



Writing Up Research

This following provides a brief overview of the structure and content of various elements in a laboratory report, based on APA guidelines. The APA publication manual should be referred to for more detail (American Psychological Association, 2010).

The purpose of a lab report is to communicate research in a clear, systematic and standardised way. Primarily, a lab report should communicate the following things:

- **Why did I bother?** Why did I do this research and why is it an interesting contribution to science?
- **How did I do it?** How did I carry out this research (this should be detailed enough so that the study could be replicated precisely)?
- **What did I find?** What were the results of your study?
- **So What?** What do your findings mean in terms of your hypotheses and what theoretical contribution do they make?



Snail of Sense!

The advice that we give you in this handout is not inflexible, it is a guide. For example, when we say that the title should be fewer than 12 words, the world will not end if your title is 13 words. So, please use your common sense. In case you don't have any, the snail of sense will appear to give you some advice.

Format of a Laboratory Report

There are several sections to a lab report:

- Title
- Abstract
- Introduction
- Method
 - Participants
 - Materials (Optional)
 - Design
 - Procedure
 - Scoring (Optional)
- Results
- Discussion
- References
- Appendix (Optional)

Title

The APA recommends that titles should be no more than 12 words.

A good title alerts the reader to the overarching theme of the work to be reported. A good title also captures the reader's attention. But the latter goal should not interfere with the former one. Don't use superfluous words or abbreviations: for example, why write "An Empirical Investigation into Anxiety Disorders in Children with ...", when you could write "Anxiety Disorders in Children with ..."?

- ✖ Too Vague: "The 'Beer-Goggles' effect".
- ✖ Too specific: "Investigation into the effects of drinking 6 pints of Guinness in a nightclub in Brighton at 11.30, while listening to drum and bass played at 100 db through a good sound system, on 12 men's and 15 women's ability to accurately judge the attractiveness of members of the opposite sex".
- ✓ About Right: "'Beer-Goggles': do alcohol and lighting influence attractiveness ratings of the opposite gender".



Apey-Ape: Titles

The Apey Ape is a stickler for APA style. He will pop up to tell you what it says in the APA publication manual.

"A title should summarize the main idea of the manuscript simply and with style. It should be a concise statement of the main topic and should identify the variables or theoretical issues under investigation"

Abstract

What is the study all about (in no more than about 150-250 words). Abstracts provide a reader with the most important details. Ideally, the abstract enables the reader to decide whether he or she should read the article. Again, never promise more than can be given. Not everyone is going to be interested in the work; but that doesn't mean the writer shouldn't point out some of the most intriguing features of the study. The abstract should not be composed of selected sentences from the body of the paper. Instead, the writer should sit down and try to distil the essential elements of the work to be reported. The abstract is extremely important; it shouldn't be short-changed. It should be written last. This paragraph should concisely describe the problem under investigation and the motivation for the study, the participants, the experimental method, findings, and conclusions. You could try to write a sentence on each of these areas. To conserve characters in the abstract, type all numbers except those that begin a sentence as digits. Avoid ending the abstract with throw-away and uninformative statements such as 'These results will be discussed', or 'how these results relate to past theory will be discussed'.

- ✓ Ugly (1993) has shown that the propensity to misclassify members of the opposite sex as attractive is increased in nightclub settings. This study was designed to ascertain whether this effect is due to the dim lighting employed in these venues, or the consumption of alcohol in this setting. Ratings of the attractiveness of a set of stooge participants were taken in both a well-lit and dimly-lit nightclub by both sober and drunk participants. A 2 way ANOVA revealed a significant effect of alcohol consumption, but not of the lighting used. The results suggest that, contrary to Ugly's hypothesis, dim lighting does not contribute to the inflated attractiveness of opposite-gender mates; instead these ratings are influenced solely by alcohol intake.

Apey-Ape: Abstract

A good abstract is:



- Accurate: it should convey the purpose and content of the study accurately. It should cover the main areas of the report (e.g., rationale, methods, results, implications).
- Nonevaluative: report what's in the manuscript, do not evaluate it.
- Coherent and readable: use verbs rather than nouns, use the active rather than the passive voice, use the past tense to describe what was done, but the present tense to describe results or conclusions drawn.
- Concise: be brief and avoid superfluous statements/words.

"Word limits vary from journal to journal and typically range from 150 to 250 words"

Introduction

A good introduction addresses two questions: What has been done in this area by other researchers? and, What is the point of the present study?



APey-Ape: Abstract

An introduction should answer these questions in a few pages:



- Why is this problem important?
- How does this study relate to previous work in the area?
- What are the primary and secondary hypotheses and objectives of the study?
- How do the hypotheses and research design relate to one another?
- What are the theoretical and practical implications of the study?

This section should not get a primary heading (i.e., "Introduction"), you simply re-write the title at the top of the page. You can use sub-headings in the introduction if it will help the reader.

The introduction is the place to include the review of the research literature that led to your hypothesis. For instance, you might show how prior findings are inconsistent or ambiguous. Explain how your research may clarify the problem. State your hypothesis explicitly toward the end of the introduction, after you have explained the research and thinking that led to it. Identify independent and dependent variables here: do this subtly, do not write things like 'The independent variable was amount of alcohol drunk and the dependent variable was the attractiveness of the mate selected', but instead say something like 'this study looks at whether the amount of alcohol drunk and the gender of the consumer has an effect on the attractiveness of the mate selected'. If you have made predictions about the outcome of the study, say so ('alcohol is expected to reduce the attractiveness of the selected mate'). Be sure you say why you expect these results. Do not expect readers to guess what you are thinking.

In the introduction, you are moving from the general to the specific: a general discussion of the problem area, to your specific hypothesis. Successive paragraphs should be explicitly connected and form the thread of a coherent argument. If we take the 'beer-goggles' example, a good 'broad' structure would be:

- Define the beer-goggles effect and why it is important.
- Describe relevant previous research and what it has told us about the beer-goggles effect. This could include theories of the beer-goggles effect.
- Describe the problems with previous research and/or explain any unresolved issues within the literature.
- Describe how you are going to overcome these problems/resolve this issue and why that will be an important advancement to our knowledge (and/or why it will have practical benefit).
- Informally state your hypotheses.

Do not criticise past work on the beer-goggles effect and then suddenly announce your prediction that the 'beer-goggles effect will be more pronounced in dim lighting'. What research has been done on levels of lighting and attractiveness ratings? Why does this research lead you to this hypothesis? Have Staggering (1996) and Vomiting (2002) had a theoretical dispute over the origins of the beer goggles effect or the factors mediating it? Make sure everything you say is there for a reason that directly leads to the motivation for your study. Other issues can be taken up in the discussion.

Provide a rationale for your study. Most of you will do experiments that are subtle variations on the experiments given to you as inspiration. This means that you are replicating in spirit what the original researchers did, but in a slightly different way. Perhaps this is simply to check the generality of the results with a slightly different procedure and with different materials. If so, state what interesting differences there are between your study and the one you're replicating to show how your results extend their findings. Or you may be extending the research in a more radical way: for example, you may be applying the beer goggles effect to a domain in which (as far as you know) it hasn't been applied before (for example, attractiveness ratings of same-gender mates). Whatever the rationale of your study, state it. Related to this point, state why you chose the conditions that you did, and what you expect to happen. However, this needs to be stated informally (anyone writing 'my experimental hypothesis is that ...' will be fed to a large swimming pool of hungry piranha fish).

Method

This section should be written so that someone else can repeat the experiment just by reading your method section. A key point throughout is include enough information for replication, but to not include superfluous information that you don't think has any bearing on the results of your study. The method section generally consists of subsections:

DISCOVERING STATISTICS



1. Participants
2. Materials (Optional)
3. Design (Optional)
4. Procedure
5. Scoring (Optional)

At the bare minimum, the method section should have a participants and procedure section; however, it is common to also describe the materials, research design and scoring procedures as well.

Snail of Sense: Subsections



Although the above 5 sections are recommended, if you look through journal articles in different areas of psychology, and from different publishers you'll notice differences in these sections.

For example, it might not be sensible to have a 'materials' section for your particular piece of research, but you might choose to have a 'stimuli' section (common in cognitive psychology), or 'apparatus' (for example, if you have used an fMRI scanner, you might want to describe its details).

Similarly, the 'scoring' section is not that common in some areas of psychology, but in developmental psychology you often see a section on 'scoring' or 'coding' where you, for example, explain how you have transformed videos of children into numeric codes/values.

Also, some articles have a design section, whereas others don't. Just be aware that there isn't a 'law', just guidelines. Read a few APA journals (e.g. Journal of Experimental Psychology, Journal of Abnormal Psychology, Journal of Personality and Social Psychology, Emotion, Developmental Psychology) to see the variability in how research is written up.



Throughout the method, results and discussion, label any experimental groups with meaningful names, not with numbers or letters.

Participants/Subjects

Who was studied? How were they selected? From where were they selected?

Describe the sample in sufficient detail to allow the reader to determine how generalizable the results are. You should try to cover these details:

Demographic information: It is the norm to detail the major demographic characteristics *that are relevant to the study* such as gender, ethnicity/racial group, level of education, disability status etc. You might also describe topic-specific information (for example sexual orientation in studies about romantic relationships).

Sampling: How were participants recruited? How many participants were approached and what proportion actually took part? What sampling method was used (advertisements? Approached on the street? Recruited through schools or hospitals?) Were participants paid for taking part?

Sample size: how was the necessary sample size determined (was a power analysis conducted?).

It is important to state how participants were allocated to groups (or experimenters to participants), but if randomization was used you don't need to say exactly how that randomization was done (unless the method is important to the design).

- Example: Fifty heterosexual participants completed all conditions of this study: 25 were male and 25 female. Eighty percent of participants described themselves as white British, 10% as black British and 10% as Asian British. Ages ranged from 18 to 39 years ($M = 24.26$, $SD = 3.52$ years). Participants were all undergraduate students at the University of Sussex who took part in return for free admission to the nightclub. One hundred

and twenty-five participants were initially approached during lectures, with 50 consenting. All participants were naive to the purpose of the experiment.



- Use the word 'subject' only when referring to non-human animals (i.e. mice, rats, skunks, killer whales etc.). When referring to humans use the word 'participant'.
- Although it is good to describe your participants' characteristics as specifically as possible, focus on characteristics that might affect the interpretation of your results.

Materials/Apparatus/Stimuli

What equipment or instruments were used to collect data? If questionnaires were used, they should be described in this section, giving brief examples. If computers were used, describe the specific models of the computers and the software used to collect the data, if this is relevant to how the data was collected. Sometimes these sections are separated – the section for apparatus describes the physical tools to present or collect data, and the materials section describes the stimuli that participants see or hear. If materials (such as a questionnaire) were used, either cite your source (if published materials were used) or provide a copy in the appendix of your paper if you devised the instrument yourself. For example:

- Considered Ratings of Attractiveness of Personality Scale (CRAPS), Legless (1994): the CRAPS was used to measure each participant's opinions of the attractiveness of the stooges' personalities. This scale is a 45-item self-report questionnaire containing a 5-point Likert response scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Dazed and Confused (2005) found that, compared to other assessment scales, the CRAPS is a better measure for discriminating between nice people and statistics lecturers, and has high internal consistency, $\alpha = .83$.
- Considered Opinion of Attractiveness Rating scale (COAR), Nicearse (1992): the COAR was used to ascertain participant's opinions of the physical attractiveness of the stooges. This scale is a 30-item self-report questionnaire containing a 5-point Likert response scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Minger (2003) found that, compared to other assessment scales, the CRAPS is a better measure for discriminating between ugly and attractive people, and has good internal consistency, $\alpha = .76$.



There is no need for an apparatus section unless you have complex apparatus. In materials, there is no need to list objects that you self evidently used, such as pieces of paper, pens, chairs and tables etc. Instead, in materials you should describe only the stimuli and their relevant properties and the criteria by which you selected or constructed them. For example, if participants had to view a video tape of a traumatic event, from where did the footage come?

Design

This heading is normally included only if you have an experimental design that is complex, such as a design with several independent or dependent variables. Otherwise, this information would be part of your procedure. It should explain to the reader clearly what the different conditions are and how they were manipulated. This tells the reader about what form the experiment took. How many people took part in each condition and what did you ask them to do? Did each person perform in all the experimental conditions? Did you have a number of different groups of people, each of whom took part in only one experimental condition (i.e. repeated measures -vs- randomised design)? How did you decide who was in which group, if you used a randomised design? What kind of measurement scale best describes the data you collected? State clearly what your independent and dependent variables were and how they were operationalised.

- Example: A repeated measures design was used. There were two independent variables: the lighting used in the nightclub (bright or dim) and the level of alcohol consumed (none or six pints). There were two dependent measures that were analysed separately: the participants' ratings of physical attractiveness (the COAR scale) and the participants' ratings of the attractiveness of personality (the CRAPS scale). Participants took part in all four conditions of the experiment.



Procedure

How were the data gathered? Were participants run individually or in small groups? Were participants tested in a laboratory or in a field setting? How were relevant dependent variables assessed? Did participants respond using a questionnaire, a computer, or were their behaviours assessed using videotapes and trained raters? Give enough information for replication, but don't give information that would not be relevant to how the results were obtained, e.g. don't say 'participants entered the laboratory and were told to sit down on the provided chairs' unless the chair has a steaming dog-turd on it and your study is about reactions to being asked to sit on steaming dog turds.

In the procedure, make sure you describe what the cover tasks were; the reader should not have to refer to the appendix, materials section, etc, to know what the procedure was (conversely, don't put procedural information in the materials or other sections). Note if participants responded to the cover task questions verbally or in writing; if verbally, how did you record the participant's responses? Were participants run individually or in groups?

Results

What did you find? The first paragraph in the Results section should include a brief overview of the analyses to be described. This might include summarizing the hypotheses to be investigated. In subsequent sections, the researchers should state the specific hypothesis being evaluated and describe the analyses that were performed to test the hypothesis. The results should then be reported. Generally, one reports descriptive statistics, then inferential statistics, then states in words what was found. It may be helpful to provide a table or figure to aid in presenting the results from specific analyses.

APey-Ape: Effect Sizes



Historically, researchers have relied on null hypothesis significance testing (NHST). That's what you're doing when you look at p -values and declaring that effects are or are not 'significant'. The APA stresses that this form of testing is but a starting point. They recommend reporting additional information such as:

- Confidence intervals
- Effect sizes
- Report exact p -values (except when $p < .001$)

- This section should be a summary of your findings.
- Begin with a description of the analysis.
- Describe the data (Means, CIs etc.). If you have lots of summary statistics (i.e. means) to report, use a Graph or a Table instead of writing them.
 - Remember to give any graphs or tables full titles - remember to label the axes on graphs.
 - Graphs of means should include error bars (preferably showing the CI).
- Report the findings in sentence form.
- Include the results of any statistical tests and explain what these tests mean in relation to the experiment and your initial predictions.
 - Report statistical tests in APA format (your stats handouts will advise you on this for specific tests), and Field (2013) also summarise how to report a variety of different tests.
- Finally, ask yourself "If the graphs and/or tables were removed, could the reader still understand the results from the text I have written?" If the answer is 'no' then you haven't included enough information on how you did your analysis and what it means.
- * Don't cut and paste tables straight from SPSS – reformat tables using APA guidelines to include only pertinent information, and graphs may need to be edited in the SPSS graph editor.
- * Do not include raw data.
- * Don't present the same data in both a graph and a table - do one or the other.

- * Do not discuss your results in this section—save it for the discussion section.
- * Do not try to complicate the results section. You don't get extra marks for trying to flash for the sake of it. The best experiments are elegantly designed so that they can be analysed with a straightforward statistical procedure.

APey-Ape: Reporting Results

Reporting your results in APA format *is* important because it ensures that we communicate numeric data in a way that everyone understands. Therefore, using *M* to represent the mean, *SD* to represent the standard deviation and so on, matters because everyone can be 100% clear about what you're reporting. So, this is one respect where (in my opinion) attention to detail is good. Read the section on writing results.

Some common mistakes are:

- Forgetting to italicize *p* and statistical symbols (e.g., *F*, *t*, *r* etc.)
 - $t(34) = 2.39, p = .011$ is wrong
 - $t(34) = 2.39, p = .011$ is right
- Forgetting to put spaces around = and <.
 - $t(34)=2.39, p<.001$ is horrible
 - $t(34) = 2.39, p < .001$ is nice
- Putting leading zeros on *p*-values and correlation coefficients:
 - $t(34) = 2.39, p < 0.001, r = 0.23$ is wrong
 - $t(34) = 2.39, p < .001, r = .23$ is right
- Reporting exact *p*-values (except where $p < .001$)
 - $t(34) = 2.39, p < .05$, is wrong
 - $t(34) = 2.39, p = .03$, is right
 - $t(34) = 2.39, p = .00000024$, is wrong
 - $t(34) = 2.39, p < .001$, is right
- Forgetting degrees of freedom
 - $t=2.39, p<.001$ is bad
 - $t(34) = 2.39, p < .001$ is good
- Writing 'There was no effect'
 - There is always an effect it just might not be significant or meaningful



Snail of Sense: Results



Although you often get told not to 'interpret' or 'discuss' your results in the results section, this doesn't mean that you can't talk about them at all. Note that I've also said that you *should* 'report your results in sentence form'. So, it's good to report a result and say something like '... indicating that difference in attractiveness ratings due to lighting was present in the sober participants but not the drunk ones'. That's not discussing your results, that's stating what they are. However, you should try to avoid saying things like '...indicating that difference in attractiveness ratings due to lighting was present in the sober participants but not the drunk ones, which supports Drunk's (1978) theory of the beer-goggles effect, in which he states that lighting will magnify the effect of beer on attraction'.

Example

Figure 1 shows the mean attractiveness ratings given by participants in each of the four experimental conditions: when participants were drunk, the attractiveness ratings were higher than when participants were sober, supporting the idea that the beer-goggles effect is alcohol dependent. The level of lighting appeared to have an effect in sober participants who rated the stooges as more attractive in dim lighting, $M = 40.77$, 95% CI [36.66, 44.77], than a light setting, $M = 34.31$, 95% CI [30.46, 38.65]; for drunk participants the differences between ratings in dim, $M = 51.58$, 95% CI [48.04, 55.00], and light, $M = 55$, 95% CI [51.15, 58.65], settings was less pronounced and in the opposite direction.

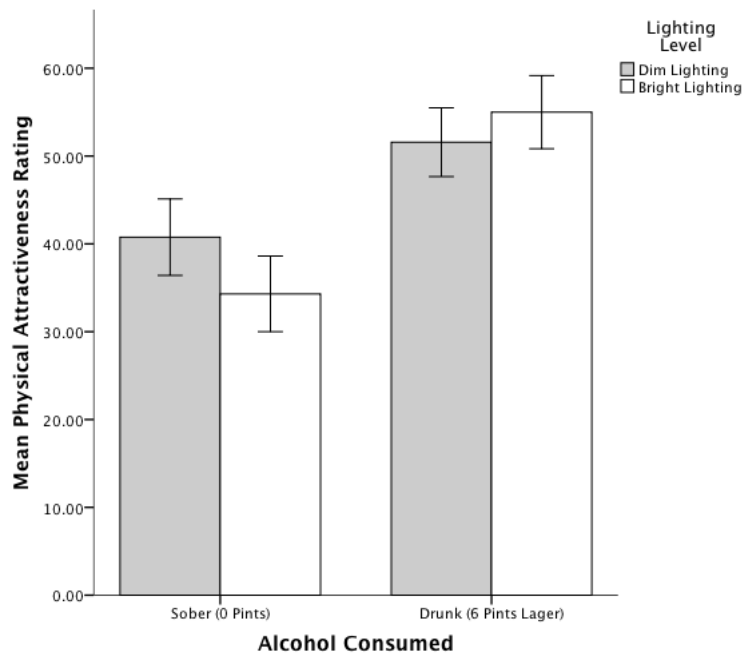


Figure 1: Graph showing the mean physical attractiveness ratings (and 95% confidence interval) given by participants when sober and drunk, and in dim and bright lighting.

A two way 2 (alcohol: 0 pints or 6 pints) \times 2 (lighting: dim vs. bright) repeated measures ANOVA was conducted on the attractiveness ratings. This revealed a significant main effect of alcohol, $F(1, 25) = 68.64$, $p < .001$, indicating that attractiveness ratings were significantly higher when participants were sober. There was not a significant main effect of lighting, $F(1, 25) = 0.50$, $p = .484$, indicating that attractiveness ratings were similar overall in dim and bright conditions. The alcohol \times lighting interaction was significant, $F(1, 25) = 8.82$, $p = .006$, indicating that difference in attractiveness ratings due to lighting was present in the sober participants but not the drunk ones.

Discussion

Your lab report should follow the shape of an hour glass. It should start in the introduction in broad terms as you introduce the background to your study, narrow in the middle as you describe your study in detail, and then broaden out towards the end as you discuss the implications of your findings.

- ✓ Start your discussion by summarising your main findings. Even though the results were described in some detail in the Results section, they should be briefly reviewed here. You shouldn't include any statistical results in the discussion, only the conclusions from them. This portion of the Discussion section need not be longer than a short paragraph.
- ✓ Then relate these findings back to your original predictions, and in turn what this means in terms of the question you were originally trying to answer. What are the theoretical implications of your findings?
 - Do the results support, contradict, extend or qualify the previous findings? The implications of each of the major findings should be discussed. It is particularly important to link the findings obtained in the study being described with those of other researchers. The reader should be told how the researcher's findings fit into the available literature on the topic, and what the implications of these findings could be. Speculation can also be offered to explain the data if they are not consistent with other research
- ✓ What are the weaknesses of your own study? Are there any factors that could be improved?
 - When bringing up criticisms of your study in the discussion, relate what you say to the conclusions you drew. How could the particular point you bring up undermine the conclusions you draw? If it cannot, then it is not a useful criticism of your study. Just because a variable you did not control e.g. an individual difference between people (or a materials variable) could influence the dependent



variable, it does not mean there is a problem with your study. Remember the magic of random assignment of participants to groups. If you bring up a problem explain why it is really a problem.

- ✓ Suggest some areas for future research based on what you've found.
- ✓ Finally, conclude by summarising the main findings and their implications.
- ✗ Do not repeat statistical details in your discussion (those that do will be dragged naked through a field of stinging nettles).

References

Follow the APA style guidelines summarised below.

Appendix

An appendix is appropriate for materials that are relatively brief, but need to be outside of the main body of the report. Some examples are:

- ✓ Full instructions given to participants.
- ✓ Full list of stimuli presented to participants.
- ✓ Diagrams, sketches or descriptions of unusual experimental equipment.
- ✓ Although you would not do this for an APA style manuscript, for the purposes of your laboratory report and final year empirical project you could put master copies of questionnaires and forms used in the experiment (e.g. a parental consent form).
- ✗ Do not include any SPSS output unless you are told to do so.

If you have only 1 appendix, label it *Appendix*, if you have several then label each with a capital letter (e.g., Appendix A, Appendix B etc.) on separate pages in the order in which they are mentioned in the main body of your report. You can include tables and figures within an appendix but if you do label and number them within the appendix (e.g. the first table in Appendix A would be labelled Table A1, the second table in Appendix B would be labelled Table B2, and so on).



Getting to grips with APA Style

Your lab report should follow the same format as an article submitted to be published in a Psychology Journal. Psychology journals differ in the exact format and style that they require; however, a great many of them follow the conventions of the publication manual of the American Psychological Association, or APA for short (American Psychological Association, 2010). APA style refers to an editorial style which is followed by journals of the American Psychological Association (APA) and used by many other journals in psychological and social sciences. *We expect you to follow APA style in all written work for this course.* This editorial style consists of rules or guidelines that a publisher observes to ensure clear and consistent presentation of written material. Editorial style concerns uniform use of such elements as:

- Punctuation and abbreviations
- Construction of tables
- Selection of headings
- Citation of references
- Presentation of statistics
- Many other elements that are a part of every manuscript

The style is documented in APA Publication Manual (American Psychological Association, 2010), which is currently in its sixth edition. It's an unwieldy beast, and although copies are available in the Sussex library (Main QZ 35 AME), only a madman would read it from cover to cover. Summaries of the rules for using APA style are available on the APA's own style website:

- <http://www.apastyle.org>

This link below has in a great to resource for writing psychology reports and using APA style:

- <http://owl.english.purdue.edu/owl/resource/560/01/>

This all Sounds Horribly Complex: I'm Going to Have a Nervous Breakdown!

Don't (have a nervous breakdown, that is). We don't expect you to follow APA style to the letter. We aren't concerned if you don't indent paragraphs in the exact way specified by the APA, for example, as long as the lab report looks presentable. The APA Manual is written to guide psychologists submitting their work to academic journals for publication. Obviously, when you write a term paper you are not submitting it to a journal. Therefore, there are some APA conventions that your tutor might be happy for you to ignore in the interests of a better-flowing piece of work. One example is that APA manuscripts refer to tables and figures within the text but place those figures/tables in order at the end of the document. However, it makes a lot more sense for class papers to place figures and tables within the main body of the text at a point close to where you refer to them in the text.

A good way to get an idea of how to format your paper is look at recent journal article in the field that you are writing on and emulate the style they have used. Articles can be easily viewed from the electronic resources for psychology section from the library, available at this link:

- http://www.sussex.ac.uk/library/subjects/psych_indexes_and_abstracts.php

However, there are certain aspects of APA style that we do expect to be adhered to, such as the use of references and presentation of results, which we will give some pointers for. Other notable aspects are:

- **Word-Processing:** Reports should be word-processed, with a size 12 serif font (such as Courier or Times New Roman) with no handwriting.
- **Use of Colour:** Use colour only when it is absolutely necessary – most figures and graphs in APA publications are clear enough without the use of colour.



- **Abbreviations:** Give the full title of abbreviations on their first usage; don't overuse abbreviations and acronyms. You should only use abbreviations sparingly and only if it helps to understand the paper (for example, using commonly understood acronyms in the research area).
- **Emphasis:** A general rule of thumb is to use italics and other marks of emphasis (i.e., such things as quote marks, dashes to separate words, and capitalized letters) sparingly.
- **Quotations:** Short quotations (fewer than 40 words) should be incorporated in the text and longer quotes in freestanding, indented blocks of lines (double spaced), without quotation marks. Start such a block quotation on a new line, and indent the block about 1/2 in. (1.3 cm, or five spaces) from the left margin (in the same position as a new paragraph).
- **Statistical Notation:** Throughout your results sections you should follow APA conventions, these will be highlighted in handouts on particular topics and examples can be found also in Field (2013).

How Do I Reference Material?

Your use of evidence is crucial to a successful lab report. Don't write "evidence suggests..." or "figures show that 58% of people have some kind of anxiety disorder" – always cite from where your evidence comes. That's where references come in. Students often struggle with correctly formatting references. Here are some simple guides:

- References cited in the text must appear in the reference list; conversely, each entry in the reference list must be cited in text (i.e., don't include references in the reference list that you didn't include in the text).
- You should also not cite articles that you read about in a secondary paper or book, without acknowledging that you haven't actually read that article. You can cite secondary sources, by saying something like: "Smith (as cited in Jones, 2000) suggested that anxiety disorders can be bad for you". You should include the reference to the Jones article at the end, but you don't include the secondary Smith reference. Use secondary sources sparingly.

References in the Text

To refer to an item in the list of references from the text, an author-date method should be used. That is, use the surname of the author (without suffixes) and the year of the publication in the text at appropriate points. Example:

- ✓ Evidence suggests that drunk people tend to overestimate the attractiveness of the opposite sex (Legless, 1994)
- ✓ Studies by Legless (1994, 1987) indicate that drunk people tend to overestimate the attractiveness of members of the opposite sex.
- ✓ Largerlout (1987) found that alcohol did not impair his ability to judge the attractiveness of women, however, his subsequent marriage to Daisy the cow casts doubt upon his findings.

Citing Work of Two or More Authors

When a work has two authors, always cite both names every time the reference occurs. For works with three, four, or five authors, cite all authors the first time the reference occurs. In subsequent citations, include only the last name of the first author followed by et al. When an article has 6 or more authors cite the first author and et al. for the first instance and all subsequent ones. When the citation is in the text use 'and' between the final two authors names, but when they are in parenthesis use '&' instead (see Table 1).

APey-Ape: Referencing exceptions



If two references from the same year with three or more authors abbreviate to the same form, then after the first citation cite as many authors as necessary to distinguish them:

- If you wanted to cite Dickinson, Smith, Murray and Harris (1983) and Dickinson, Smith, Harris and Murray (1983) then after the first citation you would cite them in text as:
 - Dickinson, Smith, Murray et al. (1983)
 - Dickinson, Smith, Harris et al. (1983)



If you have two papers from the same year of six or more authors that have the same abbreviation then cite them using as many authors as necessary to distinguish them from the first citation.

- If you wanted to cite Dickinson, Murray, Smith, McBrain, Gers and Harris (1983) and Dickinson, Smith, Harris, Gers, McBrain and Murray (1983) then rather than citing them both as Dickinson et al. (1983) we would cite them (respectively) as:
 - Dickinson, Murray et al. (1983)
 - Dickinson, Smith, et al. (1983)

Citing references in parenthesis

When citing papers in parenthesis list them in the order that they appear in the reference list (see the next section) separated by a semi-colon:

- Recent studies have shown that drunk people cannot accurately judge the attractiveness of other humans (Hammered & Stoned, 2003; Shitfaced, 1999).

If citing several papers by the same authors then list them chronologically and cite the names only once. Separate years with a comma:

- Recent studies have shown that drunk people cannot accurately judge the attractiveness of other humans (Hammered & Stones, 2003, 2010).

If citing several papers from the same authors in the same year then distinguish them with letters a, b, c etc. Make sure you also use these letters to identify the corresponding reference in the reference list:

- Recent studies have shown that drunk people cannot accurately judge the attractiveness of other humans (Hammered & Stones, 2010a, 2010b).

Table 1: Formatting of In-Text Citations

Type of citation	First citation in text	Subsequent citations in text	Parenthetical format, first citation in text	Parenthetical format, subsequent citations in text
One work by one author	Field (2004)	Field (2004)	(Field, 2004)	(Field, 2004)
One work by two authors	Field and Dickinson, (2005)	Field and Dickinson, (2005)	(Field & Dickinson, 2005)	(Field & Dickinson, 2005)
One work by three authors	Field, Dickinson, and Harris (2006)	Field et al. (2006)	(Field, Dickinson, and Harris, 2006)	(Field et al., 2006)
One work by four authors	Field, Dickinson, Harris and Smith (2007)	Field et al. (2007)	(Field, Dickinson, Harris and Smith, 2007)	(Field et al., 2007)
One work by five authors	Field, Dickinson, Harris, Smith and Murray (2008)	Field et al. (2008)	(Field, Dickinson, Harris, Smith & Murray, 2008)	(Field et al., 2008)
One work by six or more authors	Field et al. (2009)	Field et al. (2009)	(Field et al., 2009)	(Field et al., 2009)
Groups (readily identified through abbreviation) as authors	Journal of Experimental Psychopathology (JEP, 2009)	JEP (2009)	(Journal of Experimental Psychopathology [JEP], 2009)	(JEP, 2009)
Groups (no abbreviation) as authors	Iron Maiden Holdings Ltd. (2010)	Iron Maiden Holdings Ltd. (2010)	(Iron Maiden Holdings Ltd., 2010)	(Iron Maiden Holdings Ltd., 2010)



Reference List

The reference list should be given on a separate page after the main body of the report and listed in alphabetical order. References should use a hanging indent. Authors are cited by surname, followed by their initials. So, a paper by Andy P. Field would be listed as Field, A. P. Remember that no letter precedes a letter, so articles by Andy P. Field and Frank Fieldmouse would be listed in this order:

- Field, A. P.
- Fieldmouse, F.

If two authors have the same surname then you use their initials to alphabetize their names; for example, an article by Andy Field would precede an article by Paul Field because the 'A' of Andy comes before the 'P' of Paul in the alphabet:

- Field, A. P.
- Field, P. D.

When an author has been cited several times then their articles are listed alphabetically (by co-authors) then by year (when the authors are the same):

- Field, A. P. (2007)
- Field, A. P. (2013)
- Field, A. P., & Field, Z. C. (2013)
- Field, A. P., Lawson, J., & Banerjee, R. (2008)
- Field, A. P., & Lester, K. J. (2010)
- Field, A. P., & Lester, K. J. (2011)
- Field, A. P., & Storkson-Coulson, H. (2007)

Note that the list is alphabetic, but when several papers by the same list of authors are cited they are arranged chronologically.

There are a whole host of types of things you might want to cite, from journal articles, to books to web pages. Refer to the apastyle.org website for more guidance but below show some common things that you'll want to cite.

Journal articles

The format for a journal article is:

Surname1, A., Surname2, A., & FinalSurname, A. (Year). Title of article. *Journal name*, volume(issue), Startpage-Endpage. doi: number

Note you list each author, their initial and any subsequent authors. Pay attention to the punctuation used. You then cite the year of publication (in brackets) followed by a full stop. Then the title of the article followed by a full stop. Then the name of the journal in italics followed by a comma and then the volume (and sometimes the issue¹) of the journal in which the article is located, then a comma then the page numbers of the article. Finally, if the article has a Digital Object Identifier (doi) then quote this too. Here are two examples:

Slaughtered, V., & Offmyface, J. (1994). The effect of alcohol on perception of objects. *Journal of Liver Cirrhosis*, 15, 154-167.

Field, A. P., Lawson, J., & Banerjee, R. (2008). The verbal threat information pathway to fear in children: The longitudinal effects on fear cognitions and the immediate effects on avoidance behavior. *Journal of Abnormal Psychology*, 117(1), 214-224. doi: 10.1037/0021-843x.117.1.214

¹ You include the issue number (in parentheses after the volume number) only if the journal is paginated by issue. This means if each issue starts at page 1. Otherwise, the issue number is not included. Most journals paginate by volume, so the issue number is usually omitted.



Books

Surname1, A., Surname2, A., & FinalSurname, A. (Year). *Title of book*. Location of publisher: name of publisher. doi

Note you list each author, their initial and any subsequent authors. Pay attention to the punctuation used. You then cite the year of publication (in brackets) followed by a full stop. Then the title of the book in italics followed by a full stop. Then the location of the publisher followed by a colon and the name of the publisher. Finally, if the book has a Digital Object Identifier (doi) then quote this too (this is less common for books than journal articles). Here are two examples:

Drunkwoman, M. G. (1992). *Beer-Goggles: Fact or fiction*. Langedred, USA: Betty Ford Clinic Press.

Hadwin, J. A., & Field, A. P. (2010). *Information processing biases and anxiety: a developmental perspective*. Chichester: Wiley-Blackwell.

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage.

Field, A. P., Miles, J. N. V., & Field, Z. C. (2012). *Discovering statistics using R: And sex and drugs and rock 'n' roll*. London: Sage.

Note that for the SPSS book I included the edition number in parenthesis, and this was not italicized.

Chapters in Books

Surname1, A., Surname2, A., & FinalSurname, A. (Year). Title of chapter. In A. Editor, B. Editor, & C. Editor (Eds.), *Title of book* (pp. startpage-endpage). Location of publisher: name of publisher. doi

Note you list each author, their initial and any subsequent authors. Pay attention to the punctuation used. You then cite the year of publication (in brackets) followed by a full stop. Then the title of the chapter followed by a full stop. Then list the names of any editors of the book (note their initials come before their surnames) and then the phrase (Ed.) for one editor or (Eds.) for two or more editors, then a comma, then the title of the chapter in italics. The Page numbers of the first and last page of the chapter are then cited in parenthesis followed by a full stop. Finally, the location of the publisher followed by a colon and the name of the publisher. Finally, if the book has a Digital Object Identifier (doi) then quote this too (this is less common for books than journal articles). Here are two examples

Shit-faced, H. (1991). A few pints never stopped me from being able to accurately judge attractiveness. In M. G. Drunkwoman (Ed.) *Some boring case histories from people who think that they are immune to the effects of alcohol* (pp. 234-246). Yawn, USA: Boring Press.

Field, A. P., & Purkis, H. M. (2011). The role of learning in the aetiology of child and adolescent fear and anxiety. In W. K. Silverman & A. P. Field (Eds.), *Anxiety Disorders in Children and Adolescents: Research, Assessment and Intervention*. (2nd ed., pp. 227–256). Cambridge: Cambridge University Press.

Field, A. P., & Lester, K. J. (2010). Learning of Information processing biases in anxious children and adolescents. In J. A. Hadwin & A. P. Field (Eds.), *Information processing biases and anxiety: a developmental perspective*. (pp. 253-278). Chichester: Wiley-Blackwell.

Reporting Results

The use of Numbers

Use numerals to express

- Numbers 10 and above (e.g., 15 cm wide, the remaining 20%, 11 years old, 10th-grade students)
- Numbers in the abstract of a paper or in a graphical display within a paper.
- Numbers that immediately precede a unit of measurement (e.g., a 200-volt shock)
- Numbers that represent statistical or mathematical functions, fractional or decimal quantiles, percentages, ratios, and percentiles and quartiles (e.g., divided by 6)
- Numbers that represent time, dates, ages, scores and points on a scale, exact sums of money, and numerals as numerals (e.g., 2 hr 15 min, scored 2 on a 5-point scale)



- Exception: Use words for approximations of numbers of days, months, and years (e.g., about three years ago).
- Numbers that denote a specific place in a numbered series, parts of books and tables, and each number in a list of four or more numbers (e.g., Grade 3, Table 1, row 5).

Use words to express

- Any number that begins a sentence, title, or text heading. (It is preferable to reword the sentence to avoid beginning with a number.)
 - Fifty percent of the sample showed a decrease; 12% showed no change.
 - Twelve children cried but 34 laughed as we poked them with sticks.
- Common fractions (e.g., one fifth of the population is a moron)
- Universally accepted usage (e.g., the Ten commandments, Five Pillars of Islam)

Use a combination of numerals and words to express back-to-back modifiers (e.g., 3 two-way interactions; four 5-point scales). If the readability will suffer from applying the above rule then spell out both numbers. For example 'The first two items' is good practice but 'the 1st 2 items is bad practice).

Decimal Fractions

General

- Use a zero before the decimal point with numbers that are less than 1 when the statistic can exceed 1. (E.g., 0.67 cm; Cohen's $d = 0.70$; 0.48 s).
- Do not use a zero before a decimal fraction when the statistic cannot be greater than 1 (e.g., correlations, proportions, Cronbach's alpha, eta and partial-eta-squared, and levels of statistical significance).
 - $r(24) = -.43, p = .028$ is correct
 - $r(24) = -0.43, p = .028$ is incorrect
 - $r(24) = -.43, p = 0.028$ is also incorrect but for a different reason.
 - $r(24) = -0.43, p = 0.028$ is doubly incorrect and grounds for execution.

Precision

Precision refers to the number of decimal places to use in reporting the results of experiments and data analysis. Round as much as possible but bear in mind the level of precision of the statistic being reported. Other things being equal 2 decimal places should be sufficient, but it will depend upon the units of measurement.

- As an example of precision, an mean of values reported to 2 d.p. should not be reported to more than 2 d.p. because it the numbers that contributed to its calculation had only 2 decimal places and so that is the level of precision that the mean will have.
- As an example of units of measurement, a measurement of 3mm would require more than 2 decimal places if reported in meters. In this case it would be better rescale the unit of measurement to mm.

Reporting Statistics

p-values

Probability values referring to significance tests should be reported **exactly**², i.e. to either two or three decimal places. (Note that *p*-values less than .001 should be reported as $p < .001$). To re-iterate the general point above, you should not use a leading zero when reporting *p*-values as they cannot exceed 1:

² Once upon a time psychologists used to use standard conventions for reporting *p*-values such as $p < .05$ and $p < .01$. This is because in 1920 when computers hadn't really taken off, you had to do statistics by hand and consult published tables of probability values. Rather than compute these tables for every single eventuality (which would have been



- × $p = 0.02$
- × $p < .05$
- ✓ $p = .02$

Inferential Statistics

When reporting inferential statistics (e.g. t test, F tests, Chi square) include enough information to allow readers to make sense of the analysis. Also, **effect sizes and confidence intervals must be included where possible** (or enough information so that the reader can construct them). Throughout your statistics handouts you will be given advice on APA format for particular techniques, and Field (2013) has a lot more detail too, but Table 2 summarises how to report some commonly used statistics.

Table 2: Examples of how to report common statistics in psychology

Statistic	General Format	Example
Mean	$M =$	The mean score in the conflicting condition, $M = 37.5$ s, $SD = 5.9$ s was greater than the mean score in the consistent condition, $M = 24.3$ s, $SD = 6.8$ s.
Standard Deviation	$SD =$	The mean score in the conflicting condition, $M = 37.5$ s, $SD = 5.9$ s was greater than the mean score in the consistent condition, $M = 24.3$ s, $SD = 6.8$ s.
Confidence Interval	95% CI [LL, UL]	Participants who drank Sleepy Head tea 20 min before going to bed did fell asleep significantly faster, $M = 10.5$ min, 95% CI [5.11, 15.23] than those who drank a pint of coffee 20 min before going to bed, $M = 19.3$ min, 95% CI [14.11, 25.23]
p -values	$p =$ value (no leading zero).	The more drunk the participants, the higher their attractiveness ratings for the stooges, $p = .003$.
	$p < .001$ (if the value is less than .001).	The more drunk the participants, the higher their attractiveness ratings for the stooges, $p < .001$.
Cohen's d	$d =$ value	The mean score in the conflicting condition, $M = 37.5$ s was greater than the control, $M = 24.3$ s, $d = 1.94$.
Chi-Square	$\chi^2(df) =$ value, p -value, effect size	There was a significant association between the type of training and whether or not cats would dance $\chi^2(1) = 25.36$, $p < .001$
t -test	$t(df) =$ value, p -value, effect size	The mean score in the conflicting condition, $M = 37.5$ s, $SD = 5.9$ s was significantly greater than the mean score in the consistent condition, $M = 24.3$ s, $SD = 6.8$ s, and this difference was significant, $t(67) = 4.38$, $p = .032$, $r = .47$
Correlation ($r =$ Pearson, $r_s =$ Spearman)	$r =$ value (with no leading zero), confidence interval, p -	The more drunk the participants, the higher their attractiveness ratings for the stooges, $r = .54$, 95% CI [.44, .64], $p = .003$

very tedious indeed) they were produced for only a few probability values (such as $p = .05$ and $p = .01$). Therefore, in 1920 it made sense to report things in this way. However, it also made sense then to attach leeches to your genitalia to cure a cold and by reporting p -values in this way we lose important information; for example, $p = .99$ and $p = .06$ would both be reported as $p > .05$ despite them representing very different situations. It's not 1920 anymore, and computers can compute exact p -values in less time than it takes you to blink, therefore, you should report exact p -values and anyone you see using those daft $< .05$ stick a leech on their genitalia.



value		
ANOVA	$F(df_{\text{effect}}, df_{\text{error}}) = \text{value},$ $p\text{-value}, \text{effect size}$	There was a significant effect of Viagra on levels of libido, $F(2, 12) = 5.12, p = .025, \omega = .60$

Using Tables and Figures

'Figures' is the technical term for graphs, charts, drawings and pictures. When correctly used they can be invaluable in aiding the presentation of complex data. Avoid duplication description of data, i.e. don't have table and graph that shows the same thing, and describe the data in detail in your text as well. As well as mentioning the figure or table in the text, you should also describe in words what they tell you, such as the main trends of results that a figure shows.

Figure checklist for APA style:

1. All figures included in a paper should be necessary for understanding the results.
2. Figures should be simple, clean, and free of elaborate detail. Avoid chartjunk.
3. Always double-check to see if data have been plotted correctly.
4. All figures should be mentioned in the text (e.g. 'see Figure 1').
5. Number figures consecutively (Figure 1, Figure 2, etc.).
6. The outcome (or dependent) variable is plotted on the Y-axis, and the predictor (or independent) variable is plotted on the X-axis.
7. Clearly label each axis with respect to what was measured, quantity measured, and units in which the variable was measured.
8. Choose the appropriate scale units (length of intervals) so that the figure will not distort actual data points.
9. Make sure that the scale points on each axis have equal intervals.
10. All figures are followed by a caption, which is written below each figure and ended with a period, e.g.,: 'Figure 6. Reaction time (and 95% CI) in seconds as a function of the intensity of the stimulus'.

Table checklist for APA style

1. All tables included in a paper should be necessary for understanding the data.
2. Tables should be simple, clean, and free of elaborate detail.
3. Always double-check to make sure the data are correct.
4. All tables should be mentioned in the text.
5. Table should be numbered consecutively (Table 1, Table 2, etc.).
6. The data are listed in an orderly fashion with the decimal points falling in a straight vertical line.
7. All tables include a caption which is located directly above the table. These should be concise but communicate essential features of the table (what it measures and in what units).

General Style

If you really want to get top marks, then you should be aiming to write a lab report that, in principle, is worthy of publication. If you want some advice on what makes papers worthy of getting published and what makes others get rejected, the following guide is useful. This link below is from APA and provides a gateway to online tutorials and the like.

→ <http://www.apastyle.org/>



If all as else fails, you might want to read:

- Field, A.P., & Hole, G. (2003). How to design and report experiments. London: Sage.

Better still read the assessment criteria that we use for marking:

- <http://www.sussex.ac.uk/psychology/internal/students/examinationsandassessment>

General Tips

Tense

Use the past tense to refer to things that happened at a definite point in the past (e.g., past research, your results):

- ✓ Field (2013) published the best statistics book ever.
- ✓ Our results showed that if you drop Field's (2013) textbook onto a mouse from a distance of 1 m, it flattens it.

Use the present tense to refer to things in the past that did not have a definite point in time, or which continue into the present.

- ✓ Field has an overinflated opinion of his own book.
- ✓ Since our mouse experiment, we are chased by angry mice who throw copies of Field's book at us.

Voice

It is a common myth that you can't use 'we' or 'I' in a lab report and that you must use the passive voice. Actually, the APA encourages use of the active voice, and this invariably entails using 'we' (if you're a team of researchers) or 'I' (if you're a lone researcher). Needless to say you still have to write in a scientific and evidence-based way (you shouldn't write things like "I think that ..." without justifying your view with evidence), and you shouldn't abuse the privilege, but you should use the active tense where possible.

- ✓ We took the textbook and dropped it onto the mouse from a height of 1m.
- ✗ The book was dropped onto the mouse from a height of 1m.

Use an evidence base

Make sure any factual assertions are substantiated with a reference or your own data (*note: your own data not your own experience*). Don't make sweeping statements and generalisations without good evidence. Saying things like 'I think the beer goggles effect is rubbish because I can drink 10 pints and never end up waking up next to a gibbon' will result in a large electrical current being passed through parts of your anatomy that ensure the beer goggles effect will no longer be something with which you unduly concern yourself.

Some final tips

- ✗ Do not use technical terms (especially statistical ones) inappropriately: the marker will not be fooled!
- ✗ Do not quote other people without referencing them: this is plagiarism and the university gets very upset about it.
- ✗ Do not copy your mate's report: It is very easy to detect, it is nearly always picked up on, and the results are usually unpleasant for all concerned.

How to Write Well

A good lab report would be well written, which would involve having well constructed sentences, without grammatical errors and spelling mistakes. Sentences should follow on from each other logically, and paragraphs should be used



appropriately. Advising how to do this is beyond the scope of this document, but there are numerous guides on the internet and books in the library that can help you in improving your writing. One classic work is:

- Strunk, W., Jr., & White, E. B. (1979). *The elements of style* (3rd ed.). New York: Macmillan. Which is available online: <http://www.bartleby.com/141/>

You would also benefit from looking at the style of writing found in articles from psychology journals, and using them as a model of how to write.

Good writing is a process that takes time, care and practice. Some basic process tips on writing any kind of academic work are given below:

- **Never turn in a first draft.** The secret to good writing is re-writing. Review and edit your paper — several times, if necessary — to achieve your best work. The quality of your grade will depend on the quality of your work.
- **Never write your paper the night before (or day) it is due.** Write your paper, then walk away from it for a day or two. You will be surprised at the mistakes and improvements you will discover when you re-visit it!
- **Every paper is too long.** A good paper is direct, to the point, and economical. A good exercise is to (a) write your paper, (b) wait a couple of days; then (c) rewrite your paper cutting the length by one-third.
- **Always proofread your papers.** Nothing makes a bad impression on a tutor like a paper that contains obvious typographical, spelling, punctuation, and grammatical errors. In addition, never rely on your spelling checker as your proof-reader. Spell checkers generally cannot correct grammatical or punctuation errors. Spell checkers also miss typographical errors where the word used is incorrect, however, it is spelled properly (e.g., form instead of from).
- **Work from an outline.** It does not matter if you have all the facts if the reader has to work to make sense of your paper. Content is not enough. It has to be well-organized. Any lack of organization will be obvious.
- **Make it interesting:** Remember that someone is going to read your paper, so make it interesting. No one likes a flat, monotonous, colourless recitation on a topic.
- **Make sense:** give your report to a non-psychologist. If they can understand it then you have probably written it clearly.

Acknowledgements

This handout has a long history. Some of it is from an old handout I did in about 1998, it also cribs some stuff from an old handout of [Zoltan Dienes](#), and much of it comes from a handout [Shane Lindsay](#) did in 2004, when he was a tutor on my module. Both Zoltan and Shane consented to me incorporating their material into the handout I'd already written. However, Shane's handout used material found on the following sources, which has probably found its way into this handout without me necessarily being aware of it:

- Writing an APA style Research Paper and APA 6 checklist
 - <http://www.hamilton.edu/documents/Writing%20an%20APA%20Style%20Research%20Paper.pdf>
 - <http://www.hamilton.edu/writing/APA%20Quick%20Guide-Communication%20Dept.pdf>
- Preparing your laboratory report by Dr. Jan Kennedy
 - <http://www.psychwww.com/tipsheet/labrep.htm>
- Owen Williams' APA crib sheet, University of Minnesota, Crookston.
 - <http://umclibrary.crk.umn.edu/apa6thedition.pdf>
- Russ Dewey and Bill Scott's APA Crib Sheet (which is based on the fifth edition of the APA manual so is a little dated now):
 - <http://www.wooster.edu/academics/areas/psychology/apa.pdf>



Needless to say, you should consult these excellent resources, and I am grateful to the authors for generously making them available. I also apologise to them for almost certainly taking their work and inserting loads of gratuitous smut, and my own (no doubt) bad advice. They should not be blamed for these additions. The current version I have updated to comply with the APA publication manual 6th edition, and changed lots of other stuff too.

References

- American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington DC: APA Books.
- Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage.