Designing and reporting experiments in psychology
SECOND EDITION

Peter Harris

Open University Press
Buckingham · Philadelphia
# Contents

**Preface** xiii

- To students xiii
- How to use this book xiii
- To tutors xvi

## Part 1 Writing experimental reports 1

<table>
<thead>
<tr>
<th>1 Some preliminaries</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Experienced students, inexperienced students and the report</td>
<td>6</td>
</tr>
<tr>
<td>1.2 Writing the report</td>
<td>7</td>
</tr>
<tr>
<td>1.3 The importance of referencing in the text</td>
<td>8</td>
</tr>
<tr>
<td>1.4 The report as a research instrument</td>
<td>10</td>
</tr>
<tr>
<td>1.5 Finding things to write about: how to get more references</td>
<td>12</td>
</tr>
<tr>
<td>1.5.1 Where to start</td>
<td>13</td>
</tr>
<tr>
<td>1.5.2 Ways of adding to your references</td>
<td>14</td>
</tr>
<tr>
<td>1.6 Experimental ethics</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 The introduction section</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 The first part of the introduction: reviewing the background to your study</td>
<td>17</td>
</tr>
<tr>
<td>2.2 Inexperienced students, experienced students and the introduction</td>
<td>18</td>
</tr>
<tr>
<td>2.3 Your own study</td>
<td>21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 The method section</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 The design subsection</td>
<td>27</td>
</tr>
<tr>
<td>3.2 The participants subsection</td>
<td>29</td>
</tr>
<tr>
<td>3.3 The apparatus or materials subsection</td>
<td>31</td>
</tr>
<tr>
<td>3.4 The procedure subsection</td>
<td>33</td>
</tr>
</tbody>
</table>
3.5 Interacting with and instructing participants 37
3.6 Optional additional subsections of the method 39
3.6.1 Pilot test 39
3.6.2 Ethical issues 39
3.6.3 Statistical power 40

4 The results section 41
4.1 Describing the data 42
4.2 Analysing the data 45
4.3 An example results section 46
4.4 Mistakes to avoid in the results section 48
4.5 Rejecting or not rejecting the null hypothesis 50
4.6 Reporting specific statistics 51
4.6.1 Chi-square, \( \chi^2 \) 52
4.6.2 Spearman rank correlation coefficient (rho), \( r_s \) 52
4.6.3 Pearson's product moment correlation coefficient, \( r \) 52
4.6.4 Mann-Whitney U test, U 53
4.6.5 Wilcoxon's matched-Pairs Signed-Ranks Test, T 53
4.6.6 Kruskal-Wallis one-way analysis of variance, H 53
4.6.7 Friedman's ANOVA, \( \chi^2 \) 54
4.6.8 The t test (independent and related), t 54
4.6.9 Analysis of variance (ANOVA), F 55
4.6.10 Do's and don'ts when reporting ANOVA 57
4.6.11 Statistics of effect size 58

5 The discussion section 59
5.1 How well do the findings fit the predictions? 61
5.2 What do the findings mean? 61
5.3 What are the implications of these findings? 64
5.4 What to do when you've been unable to analyse your data properly 65
5.5 External validity: the generalizability of findings 65
5.6 Some tips to help you to avoid some common failings in the discussion 67
5.7 Two example discussion sections 68
5.7.1 The cheese and nightmare experiment 68
5.7.2 The mnemonic experiment 70

6 The title and abstract 72
6.1 The title 72
6.2 The abstract 73

7 References and appendices 76
7.1 The references section 76
7.2 General rules for the references section 76
7.3 Citing specific types of reference 77
7.4 Citing electronic and online sources 78
7.5 Appendices 79
Part 2 Designing experiments

9 Experimenting in psychology

10 Experimental design I
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.8</td>
<td>The external validity of your experiment</td>
<td>137</td>
</tr>
<tr>
<td>10.9</td>
<td>The internal validity of your experiment</td>
<td>140</td>
</tr>
<tr>
<td>10.10</td>
<td>Ethics: the self-esteem and welfare of your participants</td>
<td>141</td>
</tr>
<tr>
<td>10.10.1</td>
<td>Informed consent</td>
<td>143</td>
</tr>
<tr>
<td>10.10.2</td>
<td>Debriefing your participants</td>
<td>144</td>
</tr>
<tr>
<td>10.10.3</td>
<td>Data confidentiality</td>
<td>145</td>
</tr>
<tr>
<td>11</td>
<td>Statistics: significance testing</td>
<td>146</td>
</tr>
<tr>
<td>11.1</td>
<td>Inferential statistics</td>
<td>147</td>
</tr>
<tr>
<td>11.2</td>
<td>Testing for statistical significance</td>
<td>151</td>
</tr>
<tr>
<td>11.3</td>
<td>Type I and type II errors</td>
<td>154</td>
</tr>
<tr>
<td>11.4</td>
<td>Choosing a statistical test</td>
<td>157</td>
</tr>
<tr>
<td>11.5</td>
<td>Two-tailed and one-tailed tests</td>
<td>159</td>
</tr>
<tr>
<td>11.6</td>
<td>Testing for statistical significance: summary of the procedure</td>
<td>161</td>
</tr>
<tr>
<td>12</td>
<td>Statistics: effect size and power</td>
<td>163</td>
</tr>
<tr>
<td>12.1</td>
<td>Effect size</td>
<td>164</td>
</tr>
<tr>
<td>12.2</td>
<td>Power</td>
<td>165</td>
</tr>
<tr>
<td>12.2.1</td>
<td>Estimating power</td>
<td>165</td>
</tr>
<tr>
<td>12.2.2</td>
<td>Increasing the power of our experiments</td>
<td>167</td>
</tr>
<tr>
<td>12.3</td>
<td>Effect size and power: reporting and interpreting findings</td>
<td>168</td>
</tr>
<tr>
<td>12.3.1</td>
<td>Reporting for those who do not know how to calculate power or effect size statistics</td>
<td>169</td>
</tr>
<tr>
<td>12.3.2</td>
<td>Reporting for those who have been taught how to calculate power or effect size statistics</td>
<td>171</td>
</tr>
<tr>
<td>13</td>
<td>Experimental design II</td>
<td>174</td>
</tr>
<tr>
<td>13.1</td>
<td>Extending the number of levels on the independent variable</td>
<td>174</td>
</tr>
<tr>
<td>13.1.1</td>
<td>Unrelated samples IVs</td>
<td>174</td>
</tr>
<tr>
<td>13.1.2</td>
<td>Related samples IVs</td>
<td>176</td>
</tr>
<tr>
<td>13.2</td>
<td>Experimental designs with two or more independent variables</td>
<td>178</td>
</tr>
<tr>
<td>13.3</td>
<td>Labelling designs that have two or more independent variables</td>
<td>181</td>
</tr>
<tr>
<td>13.4</td>
<td>Main effects of independent variables</td>
<td>183</td>
</tr>
<tr>
<td>13.5</td>
<td>Statistical interactions</td>
<td>184</td>
</tr>
<tr>
<td>13.6</td>
<td>Analysing designs involving two or more IVs</td>
<td>186</td>
</tr>
<tr>
<td>13.7</td>
<td>Graphing statistical interactions</td>
<td>187</td>
</tr>
<tr>
<td>13.8</td>
<td>Watch out for “IVs” that are not true independent variables</td>
<td>188</td>
</tr>
<tr>
<td>13.9</td>
<td>Some final tips to help you to design better experiments and write better reports</td>
<td>190</td>
</tr>
<tr>
<td>13.9.1</td>
<td>The basic rule</td>
<td>190</td>
</tr>
</tbody>
</table>
To students

Writing reports of practical work is an important part of many courses in psychology, from school level to degree work. This book provides advice on how to go about writing these reports, focusing especially on the reports that you will most often be asked to write—reports of experiments.

It is a guide to design as well as to report writing. Why? Because these elements are inextricably linked. It is hard to write a good report of an experiment without understanding the whys and wherefores of its design. In order to fully understand what is required of you in the report, therefore, it helps to have an idea of the function that the report of a study serves in the scientific world. This, in turn, requires you to understand something about the nature and purpose of empirical studies—such as experiments. Moreover, many of the problems and difficulties that you may face with report writing involve questions such as how to report the features of your design, or how to report adequately the outcomes of your statistical analyses. The answers to such problems depend on knowledge both of the conventions of report writing and the logic and terminology of design. Consequently, this book attempts to provide an introduction to both aspects of your practical work.

How to use this book

My aim as author of this book has been to write something that will not only serve as an introduction to design and report writing, but that can also be used as a handy reference source throughout your career as a student of practical psychology. I see it being used much
like a thesaurus or dictionary – something that you turn to and read as the need arises. In particular, you may find yourself having to go over some of the sections a number of times before full understanding dawns. Don’t be above doing this – it’s what the book is for. Moreover, although you should never let yourself be overawed by the lab report, don’t underestimate the task that confronts you either. Report writing is not easy – but I hope that this book will make it easier.

It is essential that you take an active part in assimilating the text rather than being a passive receiver of information. After all, you are in an extremely good position to diagnose what you already know and what you need to learn. This book will have been a complete failure if the information remains on the page rather than ending up in your head. To help you with your learning, you will find that the chapters in Part 1 typically begin with a number of “diagnostic questions” with which you should test yourself to see whether you already have the required knowledge to tackle the chapter. If you have any difficulties answering these questions then you will be directed to another section of the book for assistance. Throughout the book you will also find self-assessment questions (SAQs) at various points in the text. Attempting these SAQs will give you feedback on your learning and a better general understanding, and will help you to be more of an active participant than a passive reader. The answers to these questions are given at the end of the book.

The summaries at the end of each section recapitulate the main points and so provide a useful aid to revision. The index of concepts that appears at the end of the book indicates the place in the text where each concept is introduced and defined. Entries in the index are in bold print in the text.

Part 1 is about writing reports. There are chapters for each of the principal sections of the report. Part 2 is about design. There is a progression to the chapters in Part 2. That is, each chapter in Part 2 has been written on the assumption that you are familiar with the material in the previous chapter. So, make sure that you are happy with the material in each chapter before you move on to the next one. In particular, make sure that you are familiar with the material in Chapters 9-11 before tackling the remaining chapters.

Although the book deals with a number of aspects of analysis and design, it does not deal with the computation and underlying rationale of specific statistical tests. You will need also to consult a decent textbook of statistics at various stages in the process of design, analysis and reporting. Nevertheless, I hope that this book offers you useful guidance on the issues that you will need to study in greater depth in methods and statistics and provides helpful accounts of most
of the basic issues. You can find recommended reading at the rear of the book and also on the Web site (see below).

To help you to develop and extend your knowledge of report writing and design, I have included towards the back of the book a separate commentary on various issues and points in the text. There is also a Web site that accompanies this book.

The commentary is designed to extend your understanding by expanding on points and issues that I don’t have space to cover in detail in the core text or by clarifying something that I’ve written. The presence of commentary is indicated in the core text with superscript numbers. The Web site is likewise intended to help you to develop your knowledge of how to design studies and write reports. You should find yourself looking to the Web site for material more and more as you become more experienced and need to write more sophisticated reports. You will find on the Web site fuller coverage of some of the material in this book and also coverage of issues that I have not been able to talk about in the book. For example, on the Web site there is further advice on how to use and report specific statistics and also how to write reports in which you have used lengthy questionnaires. I have indicated in the text at various points some of the issues covered on the Web site. Do log on and find out what is there. You can find the Web site at www.openup.co.uk/harris. Tell your fellow students about it.

I hope that you will find this book useful and that it helps you to produce good reports. However, please remember that it is designed to supplement adequate supervision—not to replace it. The advice in this book is based on the conventions in the Publication Manual of the American Psychological Association, fifth edition (American Psychological Association [APA], 2001). You will find this referred to in the text as the APA Publication Manual (APA, 2001). Nevertheless, it is quite possible that I will have written or recommended something with which your tutors disagree. If so, I hope that your tutors will make clear to you what they want from you instead and that they will not experience fits of apoplexy or direct at me torrents of abuse in the process. So, be alert to places where your tutors expect you to depart from my suggestions.

Please do give me feedback. Let me know whether you like the book or not, about the bits that you found useful and any bits that you found hard to follow. This will help me when I come to produce any further editions. It will also help me to develop the material on the Web site.
To tutors

The aims of this second edition are of course substantially those of the first. However, they have also broadened, in part from a desire to extend the usefulness of the book and in part because of the changes that have taken place since the quieter times in which I wrote the original. The book is designed both for use as an introductory text for those having to write reports and think about experiments for the first time, and also as a resource for students as they progress through the years of a degree course. As with the first edition, it focuses primarily on experiments. However, there is material to assist students with reporting other types of study, on the Web site that accompanies this book.

The academic world has changed significantly since I wrote the first edition. In the UK the number of students studying psychology has expanded enormously and the number that we admit on to degree courses is many times greater than it once was. This has inevitably changed the ways in which we teach our students. If my experience is anything to go by, students receive less experience of report writing and less feedback on their efforts than was once the case. The need for a guide such as this has therefore increased.

Changes in technology have also transformed the facilities available to students when producing their reports. The book has been updated throughout to incorporate these developments with, among other things, new material on producing word-processed reports, on using statistical software and graphing packages and on finding references using electronic resources.

Above all, there have been a number of changes in custom and practice that required changes to the recommendations in the first edition. Some of these are clear – such as the move away from describing people as subjects. Others – such as the challenge to significance testing – are, at the time of writing, less clear-cut in their implications for what we teach our students. I have tried to anticipate the way that things will develop – particularly the move in published work towards dealing with issues of power and effect size and the need, therefore, to educate and train our students in dealing with and reporting these issues.

I found that the first edition was used by more advanced students than I had expected. (I even know of postgraduates who used it to help them to prepare their theses.) Certainly it was not uncommon to find final-year students using it extensively to help them to write their projects. In the light of this I have added a commentary and other pointers to help such students move towards writing the more
sophisticated reports expected of them. A key element in this is the Web site that accompanies this second edition. The Web site can be found at www.openup.co.uk/harris. I have placed there fuller coverage of various issues discussed in this book and also material relevant to more advanced students. The Web site also contains advice on how to report studies involving questionnaires and non-experimental studies.

Please note that each chapter in Part 2 has been written on the assumption that students are familiar with the material in the previous chapter. The material in Chapters 9–11 covers the core material on design and analysis contained in a “traditional” introductory course on these issues. This book can therefore be used with such courses by omitting the material in Chapters 12 and 13.

I have taken this opportunity to bring the recommendations in the book into line with those in the fifth edition of the Publication Manual of the American Psychological Association (APA, 2001). Although not a primer in APA style per se, the aim is to encourage students from the outset to produce reports that are consistent with the style that now predominates. Those tutors for whom this is less of a concern will, I hope, find that much of what I have to recommend here nevertheless still suits their purposes. I would appreciate feedback on what works and what I might do differently.

One minor but nevertheless problematic issue was to choose terms to replace the outmoded design terminology of between- and within-subjects independent variables. There is currently no consensus on this issue, as a quick trawl of contemporary statistics textbooks will show. I have chosen the terms unrelated samples (for between subjects) and related samples (for within subjects) as these seem to be among the commoner alternatives used currently, and have the advantage of being consistent with each other and of signalling meaningfully the distinction that they denote. However, for those who wish to use alternatives, I have highlighted this issue (Section 10.2) and described the principal alternatives. I have also tried to write in such a way that my chosen terms could be easily replaced without students losing sight of the conceptual and methodological issues involved in choosing between these types of independent variable.

At the time of writing, the debate on the future of statistical significance testing continues. I have written this book on the assumption that most of the students who use it will still be asked to test for statistical significance, albeit perhaps within a broader understanding of issues to do with estimation, power and effect size. Nevertheless, it should be possible to use this book even if you do not want your students to test for statistical significance. There is also material (Section 13.8) on alternative labels for independent and dependent variables for those uncomfortable with the assumptions underlying these
terms. In the interests of clarity and simplicity, especially for introductory students, I have assumed that they will generally be testing the traditional “no effect” null hypothesis rather than “minimum-effect” ones (see, for example, Murphy & Myors, 1998).

Those who are familiar with the first edition of this book will find lots of other changes. The obvious changes are the additions of a chapter in Part 1 on producing the report and a chapter in Part 2 on effect size and power. Part 1 now also contains specific advice on how to report some of the more commonly used statistics. In Part 2 I have also expanded the coverage of designs involving two or more independent variables and introduced material on graphing interactions. Part 2 also contains additional material on controlling variables, now covers internal and external validity and has an expanded section on ethics. There is also a new appendix – Appendix 3 – which covers how to use tables of critical values of inferential statistics, given that students are now likely to be less familiar with the use of these and yet will still need to refer to them from time to time.

Material on the Web site covers statistics, from using and reporting chi-square through to multiple linear regression. This is designed to be of use both to relative beginners and more advanced students who may need to run and report statistics of effect size, multiple comparisons, tests of simple effects and so on. For each statistic there is a section on things for the student to watch out for when using it or reporting the outcome of the analysis. Although this part of the Web site is not intended to replace an adequate statistics textbook, it should provide the student with a useful additional source of material and help them to have a reasonable go at reporting the statistics that they are most likely to encounter as undergraduates.

Although I have written this book primarily for students of psychology, I should imagine that many of the rules and conventions are shared by related disciplines – such as biology – and so it may prove useful to students of these subjects too.

I hope that much that was good in the first edition of the book remains and that at least most of the changes are improvements. To be frank, I didn’t get much feedback on the first edition, although as an old empiricist I take its sales figures to mean that I largely got it right. Very occasionally at a conference or other function someone came up to me and said something nice about the book but sometimes also asked me to change something next time round. Wherever I’ve been able to remember such advice, I’ve tried to incorporate it. Most gratifying of all were those times when letters arrived from students who’d found the book useful and wanted to let me know and especially those occasions when they came up to me and told me the same thing. These experiences made me feel warm and happy, but in
the event contributed to how daunted I became at the prospect of revising it.

This second edition has been a long time coming. I am grateful to Justin Vaughan and his colleagues at Open University Press for their patience. I would also like to thank the reviewers of the first draft of this edition – David Clark-Carter, Hugh Coolican and Judith Greene – for the time, thought and effort that they evidently put into their detailed, helpful and constructive reviews. These unquestionably enabled me to make this book better than it would otherwise have been. In the case of Judith Greene, this was for the second time of asking – her excellent and very helpful comments on the first edition undoubtedly improved that one too.

While I’m on the subject of thanking people, this is a useful opportunity for me to update my thanks to my family and to the many friends, teachers, colleagues and students who have put up with me over the years. I am fortunate to know so many splendid people. Distinguished service awards go to my brother, David, my sons, Antony and Richard, and to Julia. Thanks for various things also to Joanna Fitzgerald, Mike Inglis, Fiona Jones, Mike Parkinson and Paul Sparks and to my colleagues and friends at the University of Sussex. I would also like to thank my new colleagues and students at the University of Sheffield who provided me with the support and time that I needed to get this finished even though I’d only just arrived.
Part 1  Writing experimental reports
When you first signed up for a psychology course, the chances are that you didn’t really expect what was coming, particularly the emphasis on methodology and statistics. For a few of you this may have come as a pleasant surprise. For most, however, it will undoubtedly have been a shock to the system.

No doubt in other parts of your course you will examine critically academic psychology’s scientific aspirations. My task in this book is to help you as best I can to face up to one of its major educational consequences. This is the prominence given in most psychology courses to practical work (especially experimenting) and the requirement in most instances to write up at least some of this work in the form of a highly structured and disciplined practical report.

All a report is (really) is the place in which you tell the story of your study; what you did, why you did it, what you found out in the process, and so on. In doing this you are more like an ancient storyteller, whose stories were structured in accordance with widely recognized and long-established conventions, than a modern novelist who is free to dictate form as well as content. Moreover, like the storytellers of old, although you will invariably be telling your story to someone who knows quite a bit about it already, you are expected to present it as if it had never been heard before. This means that you will need to spell out the details and assume little knowledge of the area on the part of your audience.

The nature of your story - the things that you have to talk about - is revealed in Figure 1.1.

Our first clue as to the nature of the conventions governing the report comes with a glance at its basic structure. The report is in sections, and these sections (by and large) follow an established sequence. What this means is that, in the telling, your story is to be cut up into chunks; different parts of the story are to appear in different
Some preliminaries

1 What you did
2 Why you did it
3 How you did it
4 What you found (including details of how you analysed the data)
5 What you think it shows

Figure 1.1. Information to be provided in the practical report.

places in the report. The typical sequence of the sections is shown in Figure 1.2.

Most of the sections are separated from each other by putting their titles as headings in the text. The exceptions are the title and introduction, neither of which need headings to introduce them.

T I T L E
A B S T R A C T
I N T R O D U C T I O N
M E T H O D
R E S U L T S
D I S C U S S I O N
R E F E R E N C E S
A p p e n d i c e s ( i f a n y )

Figure 1.2. The sections of the practical report.

The exact relationship between the elements of your story and the sections of the report is shown in Figure 1.3.

I N T R O D U C T I O N What you did
M E T H O D Why you did it
R E S U L T S How you did it
D I S C U S S I O N What you found (including details of how you analysed the data)
D I S C U S S I O N What you think it shows

Figure 1.3. Where the information in Figure 1.1 should appear in the report.

The method is composed of a number of subsections (Figure 1.4). There is some disagreement over the precise order in which these subsections should appear and over which are essential and which are optional. In this guide I will use the order illustrated in Figure 1.4. You may be advised to employ a different one. This is fine: the important thing is that you report the appropriate material in the right way in these subsections.

The report, therefore, is a formal document composed of a series of sections in which specific information is expected to appear. We will
Some preliminaries

Figure 1.4. Subsections of the Method.

discuss the precise conventions governing each section as we go along. There are, however, certain general rules that I can introduce you to straightaway.

The first of these concerns the person to whom you should address your report, whom I shall call your reader. A very common mistake, especially early on, is to assume that your reader is the person who will be marking the report. In reality, however, the marker will be assessing your report on behalf of someone else – an idealized, hypothetical person who is intelligent, but unknowledgeable about your study and the area of psychology in which it took place. Your marker will therefore, be checking to see that you have written your report with this sort of reader in mind. You need to make sure, therefore, that you have:

• introduced the reader to the area of psychology relevant to your study;
• provided the reader with the background necessary to understand what you did and why you did it;
• spelt out and developed your arguments clearly;
• defined technical terms;
• provided precise details of the way in which you went about collecting and analysing the data that you obtained.

In short, you should write for someone who is psychologically naive, taking little for granted about your reader's knowledge of things psychological. So, when in doubt, spell it out!

If you find this difficult to do, then a useful approach is to write the report as if it will be read by someone you know who is intelligent but unknowledgeable about psychology; a friend of yours, say, or your partner. Write it as if this person were going to have to read and understand it. Indeed, it is a good idea, if you can, to get just such a person to read your report before handing it in (Section 8.6).

? SAQ 1

In which sections of the report are you expected to give an account of (a) what you found in your experiment? (b) what you think your findings have to tell us?
The people who mark your reports are professional psychologists. As they know quite a bit about the subject already, you can safely assume that they will understand what you did and why you did it without this having to be spelt out by you in the report. You should, therefore, direct your report at the expert, specialized reader.” True or false?

Experienced students, inexperienced students and the report

The demands and expectations placed upon you will of course vary with your experience of report writing. Early on in your career as an author of practical reports less will be expected of you than later, especially in what are really the key sections of the report – the introduction and discussion. At this early stage you will be expected principally to show that you understand what you did in your practical and its implications, together with evidence that you have at least a basic grasp of the demands of the report’s format.

In particular, little will be expected of you here in the “why you did it” part of the introduction (Figure 1.3). There are a number of reasons for this, but the main one is that the early studies that you do in your practical course tend not to be justifiable in the terms that we use here – that is, in research terms. Generally speaking, these early practicals are chosen for you; more often than not, this is for reasons other than their earth-shattering research significance. It would be rather perverse of us, therefore, to expect you to fabricate some plausible research justification for undertaking such studies.

Later on, however (as you begin to take more responsibility for the design of your study), you will be expected to pay more attention to the research significance of what you did. This why part will then become more important – because, in being responsible for the choice of topic and design, you will be expected to be able to justify this choice. So, you must be able to tell us why it is that, given the options available to you, you decided to conduct your particular study. Moreover, these will need to be research justifications, not merely ones of expediency! You will need, therefore, to develop the habit of thinking about how the ideas that you are entertaining for your experiment or study will look in the report, paying particular attention to how they will fit into the introduction. Specific dangers that you must watch out for here are, first, a lack of adequate material (references) to put in this section and, second, the undertaking of a project that lacks any
research justification (because it is based on assumptions that are
ccontradicted by existing findings in the area). Thinking clearly in
advance will help you to avoid making these mistakes.

**Summary of Section 1.1**

1. The practical report is composed of a series of separate sections in
which specific information is to be reported. Your task in the report
is to tell your reader all about the study that you conducted.

2. You must write, however, for someone who knows nothing about
your study or the area of psychology in which it took place.

3. This means that you should spell out the precise details of your
study and provide your reader with knowledge of the background
relevant to it (previous findings in the area) when writing the report.

4. The demands placed upon you with regard to this task will vary
with your experience as a student of practical psychology. In
particular, as you progress you will need to get into the habit of
thinking about how the ideas that you are entertaining for your
experiment or study will fit into the report. In particular, pay atten-
tion to how you will be able to develop and defend your arguments
in the introduction.

**1.2 Writing the report**

Before running your study you should really have a good idea of
exactly how you are going to do it, as well as why it's worth doing,
and how it relates to previous work in the area. However, you will
have no real idea of what you are going to find and, therefore, no
precise knowledge of the implications of your study. Thus the intro-
duction and method could, in principle, have been written before
you conducted the experiment, because these sections report material
that you should have decided upon in advance. The results and
discussion, however, can't be written in advance, as these depend
critically upon the outcome of your study.

However, although the order in which the sections appear basically
reflects this historical sequence (Figure 1.2), it is ill advised to write
them in this order. For some of the sections – such as the introduc-
tion and discussion – require greater thought and effort to complete
adequately than others. Consequently, you would be wise to work on
these sections when you are at your freshest, leaving the more straight-
forward ones – such as those that comprise the method – to those
Some preliminaries

moments in which your interest in what you are doing is at its lowest ebb. In particular, never leave the DISCUSSION until last. I have seen too many reports in which students have devoted the better part of their time to the earlier sections, and lost interest in what they were doing by the time that they reached the DISCUSSION. The consequence is a perfunctory DISCUSSION, and a poorer mark than they would have obtained had they budgeted their time more sensibly. Always bear in mind that the DISCUSSION is the key section of the report; it is there that the true value of what you have done in your study will be revealed in all its glory, when you come to assess the implications of your findings. How much have your findings added to the stock of knowledge that you described in the INTRODUCTION? In a very real sense, the whole experimental process – from design through to the writing of all of the other sections of the report – is intended to clear the ground for the DISCUSSION. So, write your report with this in mind. (Again, this will become more and more important as you come to play a larger role in designing your own studies.)

Finally, the ABSTRACT is invariably best left until last, even though it is the first section to appear in the report. (Indeed, it is difficult to imagine writing an abstract of an unfinished report.)

<table>
<thead>
<tr>
<th>? SAQ 3</th>
<th>Which sections of the report could, in principle, have been written before you conducted the experiment? Why?</th>
</tr>
</thead>
</table>

| ? SAQ 4 | Which is the key section of the report? |

### 1.3 The importance of referencing in the text

Whenever you write in psychology you must substantiate all factual assertions. A factual assertion is simply anything that could prompt your reader to ask “who says?” or “what’s the evidence?”. A factual assertion is a claim about the psychological universe, and few such claims are undeniably, self-evidently true. For example, “people want to be happy”, “memory deteriorates with age”, “children grow into adults”. Only the last of these statements is undeniably true, and only if we take adult to mean “grown up physically”. Be alert to this issue: you will be making many factual assertions when you write, and most of the time these will require substantiation. You will be expected to tell the reader at least who presented evidence or arguments for the claim and when. So, if you make a firm statement about any aspect
of the psychological universe (however trivial), you must attempt to support it.

In practice, this means that statements such as “Emotion interferes with the ability to reason logically” or “Anxiety enhances the impact of a persuasive message” are not acceptable. However, statements such as “Emotion interferes with the ability to reason logically (Dwyer, 1972)” and “Anxiety enhances the impact of a persuasive message (Dale & Stant, 1996)” are acceptable. The reason is that they contain what we call references, whereas the first two statements do not.

The use of references is the preferred method of substantiating factual assertions in psychology, for references provide direct answers to the questions who found, argued or claimed something and when. If they wished to, the reader could look up the source referenced to see if it really does say what you claim it says. So, wherever possible you should cite a reference (at least a name and date) for all findings, definitions, and quotations at all times, even where you have made the citation before. It must be clear to which author, and to which particular piece of their work, you are referring at any given time. For example:

Legg (2000) found that emotion impaired participants’ ability to reason logically. Emotion did not, however, affect the female participants any more than the male participants. Indeed, the reasoning performance of the women was superior to that of the men when the emotional arousal was positive. On the basis of these data and previous findings (Legg, 1999), he argued that “the traditional viewpoint that emotion disrupts the reasoning abilities of women, but not those of men, is untenable” (Legg, 2000, pp. 12–13).

You must be aware of the importance of referencing in this way in scientific writing. The conventions governing referencing in psychology are described in Chapter 8. You must adhere to these in your reports and indeed in everything that you write in psychology.

In most cases you will be given at least some references to read for your practical. As you become more experienced, however, more will be expected of you in terms of reading around the area and even hunting down your own references. Advice on how to locate references can be found in Section 1.5.

In psychology you should never find yourself having made a claim about an aspect of the psychological universe without attempting in some way to shore it up. Whatever happens, therefore, you should attempt to substantiate your viewpoint. This is particularly true of what you will come to know as the experimental hypothesis. You should
always attempt to justify the experimental hypothesis (or hypotheses), especially as you become more experienced.

**SAQ 5**
If you make a statement that might prompt your reader to ask “who says?”, what should you do?

**Summary of Sections 1.2-1.3**

1. The **discussion** is the key section of the report. It is there that the true value of your study will be revealed, for it is there that you come to assess the implications of your findings. You should therefore budget your time when writing the report so that you devote sufficient thought and attention to this section.

2. When writing the report you will be expected to substantiate all factual assertions, preferably by using references.

**1.4 The report as a research instrument**

So far, therefore, you have been introduced to the basic requirements of the report and been given some idea of how to go about writing it. Yet why does the report take this form: why is it in sections? Why do these sections come in a particular order? Why are there restrictions over what material is to be mentioned, where it is to come, and how it is to be expressed? These are good questions. The answers to them require you to understand something about the function of the report in its research context.

Those of you who have already written reports may well have found yourselves confused and frustrated at some stage or other by rules of format and principles of construction that strike you as being rigid, restrictive, inhibiting, and more or less arbitrary. One of the main reasons for this is that you meet the report in a strange environment. For the report is primarily a research instrument. Its natural habitat is the academic journal. The rules and conventions that govern its construction have evolved for the purpose that it serves there. In its educational setting, therefore (where you meet it), these conventions are often difficult to understand, because you have inherited the report divorced – at least at first – from its principal function.

What is a journal? When, as a naive undergraduate, I first encountered this term and was packed off to the library to start work on my first practical report I didn’t know what people were talking about. Bewildered, I wandered around the library trying to work out in what
ways a journal might look different on a shelf from a book. To me a
journal was a dusty old, handwritten thing kept by some intrepid
Victorian travelling through the Congo or awaiting the relief of
Mafeking. Quite what psychology had to do with such things was
beyond me. Now, of course, I know better. Academic journals are the
main way in which researchers inform each other about their work
and, therefore, the places in which much of a discipline’s knowledge
and understanding can be found. They are collections of what are
thought to be the best papers submitted to a journal’s editors and are
published at regular periods (and are thus sometimes also referred to
as periodicals, especially in libraries). Most of the studies that you will
cite in a report will be published in journals. (These published reports
are usually called papers, just to add to the confusion.)

In its research context, a journal article serves to inform those who
may be interested in a researcher’s work of its nature, purpose and
implications, in as clear, thorough and concise a way as possible (note
the conflicting demands). To this end, the idea of a general format,
with clearly labelled sections in which clearly defined pieces of infor-
mation are to be provided, has developed (Figure 1.5). In theory,
using this format, it should be possible for readers to establish quickly
and with the minimum of effort whether the reported work is of
interest and to locate any particular piece of information they want.
Ideally, readers should be able to rerun your study (to conduct what
we call a “replication”) based solely on the description in your report.
This is the level of description that you should aim for, within the
constraints imposed by the word limit for your report.

The conventions that govern the construction of the report, there-
fore, have been developed for the purpose of conveying information
clearly, precisely, quickly and concisely to those who are interested.
To a large extent, these are the conventions that you must obey in

<table>
<thead>
<tr>
<th>INTRODUCTION</th>
<th>1 Summarize state of area prior to study. (Why you did it)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 Sketch study in broad outline. (What you did)</td>
</tr>
<tr>
<td></td>
<td>3 State the experimental hypothesis (or hypotheses) and</td>
</tr>
<tr>
<td></td>
<td>associated predictions (Section 9.1.4)</td>
</tr>
<tr>
<td>METHOD</td>
<td>4 Outline precise details of study. (How you did it)</td>
</tr>
<tr>
<td>RESULTS</td>
<td>5 Present relevant data, together with outcomes of</td>
</tr>
<tr>
<td></td>
<td>appropriate inferential statistical analyses. (What you</td>
</tr>
<tr>
<td></td>
<td>found)</td>
</tr>
<tr>
<td>DISCUSSION</td>
<td>6 Summarize and interpret findings.</td>
</tr>
<tr>
<td></td>
<td>7 Assess implications for area (i.e., return to 1).</td>
</tr>
<tr>
<td></td>
<td>(What you think it shows)</td>
</tr>
</tbody>
</table>

Figure 1.5. The requirements of the research report.
report writing, even though very few of you are ever likely to have your work read by fellow researchers. In essence, these conventions have been transplanted from the research world into the educational one.

**SAQ 6**

What principal purposes are served by the conventions of the research report?

As you progress, you will be expected more and more to emulate the research process – to design your studies with their research implications in mind and to write your reports with greater emphasis on the implications of what you have done for existing findings and ideas. As a result, more will be expected of you in the report, particularly in the **INTRODUCTION** and **DISCUSSION**. So, those of you who will be expected to progress in this way must watch out for this transition. (In the UK, this will probably occur for most of you during the second year of an undergraduate course.)

As this is critical to the way in which you should write your report (and as it will obviously affect the way that your report is marked), if you have any doubts about which group you fall into, then ask your tutor. Indeed, this is a general rule for anything in this book: when in doubt, ask your tutor.

**Summary of Section 1.4**

1. The practical report is related to the research article. The conventions that govern the construction of the research article have been developed for the purposes of conveying information clearly, precisely, quickly and concisely to those who may be interested in a researcher’s work.

2. To a large extent, these are the conventions that you must obey when writing your practical reports, particularly as you become more experienced.

**1.5 Finding things to write about: how to get more references**

When you start off as a student, references are generally no problem. Your tutor gives them to you, you read them and write a potted account of what they say. Indeed, in your early reports there may not
be much space for anything expansive. As time goes by, however, expectations change. You will be expected to know more, write about more, and to find out more yourself. At this stage you need useful, informative and up-to-date things to read to help you to design studies that ask interesting questions based on an informed understanding of what has already been found and to help you to structure your introduction. These days anyone with access to a college or university library and a bit of time can come up with a reasonable set of references to collect and read.

When doing your reading, you need to take it in stages. You need to discriminate primary from secondary sources (see below). You also need to differentiate material that is readily available to you – in the library or electronically – from that only available by ordering it from elsewhere, which will cause delays.

1.5.1 Where to start

Start by reading something general if you can. A decent, up-to-date textbook chapter will give you an overview of the themes and issues in the area and a sense of what are the key studies. Wander around the shelves of the library looking for something suitable if no such source is on your reading list. More advanced students should search for an up-to-date review in a journal. A recent article in a decent journal will contain some sort of review of the area. If you need further references, try to get hold of any promising-looking articles contained in the references sections of these articles. There are also journals and other sources dedicated to reviews; if in doubt, ask your tutor where you might look and what might be suitable for your level of study. Ask also what journals s/he considers to be the best in the field.

In some cases there will be an obvious starting study or studies on which your experiment is based. If so, start there.

Make sure that you differentiate primary from secondary sources. A primary source is the original piece of work; the paper in which the authors argued something or first published their findings. Anything in which people give a second hand account of another piece of work is a secondary source. Textbooks are secondary sources. In these the author provides potted accounts of people’s work. Such secondary sources are useful starting points, but much of the detail is lost and sometimes mistakes and misinterpretations creep in. As you progress as a student, you should expect more and more of your reading to be of primary sources and your use of secondary sources to be limited to the first phase of your reading in the area.
1.5.2 Ways of adding to your references

Many of you, most of the time, do not read enough. However, some of you read too much. Reading just the right amount to give you an informed understanding of the area, but leaving you still able to see the wood for the trees, is an important skill. So rule one, for most of you, is: read enough! Rule two, for some of you, is: know when to stop!

If you need to add to the list given to you by your tutor, here are three useful ways of doing so. Use any or all of them.

1 Extremely useful resources are available electronically. Abstracting services, such as the Social Science Citation Index and Psychological Abstracts, contain up-to-date catalogues of titles, abstracts and reference lists of thousands of articles in psychology journals and other disciplines. You can search these electronically by keyword to find some useful articles for your report. Depending on your request, the computer will search for the keyword in the title, abstract, author names, and references section of the articles on the database and provide you with a list of the ones that it has found. Many journals themselves are also available electronically, and these usually have search facilities built in to enable you to search for articles on the topic of interest. Your library will have lists of what electronic resources are available to you (e.g., Web of Science, PsycINFO) and instructions and tips on how best to use them.

2 If your library takes journals, find out where the very latest editions are displayed and look through the ones likely to have articles relevant to the topic. (If in doubt, ask your tutor which these are.) You can also use the references sections of any articles that you find to discover the full references for other articles they cite that look like they might also be useful.

3 The World Wide Web (WWW) contains an enormous range of resources. Access the home page of your college or university to see what relevant sites it provides ready access to. Even better, see whether your department maintains a Web site and what links it gives to resources and other Web sites. The home pages of the professional associations, such as the British Psychological Society and the American Psychological Association, also contain links to other Web sites. If none of this works, use a search engine to obtain lists of Web sites using relevant key words.

Finally, do not underestimate the importance of reading up-to-date material. One of the first things that I do when I look at a project or practical report, especially from the more advanced students, is to scan
the references section to see what proportion of references are from the last two or three years. I want to see a good mix of references to classic sources but also evidence that the student has read recent, up-to-date material published in decent journals.\(^2\)

Summary of Section 1.5

1. As you progress as a student of psychology you will be expected to find relevant things to read yourself and to read more primary sources.

2. You can use searches of electronic databases and hand searches of books and journals to help you to get additional references to read. The WWW also contains potentially useful information.

3. More advanced students should attempt to read a good mix of references to classic articles and up-to-date ones from decent journals.

1.6 Experimental ethics

Before you even begin to think about designing and running your own experiments, let alone writing them up, you need to learn how to treat your participants ethically. Any investigation involving humans or animals is governed by a set of ethical principles, and you are required to act in accordance with these. It can be very easy when designing your experiments to get caught up in the details and the science and to lose sight of the potential for insult, upset or distress in your procedures. When you first start out your tutor will play the major part in keeping an eye on this aspect of your work. Nevertheless, you too have a responsibility to make sure that your experiments and other studies are run ethically. Make sure, therefore, that you obtain, read and understand the principles adhered to in your department. At some stage you may undertake project work for which you need prior ethical approval. Make sure that you know how to obtain approval under these circumstances, and don’t start without it! You will find more on ethical issues in Section 10.10.