

Writing an Empirical Paper in APA Style

A lab report is a writeup of an experiment and has the same components as a published research study. This handout provides general tips on how to write a psychology lab report. Course standards vary, so check with your instructor if you are not sure what is required.

Using APA Style

Manuscripts submitted for publication in American Psychological Association (APA) journals must use APA style, as described in the *Publication Manual of the American Psychological Association* (6th ed., 2010), commonly referred to as the "APA Manual". Many instructors relax these formatting requirements for writing assignments, but most require students to at least cite references in APA format. Additional guidelines on using APA citation format are accessible from our web page ("APA Citations: A Guide for Psychology Undergraduates").

Organization of APA-Style Papers

Lab reports have eight sections (see also the APA Manual, Chapter 2):

- [Title Page](#)
- [Abstract](#)
- [Introduction](#)
- [Method](#)
- [Results](#)
- [Discussion](#)
- [References](#)
- [Tables and Figures](#)

General Requirements

Spacing. Double-space all text.

Margins. APA specifies 1-inch margins all around (top, bottom, left, right).

Pagination. Use your word processor's header function to put page numbers in the upper-right-hand corner one inch from the right-hand edge of the page. Start with the title page and go all the way through. Figures placed at the end of the lab report are not numbered.

Running Header. Also often used only in formal APA style, this is a short descriptive title that appears at the top of every page in the published journal. In a manuscript, it appears on every page (including the title page), flush left, in uppercase letters, on the same line as the page number.

Headings. Headings are the titles of each of the sections of the research report. Center headings of all major sections, using upper and lower case (Abstract, Method, etc.). The heading for the introduction is the title of the paper, not the word "Introduction". Headings for subsections (subheadings) of the paper are bolded and flush with the left margin, with text beginning on the next line. Subheadings are used mainly in the methods section. For descriptions of how to do further subdivisions, see the APA Manual.

Tables and Figures. For student papers, either place these at the end of the paper (formal APA style) or incorporate them into the text; ask your instructor.

How To Proceed

- The hypotheses, methods and results are the easiest to write because they are the most concrete, so you may want to write these first. The introduction and discussion are often written next. The title and abstract usually come last.

- Make sure that all the sections are well integrated. Start by finding your hypotheses in the introduction and making sure that they are clearly stated. Then see whether each hypothesis is addressed, usually in the same order, in the Results and Discussion.
- Pay attention to scientific terminology. Scientific reports don't sound like essays or news stories. They are more condensed and use more precise language. For example, we cannot "prove" theories in science (we give supporting evidence or fail to find such evidence). Similarly, avoid adverbs (e.g., "really", "very", "surprisingly"); they are not quantitative and therefore add no information. See also our handout, *Style Points for Scientific Writing*.
- Check tables and figures (graphs) for accuracy and captions for specificity.
- Check for spelling and typographical errors. Don't rely only on spell checkers; they often miss errors (e.g., affect/effect, its/it's).
- Proofread. Ask at least one other person to read what you have written; they will catch things that you miss.

Title Page

The title page announces the title and running head of a lab report or research article. It gives the article title, author name(s), author affiliation, running head and page number.

How to Proceed

1. Arrange the title page information on its own page. Center this information from the side margins. Place the title a little more than one-third of the way down the page, where the reader's eyes naturally fall.

Note: The APA manual says to center the title. This means to center from the sides, not from the top.

2. Choose a title thoughtfully (see below). Even if you change it later, a descriptive title will help you to stay on track as you write your paper and will convey a good first impression to your readers.

- **Make the title specific.**

NOT: The Effects of Language Complexity on Mental Processing
BUT: The Effects of Sentence Complexity on Mental Processing Speed

NOT: Can Stress Predict Memory Accuracy?
BUT: Can Stress Level Predict the Accuracy of Eyewitness Accounts?

- **Try to make a statement or ask a question.**

Categorical Discrimination Begins at Birth
Can the Yerkes-Dodson Law Predict Human Performance?

- **Consider including the independent variable (IV) and dependent variable (DV) (and perhaps even the outcome if it is straightforward).**

FORMAT: IV as a Predictor of DV
EXAMPLE: Perspective Taking as a Predictor of Marital Adjustment

FORMAT: The Relation between DV and IV is ...
EXAMPLE: The Relation between Intelligence and Performance Under Stress is Not Inverse

- **Use plain type face**

Keep font and font size consistent, and avoid bolding, italics, or underlining in titles.

Abstract

Think of the abstract as the "Reader's Digest" version of the report. Its purpose is to show the study at a glance. Writing good abstracts requires knowing which information is essential and how to condense it.

Requirements

Condensed format. Abstracts must be short (APA Manual: 150-250 words) yet stand alone. This means that the abstract should be understandable to someone who has not read the study.

Order. Arrange information in the same order as the sections in the paper: Introduction, Method, Results, and Discussion. Each section of the paper requires at least one sentence in the abstract. Methods and Results usually require more than one sentence each.

Single paragraph. Abstracts are written as one paragraph.

How to Proceed

1. Write the paper before writing the abstract.
2. Look at abstracts from articles in APA journals and use them as models.
3. Focus initially on content, not length. It is easier to condense than to expand.
4. Look at each section in the paper to determine the main point(s). Underline key sentences or write down the point of each paragraph.
5. Write a first draft, using the same order as you would for the report:
 - a. Announce the research question (usually one sentence).
 - b. State the purpose of experiment (hypothesis).
 - c. State the method, including number of subjects and what they did. (Requirements will vary by instructor. Some instructors want a synopsis in 1-3 sentences; others want more detail.)
 - d. State results (1-3 sentences. Some instructors want *p*-values. APA does not require them).
 - e. Discuss implications (usually only one sentence).
6. Cut out nonessential information. Transitions such as "The results showed..." are unnecessary.

Introduction

The goal of the introduction is to justify your study. Introduce the research question, summarize and cite the research done to date, and identify a question that has not yet been answered (your study). At the end of the introduction, state the hypotheses that you tested.

Requirements

Give background. This section gives the history behind your research question. Identify the key research done in the area so far and the value of your study.

Cite all relevant research, not just the studies whose results you agree with. Identify studies that support

contradictory findings, and suggest what might underlie the differences (look especially at the introduction and discussion sections of the articles you are comparing).

State hypotheses and predictions. At the end of the introduction, state the hypothesis that you tested and specific predictions that follow from it.

How to Proceed

- **Find an old review article.** Reading a review article or book chapter is an efficient way to start to get an overview of a new research area. Then, to follow up on the important areas and authors you have identified in the article, use online search databases to:
 - Look for later studies by the authors cited in the review article (e.g., PsycINFO).
 - Find other studies that cite the authors cited in the review article (e.g., SSCI, or Social Science Citation Index).
- Make an outline that shows the progression of research that has led to your hypotheses. (See “How to Make an Outline.”)
- For each main point, start by citing noncontroversial assumptions of findings. Then discuss areas in which conflicting results, if any, have emerged. Try to explain the source of the disagreement (e.g., insensitive measures, inadequate design, conclusions that went beyond the data or didn't go far enough).
- At the end of the introduction, identify questions that have not been addressed that led to your hypotheses. If there are more than one or two hypotheses, list them ('This study will test the following hypotheses: (1) ... (2) ... (3) ...'). It may be necessary to give a conceptual overview of the experiment here as well, but save the details for the Method section.
- Avoid plagiarism by giving credit where credit is due. Whenever you cite someone else's ideas or use their language, give the name of the author and the year of publication (see [References](#); "APA citations" handout). Using old review articles as a starting point for your paper is not plagiarism, but don't present someone else's ideas as though they were your own. Your paper must, of course, provide your own synthesis of your research.
- In scientific writing, it is much more common to paraphrase an author's ideas than to use direct quotes (see "APA citations"). If you use direct quotes, however, also cite the page number, like this: "insert quote here" (Abel, 1989, p. 93).
- Use specific language and support your arguments with concrete examples. Specify referents (e.g., "this illustrates" should be "this experiment illustrates"). Subjective phrases like "I feel" or "I think" often signal unsupported statements that need to be explained.
- Don't hesitate to evaluate and critique what you have read. Many novice writers are good at writing detailed descriptions but balk at evaluating the work of established researchers. Evaluation requires more work and entails more risk, but without it, your paper lacks original synthesis, which falls short of the goal of the paper: to make an original contribution to a research area.

Method

The Method section is a detailed breakdown of the experiment, including your subjects, research design, stimuli,

equipment used, and what the subjects actually did (the procedure). Give the reader enough information to be able to replicate the experiment.

Requirements

The Method section is often divided into subsections, such as Subjects, Design, Stimuli, Equipment, and Procedure. Each subsection should provide only the essential information needed to understand and reasonably replicate the experiment. Very short subsections can be combined (e.g., Stimuli and Equipment). There is no APA rule on the order of subsections. The order shown below is common.

How to Proceed

Subjects/Participants. State the number of participants (if human) or subjects (if animals), who they were, and how they were selected.

Participants

We randomly selected 16 University of Washington students from an introductory psychology course to participate in exchange for extra credit.

Subjects

Subjects were 30 male pigtailed macaques (*Macaca nemestrina*) bred at the Washington Regional Primate Research Center Breeding Colony, Medical Lake, Washington. All animals were bred specifically for this project and were shipped to the laboratory at 3-5 days of age. We randomly assigned subjects to each condition.

Materials. This subsection may also be called Stimuli, Equipment, or Apparatus. It briefly describes the equipment/materials used in the experiment.

Eye movements were recorded using an NEC model 120 Eyetracker.

Design. Identify and explain variables and their levels, and state whether the variables are between groups or within subjects.

The design was a mixed model with type of information requested, type of emotion, and sex as the between-subjects factors. Heart rate and blood pressure were the within-subjects factors.

Procedure. Describe in sequence the procedures used.

Subjects were seated at a computer work station. After completing a demographic questionnaire, they received written instructions that differed by condition. All subjects were instructed to read a business letter and write a reply. Subjects in the multiple draft condition were told to write an outline of a reply letter before writing a final draft.

Results

This section presents the statistical analysis of the data collected. It is often less than a page long.

Requirements

Condensed format. The Results section is the most condensed and standardized of all the sections in the text of a lab report.

No data interpretation. Statistical results are presented but are usually not discussed in this section. Discuss results in the Discussion section.

How to Proceed

- Keep your hypotheses in mind while you write. Each result must refer to a stated hypothesis.

- Describe all results that are directly related to your research questions or hypotheses. Start with hypotheses you were able to support with significant statistics before reporting nonsignificant trends. Then describe any additional results that are more indirectly relevant to your questions.
- If you present many results (i.e., many variables or variables with many levels), write a brief summary, then discuss each variable in separate subsections.
- Report main effects before reporting contrasts or interactions. Briefly mention problems such as reasons for missing data, but save discussion of the problems for the discussion section.
- Use tables and figures to summarize data. Include descriptive statistics (such as means and standard deviations or standard errors), and give significance levels of any inferential statistics. The goal is to make your results section both succinct and quantitatively informative (see our handout, "APA Table Guidelines").
- For each test used, provide degrees of freedom, obtained value of the test, and the probability of the result occurring by chance (p-value). Here are examples of the results of a t-test and an F-test, respectively: $t(23) = 101.20, p < .001$; $F(1, 3489) = 7.94, p < .001$ (see also our handout on reporting statistical results in APA format).

Discussion

In this section, interpret your results by relating them to your hypotheses. Use words to explain the quantitative information from the results section.

Requirements

Discuss the results in relation to each hypothesis. This is the most important part of the Discussion section.

Discuss possible explanations for your results. This part should follow from the predictions you made earlier based on possible outcomes of the study. Do the results agree or disagree with the ideas that you introduced in the Introduction? How do the results relate to previous literature or current theory? Identify and discuss limitations in the experimental design that may reduce the strength of your results. **Generalize your results.** This is where you tell the reader the extent to which your study is externally valid. Discuss strengths and weaknesses of applying your results to, for example, another population, species, age, or sex.

Identify followup experiments. Introduce new ideas that your results suggest, and propose ways to test them.

How to Proceed

- Explain whether your results support the hypotheses.
- Discuss how the results relate to the research question in general.

The results are consistent with the Yerkes-Dodson law.

These results show the advantage of using a secondary reaction time paradigm for assessing cognitive load during reading.

The finding that the infant monkeys increased their food intake in the low-calorie condition and reduced food intake in the high-calorie condition is consistent with the hypothesis that pigtailed macaques adjust their food intake to maintain a constant level of caloric intake. Although the difference between the two conditions decreased across time, however, the infants consumed more calories in the high-calorie condition than the low-calorie condition.

- If you had a directional hypothesis and your results didn't turn out as expected, discuss possible explanations as to why, including unanticipated shortcomings in the design, problems such as equipment failure, or even

that the theory you tested may need modification. Show how your explanation accounts for the specific pattern of results.

NOT: One reason for this puzzling result could be that some subjects received different instructions. Another possible reason might be that the room was hot. A third possibility is that we should have . . .

This example is not well written for two reasons. First, the reasons are unsupported. The author does not explain how these reasons may have led to the unexpected pattern of results. Second, probably because of this lack of justification, the author's use of "could" and "should" does not sound confident.

BETTER: One possible explanation for this result is that experimental subjects received slightly different instructions than control subjects. Subjects in the control condition were told to press [1] for "yes", but subjects in the experimental condition were told to press [y] for "yes". Because [1] and [y] are positioned apart on the computer keyboard, the extra time required to find [y] may account for the overall longer reaction time in the experimental condition. Another unexpected variable was that the ventilation in the room malfunctioned and the room was over 75^oF. Although this made the test situation uncomfortable, the room temperature affected all subjects equally, so we do not regard this extraneous variable as a confound, but it could have affected the validity of the results if subjects performed more poorly as a result.

Discuss limitations of the experiment that could be remedied in future experiments. State the specific reason for performing the next experiment. Do not assume that anything is obvious.

Although we controlled the level of subject arousal, we did not control the type of arousal (negative or positive). A future study in which we assessed the effects of negative versus positive arousal on eyewitness accuracy would enable us to refine Yerkes-Dodson predictions.

- Avoid overstating the importance of your findings. Be modest rather than expansive. Avoid speculating beyond the data.
- Stay focused on the research question. Resist the urge to digress or to state glittering generalities just because this section is the most flexible one.
- Although you should acknowledge problems or weaknesses of your design, end the paper on a high note. Summarize the study's strengths, conclusions, implications and/or ideas for future research.

References

Below are the most common citation styles used for writing lab reports (see also pp. 193-224 of the APA Manual, 6th ed., and our "APA citations" handout).

Requirements

Use APA format unless instructed to do otherwise. Capitalization, spacing, punctuation, and underlining must be exactly as specified. Correct APA style is important because it will make your paper easier to read and help you to present information accurately. Keep in mind that publishers convert APA-formatted manuscripts into the specific format used in their journal (and non-APA journals may not even use APA style), so don't just copy a style that you see in a journal.

How to Proceed

- List all authors cited in the text in alphabetical order. Do not list authors that you did not cite in the text, or cite authors of primary citations when you read only the secondary citation (see "APA citations").
- Use the correct citation format for each source (see examples below, the APA manual, or "APA citations").

- Double-space each citation, indenting each line after the first (hanging indent). Instructors may allow older formats, or single spacing with a double space between references, but this is not APA format.

Examples:

Journal with one author:

Sanders, G. P. (1990). Animal models of discrimination learning. *Journal of Learning and Behavior*, 81, 635 - 647. doi: 10.1549/4458-6487.458.3.574

Journal with two or more authors:

Becker, L. J., & Seligman, C. (1996). Infant social behavior: Developmental issues. *The Development of Children*, 5, 1 - 43. Retrieved from <http://journals.fake.org/devchildren>

Book:

Bernstein, T. M. (1965). *The careful writer: A modern guide to English usage*. New York: Atheneum.

A study cited within a later study (secondary citation):

Smith (cited in Jones, 1996) argued that ...

The example above refers to a 1996 paper by Jones (which you read), in which Jones cited a 1954 paper by Smith (which you did not read). Always try to read the original article (see "APA citations" for an explanation). If you think that you must refer to Smith's study, but you are unable to read Smith's paper, then cite only Jones in the reference list. In the text, cite Smith, but not the year of Smith's study, as shown above.

Tables and Figures

Tables and figures often represent results more clearly and concisely than does text.

Requirements (for a more detailed discussion, see APA Manual, 6th ed., pp. 125-167):

Captions. All tables and figures require captions. Place table captions above the table. Place figure captions below the figure. The caption consists of the table/figure number in arabic numerals and a clear, specific description of the table or figure. Use complete sentences in figure captions.

Labels. Number the tables and figures separately.

Footnotes. Use footnotes in tables to explain missing data and any other key information that doesn't fit in the table itself.

Align margins. Line up columns of numbers on the decimal points. Line up text along the left margin of a column.

References to text. Tables and figures are supplements to the text and should not duplicate text. If you include a table or figure, you must refer to it in your paper. Refer to tables and figures by their numbers either in the text or in parentheses.

How to Proceed

- To get an idea of the type of content normally included and the formatting used, look at the APA manual or published articles for examples of tables and figures.

- Tables save more space, but figures have a greater visual impact.
- Use tables to summarize data when the information is too wordy for the text (e.g., number of subjects, means and standard deviations, p-values).
- Use figures to help the reader visualize patterns of results.
- Design the table or figure to stand alone, as an independent source of information. Captions, variable labels, and value labels should be precisely worded.
- Have someone else critique the table or figure for thoroughness and ease of understanding.
- Allow time to design tables and figures. They are not easily done at the last minute. Sloppy graphics make tables and figures hard to understand.

Other Resources

American Psychological Association (2010). *Publication manual of the American Psychological Association (6th edition)*. Washington, D.C.: American Psychological Association.

Bem, D. J. (1987). Writing the empirical journal article. In M. P. Zanna & J. M. Darley (Eds.), *The complete academic: A practical guide for the beginning social scientist* (pp. 171-201). New York: Random House.

Kazdin, A. E. (1995). Preparing and evaluating research reports. *Psychological Assessment*, 7, 228-237.