Writing about empirical research

Taken from Passion Driven Statistics 2014 ibook

Purpose

The goal of research is to disseminate your work and allow it to guide further study. As such, writing is an important and ongoing part of the research process.

Successful empirical writing minimizes descriptive or complex language so methodologies, conclusions, and theories are accessible to readers from all areas of expertise. Although this sounds easy, it is difficult to write clearly and concisely - especially when writing an empirical paper for the first time. What follows is information about how you should structure your paper, so you can focus on precise writing. We offer advice on how to write each section of a research proposal for an empirical paper; we discuss how to use evidence and sources in empirical writing; finally, we present conventions for empirical writing.

Writing a Research Proposal for Empirical Research

An empirical paper has six sections:

1. title and abstract
2. introduction
3. methodology
4. results
5. discussion
6. references.

A research proposal often has five sections:

1. title,
2. introduction,
3. methodology,
4. predicted results or implications
5. references.

Both paper types should have an "hourglass" shape:

- introduce broad statements
- narrow to specific methodologies, and conclusions
- then broaden again to discuss the general significance and implications of your work.

Thus, the beginning of your introduction and end of your discussion should contain your broadest statements, and the methodology and results sections should contain your most specific statements.

Sections

Title

Using what you know now about your project and the model title in the reading, develop a working title fully knowing it is going to probably change.

- A title should summarize the main idea of your research question.

- It should be a concise statement of the main topic and should identify the actual variables under investigation and the relationship between them.
  - An example of a good title is *The association between weather patterns and caterpillar reproduction.*
- Include the terms "association between" or "relationship between" in your title to join your variables of interest.

- A title should be fully explanatory when standing alone.
- Avoid words that serve no useful purpose.
  - The words "method" and "results" do not normally appear in a title
  - Nor should such redundancies as "A Study of" or "An Experimental Investigation of" begin a title.
- Do not use causal language.
  - "the impact of", "the effect of", etc.
- Avoid using abbreviations in a title.

Model Title:

> The Association between Nicotine Dependence and Major Depression at Different Levels of Smoking Exposure

Introduction

The introduction describes the question you intend to investigate and how your research relates to other work in the field. It comprises opening statements and a literature review.

Opening Statements

- Opening statements introduce your topic and rationale for study but are accessible to both nonspecialists and specialists.
- Successful opening statements gradually introduce your topic with examples and explicit, if nontechnical, definitions of crucial terms.
- Avoid introducing the formal theory if one motivates your research and jargon specific to your topic
  - doing so makes your introduction seem forbidding to non-specialists and intellectually masturbatory to specialists.
- However, oversimplifying your opening statements will make your introduction seem condescending to non-specialists and boring to specialists.

Literature Review

- The literature review summarizes the state of the field you investigate.
- Each statement in the literature review should build to the justification of your own research by identifying a hole in existing scholarship.
- Emphasize major findings and key conclusions rather than citing tangentially related works.
- Assume your reader is basically knowledgeable about your topic rather than writing an exhaustive review.
- Include proper in-text citations

The following is a successful section of a literature review:

> Through to the mid-1990s, most research suggested that academic censorship reduced college students' respect for authority. However, results were inconsistent. In a landmark two-year case study of college student social dynamics, Jones (1996) found that college students' respect for authority declined significantly after censorship was imposed. However, Jones relied exclusively on objective measures rather than self-reported measures of respect for authority.

- Observe that the first two sentences identify trends in the literature, the third sentence emphasizes major findings, and the fourth sentence suggests gaps in the literature that the present study will fill.
- This literature review is successful because it summarizes findings and can be understood by specialists and non-specialists alike.

Important

- The main evidence used in an empirical paper is data.
- Opinions and paraphrased statements, even if they corroborate your claim, are not evidence unless accompanied by empirical results.
- The main sources used in an empirical paper are primary sources such as journal articles.
- When researching a topic, use the literature review and references sections of secondary sources to find primary sources related to your topic.
- When searching online databases, look for articles that have been cited by other authors.
- It is important to note that the literature review is an argument that sets the stage for your research question.
  - It is not an exhaustive review of research details.

Research Questions

Your introduction should build to and conclude with the research questions or study objectives that you will address.

Model Introduction:

> One of the most potent risk factors consistently implicated in both the etiology of smoking behavior as well as the subsequent development of nicotine dependence is major depression. Evidence for this association comes from longitudinal investigations in which depression has been shown to increase risk of later smoking (Breslau, Peterson, Schultz, Chilcoat, & Andreski, 1998; Dierker, Avenevoli, Merikangas, Flaherty, & Stolar, 2001). This temporal ordering suggests the possibility of a causal relationship. In fact, the vast majority of research to date has focused on the role of major depression in increasing the probability and amount of smoking (Dierker, Avenevoli, Goldberg, & Glantz, 2004; Rohde, Kahler, Lewinsohn, & Brown, 2004; Rohde, Lewinsohn, Brown, Gau, & Kahler, 2003).
>
> While it is true that smoking exposure is a necessary requirement for nicotine dependence, frequency and quantity of smoking are markedly imperfect indices for determining an individual's probability of developing nicotine dependence (Kandel & Chen, 2000; Stanton, Lowe, & Silva, 1995). For example, a substantial number of individuals reporting daily and/or heavy smoking do not meet criteria for nicotine dependence (Kandel & Chen, 2000). Conversely, nicotine dependence has been seen among population subgroups reporting relatively low levels of daily and non daily smoking (Kandel & Chen, 2000).
>
> A complementary or alternate role that major depression may play is as a cause or signal of greater sensitivity to nicotine dependence, over and above an individual's level of smoking exposure. While major depression has been shown to increase an individual's probability of smoking initiation, regular use and nicotine dependence, it remains unclear whether it may signal greater sensitivity for nicotine dependence regardless of smoking quantity. The present study will examine young adults from the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC). The goals of the analysis will include 1) establishing the relationship between major depression and nicotine dependence; and 2) determining whether or not the relationship between major depression and nicotine dependence exists above and beyond smoking quantity.

Methods

The methods section describes how the research was conducted. It comprises discussions of your sample, measures, and procedures. This should **not** be an exact copy of the information found in the codebook. You must rephrase this into your own words.

Sample

- Identify who or what was studied (people, animals, etc.).
- Identify the level of analysis studied (individual, group, or aggregate).
- Describe observations vividly so your reader can distinguish them clearly. If you group observations, use meaningful names ("Low-Income Women") rather than abbreviations ("PPM100") or labels ("Control Group").

The following is successful section of a sample description:

> The sample of 1,203 pregnant women was drawn from two public prenatal clinics in Texas and Maryland. The ethnic composition was African American (n = 414, 34.4%), Hispanic, primarily Mexican American (n = 412, 34.2%), and White (n = 377, 31.3%). Most women were between the ages of 20 and 29 years; 30% were teenagers. All were urban residents, and most (94%) had incomes below the poverty level as defined using each state's criteria for Women, Infants, and Children (WIC) eligibility.

This sample description is successful because it

- identifies both the observations (1,203 pregnant women) and the location (two prenatal clinics in Texas and Maryland).
- describes the composition of the group ethnically and by income using language consistent with writing standards for the empirical research.

Procedures

- Explain what participants/observations experienced.
- Discuss whether data were collected by surveillance, survey, case study, or another method.
- Discuss where data were collected and the period over which they were collected.
- Mention observations discarded during data collection in this section, but discuss observations discarded during data analysis in the results section.
- If appropriate, comment on the reliability of data collection here, rather than in the discussion.

The following is a successful section of a procedures discussion:

> Random sampling was used to recruit participants for this study. Surveyors went to considerable lengths to secure a high completion rate, including up to four call-backs, letters, and in some cases monetary incentives. Trained research assistants conducted face-to-face interviews with all study participants.

This procedures description is successful because it

- describes how the sample was collected (a random survey),
- which observations were discarded (surveys incomplete after callbacks, letters, and incentives),
- and how data were collected (during interviews).

Conclude your methodology section with a summary of your procedure and its overall purpose.

Measures

Describe the questions or measures of your participants/observations and relate these to the type of data you collected (quantitative or categorical).

The following is a successful section of a measures discussion:

> Attitude toward school was measured with a questionnaire developed for use in this study. It contains nine statements. The first three measure attitudes toward academic subjects; the next three measure attitudes toward teachers, counselors, and administrators; the last three measure attitudes toward the social environment in the school. Participants were asked to rate each statement on a five-point scale from 1 (strongly disagree) to 5 (strongly agree).

This measures discussion is successful because it indicates how attitudes were measured (ranking on a five-point scale).

Model Methods:

> *Sample*
>
> The sample from the first wave of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) represents the civilian, non-institutionalized adult population of the United States, and includes persons living in households, military personnel living off base, and persons residing in the following group quarters: boarding or rooming houses, non-transient hotels and motels, shelters, facilities for housing workers, college quarters, and group homes. The NESARC included over sampling of Blacks, Hispanics and young adults aged 18 to 24 years. The sample included 43,093 participants.
>
> *Procedure*
>
> One adult was selected for interview in each household, and face-toface computer assisted interviews were conducted in respondents" homes following informed consent procedures.
>
> *Measures*
>
> Lifetime major depression (i.e. those experienced in the past 12 months and prior to the past 12 months) were assessed using the NIAAA, Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM-IV (AUDADIS-IV) (Grant et al., 2003; Grant, Harford, Dawson, & Chou, 1995). The tobacco module of the AUDADIS-IV contains detailed questions on the frequency, quantity, and patterning of tobacco use as well as symptom criteria for DSMIV nicotine dependence. Current smoking was evaluated through both smoking frequency ("About how often did you usually smoke in the past year?") coded dichotomously in terms of the presence or absence of daily smoking, and quantity ("On the days that you smoked in the last year, about how many cigarettes did you usually smoke?").

Predicted Results or Implications

- It is important that this section includes real implications linked to possible results.
- Often writers use this section to merely state their research question.
- This is an important section of a research proposal and sometimes best written after you've had a few days to step away from your paper and allow yourself to put your question (and possible answers) into perspective.

Model Implications:

While chronic use is a key feature in the development of dependence, the present study will evaluate whether individual differences in nicotine dependence exist above and beyond level of exposure. If individuals with major depression are more sensitive to the development of nicotine dependence regardless of how much they smoke, they would represent an important population subgroup for targeted smoking intervention programs.

References

- Reference citations document statements made in your paper.
- All citations in the research plan should appear in the reference list, and all references should be cited in text.
- Begin your references section on a new page.
- Use Endnote or some other bibliography generator software to generate the bibliography and insert in-text citations.

Model References:

Breslau, N., Peterson, E. L., Schultz, L. R., Chilcoat, H. D., & Andreski, P. (1998). Major depression and stages of smoking: A longitudinal investigation. Archives of General Psychiatry, 55(2), 161-166.

Dierker, L. C., Avenevoli, S., Goldberg, A., & Glantz, M. (2004). Defining subgroups of adolescents at risk for experimental and regular smoking. Prevention Science, 5(3), 169-183.

Dierker, L. C., Avenevoli, S., Merikangas, K. R., Flaherty, B. P., & Stolar, M. (2001) Association between psychiatric disorders and the progression of tobacco use behaviors. Journal of the American Academy of Child & Adolescent Psychiatry, 40(10), 1159-1167. Grant, B. F.,

Dawson, D. A., Stinson, F. S., Chou, P. S., Kay, W., & Pickering, R. (2003). The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADISIV): Reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. Drug and Alcohol Dependence, 71(1), 7-16.

Grant, B. F., Harford, T. C., Dawson, D. D., & Chou, P. S. (1995). The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): Reliability of alcohol and drug modules in a general population sample. Drug and Alcohol Dependence, 39(1), 37-44.

Kandel, D. B., & Chen, K. (2000). Extent of smoking and nicotine dependence in the United States: 1991-1993. Nicotine & Tobacco Research, 2(3), 263-274.

Writing Conventions

- Avoid surprises.
- Lead your reader through your paper.
- Clearly explain your claims, your evidence, and how your evidence supports your claims.
- In each section, allude to your next section.
- Avoid direct quotations.
  - Instead, summarize other authors' work.
- Include the name and year of an author in-line and include their work in your references section.
- Avoid language bias.
  - Refer to people as those people refer to themselves.
  - For a study, use "participants" rather than "subjects".
- Be succinct.
  - Excise unnecessary words and sentences.

- Revise liberally.
- Avoid jargon.
  - Use jargon only if it more accurately denotes and connotes your meaning. Otherwise, use English.
  - Define jargon explicitly, implicitly, or by example.
- Voice. Use "I" and "We" sparingly (or ideally, never) and only to refer to the authors of a paper.
- Note that every primary source article that you read as you conduct your literature review is a model of the kind of writing you are trying to accomplish.

Campus Resources

- The Writing center has programs for in person and online help!
  - http://www.csuchico.edu/slc/writing-center.shtml
- Non-native English speakers can also get help from the ESL Resource Center
  - https://www.csuchico.edu/engl/student-resources/eslcenter.shtml