Style Instructions for Writing Laboratory Reports

An critical part of being a scientist is to be able to communicate one's experimental findings to your scientific peers and even the lay public. Your peers need the information to guide future advances of knowledge. The public is usually paying for the research and thus should understand how important it is, especially in a time of limited funding! So, in addition to learning some experimental skills of cellular neurobiology, you will practice communicating your laboratory results in several different ways. Most importantly, you will write your lab reports up in the style of a conventional scientific paper.

Scientific writing has the primary purpose of communicating findings and theoretical ideas to interested parties who might have some degree of sophistication with the basic terminology of the discipline but who might not be familiar with the specific background literature on the topic. The fundamental principles involved in this task are similar to those of other writing efforts. Thus, the information that you learn in general writing courses is directly applicable to expressing information in laboratory reports and scientific articles. Use of precise words, orderly presentation of ideas, smoothness and economy of expression, and consideration of the reader are all requirements of good laboratory reports. Each laboratory report should contain the following sections: title page, abstract, introduction, materials and methods, results, discussion, references, tables, and figures. A brief description of these sections follows below. All papers should be typed double spaced with normal margins and pages numbered. Write the lab reports as if they were brief scientific papers.

Title

The title should be brief but still able to be understood when read alone. It should state the main topic of the paper, including reference to the major variables under study.

Abstract

The abstract is a brief summary of the paper (75-150 words) that allows the reader to examine the contents of the report quickly. It should contain statements of the problem, method, results, and discussion. The abstract should be informative and succinct. Information that is critical for an understanding of the research should be included, but many of the specific statements must be saved for the body of the text. The abstract should be on a separate page from other sections of the paper.

Introduction

The introduction begins on a new page and is not labeled. The purposes of this section are to provide the reader with relevant background material and to develop an understanding and appreciation of the problem studied. The introduction should conclude with a statement of the precise purpose and approach of the study. If the introduction is well written and the logic of the author's thinking is spelled out, the reader should be able to predict that statement before he or she reads it. Hypotheses should be stated either implicitly or explicitly in this section.

The introduction should answer the question- "Why did you bother to do this".
Materials and Methods

This section should be labeled and is often divided into various subsections. The purpose of this section of the paper is to allow another investigator to replicate your study with as much precision as possible. The author must decide which details might have affected the outcome of the study and which details were unimportant in this respect (only the former are to be included in the report). Think carefully about what details are important for someone to replicate your study. You should include a description of all of the critical features of the apparatus used. Diagrams of the apparatus and preparation might be helpful, and model numbers of specialized equipment should be included. State all measurements in metric units. Report physical parameters that might have affected your results, such as temperature.

Provide a step-by-step description of the procedure used in the study. This section should include information on what you did and why you did it. Parameters should be quantified for precision. Don't just refer to your lab manual. Say in your own words what you did.

The M & M should answer the general question- "How did you go about doing this work?"

Results

The results section states what happened in your study. It includes all observations and statistical analyses, and data should be summarized in this section. Remember that the results provided by inferential statistics (e.g., analysis of variance) are meaningless to a reader without reference to the corresponding descriptive statistics (means of the different groups). If figures or tables are used, then they should be referred to in the text. They should also be interpreted in the text to indicate the main points that the reader should note in them.

Tables are numbered sequentially with a title and appropriate explanatory footnotes. Figures are also numbered sequentially, and they have captions instead of titles. Figure captions should be presented together on a separate page. Figure axes should be labelled with large symbols chosen to distinguish different groups (include a key if there is more than one group). Data from tables and figures should not be duplicated in the text.

The Results should answer the question- "What did you find?"

Discussion

In this section you should relate the findings to the problem and literature that were outlined in the introduction. The discussion should open with a clear summary of the results with respect to the hypotheses stated in the introduction. It is also possible that there will be other articles not mentioned in the introduction that can be discussed here to explore points brought up by the experimental results. Theoretical and practical implications of the study should be explored here.

The Discussion should answer the question- "What does it all mean?"

Acknowledgements

It is appropriate to thank people who have made contributions to the ideas or data who are not authors of the paper, and the funding sources for the work.
References

Only include references that were cited in the text of the paper. You should have read every article that is indicated in your reference section. Do not use abstracts or secondary sources. If you must use an abstract, indicate it as such at the end of the reference. List all references in alphabetical order. Formats for referencing articles differ but here are some appropriate formats for listing journal articles, books, and chapters in edited volumes:


General writing tips

1. Avoid using quotations as an easy way of getting through difficult ideas. In general, your report will be clearer and more coherent if you think the ideas through and state them in your own words.

2. Avoid using the passive voice in the report.

3. Avoid using the phrase "Studies have shown that ...". Just state what the studies have shown.

4. Avoid listing the references you read, beginning each paragraph with the authors' names. Your report should be emphasizing the concepts, not the authors.

5. Avoid starting a sentence with an arabic number. Write out the word for the number in those instances.

6. Avoid discussing what your experiment "proves." We usually collect support or reject hypotheses. Studies are rarely definitive enough to provide "proof."

7. Understand the difference between the words "effect" and "affect" as shown in the following definitions and examples.

   TO AFFECT is to concern, be of interest or importance to; to produce an effect in or upon something. AN AFFECT is an emotion or feeling state.

   TO EFFECT is to accomplish or bring about something. AN EFFECT is a result, end product, or consequence.

Examples: "The actress was very effective in producing an affective reaction in her audience." "My new study habits have had a positive effect on my grades, which will affect my chances of making the Dean's list." "Diet affects weight loss, but it also has an effect on energy level."
8. Avoid the simultaneous presentation of more than one point. Some points will relate to others, but they should be presented by the logical assembly of distinct arguments, not simultaneously.

9. Avoid the presentation of ideas and lines of arguments in a line of argument that does not require them.

10. Develop the simplest and most logical arguments. This will help you sort out what is important and what is secondary.

11. Shorten sentences to deal with one point.

12. Unfold your arguments as a series of connected statements and make these connections explicit.

13. Tell the reader what is important and what is secondary. Do not let a host of secondary arguments or facts bury your most important points.

14. Establish the direction of the argument before proceeding with the details. Start with the broadest and most important points and then work downwards. At each stage, define the objective, state the problems involved and tackle each issue in turn, according to a defined logical sequence.

15. Read what you have written critically. Use the viewpoint of someone who wants to learn what you have to say but is completely unfamiliar with your arguments.

16. Read scientific papers with an eye to why one paper seems especially clear and another seems opaque. Your failure to understand may not be your fault!

**Improving the quality of your writing improves the quality of your thinking.**
Effects of Suggestions About Style on the Quality of Laboratory Reports

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BioNB 491
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Suggestions For Final Oral Presentations

1. Provide a clear and informative presentation of the background literature relevant to your proposal. If necessary, go into brief detail to explain a particularly relevant article.

2. Develop the logic to explain the hypotheses that your proposed study is designed to test.

3. Explain clearly the methods that you propose to test the hypothesis that you have presented.

4. Indicate the expected results briefly.

5. Provide a very brief conclusion regarding what the contribution of your study would be.

6. Write any names that people might not be familiar with (anatomical locations, drug names, new techniques) on the blackboard to ensure that everyone understands your presentation.

7. Use the blackboard, transparencies or handouts to aid in your explanation of the material. Anatomical pathways or complicated patterns of results are difficult to understand without visual aids. We will make photocopies and/or transparencies for you if you give the originals to us at least 1 day before the presentation.

8. Rehearse your presentation so that it is limited to 10 minutes in length.

9. Do NOT read your paper to the class. Bring notes or an outline to remind yourself about the main points to cover or specific details.

10. During your presentation, if you feel that you are speaking at the correct speed, then you are really probably speaking too quickly.