BC2137 Social Psychology Lab Manual

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About this handbook

This handbook is intended to serve as a resource allowing you to see from the outset what lies ahead, and as a place to collect your notes as we progress through the course.

It is important that you know in advance what to expect from this lab so that you can plan your time accordingly. That information is all here in this handbook. This laboratory handbook outlines the procedures, rationales, and techniques for lab exercises, and provides an overview of the accompanying assignment for each week.

Each lab section contains blank pages for recording notes and for collecting observations. Therefore, you should bring the lab manual to each meeting of the lab.

You should skim through this handbook at the beginning of the course so that you have at least a rough sense of what will be required and when, and so you know where you can find relevant information as and when you need it.

You'll find a section for each lab session, giving a brief overview of the main themes and questions for that session, some suggested (optional) additional readings, and any pertinent information about the accompanying assignment.

You'll also find a number of appendices, covering things like searching the academic literature, how to approach reading journal articles, summaries of the basic statistics you should be familiar with, examples of informed consent and debriefing forms, and an extensive guide to writing a lab report.

I will reiterate much of this information as part of each lab session's instructional component, and we'll greatly expand on the themes through the activities I'll have you do and our collective discussions that follow.

Lab 1: Course Overview

Syllabus

Content goes here.

Lab 2: Project Planning

Key ideas

- Searching the literature
- How to read a research paper
- Beginning to decide on an appropriate research question

This session is about looking ahead to what your lab paper will consist of and starting to lay the foundations. We'll cover critical skills, including how to search the psychological literature to find existing research relevant to your interests (see Appendix A, p.) and how to skim papers to quickly determine whether they are worth spending your time on and how to read them to get the most out of them (see Appendix B, p.). We'll also practice coming up with viable hypotheses to test social psychological questions.

Assignment

Your assignment this week is to write a short summary of a published research paper that may be relevant to your project proposal. You may later decide to go in a different direction and that the paper isn't actually relevant: that's fine. The point is simply to begin discovering the kind of research other people have done on the topic you are interested in and to use it as inspiration to gradually start forming the idea for your own novel research proposal, which should build incrementally on what has been done before.

You'll post your summary publicly in the Canvas discussion thread—the idea being that other people might also find that paper relevant and worth reading, so we'll collectively be discovering and sharing a wide variety of research.

To get the best possible grades for these summaries (note that your grade and feedback will, of course, be private), you should be writing concise, detailed and thoughtful summaries, spending up to about an hour and a half to submit your best work possible. Your summary should be less than a page (no more than 400 words or so), briefly outlining the paper's:

- Background (what did the researchers base their approach on?)
- Method (what did the researchers do?)
- Results (what did they find?)

- Conclusions (what conclusions did they draw?)
- Strengths/limitations (what are the major strengths and limitations of the study, in your view?)
- Relevance to your thinking/ideas for how you could extend upon this research (what does this add to your thinking as far as the research proposal goes?)

You'll receive a score and feedback based on the following rubric (again, even though you'll post your summary publicly, your grade and feedback will be private to you, provided via SpeedGrader in Canvas).

Lab 3: Ethics and Design

Key ideas

- Asking questions that psychological research can answer
- Observing and measuring behavior
- Researcher influence over outcomes
- Pre-registration of research methods
- Informed consent and deception

As an introduction to social psychological thought, methods, and ethical considerations, this session will focus on Stanley Milgram's research on obedience to authority, conducted in the 1960s. This is one of the most famous studies in the history of social psychology to ostensibly show the power of external situations over individuals' choices. It's well known, but not necessarily well understood by people who haven't studied it in depth. In fact, over the years it has been misconstrued in many psychology textbooks. A detailed discussion and critique can teach us about the approaches, methods, and challenges of psychological inquiry, and the influence of both situations and individuals' personality and preferences on behavior. It is also revealing about the history and evolution of psychology as a field of research, and the development of ethical guidelines for research with human participants.

Suggested reading

Milgram, S. (1963). Behavioral study of obedience. Journal of Abnormal and Social Psychology, 67(4), 371.

Haslam, S. A., & Reicher, S. D. (2012). Contesting the "nature" of conformity: What Milgram and Zimbardo's studies really show. PLoS Biology, 10(11), e1001426.

Reicher, S. D., Haslam, S. A., & Smith, J. R. (2012). Working toward the experimenter: Reconceptualizing obedience within the Milgram paradigm as identification-based followership. Perspectives on Psychological Science, 7(4), 315-324.

Assignment

You will write a summary of a second published research paper. The rubric will be largely the same as before, but you should additionally begin drawing connections between this and the previous paper you summarized.

Lab 4: Measuring Social Psychological Constructs

Key ideas

- Social psychological constructs
- Operational definitions
- Questionnaire design; attention checks; socially desirable responding

When designing research, a key first step is defining the psychological construct you are interested in and deciding how to measure that construct.

Social psychological constructs include all the attitudes, thought processes, and behaviors that we as social psychologists might be interested in. Examples include things like aggression, attraction, conformity, obedience, stereotypes, prejudice, credulity.

The challenge researchers face is how to measure complex, hypothetical constructs in an objective and quantifiable way. The specific method a researcher decides to use to measure a construct is called the operational definition. Usually there are many possible operational definitions for a given construct. The advantages, disadvantages, and practicalities of various possibilities must be considered when designing research: will participants be willing and able to pay close attention; will they be willing and able to give you accurate and honest answers; is it possible that they could misunderstand what the researcher is asking, or that different participants might interpret the same question or instruction differently; how can researchers attempt to minimize these potential problems?

Suggested reading

Collins, N. L., & Read, S. J. (1990). Adult attachment, working models, and relationship quality in dating couples. *Journal of Personality and Social Psychology, 58*(4), 644-663. https://doi.org/10.1037/0022-3514.58.4.644

Hone, L.C., Jarden, A., Schofield, G.M., & Duncan, S. (2014). Measuring flourishing: The impact of operational definitions on the prevalence of high levels of wellbeing. *International Journal of Wellbeing, 4*(1), 62-90. https://doi.org/10.5502/ijw.v4i1.4

Assignment

You will write a summary of a third published research paper. Again, you should emphasize the connections between this paper and the previous paper you read.

Lab 5: Correlation

Key ideas

- Correlational research questions
- The correlation coefficient
- Mediation
- Correlation vs causation

Having explored how social psychologists define and operationalize relevant constructs, we will now move on to looking at how such measures are used in typical research, and the analytic techniques used to uncover meaningful relationships or causal effects. We will begin with the simplest type of design, in which researchers simply measure two (or more) constructs and look at how they relate to one another.

Simple bivariate correlations quantify the extent to which changes on one variable are associated with changes on a second variable (see Appendix C, section on correlation, p.). More complicated research might measure a third variable and ask whether it mediates the relationship between the other two; that is, can the bivariate relationship potentially be explained by the influence of a third variable?

However, while correlational techniques can tell us about associations between variables, correlational designs are generally limited in what they can tell us about causal influence. Speculation about what is causing changes must be restrained, and informed by theory and existing findings.

Suggested reading

Borgonovi, F. (2008). Doing well by doing good. The relationship between formal volunteering and self-reported health and happiness. Social science & medicine, 66(11), 2321-2334. https://doi.org/10.1016/j.socscimed.2008.01.011

Fiedler, K., Schott, M., & Meiser, T. (2011). What mediation analysis can (not) do. Journal of Experimental Social Psychology, 47(6), 1231-1236. https://doi.org/10.1016/j.jesp.2011.05.007

Assignment

You will write a summary of a fourth published research paper. By now, you should be able to point out the differences and common themes among all four papers you have summarized.

Lab 6: Experiments

Key ideas

- Correlation vs causation
- Independent and dependent variables
- Between-participants and within-participants designs

This week's lab will focus on experimental designs, in which the researcher manipulates one variable (the independent variable) and measures another (the dependent variable).

The simplest example of this design is one in which the researcher randomly assigns participants to one of two groups, and then uses statistical techniques to look for differences between the groups (see Appendix C, section on the t-test, p.).

Suggested reading

Loftus, E. F., & Palmer, J. C. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. Journal of Verbal Learning and Verbal Behavior, 13(5), 585–589. https://doi.org/10.1016/S0022-5371(74)80011-3

Assignment

Having read and summarized (at least) four papers on your topic of interest by now, you should be ready to articulate the gist of this existing body of research, as it pertains to your proposal. This Brief Literature Review will be your opportunity to put all four studies together, in conversation with one another, and to make a case for what they collectively reveal about social psychology—and what they fail to reveal. That gap in the research will likely form the basis on your own proposed study.

Your brief literature review will be based on the four individual summaries you have written, but you should rework it to be a coherent, cohesive, persuasive review of the literature rather than just stringing together your four individual summaries. I want to know how the research all fits together, as you see it.

Your submission should include:

- Title Page
  - A page with your name, your partner's name, and a (tentative) title for your project
  - Stick to the types of titles you see in published research papers
  - E.g. 'The relationship between [X] and [Y]', or 'Differences in [Z] between [X] and [Y]'
- Literature review
  - Start by identifying the general topic of your research—that is, the area of social psychology that you are interested in investigating.
  - Review the studies you have read so far. You've written individual summaries of each, but here you should begin to weave them together, pointing out how they relate to one another and how they collectively inform your proposal
  - Try to finish by articulating your overall interpretation of this existing body of research. What does it show about social psychology? What does it fail to show?
- References
  - Include an APA-formatted reference for each study you cite

Lab 7: Experiments continued

Key ideas

- Control conditions
- Factorial designs

This week's lab will focus on more complex experimental designs, focusing on the value of control conditions and factorial designs. These ideas are discussed more extensively in Appendix C, section on ANOVA, p.).

Suggested reading

Symons, C. S., & Johnson, B. T. (1997). The self-reference effect in memory: a meta-analysis. Psychological bulletin, 121(3), 371–394.

Assignment

Now you've written a Brief Literature review of the existing studies you've read you should be ready to propose your own study. This Brief Proposal will be the first step: your initial thoughts on what form your proposed research will take. Your proposal will likely not have all the methodological details at this stage, and your thinking may yet change—that's fine. The main purpose of this brief proposal is to serve as an outline so you can start to figure out the specifics. You'll get feedback on this which should help you nail down and refine the details moving forward. That said, the more thought you put into this now, the less work you will have to do for the following drafts. This would be a good time to familiarize yourself with Appendix F: Guide to Writing Lab Reports (p.), if you haven't already, as that is what this is building towards.

Your brief proposal should include:

- Title Page
  - Same as the previous assignment, unless you've changed your approach enough to require a change of title

- Literature review
  - Include your lit review from the previous assignment, with any changes (if you've made them)
- Method -State the basic design format of your proposed study—is it a scale design study, a correlational design, or an experiment? State any constructs you plan to manipulate or measure
  - For each construct, state your operational definition (i.e. how you actually plan to manipulate or measure the psychological constructs)
- Analysis
  - What is your fundamental analytic approach? Is this a correlational study where you're looking for associations between variables, or an experimental study in which you're looking for differences between randomly-assigned groups, or a quasi-experimental study in which you're looking for differences between pre-existing groups? What is it, in a nutshell, that you expect to find?
- References
  - Include an APA-formatted reference for each study you cite

Lab 8: Writing the Introduction

Key ideas

- Style and contents of an APA Introduction section
- How to frame previous findings to create a coherent and compelling justification
- APA style for citations & references

By now, you should have settled on your proposed design (though you may still be refining the details in response to collaboration with your partner(s) and guidance from Prof. Brotherton and your TA). Now you will begin to draft your complete lab paper, one section at a time. Instruction in class this week will focus on writing good APA-style Introduction section.

There are two major components of APA style. First, there are the nitty-gritty aspects of formatting the document itself, such as how to format the title page, running head, headings of different levels, figures, page numbers etc. The APA produces a manual which details exactly how to do this. However, the conventions change from time to time; the APA style guide is now in its 7th edition, published in October 2019. Because these formatting conventions are arbitrary and subject to change, I see them as relatively unimportant for our purposes. If you won't be writing any more psych research articles, it's not worth your time learning this stuff; if you will then you're better off just using a current template when starting your documents—word processors like Word and Google Docs offer such templates built-in. I will make a Google Doc template specially tailored for this lab available.

One exception, however, is for citations and references. Since you are writing a scientific document based on existing research, it is important to cite that existing research according to the conventions of the field so that your sources can easily be checked by any interested reader. So while you can largely ignore fiddly formatting details, you will have to make an effort to use the correct citation style (or let a reference manager app like Zotero do the work for you; see Appendix B.

The second component of writing an APA-style research article is the content. For our purposes this is much more important than arbitrary formatting rules. You must ensure that all the expected content is present in your work; that unneeded content is not present, so as not to distract or take away from the clarity and coherence of your writing; and that it is communicated in the tone expected of a psychological research article. The assignment description for each draft section will give an outline of required content, and you will find more advice and tips in Appendix F: Guide to Writing Lab Reports (p.).

Assignment

You will submit a draft of your Introduction section. This will be based on the literature review you have already written, but it may require some changes of emphasis, style, and structure. The general structure of a good APA-formatted Introduction is as follows:

- The first paragraph should introduce your broad area of research, emphasizing why it is a question of interest to psychologists, and, in a few sentences, summarizing the gist of existing research and how your proposed study would add to our understanding of social psychology.
- The main body of the Introduction is your literature review. Identify current theories relevant to the topic at hand, and present an overview of the findings of other researchers who have tried to answer similar questions.
  - You should include at least 4 existing studies that relate to your question.
  - They may or may not all require the same depth of description—e.g. if your methodology is very close to a particular previous study, it would require a more thorough description than a previous study for which the methodology is less directly relevant to your project.
  - The key is to make this a logically-flowing argument rather than a simple list of studies. Make sure each paragraph focuses on a single theme (which might be one study or more than one related study), and that each paragraph also transitions from and to the next by pointing out how the studies/theme relates to the others, and how they contribute towards your own research proposal.
- The last paragraph should briefly sum up your literature review, and state the question you are trying to answer. What are your specific hypotheses or expectations?
- You should be framing this as a gap in the literature you just outlined, or a necessary extension of some existing study.

Lab 9: Finalizing Methods

Key ideas

- Replicability
- Informed consent & debriefing
- Style and contents of an APA Method section

This week you will finalize the details of your planned methodology, including collecting/producing all required materials, and creating Informed Consent (see Appendix D, p.) and Debriefing (see Appendix E, p.) documents. We will consider methodological rigor and replicability, as well as what researchers are required to tell participants in the informed consent and debriefing documents, and why.

Assignment

For this week's assignment, you will produce a draft of your Method section, which must include all the detail necessary for someone else to actually run your study. That means you should have pretty much figured out exactly what participants in your study would see or do: the wording of every instruction you would present to participants, every question you would ask them, every response scale you would use to collect their answers, any images/videos/other materials you'd need, etc. Any aspect you're still not quite sure about must be nailed down now.

The content of an APA-style Method section is as follows:

- Method [the following subsections should be included with level 2 headings]
  - Design
    - State the technical design of your planned research (e.g. a single-factor, within-participants design; a 2x2 ANOVA; etc). State your independent and dependent variables (you just need to name them here; you will give more detail about how you measure them in the Materials subsection). Or, for a scale design/correlation/mediation study, state your 'variable(s) of interest'.
  - Participants

        * State how many participants you would require (see Appendix C, section on statistical power), any selection criteria (e.g. proportion of males/females or other relevant demographic characteristics), any exclusion criteria (e.g. people under 18)
    - Materials
        * Restate the constructs you plan to manipulate or measure (you can use subheadings for each construct), and for each construct, state your operational definition (i.e. how you actually plan to manipulate or measure the psychological constructs) in enough detail that any other researcher could run your study. If including complete scales or other materials as appendices, give example questions here and refer readers to the appendix.
    - Procedure
        * Give a step-by-step walkthrough of what participants will be required to do, in the order that they would do it, from providing Informed Consent, then completing your materials, to Debriefing.

- Appendices
    - Include all materials that would be required in order to actually run the study. Include everything that participants would see:
        * All questionnaire items and response scales
        * Any other necessary stimuli (e.g. videos participants would watch—include a still frame and a link to the video if online)
        * Include complete Informed Consent & Debriefing documents

Lab 10: Reporting Findings

Key ideas

- Reproducibility
- Data visualization
- Style and contents of an APA Results section

By now, you will have worked out every aspect of your study's design, and you will be ready to draft the Planned Analysis sections of your report, in which you explain how you would analyze the data your proposed design would produce. This will most likely follow the outline of one of the analyses we discussed in previous lab sessions, and covered in more detail in Appendix C.

Assignment

You'll submit a draft of your Planned Analysis section. Usually in an APA-formatted journal article this section would be called Results. But since you aren't collecting data, and are instead just formalizing a plan for how you would analyze your data, we'll call this section Planned Analysis.

This will likely be your shortest section. It should be a simple, technical statement of how you would treat your data, with some sensible anticipated results.

- Planned Analysis
  - First state any necessary data cleaning and handling
    - E.g. how you would identify outliers in the data, and any averages you would calculate, etc
  - Then explain, using the appropriate technical terms, what you would do with your chosen variables
    - E.g. factor analysis, validity tests, looking at the correlation(s) between variables, performing a t-test, ANOVA?
    - Then make sensible, informed guesses (based on the research you read and cited in your Intro) about what kind of averages/differences/correlations/effect sizes you would expect to see

- You should mention some hypothetical results, e.g. the condition means you expect, the strength of correlation you anticipate.
- You should also talk about how much variability you expect to see in the data, and how strong of an effect you expect your manipulation to produce
- Finally, state whether you expect a significant test statistic (which, presumably, you do—but this should make sense given your overall pattern of anticipated means and variability).

* Include a visualization of your expected findings. This doesn't have to be fancy—just a rough sketch is fine if it helps to visualize the trends you expect to see in the data (see p.).

Lab 11: Interpreting Findings

Key ideas

- Style and contents of an APA Discussion section
- Summarizing and interpreting findings
- Connecting findings to previous research

By now, you have an almost-complete draft of your research proposal paper. All that remains is to add a Discussion section. While you will not have analyzed any actual data, you will still produce a Discussion section which considers the implications of the various possible outcomes of your study.

Assignment

You'll submit a draft of your Discussion section. Your Discussion section should contain the following information:

- What would it mean if the data is consistent with your expectations?
  - How would it augment your interpretation of the previous research you outlined in the Introduction?
  - What would this say about social psychology that's new?
- What would it mean if the data is not consistent with your expectations?
  - Consider two possibilities:
    * Your hypothesis is correct but your study fails to find support for it. Why might that be? Are there potential flaws in your methodology?
    * Your study fails to find support not because of methodological flaws but because your hypothesis is mistaken. What are the implications for the previous research you outlined in the Introduction—might this call any of the previous findings into question? Why might the previous findings be questionable?
- What are the main strengths and weaknesses of your planned research?

  - Be critical in pointing out potential flaws, but make sure also to assert the strengths of your plan—aspects that were carefully considered, and would improve somehow upon what previous research did.

- What is the overall importance of your project?
  - Your final paragraph should sum up your project's potential contribution to the field of social psychology. This may be as narrow as replicating one existing finding, or as broad as challenging an existing theoretical perspective. Be bold but realistic.

Lab 12: Presentations

This week each project team will present their proposed project to the rest of the class.

Guide to presenting

Each team will give a two-minute presentation, accompanied by a single PowerPoint slide, which should encapsulate the motivation, methods, anticipated findings, and interpretation of your proposed project. Two minutes is not a lot of time. Apparently, people speak at a rate of around 125 to 150 words per minute on average. So a 2-minute presentation will be no more than around 300 words. The single-slide, not-many-words format demands clarity, conciseness, and being bold to spark the audience's interest in your topic.

Avoid simply reading excerpts from your paper. That would be boring, and would probably take up too many words. Make it fun and interesting. Try to grab the audience's attention and hit them with just the most important points of your ideas.

You will also have a single PowerPoint slide to accompany your presentation. Make it count. You can't just cram a load of text on there, because nobody will be able to read it. Plus, it'd distract from what you're saying. Make it a visual aid that somehow supports or clarifies what you're saying. It might be a visual representation of your design, a key piece of your experimental stimuli, a graph of your expected results, or just a pertinent meme which conveys the motivation for your question.

After your two-minute talk you'll take a few questions from the audience, and your responsiveness will contribute toward your grade as well as the quality of your presentation itself (remember a perfectly acceptable answer if often: "Good question; I don't know the answer!"). It's not usually an issue, but just in case your audience is left speechless, I suggest coming with a couple of questions or thoughts of your own that you can throw at the audience to spark more questions.

Each pair will be allotted five minutes total for their talk and Q&A. Going over time and/or failing to leave time for questions will impact your presentation grade. It is up to each pair to decide how to divide up the two-minute talk, and to practice to make sure the presentation is to time.

Guide to watching presentations

As an audience member, you are still being graded for class participation this week. That means giving everyone else's presentation the attention and enthusiasm it deserves, and rewarding their hard work with questions. (Going to the trouble of putting together a presentation only for nobody to have anything to say about it is not a good feeling.)

Good questions to ask are things like "Could you clarify X", "Had you considered Y", or "How might this relate to Z." One reason for presenting your project is to hopefully get some useful feedback from the audience with which to refine your final paper, so try to give the kind of feedback you hope to receive.

Lab 13: Final Paper

Key ideas

- Writing an Abstract
- Editing and proof reading
- Incorporating feedback

By now you have drafted and received feedback on every major section of your paper. Hopefully along the way you found the feedback useful, and you will have incorporated any useful suggestions to make your final paper a strong as it can possibly be. This editing process is a crucial part of any form of writing, including scientific reports. Most published papers you've read will have been through at least one round of extensive revisions, if not more. You should see editing as a part of the process of writing, rather than an annoying additional thing you have to do after the writing is done.

The last remaining element to add is the Abstract. This is always the last addition to a research report, as it provides a summary of everything that follows in each section of your paper. It should be between around 100–200 words, with a sentence or two summarizing each of the main sections of your paper. (This will likely be informed by your short presentation outline from the previous session).

With that done, all that remains is to submit your paper and congratulate yourself and each other on a job well done.

Assignment

You will submit your complete, APA-formatted lab report. It should consist of the following sections:

- Title Page
- Abstract
- Introduction
- Method
- Planned Analysis
- Discussion

- References
- Appendices

A Tips for Reading Research Papers

The following suggestions are guidelines for approaching research reports when you are searching the scholarly literature for previous studies relevant to your own research topic. These journal articles are usually written for other experts in the field and may contain terminology and analyses that you are unfamiliar with. Most articles that report new empirical findings have a standard format, in which the material is sectioned into an Abstract, Introduction, Method, Results, and Discussion. This means you should know where to find key information and allows for a systematic approach. You might need to revisit each section to come to a full understanding of the article.

Note that the most effective approach to reading and note-taking may be different when working on a project like this than when you are assigned specific readings for class; here I'm assuming that you are searching an unfamiliar literature and need to quickly evaluate whether the many papers you encounter are relevant enough to spend more time reading and evaluating in detail (rather than, say, critically evaluating a set article).

Note also that there are many possible ways to approach research articles. If you have a favorite method, or a hint for fellow students, please pass it on so that your suggestions can be incorporated.

Step 0. Read the title

The title of a paper is the first thing you'll see in your search results. Much of the time it should be clear from the title alone whether examining the paper further will be a good use of your time. If it seems promising, or if you're not yet sure, move on to the Abstract.

Step 1. Read the Abstract

Even though it may be confusing if you are unfamiliar with the subject matter, the abstract will give you a quick overview of the material in the article. Try to determine the overall point of the paper before starting the body of the report. Between the title and Abstract of a paper, you should be able to decide in less than a minute or so whether to continue with a paper or to discard it as irrelevant to you. For this lab, you can be ruthless; your time is very limited

and so you only want to spend it on research articles that will (hopefully) make the greatest possible contribution to your proposal.

Step 2. Skim, then read, through the Introduction

Don't spend too much time on the Introduction, unless the Abstract is overly complicated and you don't understand the point of the experiment. Begin by trying to find the hypothesis (usually near the end of the Introduction), so that you can understand where the arguments are leading. Then, read the entire Introduction and see what you can get from it. In a new area, it usually takes at least 2 readings before you understand it fully.

Step 3. Go to the Method section to get the information to better understand the Introduction

In general, the Method section should be understood fully in terms of why each step is conducted to investigate the hypotheses. While reading through the Method section you may need to review some parts of the Introduction.

Step 4. Introduction and hypothesis revisited

If at this point the study still seems relevant to you, it's worth stopping for a moment to think about what results you expect given the original hypothesis. See if you can predict what the researchers will find and roughly how they might report it. Would there be graphs; what would they look like? Seeing how your predictions pan out will give you a sense of how well you understand the research so far.

Step 5. Read though the relevant Results

Read through the entire results section, but don't agonize over it—if you haven't had a course in statistics it probably won't make much sense, and even then you may encounter more advanced statistical techniques. If there are Figures, focus on them and the associated captions, text and analyses. (And see the Summary of Basic Statistics in Appendix C).

Step 6. Skim, then read, the Discussion

First, skim thought the Discussion section to find detailed confirmation of the hypotheses. There should be nothing surprising in the Discussion, if you were able to surmise the gist of the report while reading the previous sections.

Step 7. Take notes

After going through the whole article in this fashion first, read through it again while taking notes. Your notes should include a summary of the hypotheses, a brief methodology, and summary of results, and a conclusion. Also, point out what you think are the most important strengths and weaknesses of the study.

B Searching the Literature

Step 1. Starting Your Research

If you aren't sure where to begin, request a consultation with Barnard's subject librarian for psychology: Erin Anthony; eanthony@Barnard.Edu The library also provides an Online Research Guide: https://barnard.libguides.com/PSYC

Step 2. Web searching

Use to brainstorm ideas and find vocabulary, synonyms, useful keywords to search. Wikipedia can be a good starting off point, but is not scholarly Popular books and magazines are written for a general audience. The vocabulary is less specialized, and they are not peer reviewed, and they do not always have citations and references. Nonscholarly sources can be a good place to get ideas, but the sources you cite in your paper should be "scholarly." Scholarly journals and books are written for specialized readership, by scholars or experts in a field of study, describing academic research. They are "peer reviewed" by other experts as a quality control mechanism; they have citations and references; they give the affiliation of the authors (university, research institution); and they have abstracts (in the sciences and social sciences).

Step 3. Google Scholar

scholar.google.com Searches the full text of scholarly articles It casts a wide net, searching across all disciplines, and including books and other materials in addition to journal articles, so will likely find many articles not very relevant to the topic as well as those that are relevant Use allintitle: to search in the titles only. There is no way to search in the abstracts only. Set up e-Link to show links to full-text at Columbia (go to Settings – Library links). The "Cited by" info can be useful – more influential articles will be cited more often.

Step 5. CLIO

Quicksearch searches the Catalog, Articles, the Academic Commons and the CUL website. Catalog (clio.columbia.edu/catalog) searches all the holdings of the CUL system (but NOT the articles in journals). Remember to use quotes for a phrase, and * for truncation, to find variant endings. For keyword (All Fields) searching, use the Boolean operators AND and OR e.g. (love OR sex*) AND "attachment style*" – see tinyurl.com/barnard-boolean-guide.

Step 6. Scholarly Databases

PsycINFO: the best database for psychology, it gives you the ability to do much more focused searching than Google Scholar. The quickest way to get to it is to enter Psycinfo (notice there is no "H" in Psycinfo) in the Quicksearch box on the library home page, and click on the CLIO resolver, columbia.edu/cgi-bin/cul/resolve?ALD2284. This is an Ovid database in which you do sequential searches and then combine them with the Boolean operators AND and OR – see tinyurl.com/barnard-boolean-guide. If "Map Term to Subject Heading" is checked, PsycINFO will show you a list of subjects related to the keyword you entered, which can help you to narrow down your search to articles that are actually on the topic you're interested in (rather than just containing the keyword). Click on the word "Expand" on the right hand side of the search screen if you can't see all your previous searches. Another database to try if PsycINFO doesn't cut it: Web of Science.

Step 7. Managing your References

When you are dealing with a large number of references or multiple papers, I recommend using Zotero to assist you. It is a free application with a browser plugin to collect article details as you are searching the literature. When you're on a website looking at a journal article, the Zotero browser add-on allows you to click a button to automatically download the article details into Zotero (including, if available, a PDF of the article). This allows you to keep track of all the articles you have found. Installing Zotero also installs a Word plugin that allows you to insert citations in-text and automatically generate a complete, APA-formatted references section. (Integration with Google Docs is available as well, though doesn't seem quite as robust as with Word). See the Barnard library's guide to Zotero at library.barnard.edu/find-books/guides/zotero Alternatively, if you don't want to take the time to install and learn your way around Zotero, you can find a paper on Google Scholar and click the " symbol below it, then copy and paste the APA-style reference entry into your References section. However, always check your work. Zotero and Google Scholar don't always get the reference details exactly right, and it would be poor form to pass along an error committed by them.

C Summary of Basic Statistics

Analyzing data

Once a researcher has gathered data from an experiment, she needs to interpret the data. Of course, you could just list the individual observations and try to form an intuition about the general outcome, but there are more formal means to determine whether the experimental manipulation had an effect. A statistical description summarizes the data in a way that permits interpretation.

Note that even though you will be proposing a piece of research and not actually collecting or analyzing data, familiarity with the following statistical concepts and procedures will be essential for you to propose an appropriate analysis for your proposed design, and for you to meaningfully interpret the potential results of such a design.

Descriptive statistics

The first step is to describe your data. These kinds of statistics are called descriptive statistics or summary statistics. With an experimental design where you want to compare groups, the most obvious place to start is to find an average value for the observations in a group. The average, or mean, is a measure of typical performance; it summarizes all the scores and produces a single number which represents the most typical value. The basic formula for the mean of a set of scores is:

$$M = \frac{\Sigma X}{n}$$

In this equation, X refers to all the scores in the group, and n is the number of scores in the group. The symbol Σ instructs you to sum all the scores. A simple way of saying the formula in words is: Add up all the scores in the group and divide by the number of scores in that group. If you experiment involves comparing two or more groups, you can obviously calculate the mean of each group of scores separately. If the means are different, maybe your experimental manipulation had an effect.

However, there is always variability in the scores in a group. The mean is a central value, but some scores fall below it and others above it. Therefore, researchers also need to describe the

amount of variability in scores. This puts the mean in context, describing just how representative of all the scores it is. If there is high variability, scores are spread widely and the mean is relatively unrepresentative; if there is low variability, scores are clustered tightly and the mean is relatively representative. When variability is high, the group means might be different just due to chance, not because of your experimental manipulation.

A mathematical way of describing the amount of variability in a group of scores is to calculate the deviation of each score from the mean, square the deviations, and then sum the squared deviations. This quantity is called Sum of Squares (SS). One mathematical formula is:

$SS = \Sigma(X - M)^2$

Dividing SS by the number of scores in the group minus 1 produces a quantity called variance, which is represented by the symbol s2. Variance is the average squared deviation. (Remember that to calculate an average, you add a set of scores and divide by n. Here we add a set of deviations and divide by n – 1. We use n – 1, rather than just n, because it is a necessary statistical adjustment to account for the fact that samples tend to underestimate variability.)

$$s^2 = \frac{\Sigma(X - M)^2}{n - 1}$$

Taking the square root of the variance produces another quantity, called standard deviation. It is represented mathematically by the symbol s, but in psychology papers you will most often see it represented by the letters SD.

$$SD = \sqrt{\frac{\Sigma(X - M)^2}{n - 1}}$$

While variance is the average squared deviation, SD is the average deviation in the original units (i.e. not squared). This is the most intuitive way to convey how much scores typically varied about the mean.

Inferential statistics

Knowing the standard deviation and mean for each experimental group gives you a good idea of how much scores differed within each group, and how much the groups differed on average. But researchers still need to perform a statistical test to determine whether the groups differed more than would be expected by chance alone. These kinds of statistical tests are called inferential statistics, because we are using our sample data to make an inference about what would happen if everyone in the population had taken part in our experiment, rather than just the small number of people who happened to be in our samples.

Correlation

When you measure two variables and wish to know if scores on one measure are related to scores on the other, you calculate the correlation coefficient. This quantifies the extent to which changes on one measure are related to changes on the other. For example, if higher scores on measure X are associated with higher scores on measure Y, there is a positive correlation. If higher scores on measure X are associated with lower scores on measure Y, there is a negative correlation. No correlation means that scores on X are unrelated to scores on Y.

To calculate the correlation between two variables, you must first calculate the Sum Product, SP. The mathematical formula is:

$$SP = (X - M_X)(Y - M_Y)$$

Notice that X-MX and Y-MY are deviation scores, just like we calculated for the standard deviation. Here we have two variables, X and Y, so the equation is telling us to calculate the deviation of each score from its respective mean. We then multiply each deviation for variable X by its counterpart deviation from variable Y. These are the "products," meaning multiplied deviation scores. Finally, the tells us to add up all those products, giving the "sum of products," SP Once we have calculated SP, the correlation coefficient, symbolized by r is calculated using the following equation:

$$r = \frac{SP}{\sqrt{SS_X SS_Y}}$$

Here, SSX and SSY are the Sums of Squares for each variable. Multiplying them and taking the square root gets us a measure of the variability in X and Y separately. The numerator, SP, represents the covariability of X and Y. So the equation results in covariability as a proportion of all variability. It can range from -1, meaning a perfect negative correlation, to 0, meaning no correlation at all, to +1, meaning a perfect positive correlation. As a rule of thumb, in psychology, correlations of less than around ± 0.30 are considered weak, around ± 0.30 to ± 0.70 are considered moderate, and greater than around ± 0.70 are considered large.

The t-test

One test to compare two groups of scores is the t-test. One form of the t-test formula, assuming that the two groups have equal sample sizes, is as follows:

$$t = \frac{M_1 - M_2}{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

The numerator is simply the difference between the group means (the different group means are represented by the subscripts 1 and 2). The denominator quantifies how much of a difference is to be expected due to chance alone. It divides each group variance (s^2) by the number of scores in that group, adds the answers, and then takes the square root.

The size of the t statistic required to conclude that a difference between groups is real depends on the size of the samples (how many observations you took). The greater the number of observations, the smaller the t required to identify a real difference. In order to determine the exact value of t required to declare the difference in groups to be reliable, several values must be determined. One of these is the degrees of freedom for the test (df).

The degrees of freedom, df, is another statistical correction that weights the number of observations in each experimental group. Basically, we lose one degree of freedom for each group, so with two groups, $df = N–2$ (N being the total number of scores), or:

$df = (n_1 - 1) + (n_2 - 1)$