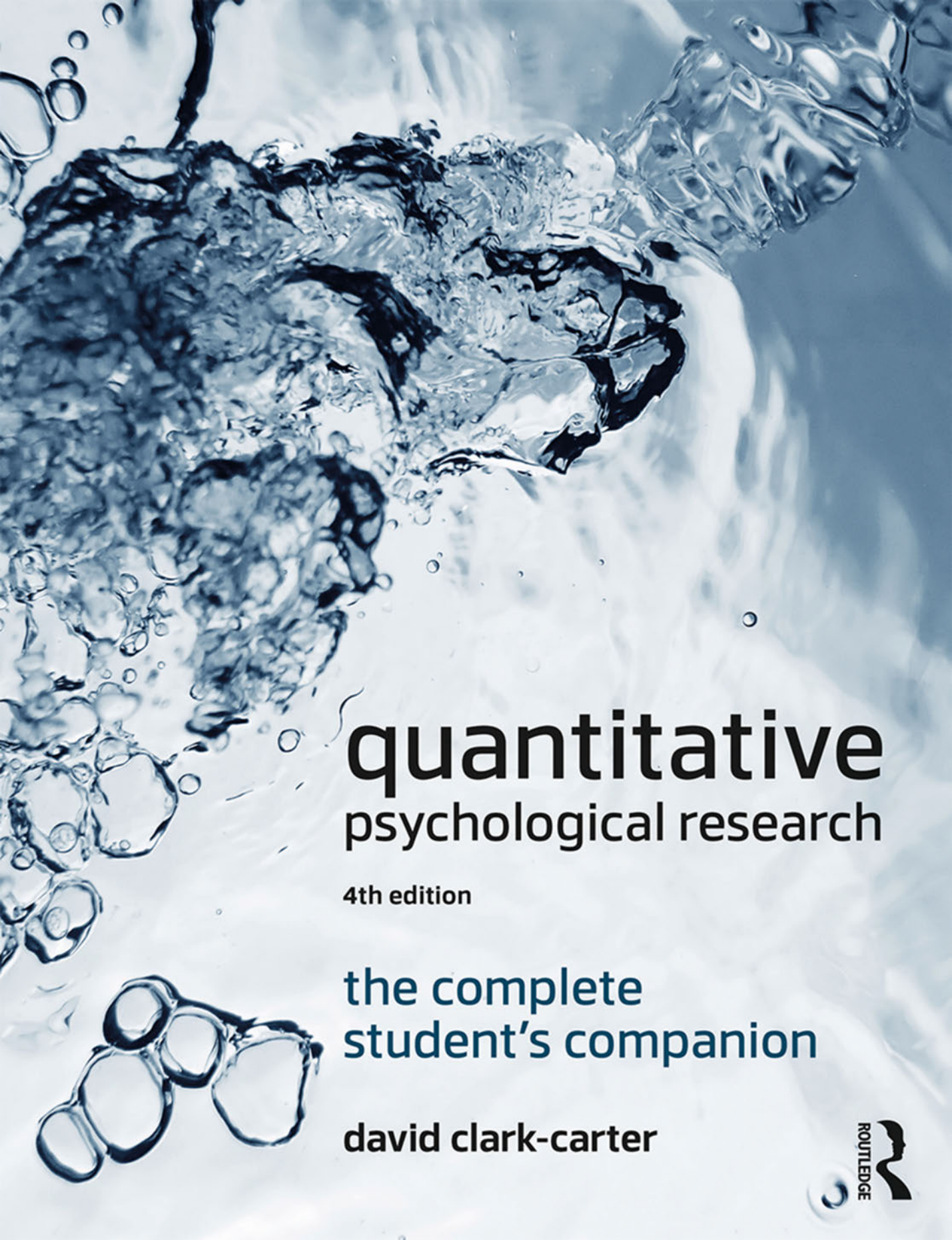

quantitative psychological research

4th edition

the complete student's companion

david clark-carter

ROUTLEDGE

Quantitative Psychological Research

Quantitative Psychological Research: The Complete Student's Companion expertly guides the reader through all the stages involved in undertaking quantitative psychological research: designing a study, choosing a sample of people, undertaking the study, analysing the data, and reporting the research.

Accessibly written and clearly presented, the book is designed for anyone learning to conduct quantitative psychological research. It covers the full research process, from the original idea to reporting the completed study, emphasising the importance of looking beyond statistical significance in evaluating data. The book provides step-by-step guidance on choosing, interpreting and reporting the appropriate analysis, featuring worked examples and extended calculations as appendices for advanced readers.

This edition features new chapters on exploratory factor analysis, logistic regression and Bayesian statistics, and has been thoroughly updated throughout to reflect the latest research practices. Care has been taken to avoid tying the book to any specific statistical software, providing readers with a thorough grounding in the basics no matter which package they go on to use.

Whether you're at the beginning of your undergraduate degree or working towards your masters or doctorate, this book will be invaluable for anyone looking to understand how to conduct quantitative psychological research.

David Clark-Carter is Professor of Psychological Research Methods at Staffordshire University and Consultant Editor of the *British Journal of Mathematical and Statistical Psychology*. In 2016 he was awarded the lifetime achievement award by the Education and Public Engagement Board of the British Psychological Society.


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Quantitative Psychological Research

The Complete Student's Companion

4th Edition

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To Anne, Tim and Rebecca


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Detailed contents of chapters

Preface

This book is designed to take the reader through all the stages of research: from choosing the method to be employed, through the aspects of design, conduct and analysis, to reporting the results of the research. The book provides an overview of the methods which psychologists employ in their research but concentrates on the practice of quantitative methods.

However, such an emphasis does not mean that the text is brimming with mathematical equations. The aim of the book is to explain how to do research, not how to calculate statistical techniques by hand or by simple calculator. The assumption is that the reader will have access to a computer and appropriate statistical software to perform the necessary calculations. Accordingly, the equations in the body of the text are there to enhance understanding of the technique being described. Nonetheless, the equations and worked examples for given techniques are contained in appendices for more numerate readers who wish to try out the calculations themselves and for those occasions when no computer is available to carry out the analysis. In addition, some more complex ideas are only dealt with in the appendices.

The structure of the book

A book on research methods has to perform a number of functions. Initially, it introduces researchers to basic concepts and techniques. Once they are mastered, it introduces more complex concepts and techniques. Finally, it acts as a reference work. The experienced researcher often is aware that a method exists or that there is a restriction on the use of a statistical technique but needs to be reminded of the exact details.

This book is structured in such a way that the person new to the subject can read selected parts of selected chapters. Thus, first-level undergraduates will need an overview of the methods used in psychology, a rationale for their use and ethical aspects of such research. They will then look at the stages of research, followed by a discussion of variables and an overview of research designs and their internal validity. Then, depending on the methods they are to conduct, they will read selected parts of the chapters on specific research methods. In order to analyse data they will need to be aware of the issues to do with scales of measurement and how to explore and summarise data. Next they will move on to trying to draw inferences from their data – how likely their results are to have occurred by chance. They should be aware of how samples can be chosen to take part in a study and how to compare the results from a sample with those from a population.

It is important that, as well as finding out about how likely their results are to have occurred by chance, they know how to state the size of any effect they have detected and how likely they were to detect a real effect if it exists. They need to know the limitations on the type of data which certain statistical tests can handle and of alternative tests which are available and which do not have the same limitations. They may restrict analysis to situations involving looking at differences between two conditions and simple analysis of the relationships between two measures. Finally, they will need to know how to report their research as a laboratory report. Therefore, a first-level course could involve the following chapters and parts of chapters:

1 The methods used in psychological research.
2 The preliminary stages of research.
3 Variables and the validity of research designs.

The sections on types of designs and on terminology in:

4 Research designs and their internal validity.

One or more of:

5 Asking questions I: interviews and surveys.
6 Asking questions II: measuring attitudes and meaning.
7 Observation and content analysis.

Then:

8 Scales of measurement.
9 Summarising and describing data.
10 Going beyond description.

The sections on statistics, parameters and choosing a sample from:

11 Samples and populations.

The sections on *z*-tests and *t*-tests in:

12 Analysis of differences between a single sample and a population.
13 Effect size and power.
14 Parametric and non-parametric tests.
15 Analysis of differences between two levels of an independent variable.

The first section in:

19 Analysis of relationships I: correlation.

Possibly the section on simple regression in:

20 Analysis of relationships II: regression.

The sections on non-sexist language and on the written report in:

25 Reporting research.

Students in their second level should be dealing with more complex designs. Accordingly, they will need to look at more on the methods, on the designs and on their analysis. They may look at further analysis of relationships and be aware of other forms of reporting research. Therefore they are likely to look at:

The section on specific examples of research designs in:

4 Research designs and their internal validity.

Anything not already read in:

5 Asking questions I: Interviews and surveys.
6 Asking questions II: Measuring attitudes and meaning.
7 Observation and content analysis.

The section on confidence intervals in:

11 Samples and populations.
16 Preliminary analysis of designs with one independent variable with more than two levels.
17 Analysis of designs with more than one independent variable.

At least the section on contrasts in:

18 Subsequent analysis after ANOVA or χ^2.

The remaining material in:

19 Analysis of relationships I: correlation.

At subsequent levels, I would hope that students would learn about other ways of analysing data once they have conducted an analysis of variance, that they would learn about multiple regression, analysis of covariance, factor analysis and meta-analysis, and that they would be aware of the range of multivariate analyses. At each stage researchers need to be aware of data screening and so it is important that they look at the material in Chapter 23. Nonetheless, this chapter contains some complex ideas and methods, and so it is likely that until later chapters in the book have been covered, greater guidance from tutors will be necessary over the material in this chapter.

As psychologists we have to treat methods as tools which help us carry out our research, not as ends in themselves. However, we must be aware of the correct use of the methods and be aware of their limitations. The debate about failure to replicate findings discussed in Chapter 1 should make this clear. Above all the things that I hope readers gain from conducting and analysing research is the excitement of taking an idea, designing a way to test it empirically and seeing whether the evidence is consistent with your original idea.

A note to tutors

Tutors will notice that I have tried to place greater emphasis on statistical power, effect size and confidence intervals than is often the case in statistical texts which are aimed at psychologists. Without these tools psychologists are in danger of producing findings which lack generalisability because they are overly dependent on what have become conventional inferential statistics.

I have not given specific examples of how to perform particular analyses in any particular computer package because of lack of space, because I do not want the book to be tied to any one package and because the different generations of the packages involve different ways of achieving the same analysis. The growth in the use and development of the open source language R confirms me in my decision not to select one statistical package to illustrate how to implement the analyses. Nonetheless, I make reference to what you can expect from the IBM Statistical Package for the Social Sciences (SPSS). There are many 'how to' books for computer packages and I recommend Gray and Kinnear (2012) for SPSS. However, it does need updating to take account of more recent developments. Kabacoff (2015) would be a useful starting point if your students want to learn about R.

The new edition

When people have heard that I was writing another edition they have often said that they didn't think the topic changed that much. They clearly don't read the statistics and methodology journals, which are constantly exploring new aspects of the subject. Apart from anything else, the development of more powerful computers has meant that the limits of statistical techniques can be tested, using simulations. In addition, my own thinking changes as I read about, use or teach a technique.

Most chapters and appendices have been altered to a certain extent. I have introduced three new chapters: one on logistic regression, one on exploratory factor analysis and one on Bayesian statistics. Details of the first two were briefly covered in the chapter on multivariate analysis in previous editions.

The decision over what other new material to put in has again partly been guided by wanting to explain to psychologists terms and procedures which are used within disciplines with which psychologists are likely to work, in particular those in the medical professions and epidemiologists. I have included sections on using intraclass correlations to measure interrater agreement, interaction contrasts as a way of examining interactions, power analysis for individual predictors in multiple regression, bootstrapping and focused comparison and forest plots in meta-analysis. I have expanded the power tables to include logistic regression. To accommodate new material in the second edition, and given the main focus of the book, I reluctantly took out the section on specific qualitative methods which had been in the first edition. In its place are details of books on the topic.

Acknowledgements

I would like to thank those people who started me off on my career as a researcher and in particular John Valentine, Ray Meddis and John Wilding, who introduced me to research design and statistics. I have learned a lot from many others in the intervening years, not least from all the colleagues and students who have asked questions which have forced me to clarify my own thoughts. I would also like to thank Marian Pitts, who encouraged me when I first contemplated writing this book and has continued to be supportive.

First edition

Ian Watts and Julie Adams, from Staffordshire University's Information Technology Services, often gave me advice on how to use the numerous generations of my word-processing package to achieve what I wanted. Rachel Windwood, Rohays Perry, Paul Dukes, Kathryn Russell and Kirsten Buchanan from Psychology Press all gave me help and advice as the book went from original idea to camera ready copy.

Paul Kinnear, Sandy Lovie and John Valentine all made helpful comments on an earlier draft of the book. Tess and Steve Moore initiated me into some of the mysteries of colour printing. Anne Clark-Carter acted as my person on the Stoke-on-Trent omnibus and pointed out where I was making the explanation particularly complicated. This effort was especially heroic given her aversion to statistics. In addition, she, Tim and Rebecca all tolerated, with various levels of equanimity, my being frequently superglued to a computer.

Second edition

Peter Harris, Darren Van Laar and John Towse all made helpful comments on the proposals I put forward about the second edition. Chris Dracup, Astrid Schepman, Mark Shevlin and A. H. Wallymahmed made helpful comments on the first draft of that edition. A number of people at Psychology Press and Taylor & Francis (some of whom have moved on) had a hand in the way that edition developed. In fact, there were so many that I apologise if I've left anyone out of the following list: Alison Dixon, Caroline Osborne, Sue Rudkin and Vivien Ward. I would also like to thank all the students and colleagues at Staffordshire University who commented on the first edition or asked questions which suggested ways in which the first edition could be amended or added to. Finally, although I have already thanked them in the preface to the first edition, I want again to thank Anne, Tim and Rebecca for their forbearance and for dragging me from the study when I was in danger, rather like Flann O'Brien's cycling policeman, of exchanging atoms with the chair and computer keyboard.

Third edition

The following helped me with the third edition. Sarah Gibson, Sharla Plant, Tara Stebnicky and Rebekah Edmondson, all of Taylor & Francis, helped at various points from the initial invitation to write the third

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Despite all the efforts of others, any mistakes which are still contained in the book are my own.

Fourth edition

The following helped me with the fourth edition. Ceri McLardy, Sophie Crowe, Jenny Guildford, Elizabeth Rankin and Michael Strang helped by, among other things, commissioning the new edition, seeking reviews of my proposals for this edition and checking the manuscript. Zaheer Hussain and Nathalie Noret provided useful comments on my proposed changes. Tina Cottone and the team from ApexCoVantage have, among other things, thoroughly checked and copyedited the manuscript and kept me up to date with when the next task would be arriving. Once again, Anne helped me to complete what has been an enormous undertaking. As time went on and deadlines approached she absorbed ever more tasks to give me the time to get on with writing. Nonetheless, we continued to take the final dog walk of the day together.


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PART 1

Introduction

1 The methods used in psychological research

Introduction

This chapter deals with the purposes of psychological research. It explains why psychologists employ a method in their research and describes the range of quantitative methods employed by psychologists. It addresses the question of whether psychology is a science. Finally it deals with ethical issues to do with psychological research.

What is the purpose of research?

Psychological research is conducted in order to increase our knowledge of humans. Research is generally seen as having one of four aims, which can also be seen as stages: the first is to describe, the second to understand, leading to the third, which is to predict, and then finally to control. In the case of research in psychology the final stage is better seen as trying to intervene to improve human life. As an example, take the case of non-verbal communication (NVC). Firstly, psychologists might describe the various forms of NVC, such as eye contact, body posture and gesture. Next they will try to understand the functions of the different forms and then predict what will happen when people display abnormal forms of NVC, such as making too little eye contact or standing too close to others. Finally they might devise a means of training such people in ways of improving their NVC. This last stage will also include some evaluation of the success of the training.

What is a method?

A method is a systematic approach to a piece of research. Psychologists use a wide range of methods. There are a number of ways in which the methods adopted by psychologists are classified. One common distinction which is made is between quantitative and qualitative methods. As their names suggest, quantitative methods involve some form of numerical measurement while qualitative methods involve verbal description.

Why have a method?

The simple answer to this question is that without a method the research of a psychologist is no better than the speculations of a layperson, for, without a method, there is little protection against our hunches overly guiding what information is available to us and how we interpret it. In addition, without method our research is not open to the scrutiny of other psychologists. As an example of the dangers of not employing a method, I will explore the idea that the consumption of coffee in the evening causes people to have a poor night's sleep.

I have plenty of evidence to support this idea. Firstly, I have my own experience of the link between coffee consumption and poor sleep. Secondly, when I have discussed it with others they confirm that they have the same experience. Thirdly, I know that caffeine is a stimulant and so it seems a perfectly reasonable assumption that it will keep me awake.

However, there are a number of flaws in my argument. In the first place I know my prediction. Therefore the effect may actually be a consequence of that knowledge. To control for this possibility I should study people who are unaware of the prediction. Alternatively, I should give some people who are aware of the prediction what is called a placebo – a substance which will be indistinguishable from the substance being tested but which does not have the same physical effect – in this case a drink which they think contains caffeine. Secondly, because of my prediction I normally tend to avoid drinking coffee in the evening; I only drink it on special occasions and it may be that other aspects of these occasions are contributing to my poor sleep.

The occasions when I do drink coffee in the evenings are when I have gone out for a meal at a restaurant or at a friend's house or when friends come to my house. It is likely that I will eat differently on these occasions: I will have a larger meal or a richer meal and I will eat later than usual. In addition, I may drink alcohol on these occasions and the occasions may be more stimulating in that we will talk about more interesting things than usual and I may disrupt my sleeping pattern by staying up later than usual. Finally, I have not checked on the nature of my sleep when I do not drink coffee; I have no baseline for comparison.

Thus, there are a number of factors which may contribute to my poor sleep, which I need to control for if am going to properly study the relationship between coffee consumption and poor sleep. Applying a method to my research allows me to test my ideas more systematically and more completely.

Tensions between control and ecological validity

Throughout science there is a tension between two approaches. One is to investigate a phenomenon in isolation or, at least, with a minimum of other factors, which could affect it, being present. For example, I may isolate the consumption of caffeine as the factor which contributes to poor sleep. The alternative approach is to investigate the phenomenon in its natural setting. For example, I may investigate the effect of coffee consumption on my sleep in its usual context. There are good reasons for adopting each of these approaches.

By minimising the number of factors present, researchers can exercise control over the situation. Thus, by varying one aspect at a time and observing any changes, they can try to identify relationships between factors. Thus, I may be able to show that caffeine alone is not the cause of my poor sleep. In order to minimise the variation which is experienced by the different people they are studying, psychologists often conduct research in a laboratory.

However, a phenomenon often changes when it is taken out of its natural setting. It may have been the result of a large number of factors working together or it may be that, by conducting my research in a laboratory, I have made it so artificial that it bears no relation to the real world. The term *ecological validity* is used to refer to research which *does* relate to real-world events. Thus, the researcher has to adopt an approach which maximises control while at the same time being aware of the problem of artificiality. Another approach is to have a research strategy which has two strands: one maximising control and the other maximising ecological validity. Then an attempt will be made to reconcile the results from the two strands; this is called triangulation. For example, researchers could test the effects of caffeine on sleep in two ways. In one they could conduct the study in a laboratory. They allocate participants to either a caffeine or a placebo condition, give them drinks appropriate for the group they have been put in and observe them at night. In the second approach they could ask participants to keep diaries of their consumption of drinks such as coffee and tea and other events in the day. In addition, they would record their sleep patterns.

Distinctions between quantitative and qualitative methods

The distinction between quantitative and qualitative methods can be a false one, in that they may be two approaches to studying the same phenomena. Or they may be two stages in the same piece of research, with a qualitative approach yielding ideas which can then be investigated via a quantitative approach. Not surprisingly, this combination is sometimes called mixed methods. The problem arises when they provide different answers. Nonetheless, the distinction can be a convenient fiction for classifying methods.

Quantitative methods

One way to classify quantitative methods is under the headings of experimenting, asking questions and observing. The main distinction between the three is that in the experimental method researchers manipulate certain aspects of the situation and measure the presumed effects of those manipulations. Questioning and observational methods generally involve measurement in the absence of manipulation. Questioning involves asking people about details such as their behaviour and their beliefs and attitudes. Observational methods, not surprisingly, involve watching people's behaviour.

Thus, in an experiment to investigate the relationship between coffee drinking and sleep patterns I might give one group of people no coffee, another group one cup of normal coffee and a third group decaffeinated coffee and then measure how much sleep members of each group had. Alternatively, I might question a group of people about their patterns of sleep and about their coffee consumption, while in an observational study I might stay with a group of people for a week, note each person's coffee consumption and then, using a closed circuit television system, watch how well they sleep each night.

The distinction between the three methods is, once again, artificial, for the measures used in an experiment could involve asking questions or making observations. Before I deal with the methods referred to above I want to mention one which is often left out of consideration and gives the most control to the researcher – modelling.

Modelling and artificial intelligence

Modelling

Modelling refers to the development of theory through the construction of models to account for the results of research and to explore more fully the consequences of the theory. The consequences can then be subjected to empirical research to test how well the model represents reality. Models can take many forms. They have often been based on metaphors borrowed from other disciplines. For example, the information-processing model of human cognition can be seen to be based on the computer. As Gregg (1986) points out, Plato viewed human memory as being like a wax tablet, with forgetting being due to the trace being worn away or effaced; see also Randall (2007) for a discussion of metaphors of memory.

Modelling can be in the form of the equivalent of flow diagrams as per Atkinson and Shiffrin's (1971) model of human memory, where memory is seen as being in three parts: immediate, short-term and long-term. Alternatively, it can be in the form of mathematical formulae, as were Hull's models of animal and human learning (see Estes, 1993). Friston (2005) discusses models of how the brain functions, including statistical models.

With the advent of the computer, models can now be explored through computer programs. For example, Newell and Simon (1972) explored human reasoning through the use of computers. This approach to modelling is called computer simulation. Miller (1985) has a good account of the nature of computer simulation, while Brattico (2008) and Fodor (2000) discuss the limitations of current approaches.

Artificial intelligence

A distinction needs to be made between computer simulation and artificial intelligence. The goal of computer simulation is to mimic human behaviour on a computer in as close a way as possible to the way humans perform that behaviour. The goal of artificial intelligence is to use computers to perform tasks in the most efficient way that they can and not necessarily in the way that humans perform the tasks. Nonetheless, the results of computer simulation and of artificial intelligence can feed back into each other, so that the results of one may suggest ways to improve the other. See Boden (1987, 2016) and Bostrom (2014) for accounts of artificial intelligence.

The experiment

Another common classification of methods is into experimental, quasi-experimental and non-experimental methods. According to this classification an experiment involves a researcher manipulating variables and allocating participants to different conditions randomly. In the preceding example of an experiment into the effects of consuming caffeine, participants would be allocated to the three different groups on a random basis.[1] According to the classification, a quasi-experiment also involves the researcher manipulating variables but the allocation to conditions is not random (see Shadish & Luellen, 2005), while a non-experiment does not involve manipulation, as in observation and asking questions.

Experiments can take many forms, as you will see when you read Chapter 4 on designs of research. For the moment I simply want to re-emphasise that the experimenter manipulates an aspect of the situation and measures what are presumed to be the consequences of those manipulations. I use the term *presumed* because an important issue in research is attempting to identify causal relationships between phenomena. As explained earlier, I may have poorer sleep when I drink coffee but it might not be the cause of my poor sleep; rather, it might take place when other aspects of the situation, which do impair my sleep, are also present. It is felt that the properly designed experiment is the best way to identify causal relationships.

By a properly designed experiment I mean one in which all those aspects of the situation which may be relevant are being controlled for in some way. Chapter 4 discusses the various means of control which can be exercised by researchers.

The quasi-experiment

The quasi-experiment can be seen as a less rigorous version of the experiment. According to some definitions it involves manipulation by the researchers but with less rigorous means of allocating participants to different conditions. For example, researchers might wish to evaluate a method to increase children's eating of a healthy diet. They would want some children to be exposed to the new method and some to be exposed to existing methods of persuading children to eat more healthily. If they found two local schools and arbitrarily chose one to be where children were treated with the new method and the other to act as a control then this would be an example of a quasi-experiment. However, although the distinction between experiment, quasi-experiment and non-experiment seems straightforward, Pedhazur and Schmelkin (1991) state that 'there is no consensus regarding the definition of quasi-experiment' (p. 278) and note that some naturally occurring events are sometimes seen as a treatment even though there was no manipulation. Because the quasi-experiment is less well controlled than an experiment, identifying causal relationships can be more problematic. Nonetheless, this method can be used for at least two good reasons: firstly, when it is not possible to manipulate the situation; secondly, when it can have better ecological validity than the experimental equivalent.

1 Chapter 4 explains the randomisation process more thoroughly.

Asking questions

There are at least three formats for asking questions and at least three ways in which questions can be presented and responded to. The formats are unstructured (or free) interviews, semi-structured interviews and structured questionnaires. The presentation modes are face-to-face, by telephone or through written questionnaire. Surveys of people usually employ some method for asking questions.

Unstructured interviews

An unstructured interview is likely to involve a particular topic or topics to be discussed but the interviewer has no fixed wording in mind and is happy to let the conversation deviate from the original topic if potentially interesting material is touched upon. Such a technique could be used when a researcher is initially exploring an area with a view to designing a more structured format for subsequent use. In addition, this technique can be used to produce the data for a content analysis (see below) or for a qualitative method such as discourse analysis or interpretative phenomenological analysis (IPA; see Potter & Wetherall, 1995; Smith, Flowers, & Larkin, 2009; Tileagă & Stokoe, 2016).

Semi-structured interviews

Semi-structured interviews are used when the researcher has a clearer idea about the questions which are to be asked but is not necessarily concerned about the exact wording, or the order in which they are to be asked. It is likely that the interviewer will have a list of questions to be asked in the course of the interview. The interviewer will allow the conversation to flow comparatively freely but will tend to steer it in such a way that he or she can introduce specific questions when the opportunity arises. An example of the semi-structured interview is the typical job interview.

The structured questionnaire

The structured questionnaire will be used when researchers have a clear idea about the range of possible answers they wish to elicit. It will involve precise wording of questions, which are asked in a fixed order and each one of which is likely to require respondents to answer one of a number of alternatives which are presented to them. For example:

People should not be allowed to keep animals as pets:

strongly agree *agree* *no opinion* *disagree* *strongly disagree*

There are a number of advantages of this approach to asking questions. Firstly, respondents could fill in the questionnaire themselves, which means that it could save the researcher's time both in interviewing and in travelling to where the respondent lives. Secondly, a standard format can minimise the effect of the way in which a question is asked on the respondent and on his or her response. Without this check any differences which are found between people's responses could be due to the way the question was asked rather than any inherent differences between the respondents. A third advantage of this technique is that the responses are more immediately quantifiable. In the preceding example, respondents can be said to have scored 1 if they said that they strongly agreed with the statement and 5 if they strongly disagreed.

Structured questionnaires are mainly used in health and social psychology, by market researchers and by those conducting opinion polls. Interviews and questionnaires can be used with focus groups.

Focus groups

Focus groups can be used to assess the opinions and attitudes of a group of people. They allow discussion to take place during or prior to the completion of a questionnaire and the discussion itself can be recorded. They can be particularly useful in the early stages of a piece of research when the researchers are trying to get a feel for a new area. Interviews and surveys are discussed further in Chapters 5 and 6.

Observational methods

There is often an assumption that observation is not really a method as a researcher can simply watch a person or group of people and note down what happened. However, if an observation did start with this approach it would soon be evident to the observer that, unless there was little behaviour taking place, it was difficult to note everything down.

There are at least three possible ways to cope with this problem. The first is to rely on memory and write up what was observed subsequently. This approach has the obvious problem of the selectivity and poor retention of memory. A second approach is to use some permanent recording device, such as audio or video, which would allow repeated listening or viewing. If this is not possible, the third possibility is to decide beforehand what aspects of the situation to concentrate on. This can be helped by devising a coding system for behaviour and preparing a checklist beforehand.

You may argue that this would prejudge what you were going to observe. However, you must realise that even when you do not prepare for an observation, whatever *is* noted down is at the expense of other things which were not noted. You are being selective and that selectivity is guided by some implicit notion, on your part, as to what is relevant. As a preliminary stage you can observe without a checklist and then devise your checklist as a result of that initial observation but you cannot escape from the selective process, even during the initial stage, unless you are using a means of permanently recording the proceedings. Remember, however, that even a video camera will be pointed in a particular direction and so may miss things.

Methods involving asking questions and observational methods span the qualitative–quantitative divide.

Structured observation

Structured observation involves a set of classifications for behaviour and the use of a checklist to record the behaviour. An early version, which is still used for observing small groups, is the interaction process analysis (IPA) devised by Bales (1950) (see Hewstone & Stroebe, 2001).

Using this technique, verbal behaviour can be classified according to certain categories, such as 'Gives suggestion and direction, implying autonomy for others'. Observers have a checklist on which they record the nature of the behaviour and to whom it was addressed. The recording is done simply by making a mark in the appropriate box on the checklist every time an utterance is made. The IPA loses a lot of the original information but that is because it has developed out of a particular theory about group behaviour. In this case, the theory is that groups develop leaders, that leaders can be of two types, that these two can co-exist in the same group and that interactions with the leaders will be of a particular type. A more complicated system could involve symbols for particular types of behaviour, including non-verbal behaviour.

Structured observation does not only have to be used when present at the original event. It is also often used to summarise the information on a video or audio recording. It has the advantage that it prepares the information for quantitative statistical analysis.

A critical point about structured observation, as with any measure which involves a subjective judgement, is that the observer, and preferably observers, should be clear about the classificatory system before implementing it. In Chapter 2, I return to this theme under the heading of the reliability of

measures. For the moment, it is important to stress that an observer should classify the same piece of behaviour in the same way from one occasion to another. Otherwise, any attempt to quantify the behaviour is subject to error, which in turn will affect the results of the research. Observers should undergo a training phase until they can classify behaviour with a high degree of accuracy. It is preferable to have more than one observer because if they disagree over a classification this will show that the classification is unclear and needs to be refined further. Structured observation is dealt with in Chapter 7.

Content analysis

Content analysis is a technique used to quantify aspects of written or spoken text or of some form of visual representation. The role of the analyst is to decide on the unit of measurement and then apply that measure to the text or other form of representation. For example, Pitts and Jackson (1989) looked at the presence of articles on the subject of AIDS in Zimbabwean newspapers, to see whether there was a change with a government campaign designed to raise awareness and whether any change was sustained. In a separate study, Manstead and McCulloch (1981) looked at the ways in which males and females were represented in television adverts. C. O'Connor (2017) looked at 'appeals to nature' in newspaper and Twitter prior to the 2015 referendum in the Republic of Ireland over same sex marriage. Content analysis is dealt with in Chapter 7.

Meta-analysis

Meta-analysis is a means of reviewing quantitatively the results of the research in a given area from a number of researchers. It allows the reviewer to capitalise on the fact that while individual researchers may have used small samples in their research, an overview is based on a number of such small samples. Thus, if different pieces of research come to different conclusions, the overview will show the direction of the general trend of relevant research points. Techniques have been devised which allow the reviewer to overcome the fact that individual pieces of research may have used different statistical procedures in producing the summary. A fuller discussion can be found in Chapter 26.

Case studies

Case studies are in-depth analyses of one individual or, possibly, one institution/organisation at a time. They are not strictly a distinct method but employ other methods to investigate the individual. Thus, a case study may involve both interviews and experiments. They are generally used when an individual is unusual: for example, when an individual has a particular skill such as a phenomenal memory (see Luria, 1975a). Alternatively, they are used when an individual has a particular deficit such as a form of aphasia – an impairment of memory (see Luria, 1975b). Cognitive neuropsychologists frequently use case studies with impaired people to help understand how normal cognition might work (see Humphreys & Riddoch, 1987). For more detail see Chapter 4.

Qualitative methods

Two misunderstandings which exist about the qualitative approach to research are, firstly, that it does not involve method and, secondly, that it is easier than quantitative research. While this may be true of bad research, good qualitative research will be just as rigorous as good quantitative research. Many forms of qualitative research start from the point of view that measuring people's behaviour and their views fails to get at the essence of what it is to be human. To reduce aspects of human psychology to numbers is, according to this view, to adopt a reductionist and positivist approach to understanding people.

Reductionism refers to reducing the object of study to a simpler form. Critics of reductionism would argue, for example, that you cannot understand human memory by giving participants lists of unrelated words, measuring recall and looking at an average performance. Rather, you have to understand the nature of memories for individuals in the wider context of their experience, including their interaction with other people. Positivism refers to a mechanistic view of humans which seeks understanding in terms of cause and effect relationships rather than the meanings which individuals have. The point is made that the same piece of behaviour can mean different things to different people and even to the same person in different contexts. Thus, a handshake can be a greeting, a farewell, the conclusion of a contest or the sealing of a bargain. In addition, the intentions of the participants will be important. Thus a handshake as a greeting could be seen by one or both participants as a chance to show how strong they are. To understand the significance of a given piece of behaviour, the researcher needs to be aware of the meaning which it has for the participants. Probably the most extreme form of positivism which has been applied in psychology is the approach adopted by behaviourism.

In the first edition of this book I briefly described some qualitative methods. In subsequent editions I have had a dilemma in that I wanted to expand that section to cover some more methods while at the same time I needed to include other new material elsewhere and yet keep the book to roughly the same size. Given the title of the book I decided to remove that section. Instead I would recommend that interested readers look at Banister et al. (2011), Hayes (1997), Smith (2015) and Willig (2013). These provide an introduction to a number of such methods and references for those wishing to pursue them further.

Is psychology a science?

The classic view of science is that it is conducted in a number of set stages. Firstly, the researcher identifies a hypothesis which he or she wishes to test. The term *hypothesis* is derived from the Greek prefix *hypo*, meaning less than or below or not quite, and *thesis*, meaning theory. Thus, a hypothesis is a tentative statement which does not yet have the status of a theory. For example, I think that when people consume coffee in the evening they have poorer sleep. Usually the hypothesis will have been derived from previous work in the area or from some observations of the researcher. Popper (1972) makes the point that, as far as the process of science is concerned, the source of the hypothesis is immaterial. While this is true, anyone assessing your research would not look favourably upon it if it appeared to have originated without any justification.

The next stage is to choose an appropriate method. Once the method is chosen, the researcher designs a particular way of conducting the method and applies it. The results of the research are then analysed, and the hypothesis is either supported by the evidence, abandoned in the light of the evidence or modified to take account of any counter-evidence. This approach is described as the *hypothetico-deductive* approach and has been derived from the way that the natural sciences – such as physics – are considered to conduct research.

The assertion that psychology is a science has been discussed at great length. Interested readers can pursue this more fully by referring to Valentine (1992). The case usually presented for its being a science is that it practises the hypothetico-deductive method and that this renders it a science. Popper (1974) argues that for a subject to be a science the hypotheses which it generates should be capable of being falsified by the evidence. In other words, if my hypothesis will remain intact regardless of the outcome of any piece of research designed to evaluate it, then I am not practising science. Popper has attacked both psychoanalysis and Marxism on these grounds as not being scientific. Rather than explain the counter-arguments to Popper, I want to question whether use of the hypothetico-deductive approach defines a discipline as a science. I will return to the Popperian approach in Chapter 10 when I explain how we test hypotheses statistically.