Report writing for Honours students

This guide is meant to provide advice, not tell you how to write a report. You have read papers in the relevant areas: these will provide plenty of examples of how to write your report. The information contained might help fill in some detail but is no substitute for using your knowledge of what a report of an empirical study 'looks like'. Remember that any report you submit, including its contents, is your responsibility. It is up to you and you alone whether or not you take notice of the suggestions given here.

Contents

1. General advice for writing

Make sure that every sentence you write makes sense! This means that before you start to write the sentence, you have to be exactly clear in your own mind what it is that you are trying to say. This may sound obvious, but a vague and ill-defined thought, that ends up as a vague and nonsensical sentence.

Similarly, before you write the paragraph you have to be clear in your own mind what the paragraph is trying to say. If you have more than one message or idea in a paragraph, it will end up being confused and therefore you report will start to feel disjoint.

Plan the structure of your writing. What is each paragraph saying? What is the point of each sentence within that paragraph? In other words, organise your paragraphs and sentences by message, not by articles or references. This will help avoid creating list-like writing of previous literature (study a showed…, study b showed…, study c showed…). More advice on how to use Word to help structure your report is given at the end of this document.

The golden rule is ALWAYS to write concisely with clarity and precision. Proofread your work carefully before submitting it, to eliminate typographical errors. Use the spell checker in Word and check each word that has a wiggly red underline (most spelling errors Word detects will be author names but go through slowly and systematically to make sure you catch the other spelling mistakes). Use the grammar-checker in word and check each sentence that has a green underline. While not perfect, the checkers in MS-Word are a great help for proof reading.

1.1. Summary of general advice

- Be as concise, precise and clear as possible.
- Write in a formal (but not pompous) style, and avoid colloquialisms.
- Write in the style of an essay, using proper sentences and paragraphs. Make the sense of the text flows, so that ideas rather than references follow each other in a logical sequence.
- All abbreviations should be defined in full when first used. If you find you have an abbreviation but only use it once or twice throughout the report, then use the full definition throughout.
- Presentation matters. Your mark depends in part on the overall quality of the written presentation, including spelling, grammar, flow, and the quality of figures & tables.
- If in doubt about a style issue, study a suitable published paper to see how it has been tackled by a professional publisher. Check with your supervisor about which journals to use as models.
- Proofread before submitting. Proofreading is not about checking the flow and argument: that should have already been done. Proofreading is about eliminating typographical errors and ensuring the grammar is correct. Use Word (or whatever word-processing package you use) to help trap spelling and grammatical mistakes. When doing the final check don't try to understand the sentences, just make sure each word is the one you want (their vs there, doe vs do…).

2. Use of figures & tables (and their legends)

Figures and tables provide the evidence that backs up statements made in the main text, but they do NOT substitute for the text itself. In other words, the main text should make logical sense to the reader without having to actually look at any of the figures or legends.

A core aspect of figures is that they display the intended results clearly and without clutter. That is, remove many of the default elements the software packages add. Make the font size as large as you dare. Always put the correct error bars on means (MS-Excel really has no idea whatsoever about error bars: always use hand-calculated values, never the in-built options). Axes should be visible but not overly crowded (may 5 or 6 markers on the y-axis, no more). Choose your scale carefully (should you include 0? If not, indicate this clearly in the legend).

All figures and tables must be numbered. Maintain separate lists for each (i.e. the first figure is Fig. 1, and the first table is Table 1). Maintain one number sequence throughout the piece: do not restart numbers in each chapter or section.

All figures and tables must be referred to by number in the text. You can use a text style that either refers to figures explicitly, such as “The experiments, illustrated in Figure 13, show that many birds like to eat pretzels.”, or implicitly, such as “Many birds like to eat pretzels (Fig. 13).” You should settle on one style and use it consistently, rather than swapping between styles (including capitalising Figure, using Fig. or Figure…). Make sure that the numbering of figures and tables reflects their order of appearance in the text.

Where possible, figures and tables should be placed in-line in the text (rather than on a separate page) near to the place where they are first mentioned. This, however, is not as straight forward as you might think, hence the need for numbering figures and tables.

All figures and tables should have a legend associated with them. The legend is a short paragraph (maybe a single sentence) which allows the reader to understand what the figure/table shows without reference back to the main text. The legend should include the key to any symbols shown in the figure (unless they are defined as part of the figure itself). If you are not sure about what goes into a legend, look at range of textbooks or research papers for examples.

A set of figures which are closely related (e.g. a series of graphs showing the effects of different conditions) can be grouped into a single figure, with sub-section labels such as A, B, C etc. You can even have sub-sub-section labels (Ai, Aii, Bi etc) within the single figure.

Avoid redundancy between graphs and tables. The reader needs each point to be made once. Repetition of information (e.g. a table and a figure) violates the golden rule: ALWAYS write concisely, precisely and clearly.

3. What goes in which section in your research paper?

This section aims to provide general advice and guidance on the organisation of the different components of a research paper or report. Ultimately the organisation and

structure is always the responsibility of the author. While the advice outlined below is intended to aid the writing, you must bear in mind that there are many approaches and strategies that are valid. Given this proviso, the broad ideas expressed should facilitate you write a coherent and detailed report that readers (markers) would find acceptable. You should, however, discuss all details with your supervisor before writing your report.

3.1. Title

The title should provide a single line summary of what you actually did. Ideally, the title will mention the independent and dependent variables. Thus, “The effect of sleep loss on the exploratory behaviour of gerbils” would be a suitable format for a title; “Keeping gerbils awake” would not. Try to avoid using catchy newspaper style headlines as titles; a formal report is not supposed to be an exercise in journalism.

Remember that your reader will initially see the title and nothing else, but wishes to know whether or not the report is relevant to his/her research interests. Your title should be a brief, but accurate reflection of the content of the report.

3.2. Acknowledgements

Please, inform in this section about who helped you with what. It is in principle the same as the declaration of authorship but without you signing it with your name to maintain anonymity. It will help the examiners in judging what you actually did by yourself. This includes a clear statement about whether you collected the data by yourself or whether they were given to you.

3.3. Abstract (overview of ALL aspects of the study)

Take particular care with your abstract; everyone will read it first, and first impressions matter! Keep it snappy and informative, giving a well-balanced and accurate summary of the main content of your thesis. It is important to give a clear description of the aims and the hypothesis. You should also include a brief statement of the methods, main results and conclusions.

3.4. Introduction (why the aims of the study are interesting)

The introduction should present the reasoning behind the particular study you are describing. This means that the reader, once the entire introduction has been read, should feel able to predict what your study will be. At the same time your introduction should allow someone who is not an expert to understand why you did this study. Normally, it is advisable to engage the reader's attention as soon as possible by explaining the problem to be investigated and why it is of interest.

The purpose is to make clear the issues, the aims and hypothesis of the study. For this reason the introduction will begin at a general background level and progress through to the specific reasons for and aims of the study. This will entail a brief review of past work in the area and an explanation of the theoretical or practical reasons for doing the study. You could consider using the following general plan (but remember that being general, it will almost certainly need adaptation to suit your needs):

- Describe and define the area that you wish to study
    - Explain why it is interesting and/or important if this is not obvious
- Describe previous work by others that is relevant to the area.
    - This is likely to be the bulk of your introduction

- Explain why the previous work is not sufficient. In many instances, studies are carried out to address the Duhem-Quine problem/thesis (trying to eliminate alternative explanations). Your position should be backed up by the literature. For example,
    - Previous studies used abstract stimuli: What about common/familiar stimuli?
        - Find references that processing varies for abstract vs common stimuli
    - Conditions where no effect was found in previous studies involved trivial differences
        - Find references that big differences have an effect
    - Previous studies where an effect was reported used unrealistically large differences between conditions
        - Find references that big but not unrealistic differences have no effect
    - Previous studies only done in children
        - Find references that adults behave differently in related processes
- Given the results in the literature and current theoretical models, what would you predict the outcome of your study to be and why? You should end this section with your hypotheses. The hypotheses can either
    - Be explicitly expressed (e.g. The null hypothesis is that there will be no difference between conditions A and B while the alternative hypothesis is that there will be a difference between conditions A and B) **OR**
    - Be expressed as predictions (e.g. based on the outcomes of previous research we expect the mean of condition A to be greater than the mean of condition B).

3.5. Methods (how you did the study)

The concept of repeatability is at the very heart of the scientific method, and the purpose of the methods section is to give enough information about the technical aspects of what you did and how you did it to enable another scientist to repeat your study as precisely as possible. Remember, you are telling the reader about the methodology you used in your study, not about ongoing work (let alone a study you are planning for the future) so use the past tense. And stick to the golden rule: ALWAYS to write concisely with clarity and precision.

3.5.a. Sub-headings

The APA format for the methods section is in reality very loosely defined: the variation in methods used within psychology makes a formulaic or constrained section unfeasible. The only real constraint is the (lack of) sub-headings. You do not need to have sub-headings, but if you choose to do so, select from the following:

> Participants, Apparatus, Materials (or Apparatus & Materials), Design, Data analysis (or Design & Analysis), Procedure

The use and selection of sub-headings in the methods section is probably the most difficult part of writing reports to master. While you should conceptually include the above sub-headings, it does not always make sense to separate them out. For example, the describing the procedure, which includes the allocation of participants to the different conditions might require describing (the between subjects) part of the design in the procedure. As a guide, you would normally expect to see the sub-headings of participants, materials, procedure and data analysis (or design &

analysis). Remember, this is not definitive let alone compulsory: write the methods as concisely and precisely as you can, then look to add sub-headings to help the reader.

Having argued that you don't need sub-headings, the following is organised by the sub-headings. To reiterate, you do not have to include the sub-headings, but you should include the relevant material somewhere in your methods section.

Participants

As a minimum you should detail the number of participants, the concrete population and the sampling method (e.g. '*28 self-selected undergraduate students at the University of St. Andrews completed the online questionnaire*' or '*20 opportunity sampled undergraduate psychology students taking PS3021 completed the study*').

The extent to which you can generalise from your study will depend on many other characteristics. For example, the two examples above used undergraduate participants: this means that generalising to the elderly or less educated may be problematic. You should treat this as a potential advantage: if there is evidence that, for example, the elderly may behave differently in similar tasks, you already have a valid discussion point.

To help readers know how far they can generalise from your study, it is not uncommon to give other important characteristics (demographics) of the participants. However, this information should only be gathered if there is a valid scientific reason related to your study. For example, if your hypothesis concerns decision making processes (how do we combine cues to reach a perceptual decision), then there is no reason to gather demographic information beyond that implicit in "undergraduate students reading psychology" (age ~18-24; well educated; mostly women).

Apparatus

Use the apparatus section to indicate precisely what equipment central to the study was used (make and model). This will often include a data collection programme (e.g. Cog Demos, v0.34, in house software; e-Prime v2.0, Psychology Software Tools Inc., USA; www.qualtrics.com, Qualtrics, Utah, USA).

Most difficulties arise when deciding what apparatus requires details and what does not. For example, when running a psychophysical study the make and model of the display unit is required. This is because the precise control over the appearance of the stimuli is central to the study. For many studies, for example when words to be remembered are being displayed, this simply does not matter ('*displayed on a windows PC with a 24" LCD screen*' is sufficient). However, in both cases details of the stimuli themselves are needed ('*Gabor patches subtending 0.5 degrees with a frequency of 10 cycles per degree and of 78% Michelson contrast*'; '*presented in black Arial 24 point font*': see Materials section for more information).

Materials

Stimuli, words, puzzles, questionnaires etc., are materials, and this section should describe what these are and how you devised them. Unlike most other sub-headings, the Materials heading can be replaced with Stimuli or Questionnaires if the entire section is about the generation / source of your stimuli/questionnaires. If there are more materials than just stimuli/questionnaires, describe the "other bits" first under Materials, then use the sub-sub headings Stimuli and/or Questionnaires.

If you didn't devise your materials, you need to give credit to the person who did and refer to a source that the reader can turn to if they want to know more about how they were developed.

Stimuli

If you are using an already published stimulus set, reference the relevant paper and give the key information ('*The concrete and abstract word lists, matched for frequency, were those used by Smith and Jones (1986)*'). It is often a good idea to use an existent stimulus set as you can compare your results (more) directly with the previous literature.

If you need to make your own stimuli, give details of the criteria you used to select the particular items for the study. For example, if using words as your to-be-remembered stimuli in a memory experiment you should tell the reader about features of their selection (it is always a good idea to control word length, word frequency[1] and meaning (noun, verb, concrete, abstract etc.)). If you are creating your own visual stimuli, give the details (e.g. ('*Gabor patches subtending 0.5 degrees with a frequency of 10 cycles per degree and of 78% Michelson contrast*'; '*presented in black Arial 24 point font'; 'neutral expression faces taken from the Karolinska Directed Emotional Faces (KDEF) database'*[2]).

Questionnaires

It is (nearly) always better to use an established questionnaire than to try and make your own. How well a questionnaire performs and how well it measure what you want (the psychometric properties) depend critically on the wording of each item (question), the order of items, the response format to name but a few issues. Established questionnaires (should) have been through extensive testing and evaluation to determine how well each of these psychometric properties is met. This is a long process involving many large scale studies (100's of respondents) which are used to whittle down the number of items and fine tune the wording etc.

If you have to devise your own questionnaire include a brief argument about why possibly related but established questionnaires are not suitable in this section (talk with your supervisor about it). Remember that using an isolated 'part' of an existent questionnaire (e.g. taking those items that measure a particular facet of personality) is not the same as using the established questionnaire. You will also need to acknowledge that the properties of the new or adapted questionnaire are unknown in your discussion, emphasising that your conclusions are tentative. Finally, you will need to include, as an appendix, all the items of your new questionnaire, including clear indication of the response format etc. (do NOT include it in the methods section).

Remember that many questionnaires require payment to use (e.g. Beck's Depression Inventory), at least require permission from the authors to use (e.g. Cognitive Emotion Regulation Questionnaire). You must ensure that you meet any restrictions before planning to use such a questionnaire (or note that the

[1] Blair & Urland (*Behavior Research Methods, Instruments and Computer* **34**(2): 286–290) show that using an internet search engine and noting the number of exact hits for each word is as good as any and allows the frequencies of any word (e.g. place names) to be found.

[2] Remember to include the relevant reference for any database: for the KDEF faces it is *Lundqvist, D., Flykt, A., & Öhman, A. (1998). The Karolinska Directed Emotional Faces - KDEF, CD ROM from Department of Clinical Neuroscience, Psychology section, Karolinska Institutet,*

questionnaires are public domain) and to say as such in your application for ethical approval.

Other materials

The materials paragraph(s) should also detail any specific chemicals or compounds if applicable. Describe & name them accurately, and, where appropriate, identify the source/supplier. Any non-human organisms that you used will be named in full in the materials section. Use the proper scientific terminology, source and authority.

Details of Schools, hospitals etc. should also be given (assuming it is appropriate and permission has been given). If you are doing fieldwork, give the specific sites etc., stating map references wherever possible.

In the case of a secondary data analysis project or computational study, the materials section contains full information about the source of the data used.

Design

You should make clear the type of study you are reporting. While this does not have to be in its own sentence, it is important that the reader understands the basic type of study (i.e. experimental, correlational or observational). This sentence is useful for inclusion in the abstract as it gives the overview of your study (but remember to take out abbreviations etc.). [In the examples, it is assumed that the scales have been described in the materials section]

For experimental studies, state what were the independent variable(s) (i.e. the variable which you manipulated) and the dependent variable(s) (i.e. what was measured). Other variables that you may need to mention (if used) are classification or control variables (which are like independent variables, except that you cannot manipulate them, such as the sex or age of your participants). For example, '*The impact of manipulating the number of time management sessions students received on academic burnout (MBI-SS) was investigated while controlling for individual differences in the five factors of personality (OCEAN), depression and anxiety (DASS).*'

For correlational or regression based studies, state the variables that you measured. If you plan to build a model, make clear which are predictor variables and which are the dependent, to-be-predicted variables. For example, '*Anxiety & depression (DASS) and the five factors of personality (OCEAN) were used as predictors of academic burnout (MBI-SS).*'

For observational studies, state what it is that you are observing and how they are going to be related.

The design paragraphs should make clear any within- and between-subject factors. For example, '*The study used a mixed 4X3X2 design. The within-subjects factor was set size which had 4 levels (1,2,5 and 9). There were two between-subjects factors, number of practice sessions and level of neuroticism. Subjects received either no, 1 or 3 practice sessions. Participants were categorised as showing either high or low levels of neuroticism.*' As always, you can condense things down (e.g. '*The mixed 4X3X2 design consisted of one within-subjects factor (set size: 1,2,5 and 9) and two between-subjects factors (number of practice sessions: 0,1 or 3; neuroticism: high or low)*'). You should probably aim for a compromise between these extremes.

You should include the method by which participants were assigned to different experimental conditions in the design section. Continuing the above example, it

might be something like '*The number of practice sessions each participant was determined randomly by asking each participant to roll a dice [a roll of a 1 or 2 = no practice sessions, 3 or 4 = 1 practice session, 5 or 6 = 3 practice sessions]. A median split on the score from the neuroticism scale of the personality questionnaire was used to determine whether a participant was allocated to the high or low neuroticism condition.*' Note that the mechanism for the assignment is given, not simply 'randomly assigned'.

If you design includes covariates (e.g. age), remember to spell these out. In general, it is better to keep covariates as continuous variables wherever possible. The example above should really use the neuroticism score as a covariate rather than dichotomising the variable into high/low scores.

Data analysis

Your methods section should also include details of any statistical analysis methods that you apply. This is particularly important for theses based on data analysis, in which the analysis methodology is likely to comprise an important component ofthe overall project design.

Remember to consider the scale type that you are using and how this influences the type of analysis that you perform. You should justify your choice of analysis method, particularly if you are using parametric analyses on ordinal data types or data that is clearly non-normal. Some useful things to note in this regard are that a score derived by combining several ordinal items (i.e. using the arithmetic average of several items in a questionnaire answered on a Likert-like response scale) produces a scale that can be considered interval providing there are not too many individual scores at the boundaries (the ends of the scale)[3]. The F ratio (ANOVA – and by extension t-tests – and MLR) is robust against non-normality (it assumes all error term distributions are the same, not that they are normally distributed). For data which is highly non-normally distributed, applying parametric analyses to the ranked data is often legitimate[4] (for example, it's what the non-parametric equivalent of 1-way ANOVA – the Kruuskal-Wallis test – does). Talk with your supervisor about the most appropriate test and how to justify the choice if it is not obvious.

It is often a good idea to put the tests of the assumptions underlying your analyses in this section. For example, the assumption of homoscedasticity in between-subject factors in ANOVA can be assessed using Levene's test. Stating '*Levene's test indicated homoscedasticity in the data for the between subject factors (all p>0.05))*'. Similarly, data transformations to reduce heteroskedasticity (e.g. square-root or log transformation of reaction time data) can be reported in the analysis section. While these are technically a result, repeated tests of the assumptions in the results section will often get in the way of presenting the main results in a clear and concise manner. Talk to your supervisor about which tests of the assumptions to use and if it is appropriate to have them in the analysis section.

[3] Carifio, J. and Perla, R.J. (2007). Ten Common Misunderstandings, Misconceptions, Persistent Myths and Urban Legends about Likert Scales and Likert Response Formats and their Antidotes**.** Journal of Social Sciences 3 (3): 106-116.

[4] Conover, W.T. and Iman, R.L. (1981). Rank Transformations as a Bridge between Parametric and Nonparametric Statistics American Statistician, 35 (3): 124-129.

NOTE: if you design your own analytical methodology and verify it with tests on known data, then you should describe these tests in the opening part of your results section.

Procedure

The procedure covers the techniques and protocols that you adopted. In many cases you will be using a standard (variant of a) paradigm. Where the procedure was standard but an essential part of the work you may describe it in brief (do **not** give a numbered list of steps like a cookery book) as well as giving the reference.

If you are using a variant of a standard paradigm of your own devising, alert the reader to "A novel variant of XXX was used." Then give the standard variant, highlighting your modifications. Where the procedure was of your own devising, describe the method in detail including all measures and how they were administered.

You may find that describing your procedure seems to replicate other aspects of your methods section. For example, in one of the fictitious studies above, participants had to roll a die to determine which condition they would be assigned to. You should either back-reference the reader to the purpose '*Each participant first rolled a 6 sided die, the result used to randomly assign the participant to a particular experimental condition (see above)*', or move the reason to the procedure. Do not repeat the information: it leads to confusion and checking ("I'm sure I read something like this earlier but was it exactly this?").

3.5.b. Statement of ethical approval

It is vital that you provide information that the study has received the relevant ethical approval. For human based studies, this will be the ethical approval code (e.g. PS14063). For animal studies, this will be – if appropriate – the home office project licence code (your supervisor will be able to provide this). The statement normally comes at the end of the methods section ('*This study received ethical approval from the School of Psychology and Neuroscience Ethics Committee (SEC), approval code PS14063*').

3.6. Results (what the study found)

The results section consists of a body of text, with figures and tables embedded in it. The text should be a cohesive piece of writing that describes the major features of your results, and which can be read on its own without the figures and tables.

The general format for presenting a result is (1) description, (2) [inferential] analysis, (3) the inference expressed in English.

If the description of a result includes a measure of central tendency (e,g, mean, median or mode), give the measure of variability (i.e. an indicator of the uncertainty of that value). Most parametric tests will allow inferences about the means: therefore the appropriate measure of variability is the standard error or the mean (sem).

Perhaps the most important (and most commonly missed) aspect of an inferential test is the associated effect size. This allows the reader to form a clear impression of how much impact the result might have independent of the number of participants and the statistical significance (p value). The metric will depend on the statistic (for t values, use Cohen's d; for F ratio's use partial eta squared (η_p^2); for correlations and regressions, use the coefficient of determination (aka R^2)).

You can state key numerical findings within the flow of the text, but do not include full numerical details of all findings; these should be placed in figures or tables. The figures and tables thus serve as evidence for, and illustrations of, the results described in the text. They enable the reader to verify that the statements of findings within the text are actually substantiated by the data. It is advisable to make figures or tables to illustrate and support your key comparisons. This is probably even more important if your hypothesised effect is non-significant (i.e. the group means were not statistically different from each other). [Remember that statistical significance is only one, often over-emphasised, way of evaluating results]

Avoid 'floating' figures or tables (a figure that is not mentioned in the main text). To this end, all figures and tables should be clearly numbered and have a legend with a title: e.g.

> *Figure 1. Mean reaction time in [condition A] and [condition B]. The mean reaction time of the 20 participants is plotted for each condition. Error bars = SEM.*

You them must make sure that each is mentioned in text (the examples of reporting a t-test below refer the reader to Figure 1). To help the reader understand the results, use suitable short-hand names for your conditions to replace [condition A] and [condition B].

Do not be afraid to have short results sections. For a simple experiment the results describing the central hypothesis could be as simple as

> *The reaction time in [condition A] and [condition B] were (mean±sem) 748±25ms and 704±31ms (see Figure 1). This difference was statistically significant (t=4.6, df=18, p<0.01, Cohen's d = 1.5). We therefore conclude that [condition A] slows processing compared to [condition B].*

If you have a number of points to make in your results (which will normally be the case), you can condense the above to:

> *Processing in [condition A] took longer on average than in [condition B] (RT mean±sem: 748±25ms vs 704±31ms respectively, see Figure 1; $t_{[18]}$=4.6, p<0.01, Cohen's d = 1.5).*

In general, aim for somewhere in between the long and short versions above. Whichever approach you take, remember to give the inference in English: this is the key part and must not be missed out.

You should not attempt detailed explanation or interpretation of the meaning ofyour findings with the results section; leave that for the discussion. However, it can sometimes be difficult to banish all explanations of data from the results section. The results may describe a series of analyses, and the purpose of a later analysis can often only be understood in the context of the explanation of the findings of previous analyses. So one has to use common sense in deciding what level of explanation needsto go into the results section, and what should be postponed until the discussion section.

3.7. Discussion (what the study tells you)

The discussion section is where you round off your paper, explain what your findings mean, and place them in the overall context of the field. You will usually include a summary of your main findings near the start of your discussion, but you should go well beyond this.

When writing your discussion you should think back to the aims that you stated in your introduction, and possibly explicitly (but briefly) re-state them, and then show to what extent your study has actually accomplished those aims.

You must consider any shortcomings in your data or methodology, and, if possible, argue that these do not detract from your main conclusions. If your data are open to several different interpretations, you should consider these in turn, and then suggest which you think is the most plausible (Occam's razor can be a useful instrument, here).

You can discuss what further work could be performed to take the project to a more advanced stage or to decide between possible alternative interpretations of your data. If you take this route, make sure that the suggested projects are clearly justified, not simply a "you could do this" (a theoretical studies are always possible, but no one would bother doing them). Remember that the Duhem-Quine thesis can help here: use the literature to postulate an alternative explanation and suggest a way of investigating that alternative.

You can speculate on interpretations of your data that go beyond what you have actually demonstrated, so long as you make it clear that this is indeed speculation. However, be careful as each element of the speculation needs to be backed up with plausible argument based on the literature, not simply because you think "it could be like this".

You may want to end of your discussion with a succinct and pithy statement of how, hopefully, your findings have advanced knowledge in the field of your research. Be careful as these statements can come back and haunt you (at the very least, be sure that the 'advance' is not already known or does not contradict other research).

N.B. In some subject areas it is permissible to combine the Results and Discussion sections, especially where the results of one study are used to plan the next. Consult your supervisor.

4. References, referencing and reference lists

When you give a piece of information, or describe an idea in your thesis, it will either be a result of your own work, or of someone else's. In the latter case, you need to decide whether you should give a reference for it. Some ideas or information come into the category of "general knowledge", and these do not need to be referenced. However, others are more specific, novel or detailed, and these should be referenced. If in doubt, reference! The point of referencing is to give credit where it is due (and thus avoid any accusation of plagiarism), and to allow the reader to follow up or verify the information that you give.

Direct quotations should *always* be referenced AND included in quotation marks or, for longer sections, indented, to give a clear indication of what text is included in the quote. It is NOT sufficient just to give a reference at the end of a section of text which is even close to direct word-for-word copy from that reference. Also note that simply changing a few words within the text of a quote does NOT remove the need for quotation marks around the rest. If you want to insert some words of your own within a quotation, the standard way is to put them in square brackets; if you want to remove a few words from a quotation, replace them with an ellipsis. Thus "If want to insert some words within a quotation [to clarify its meaning], the standard way is to

put them in square brackets" (ref). For a direct quote, the page number of the publication it is taken from should also be given (eg, Smith (2014, p. 32)

References come in two parts; a citation in the text placed at the point where the information or idea is first presented and a citation in the Reference List at the end of the text where full bibliographic information is delivered.

Make sure there are no "orphans": all citations in the text should also occur in the reference list, and *vice versa*.

You should use the APA referencing system. A brief description follows.

4.1. Use APA format for citations within the text

Use the American Psychological Association (APA) format. Within the text you only give the surname(s), date, and, if necessary, a letter qualifier for the date for each reference.

There are two styles; explicit and implicit - e.g. "As Smith (1999) proved, blue is better than red" (explicit), or "Blue is better than red (Smith, 1999)" (implicit). Either style is acceptable, but it is best to choose one and stick with it throughout your thesis.

If you quote two or more references for the same topic, put them in alphabetical order: e.g. "Blue is better than red (Bloggs, 1999; Smith, 1993)", or "As shown by Bloggs (1999) and Smith (1993), blue is better than red".

If an author published two separate articles in the same year and you need to reference them both, use a letter qualifier with the date- e.g. "Blue is better than red (Smith, 1993a) but yellow is better than green (Smith, 1993b)". This letter qualifier is also used in the reference list at the end of the thesis. However, make sure that you don't blindly copy the letter qualifier from a reference list given in a paper that you read, if you yourself only refer to one of the articles.

For a multi-author article, if there are two authors, give both names, e.g. "Smith and Jones (1999) showed…" or "Blue is better than red (Smith & Jones, 1999)". If there are more than two but less than 6 authors, give all authors the first time (e.g. "Kentucky, MacDonald and Dominos (1999) found chicken is better than beef or pepperoni." or "Chicken is better than beef or pepperoni (Kentucky, MacDonald & Dominos, 1999)". After the first time, use *et al*., e.g. "Kentucky *et al*. (1999) showed…". If there are more six or more authors, use "et. al." from the onset. Regardless of the number of authors always give the full list of all the names in the reference list.

If you are referencing work that you have not read personally, but have found referred to in a paper that you *have* read, use the format "(Smith 1988, cited in Jones 1990)". Put both references in the reference list. Don't do this more than you can help - it looks amateurish or lazy. What is more, the author of the paper that you have read may be misquoting the paper that you have not read - this is one way errors and misconceptions spread through the scientific literature. If the paper is a key paper, than you should definitely read it yourself, if necessary getting it translated from a foreign language (you should approach your supervisor if you think this is required).

4.2. The reference list and APA format

The reference list should also be in APA format. It occurs at the end of the thesis but before appendices. It should contain the full bibliographic information about the references. It must contain enough information for the readers to be able find and read the references for themselves. Regardless of the number of authors always give the full list of all the names in the reference list.

There are standard formats that are used in the reference list by the American Psychological Association. The precise format depends on whether you are citing a journal article, book, book chapter *etc*. The most common of these are shown below.

4.2.a. Reference to a journal article:

Last name, initial(s)., & Last name, initial(s). (Year). Article title. *Journal title*, *Volume Number* (issue or part number if needed), page numbers.

Kentucky, F.C., MacDonald, S., & Dominos, P. (1999). Which sort of unhealthy fast food is Mike's favorite? *Unnatural Nature, 427*, 465-466.

Note: journal names have standard abbreviations: e.g. the Journal of Experimental Psychology: Human Perception and Performance is *J. Exp. Psychol.-Hum. Percept. Perform*. Always use the full form of journal titles in the reference list.

4.2.b. Reference to a book:

Last name, initial(s)., & Last name, initial(s). (Year). *Title.* Place: Publisher.

James, W. (2010) Principles of Psychology – Part 2. Reprint: LULU Press.

Gazzaniga, M.S., Ivry, R.B. & Mangun, G.R. (2013) Cognitive Neuroscience: The Biology of the Mind (4th edition). New York, USA: W. W. Norton & Co.

4.2.c. Reference to an article in a book:

Last name, initial(s). (Year). Chapter title. In Initial. Last name (Eds.), *Book title* (pages of chapter). Place: Publisher.

Chalmers D.J. (1999). The Puzzle of Conscious Experience. In: The Scientific American Book of the Brain. Lyons Press. pp287-296.

Benton, D. (2011). Diet, behaviour and cognition in children. In D. Kilcast & F. Angus (Eds.), *Developing children's food products* (pp. 62-81). Cambridge: Woodhead.

4.2.d. Reference to a website:

Author. (Year). *Title.* Retrieved month day, year, from URL

American Psychological Association. (2012). *APA style blog.* Retrieved May 29, 2012, from http://blog.apastyle.org/apastyle/

Gilbert S.F. (1997). The embryological origins of the gene theory. Retrieved 15/06/04, from http://zygote.swarthmore.edu/gene1.html.

4.2.e. Other reference styles

There are a large number of more obscure reference formats, and many of these are shown on the quoted website, but those above are the most common. If in doubt, look at the website, or ask your supervisor.

5. Using Word to help structure your report

The aim of structure and organisation is to lead the reader along. When you get it right, every time the reader starts to think of something or an issue you deliver the relevant information immediately. And having given it, you don't repeat it or variants of that information a page or two later.

To achieve this, you need to organise the main points into a coherent order. The 'points-within-points' also need to be in a coherent order, as do the points-within-point-within-points. This iteration continues down to the level of sentences. It may help to think of structure in what is intuitively the reverse order: every paragraph should have a clear structure of sentences, each sub-section should have a clear structure based on the paragraphs, each section have a clear structure of sub-sections and so on.

Word processing packages allow the ordering of the points and points-within-points to be quickly displayed by using their inbuilt 'Table of contents' facilities. To do this, make use of the in-built 'headings' (I think the default in Word 2010 is to display heading levels 1-3, but they go on). Make a series of heading level 1 (Title, abstract, introduction, methods, results, discussion & reference list) and heading level 2 entries. Then, before doing anything more, go to the top of the menu and find the "References" tab (File…Home…Insert…Page Layout…References). At the left hand end, insert a table of contents (either of top two options work as well as any other). This will insert a table with your headings in it. It might look something like this (but will have page numbers as well)

Table of contents

- Title
- Abstract
  - Intro sentence
  - Method sentence
  - Key result sentence
  - Discussion sentence
- Introduction
  - 'Big picture' description
  - What's the big picture question?
  - Specific study area
  - Previous core findings
  - What's not known
  - Predictions based on current theory
  - Hypotheses
- Methods
  - Participants
  - Materials
  - Procedure
  - Design & analysis
- Results
  - # participants & demographics
  - Hypothesis 1 results
  - Hypothesis 2 results…
- Discussion

Summary of findings (compared to predictions)
Comparison with previous core findings
Limitations of the study (methodological)
Further work (conceptual/theoretical limitations of the study)
Conclusion
Reference list

As you write, keep glancing at the heading: is the content of your sentence related to that heading in a clear way? If not, stop because whatever you are saying doesn't belong where you are writing it. Keeping your writing focused on a theme (heading) will avoid the dreaded listing of studies.

You will find you quickly need to start putting in level 3 headings that sketch out the themed details of each point in the example table above. These sub-headings can be in shorthand form as they will almost certainly be deleted at the end. Once you've added the sub-heading and a little bit of associated text, update the table of contents.

Introduction
'Big picture' = cognitive processes of memory
Big question: know about components, less about interactions
This study examines impact of existing memories on learning
Previous core findings:
Memory
How memories structured/related to each other
Learning
Existing memories influence learning
What's not known
How structure of memories change when they influence learning
Predictions based on current theory
Structure of memories will change following new learning
Hypotheses
H0: No change; H1: Change

The updated table of contents should read as a coherent whole, albeit in note form. Think if the sequence is logical or jumps around. If you need to move headings, do so in the main body of your report (don't mess with the table of contents). Remember that if you move a 'chunk' of text around, make sure to move the associated heading and all sub-headings with it. Regularly update and check the table of contents. Does the flow still work? Have you inadvertently moved a sub-heading to an position where it doesn't work? Would the heading and its subheadings fit better somewhere else?

You should end up with a horrible looking piece of work with sub-headings in shorthand (e.g. 'intro to Stroop') all over the place. Once you are happy with the flow, decide which headings can be removed. This will probably be most if not all except two or three in the introduction and those in the methods section. You might also want to keep one or maybe two sub-headings in the discussion. Obviously, don't forget to edit any sub-headings you keep into sensible ones (e.g. 'intro to Stroop' becomes 'The Stroop task').