Writing Quantitative Empirical Manuscripts
With Rigor and Flair (Yes, It’s Possible)

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ABSTRACT. As a scientist, you are obligated to share your discoveries with colleagues and with the world. You had better do it well. In this article, I offer suggestions for writing up empirical manuscripts with quantitative data. You will learn a lot about what goes into a good manuscript, informed by the American Psychological Association’s Publication Manual (American Psychological Association, 2010) and the most recent Journal Article Reporting Standards (Appelbaum et al., 2018). Further, you will learn a good deal about how to write your manuscript so that people might enjoy reading it. Taking my cue from writing rockstars both within and beyond psychology, I encourage all scientists to adopt a classic style that puts writers and readers on a level playing field. Although I have geared this article toward emergent researchers, I hope that seasoned researchers and educators might glean something new, or at the very least, enjoy reading it.

“Y
ou must walk up to readers and say, ‘Let’s go for a ride. You pedal, I’ll steer.’”
(Elbow, 1981, p. 315)

I had just completed a draft of my master’s thesis, and although I had written several APA-style manuscripts during my undergraduate days, this was the first article I had prepared for publication. I applied all the knowledge and skills I had learned and practiced. Extensive literature review? Check. Clearly presented results and conclusions? Double check. Sterling APA Style? Triple and quadruple check. I was nervous but excited to receive feedback from my graduate mentor. I waited. And waited. Finally, with a gentle smile, she returned my draft to me—steeped in red ink, blood dangling, threatening to splatter and congeal on my worn shoes.

But I had followed the rules! How could this draft go so horribly wrong? After reading my mentor’s copious feedback (which took several days), I realized that the issue was less about “what” I wrote and more about “how” I wrote it. Writing well is so much more than scholarly exhaustiveness; writing well allows you to invite readers on a journey where you serve as tour guide, passionately immersing travelers in your story without losing your companions around the bend.

Generating an empirical article—whether for a class project or for publication—feels like you are probing an alien landscape. You easily succumb to focusing on “what” because there is so much “what” to command your attention. You care less about “how” despite its ability to terraform that terrain into something habitable, maybe even beautiful. Books on academic writing (e.g., Sword, 2012) implicitly suggest that honing style is best left to the professionals with experience in such matters. But if you are to “start a stylistic revolution that will end in improved reading conditions for all (Sword, 2012, p. vii),” you had best start early. Like now, with your next manuscript—even if it is your first.

In this article, I will share insights about the what and how of quantitative manuscript writing I have learned from wrestling with peer review, reading published works on writing, and working with many undergraduates writing their first quantitative empirical articles. Full disclaimer: I could write a book on this topic; a couple of years ago, I did (Fallon, 2016). Here, I distill nuggets that I believe will help you produce a rigorous, ready-for-primetime manuscript that engages your readers.

Before diving in, know that I have made several assumptions about your research, your
experience level, and about writing manuscripts in general. First, I assume that you are writing about a single, quantitative study with a traditional IMRAD (Introduction, Method, Results, and Discussion) organization. If you have conducted multiple studies, much of this advice will still apply, but you will need to adapt accordingly. Second, I agree with Sword (2012): “academic writing is a process of making intelligent choices, not of following rigid rules” (p. 30). But you have to know the rules to make informed and reasoned choices. Your rule book is the Publication Manual of the American Psychological Association (6th Edition; American Psychological Association, 2010), which you already know because you sleep with it under your pillow. The updated Journal Article Reporting Standards (JARS; Appelbaum et al., 2018) supplement the APA Manual. Third, I expect that you are an emerging researcher, relatively early on in your journey as a psychological scientist. As such, my suggestions are not highly specialized and can be applied broadly across subdisciplines and methodologies. Fourth, I recognize that writers need to adapt their tone and style for different audiences, goals, and occasions. But good writers are card-carrying fashionistas—they are always stylish. Sacrificing accessible prose to sound scientifically rigorous is a false choice; it alienates potential future scientists (who have to start somewhere!) as well as the public. Fifth, I expect that you have come by your data honestly and ethically. No amount of sparkling prose makes up for shoddy science. And sixth, writing well takes a lot of work, a thick skin, and drive to move consistently and incrementally toward an end. You will know when you have arrived—both cognitively and emotionally—at your terminus. You submit, in every sense of the word.

Tantalizing Title
I once likened a manuscript title to a birth announcement; you, the proud parent, get to name your baby in 12 words (Fallon, 2016). You could opt for something traditional, incorporating important constructs and teasing the finding: “Heavy Makeup Differentially Affects Men and Women’s Perception of Young Women’s Attractiveness and Confidence.” (Yes, this title is more than 12 words. Some kids have three middle names.) Traditional titling offers the advantages of sounding “scientific,” incorporates keywords that would likely cause your article to appear on database searches (Silvia, 2015), and provides enough information for readers to ascertain whether your study is relevant for their purposes. Although informative, traditional titles are not usually eye-popping.

Alternatively, you can trade some tradition for trendiness, as in “Maybe It Shouldn’t Be Maybelline: Heavy Makeup Does Not Enhance Perceptions of Young Women.” I may not know which perceptions are being studied, but I want to find out. Catchy titles do not need to follow the structure of zinger-colon-finding. Single statements with evocative language can be effective: “Heavy Makeup Can Backfire for Young Women.” Occasionally, researchers opt for questions: “Does Heavy Makeup Backfire for Young Women?”

Whimsical titles could incur costs. Cultural references may be lost on present or future readers (Silvia, 2015). Will Maybelline be around 30 years from now? Maybe not, but your manuscript will endure. Further, scholars might be turned off by cutesy titles and dismiss your work as intellectually shallow (Sword, 2012), the equivalent of people rolling their eyes when they hear you named your baby after a brand of hubcaps. Personally, I am not a fan of questions as titles. Call me old-fashioned, but I find myself answering such questions—sometimes out loud—with varying degrees of snark.

Silvia (2015) noted that your title is like a “carnival Barker, luring and wheedling people inside the dark tent of your research” (p. 164). Once you have got them, you need to keep them. For that, show readers the coming attractions.

Alluring Abstract
An effective abstract is like a good movie trailer that draws viewers into a story and leaves them wanting more. At the same time, the abstract is a teaser with spoilers; you cannot give away the entire story, but you should deliver the highlights. You have precious little space to tell your story—most abstracts range between 150 to 250 words. So, get down to it. Quickly.

Your abstract not only provides a summary of your work, but it also persuades your readers of its importance (Sword, 2012). Use a single sentence to hook your reader. State your purpose clearly. Share compelling justifications for why your study is worth reading. Briefly describe your method (participants/sample, materials, procedure) well enough for readers to understand the basic design of your study. Highlight your most noteworthy results—findings that speak to your most central predictions or results that surprised you. Include effect sizes and confidence intervals or statistical
significance levels. (Realize that including such information will inflate your word count a lot; for example, \( p = .032 \) counts as three words!) Conclude with a kicker: note practical applications of your findings, posit how your findings impact current theory, or loop back to your hook.

Given that your abstract is your manuscript’s mini-me, write it after you have drafted your manuscript. Avoid copying and pasting sentences directly from the body of your manuscript unless you want it to sound like a disjointed beat poem. That said, repeating particularly strong openers and closers could be effective. Leave your readers with an earworm that they can shake only by reading the rest of your manuscript.

Inviting Introduction

Your Introduction should bring your reader even deeper into your research, humanizing it all the while. To accomplish this, you need to harness the power of storytelling. Indeed, “To deny the power of story is to suppress our own humanity” (Sword, 2012, p. 89). Skim the introductions of the first 10 articles in a respectable journal and you will likely conclude that few psychological scientists approach manuscript writing like storytelling. Little tension, less suspense, zippo passion. You could rightly point out that these scientists nevertheless got their work published writing lifeless, turgid, yet scientifically significant prose. Why care about story? As a scientist, you are obligated to share your discoveries. As an egalitarian, you want your discoveries to be accessible. Reading an empirical article should not be an elitist rite of passage; it should be a gateway to collective understanding.

Literary storytelling involves many potent rhetorical devices (e.g., metaphor, alliteration, etc.) that normally do not wheedle their way into scientific writing. Although these devices can enliven your writing, I will focus mainly on elegant structuring and content development that will give your story a strong start. The IMRAD format imposes constraints that produce often conventional and predictable moves in empirical manuscripts (Sword, 2012). Still, mastering these conventions is not trivial. To help my students, I tell them to have a BLAST: frame the Big picture or problem; incorporate relevant Literature to contextualize your research; reveal what is Absent or lacking in said literature; briefly describe your Study; and state and rationalize Testable hypotheses. (Yes, I am this cheesy; it is part and parcel of my nerdastic charm.)

Big Picture or Problem

Hook your reader with a juicy lede, a task harder than it looks. Sword (2012) noted that only 25% of the scholarly articles she surveyed opened with a deliberately engaging hook. The beginning of a manuscript is notorious for banal boilerplate where you can swap one construct for another. If you find yourself starting your manuscript with a variant of “Since the dawn of civilization, humankind has been fascinated by ____.” “Recently, there has been renewed interest in ____,” “Little is known about ____,” or “Merriam-Webster defines ____ as . . .” (Silvia, 2015), set fire to your computer or paper. Let the phoenix rise from the ashes.

Kail (2015) offered three solid strategies for engaging openers. You could lead with a compelling statistic to frame the problem: “Directors of counseling centers at colleges and universities report that 48.2% of their clients consider anxiety their most pressing concern (LeViness, Bershad, & Gorman, 2017).” Like a stand-up comedian, you could make an offhand observation: “Walking on a college campus is now like driving—nearly everyone is buried in their phones.” Or you could set up a compelling hypothetical situation: “Imagine you are waiting in line for coffee and someone makes a racist remark.” Starting with a quotation, as I did in this article, is another option (Sword, 2012). Silvia (2015) suggested launching with an intriguing question: “How could two people witness the same event and remember it so differently?” You have no shortage of potentially engaging openers (or duds, for that matter).

A catchy hook does not guarantee that you have reeled in your reader. Flesh out your opening paragraph with enough backstory to start humanizing your research and convincing readers why your topic is important to study (Landrum, 2008). Some writers call this initial paragraph the pre-intro or intro-to-the-intro (Silvia, 2015). Realize that your pre-intro cannot contain your entire backstory; it is the teaser for what is to come. What you choose to emphasize depends on your overarching purpose. If your study is applied, perhaps you further develop the practical ramifications for studying your topic. For studies that test basic research questions, you might tease relevant theory. Studies that fall in the middle of the applied-basic spectrum—translational research—might involve both. Does the pre-intro give away the game too early? Perhaps. You are not finding out the butler did it on the first page of a mystery novel. Rather, you should move expeditiously toward the overarching purpose of your
study, which ideally occurs at the end of your first or second paragraph. Revealing your purpose early sets the lens through which your readers frame the following paragraphs.

**Literature**

To feel connected to your characters, you want to understand their origin story. Where did they come from? What led them to their current situation? Reviewing the relevant literature is the origin story of your study. You may feel a deep personal connection with your research—and that is wonderful—but readers of empirical manuscripts need to understand the scientific backstory, rather than personal revelations of how you became interested in your research question. Hold up. Did I not just say that you need to humanize your research? Yep. But humanizing—illuminating a human connection to science, the humanity of science—is not the same as personalizing.

Incorporating relevant literature into your scientific backstory can be a tricky business. Your first concern is how much literature to incorporate, which depends on how much literature exists on your topic. Writing an exhaustive literature review can look quite scholarly, but eventually your readers will ask, “Do I really need to know all this stuff?” I am not advocating cherry-picking or choosing studies that selectively advance a singular viewpoint. I am with Kail (2015), who suggested incorporating no more than two or three citations to justify claims. A bloated glut of afterthought citations disrupts the flow of your prose (Sword, 2012) and can give the impression of smarmy namedropping. You are not trying to secure an audience with the Queen, so dial it back. (That said, I do recognize that the number of citations provides an index, albeit imperfect, of scientific impact.)

Assuming you are awash in sources, your second concern is choosing sources that best justify your claims. The type of resources matter: nearly all resources included in empirical manuscripts need to be scholarly, appearing in peer-reviewed journal articles, edited books, or books. Occasionally, researchers include statistics from credible web-based resources (e.g., the Center for Disease Control’s webpage) or reference the popular press, particularly when hooking the audience.

Your third, and perhaps most daunting challenge, is determining how to use your resources. Remember, your overarching goal is to provide backstory, or context for your research story. Given that you are writing an empirical manuscript, most of your backstory will be findings from empirical research. When describing such findings, it is not enough to state that a relationship has been documented. Prioritize precision in your reporting; note the direction and strength of the relationship or magnitude of the difference. Not only does this practice convey that you are a careful and thorough researcher, it opens the door to richer discussions of your results. If the current literature consistently reports a weak correlation between variables and you find a moderate to strong correlation, that is worthy of discussion. Although scholarly sources offer a trove of previous findings, they are not a one-trick pony. Scholarly sources also define theoretical constructs (e.g., conscientiousness) and describe the tenets or assumptions of a theory/model (e.g., the Big Five model of personality). An article’s methodology could inspire your own method. Or, scientists might have noted suggestions for future research or limitations that you address in your research.

Your scholarly sources are pieces of a larger puzzle; some sources provide only one piece (e.g., findings), and others offer multiple pieces (e.g., findings and theory). Fitting those pieces together into a logical and coherent picture is your fourth challenge. A tried-and-true puzzle-solving strategy is to establish the edges and then fill in. When synthesizing the background literature, your edges are major themes or claims. Let’s say you are examining whether psychological feelings of entitlement are positively related to sexism and racism in millennials (Viola & Fallon, 2018). My edges would be entitlement, sexism, racism, and the relationships among them. Consequently, I would start by describing what is known about entitlement in millennials. I would explain why entitlement should be theoretically related to sexism and racism, which means I need to define sexism and racism. Next, I would share what is known about millennials and sexism. Can you guess what would follow?

Thoughtfully using and organizing your sources reduces the likelihood that your literature review will sound like a twitchy annotated bibliography leapfrogging from one summarized article to the next. Remember, you are the filmmaker-storyteller introducing your readers to your characters. Movies that introduce a lot of characters without showing how they interact or develop will not last long in theaters, or they will go straight to DVD.

On a more local level, paraphrasing rather than directly quoting resources helps you build a coherent picture. Although it is challenging to describe
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others’ research in your own words, doing so gives you much more flexibility as a writer. Think of films with characters that were inspired by characters (Romeo and Juliet) but not carbon copies of them (West Side Story). The original authors wrote with their purpose in mind and so should you. Imagine what it would be like to read a series of verbatim quotes from existing articles: all bones—not tendons, ligaments, or connective tissue.

Absent or Lacking Knowledge
For your research story to be compelling, you need to clearly convey your motivation for conducting your study. Even comedies need some drama to move the story forward. Expose flaws or shortcomings in the current understanding of your topic. Most of the time, authors try to hide the cracks in the vase or the stains in the carpet; here, you want to shine a spotlight on them. Doing so will convince your reader that your study is important and addresses a critical piece of the larger problem you are trying to solve. Table 1 lists some of the most common motivations for conducting empirical studies. You may find that you have more than one scientific justification for your study. Fantastic! Bludgeon your readers with this information. Otherwise, your research is nothing more than an academic exercise. Realize that you are not discussing the potential practical significance of your research here. Focus on scientific motivations, even if you are doing applied research. (Hopefully you conveyed practical significance in your hook!)

**TABLE 1**

<table>
<thead>
<tr>
<th>Potential Scientific Justifications for Your Study</th>
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<tr>
<td>Theme</td>
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<tr>
<td>Something New</td>
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<tr>
<td>Variation on a Theme</td>
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<tr>
<td>Different Context</td>
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<tr>
<td>Wash, Rinse, Repeat</td>
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<td></td>
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</tbody>
</table>

Note: Adapted from Silva (2015) and Fallon (2016).

(Your) Study
Your readers need to know the general design of your study for two reasons. First, readers need to get a sense of whether your study will fill the gap that you so skillfully exposed. If your study was designed to conceptually replicate a phenomenon, readers want to know, in broad strokes, how your study will do so. You will describe your methodology in detail in the Method; here, the extent of your description will depend on how much you think your reader needs to know. Survey research testing associations generally can be described in one or two sentences. Experimental research may need more exposition, depending on the complexity of the method. A second reason to describe your study is to help your readers better understand your hypotheses.

Testable Hypotheses
Your hypotheses are a contract between you and the reader—you commit to statistically evaluate each prediction you make. The most recent JARS guidelines (Applebaum et al., 2018) call for both primary and secondary hypotheses. Primary hypotheses are most central to your research question and incorporate your primary measures. Secondary hypotheses involve supplemental measures (e.g., subscales from a questionnaire) and can address potential alternative explanations for your findings such as manipulation checks for experimental designs. This practice encourages the sound scientific practice of putting your horse before your cart: you designed the study based on their most impressive catch. You will describe your methodology in detail depending on the complexity of the method. A second reason to describe your study is to help your readers better understand your hypotheses.

State your hypotheses affirmatively: you expect a relationship between $x$ and $y$, that manipulating $x$ causes a change in $y$, that $a$ and $b$ uniquely explain variance in $c$, and so on. If you are conducting null hypothesis testing, this practice runs counter to most of your training in your introductory statistics class where you were drilled to state the null hypothesis. Those of you using Bayesian approaches already state your priors affirmatively, so there is no contradiction. You can predict the direction of the relationship or effect (e.g., you expect a positive relationship between $x$ and $y$) but be mindful of locking yourself into a one-tailed statistical test if you are using NHST. Hedge directionality; you can clarify your intent to use 2-tailed tests within the analysis plan of your Method section (see Field, 2018, for
reasons why you would want to use 2-tailed tests). Word your hypotheses at the level of the variable or construct rather than at the level of the operational definition. It is much easier to understand “I expected self-esteem to be positively related to depression symptoms” than “I expected scores on the Rosenbaum self-esteem questionnaire to be positively related to scores on the Beck Depression Inventory.” For experimental enthusiasts, “I expected switch costs to increase in the presence of background noise” is more accessible than “I expected the difference in reaction time between subsequent trials in which the instructions remain the same and reaction time between subsequent trials in which the instructions differ to increase in the presence of background noise.” (Yikes.)

You do not pull your hypotheses out of thin air. Ideally, you derive hypotheses from the theory that you have summarized in your backstory. If your study is sparse on theory, your predictions should be consistent with the previous literature—and make that known. For cases where the literature has produced mixed results (i.e., some published records find the relationship, others do not or find—egads—the opposite relationship), side with the most scientifically compelling evidence.

General Organizational Advice
In my view, the Introduction is the most challenging section to write because it demands that you creatively and coherently weave ideas together, particularly for your literature review and scientific justification. The typical organizational metaphor is a funnel: You start broad and get more specific. The BLAST method provides a reasonably robust organizational template, funneling your readers from the big problem to the specific hypotheses of your study. Even so, no one-size-fits-all recipe works for all cases. Silvia (2015) suggested that your particular brand of scientific justification can affect the organizational moves you make.

To help readers keep track of where you are in your story, you have the option of including subheadings, or signposts. But beware. You could be tempted to use subheadings to subvert clear, logical transitions to the next big idea. It is like dropping stones into opposite ends of the same pond—both rocks are in the pond, but the ripples never touch.

Meticulous Method
The plot thickens as you describe your participants (or sample), materials, procedure, and data strategy in separate subsections of your Method. Although this section progresses quite linearly, you can still tell a good story (Landrum, 2008). Your priority is to provide enough detail so that readers clearly understand how you obtained your data. Your Method passes muster when: (a) your Participants or Sample subsection allows readers to make reasonable inferences about the generalizability and fidelity of your findings; (b) your Materials and Procedure subsections enable other scientists to directly replicate your study; and (c) your plan for analyzing data is sound.

Here’s the plot twist: what you include in your Method will differ dramatically depending on the nature of your data. You could be analyzing content of existing artifacts created outside a research context (i.e., magazines, songs, texts, social media posts), working with secondary data sources (i.e., analyzing an existing dataset), or collecting primary data (i.e., recruiting participants directly and contributing to a dataset). Consequently, I will address these distinct approaches—content-based datasets, secondary datasets, and primary datasets—in turn. But before I do, there are some general aspects of Method sections common to all approaches.

General Aspects of Method Sections
Traditionally, Method sections have been trisected into Participants (or Sample), Materials (or Measures or Apparatus), and Procedure. With the most recent JARS recommendations (Appelbaum et al., 2018), I suggest adding a fourth subsection: Data and Analysis Plan.

Participants. Who or what was observed, surveyed, or tested? Describe your participants (humans) or your sample (nonhuman animals or things) including relevant characteristics. Also, report exclusion criteria (i.e., how many people, nonhuman animals, or things were excluded from your sample and why they were excluded). Finally, justify your decisions about your sample size. Did you conduct a power analysis (e.g., G Power) or use another method to estimate the number of participants or observations you need to soundly examine your hypotheses? Did you achieve the sample size you intended?

Materials. What did you use to manipulate and/or measure the behavior or characteristics of the sample? When your study involves coding things or observable behaviors, you might refer to this subsection as “Coding Scheme.” At the end of the day, this subsection boils down to how you operationalized your variables. When applicable, report the construct validity of your materials (e.g.,...
questionnaires, coding schemes). Also, include any specialized apparatus required to replicate your study. Typical white 8 1/2 x 11-inch paper does not qualify as specialized apparatus; finger electrodes used to measure galvanic skin response do.

Procedure. What specific procedures did you use to gather data? If the Materials are like ingredients in a recipe, your procedure offers chronologically ordered, specific steps to combine your ingredients. Here, your readers are looking for internal validity. And experimental design does not have a lock on it; confounding variables can insidiously slip into nonexperimental designs as well.

Data and analysis plan. What were your analytic plans for your data before doing any analysis? You guessed it—this section actively discourages the turds-turned-diamonds approach. Specify the conditions under which you excluded collected data: participants were not paying attention or were otherwise incapacitated (it happens!), the equipment malfunctioned, unexpected loud noises disrupted the testing session. (Notice the difference between excluding participants who did not meet inclusion criteria and excluding the data because it is not valid). If you used behavioral tasks or physiological measures that produced multiple responses per participant, describe how you intended to reduce your data and handle missing responses on trials. On tasks with multiple trials, participants occasionally goof or zone out. In such cases, you might drop those trials from analysis or replace reaction time data with an artificial maximum response time.

After describing how you would prepare your data for analysis, focus on the statistical analyses. How did you intend to statistically evaluate your primary (and secondary, if applicable) hypotheses? Which assumptions would your data need to meet (e.g., normal distribution, not heteroscedastic)? Would you transform variables to meet these assumptions? If so, how? It may seem redundant to describe what you planned to do before you analyzed your data and then report how you analyzed your data. (This is what I planned and—see?—I did it!) However, more researchers are preregistering their studies on the Open Science Framework, making their analytic plans open to increase scientific transparency. Stating how you expected to carry out your analyses provides a check against your statements on the Open Science Framework and also demonstrates that science does not always progress as planned—sometimes unexpected revelations occur as you tussle with your data.

Specific Recommendations

Content-based datasets. Begin by describing the elements that comprise your sample, how many you examined, and how you selected them. Suppose you compared 100 tweets from U.S. Presidents Barack Obama and Donald Trump. Perhaps you targeted the first consecutive 100 tweets after being inaugurated. Or perhaps you randomly selected 100 tweets from each president’s first year in office. Did you consider tweet threads as a single tweet?

Next, describe how you coded these elements. Let’s say you wanted to measure optimism in those tweets. You could define which words convey optimism. You would decide whether you are counting the number of optimistic words per tweet or making a binary decision of whether the tweet sounded optimistic (or both!). Perhaps you developed a more sensitive rating scale where you subjectively rated each tweet on a scale of 0 to 10. Relay how you assessed reliability of your coding. Did you or someone else code a subset of tweets?

Within your procedure, document how you collected your data. Did you personally code each tweet, or did you use a text analysis program? If you did the coding, describe how you conducted your coding sessions: the duration of each session, how many tweets you coded in a single session, and the overall duration of coding.

Secondary datasets. Describe your dataset: include the name of the dataset (if it has one), when the data were collected, and how many total cases exist in the dataset. If you used only a subset of the database, what criteria did you use to select those cases? How many cases were in the subset that you analyzed?

A note about secondary data sources: Because these datasets usually have so many cases, you can conduct highly powered statistical analyses. For example, the “Emerging Adulthood Measured at Multiple Institutions 2” database (Grahe et al., 2017) is available on the Open Science Framework and contains over 3,000 cases. And it is there for the taking! However, you need to be careful. Reanalyzing the same variables in slightly different configurations inflates the likelihood of artificially finding a significant relationship between variables (a Type I error). It is like double-dipping with guacamole—the more times you go into the bowl with the same chip, the more likely you are to share your germs. The Open Science Framework makes it possible to determine which research questions others have pursued or “claimed” so you can make informed decisions. Still, you need to do your
homework and list published relevant articles using that database (see Standard 8.13 of APA’s Ethical Principles of Psychologists and Code of Conduct).

These concerns and suggestions extend to smaller nonpublic databases, including researchers who have previously amassed data and continue to draw from the same well without replenishing with new data. That well gets muddy pretty quickly. Publishing fragments from the same dataset give the erroneous impression that the data were collected afresh for each manuscript. This practice can gravely impact researchers using those sources in reviews or meta-analyses, distorting the scientific literature (APA, 2002).

In addition to documenting the characteristics of the database, you need to operationalize your variables (Materials) and describe how the database came to be (Procedure). A document containing the exact questions or measures included in the database and data collection procedures should be available for your inspection. You will not likely analyze all the variables in the database, so focus on the nondemographic variables included in your predictions. The database may include responses from multiple-item measures that need to be aggregated into a single score. For example, the EAMMi2 contains several multiple-item measures such as Brown and Ryan’s (2003) 15-item mindfulness questionnaire. Describe each multiple-item measure relevant to your study in detail and report interitem consistency (see Primary datasets below and Table 2).

**Primary datasets.** Here, too, start by describing your sample. State the number of people or nonhuman animals you collected data from, and include descriptive statistics of important characteristics. If you are working with humans, at a minimum note gender, age, and race/ethnic background (see Hughes, Camden, & Yangchen, 2016, for excellent suggestions regarding the collection and reporting of demographic data). Those of you working with nonhuman animals should include genus, species, and strain number (see Appelbaum et al., 2018, for other important characteristics). Summarize characteristics across groups of participants that you directly compare within your Results. For example, if your participants experienced one of three manipulated levels in an experiment, and you found substantial performance differences across groups, group-level individual differences could partially account for your findings. (This would be an example of a secondary hypothesis/analysis.) Note restrictions to your sample. If you were studying the transition to college, you would restrict your participants to first-semester students. Occasionally, (human) participants who do not match your inclusion criteria will nevertheless opt into your study. In such cases, report the number of participants you exclude for not meeting the inclusion criteria. Describe your recruitment method and sampling procedure. You do not need to trot out the jargon declaring, “I recruited a convenience sample.” Stating that you recruited human volunteers in person from an Introductory Psychology course or online through MTurk does the job. Also, if applicable, note how participants were compensated.

**TABLE 2**  
Information to Include When Describing Different Types of Materials

<table>
<thead>
<tr>
<th>Type of Material</th>
<th>Information to Include</th>
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<tbody>
<tr>
<td>Published questionnaires</td>
<td>Number of items on the instrument; response scale (e.g., 5-point Likert); if applicable, subscales (i.e., specific items that measure particular aspects of a construct, like the extraversion subscale of a personality measure) and the number of items per subscale; a sample item (one for each subscale if possible); psychometric properties (e.g., convergent validity, interitem reliability) from the seminal study; psychometric validation (at least interitem reliability) from your current study; how you reduced responses on multiple items into a single score (e.g., averaged or summed responses), including whether you decided to discard items based on your psychometric evaluation.</td>
</tr>
<tr>
<td>Original or revised published questionnaires</td>
<td>Same information for published questionnaires; for revised questionnaires, describe how you altered questions from the published measure.</td>
</tr>
<tr>
<td>Overt behavioral observation</td>
<td>Clear and thorough descriptions of each variable as defined through physical actions, spoken word, nonverbal behaviors, or physical trace left behind by participants. (Similar to coding schemes for content datasets.)</td>
</tr>
<tr>
<td>Behavioral tasks</td>
<td>Characteristics of stimuli (e.g., number, color, size, shape, duration, loudness, brightness, etc.), especially how stimuli were manipulated (i.e., systematically differed); how you obtained or selected stimuli (e.g., an image database); number of trials (i.e., the number of times participants were asked to respond); type of response (e.g., recalled words, speed detecting an object appeared on a computer screen); apparatus; including software, used to deliver stimuli or record responses (e.g., computer, PowerPoint slideshow).</td>
</tr>
<tr>
<td>Physiological measures</td>
<td>Apparatus, including software, used to collect responses (e.g., fMRI, automated blood pressure machine); makes and models of apparatus; units of measures (e.g., volts, microHertz).</td>
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</tbody>
</table>
Your materials comprise anything you intentionally expose your participants to during your study, excluding standard ethical practices such as consent forms and debriefings. Common materials include questionnaires, behavioral observations, tasks with stimuli (i.e., something—or someone—intended to provoke a response), or physiological measures (e.g., blood pressure, respiration rate). As you can imagine, these varied materials require specialized description. Table 2 lists the most important information to include when describing your materials. Because most studies have multiple materials, use subheadings to enhance organization and clarity. For example, describe each published questionnaire in a separate paragraph introduced by a subheading (Level 3 for all you APA aficionados!). Figure 1 illustrates what this structure might look like.

Start your procedure affirming that your study received approval from your institutional review board. Even if your research was exempt from IRB review, state that. Describe where you collected your data (e.g., in a laboratory; online) and how many participants were tested or observed during study sessions. For some studies, testing layout may also be important. When applicable, explain how you introduced your study to participants and obtained informed consent. Next, detail how your participants experienced your materials or—in the case of observational studies—how you observed participants. Include important details about your procedure: how you ordered a series of questionnaires, how you assigned participants to levels of a manipulated variable, how you counterbalanced within-participant conditions (if not described within your materials). You want your readers to imagine themselves as participants with under-the-hood access to the mechanics of your study. To wrap up, describe how you debriefed participants when applicable. In cases where you deceived participants, intentionally altered participants’ affective state, or exposed participants to sensitive topics, explain how you dehoaxed participants and removed or mitigated potential negative aftereffects. Finally, note the duration of your procedure.

**Revealing Results**

The time has come for your big reveal! Like your Method section, Results sections have a macrostructure of subsections and a microstructure of what to put in those sections. As illustrated in Figure 2, the overarching organization should be driven by your hypotheses for primary and secondary analyses and bookended by missing data and initial analyses up front, and exploratory analyses in the rear.

**Missing Data**

Although you described your plan for addressing missing data within your Method, now you report how many data points you actually discarded and why you discarded them. Include frequencies or percentages for each reason: “A total of 6 animals’ complete records were discarded for equipment malfunction (n = 4) and experimenter error (n = 2).” Also, state whether and how you replaced missing data. Report exactly how often you made such replacements.

**Initial Analyses**

Provide readers with enough information about your outcome variables to determine whether statistical assumptions have been met for your analyses. For example, you may need to examine whether continuous outcome variables are normally distributed or to ascertain how strongly predictors are correlated. Also, note outliers or points of
influence and their fate—did you exclude them from subsequent analyses? Further, did you transform the data to address nonnormality, or did you decide on a statistical test that does not require that assumption to be met (e.g., robust regression)? By looking at your data, you also might find that a continuous variable is bimodal or multimodal; no transformation will fix that, but you could consider making the variable categorical. If you did, report the ranges of scores that determined membership in each category.

Primary and Secondary Analyses
As with your Data and Analysis Plan subsection of your Method, I highly recommend using a subheading structure that reminds readers of the hypotheses you statistically evaluated (see Figure 2). For each hypothesis, begin by noting how many cases were included in the analysis. Restate the analysis you used to evaluate the prediction. Include descriptive and inferential statistics. Where appropriate, include exact $p$ values, effect sizes, and confidence intervals. Signal whether your findings are statistically significant (when applicable) and describe the direction of the relationship or effect. That’s a tall order, but you can accomplish many, if not all of these goals in a single sentence: “A 2 x 2 ANOVA using sexual debut (early, late) and biological sex (woman, man) as between-subjects variables and relationship duration as the between-participants variable revealed that women ($M = 4.36$ months, $SD = 1.93$), 95% CI [3.81, 4.92], reported longer relationships than men ($M = 3.21$ months, $SD = 1.55$), 95% CI [2.62, 3.80], $F(1, 74) = 8.54$, $p = .005$, $\eta^2_p = .104$” (Vancour & Fallon, 2017, p. 127). Yes, the writing is dense. Of all the sections in your manuscript, your Results will likely be the most technical and feel the most foreign. For all my haranguing about style, here you have to play it straight.

Liberally use tables to summarize data—particularly descriptive statistics—and figures to illustrate main findings. Admit it: you have at one point skimmed (skipped?) over some text in a Results section and focused on the tables and figures. And for good reason! Vivid visuals powerfully display your findings. See Nicol and Pexman (2010a, 2010b) for multiple examples of effective tables and figures—a visual for every occasion.

Exploratory Analyses
Sometimes when you are working with a dataset, you will have a flash of insight that you did not consider when you planned the study. When this occurs, you have the option of reporting your finding as an exploratory analysis. Remember, you do not have license to fish and you should statistically correct for the additional tests you have conducted. But if you happen to find something interesting, you can report it so that you or another researcher can explicitly design a study to follow up your promising, yet preliminary results.

Discerning Discussion
Time to wrap it up and roll credits. Before that, you have some (actually, a lot of) explaining to do. Your Discussion is part extension of your Results and part inverse of your Introduction. You focus on explaining your Results, then zoom out to the big picture or problem. Your Discussion contains multiple components, most of which can be organized interchangeably—so no cheesy acronym this time. (Sorry to disappoint.) However, Discussions usually begin with a summary and end with a take-home message that speaks back to your opening hook. In the middle, you place your findings in the context of previous research, entertain alternative explanations for your findings, acknowledge limitations of your study, offer ideas for future research, and consider practical applications of your findings.

Summarize Your (Primary) Results
Your readers have just worked through multiple analyses and statistics; do them a solid and summarize the main findings of your study. I recommend focusing on primary analyses, clearly stating whether your findings were consistent with expectations. Your research story has three potential outcomes: your findings supported your hypotheses, your findings partially supported your hypotheses, or your findings did not support your hypotheses. Regardless of the endgame, thoughtfully and thoroughly discuss your findings.

Relate Findings to Previous Research
Remember that research you used to justify your predictions? Revisit these sources and connect your findings to previous research; show readers how your findings fit—or do not fit—with our current understanding. When appropriate, discuss whether your findings are consistent with the theory you used to derive predictions. Readers should come away with a clear impression of how your findings enrich collective understanding.

If you reported exploratory analyses, you likely uncovered unexpected relationships that you could
not have anticipated within your Introduction. In such cases, incorporate literature that helps readers appreciate how your preliminary findings fit into a broader context. Use the literature to inform potential explanations for your exploratory findings.

Entertain Alternative Explanations (and Acknowledge Limitations)
You may think that posing alternative explanations for your findings weakens your conclusions. But it is better to get ahead of criticism rather than letting someone else poke holes in your work. Entertaining alternative explanations demonstrates that you have thought deeply about your findings, and although you cannot address every possible alternative explanation, you should give your readers an insightful sampling.

Your secondary hypotheses and analyses point you toward alternative explanations of your findings. Indeed, you planned these analyses to rule out alternative explanations. For example, manipulation checks (when done well) demonstrate that a manipulation worked. Analyses demonstrating that the strength of the effect was correlated with the strength of the manipulation suggests that the manipulation caused the observed effect.

Acknowledging limitations—carefully considering your study’s validity from multiple angles—provides another means to address alternative explanations for your findings. No study is perfect, including yours. For example, null results happen for many reasons: no relationship actually exists; the manipulation might not have been strong enough or your measures not sensitive enough (i.e., construct validity); or uncontrolled extraneous variables wreaked havoc and obscured relationships (i.e., statistical validity). Also, discuss how generalizable your findings are outside your specific research context (i.e., external validity). Is your sample “WEIRD” (Western, educated, industrialized, rich, and democratic)? Are the demographic characteristics of your sample representative of the population from which your sample was drawn? You would not want to claim that your findings apply to all young adults when your sample is not representative of young adults.

Beware letting your negativity bias run amuck, resulting in a litany of limitations. Not all limitations are compelling. Sample size is such low-hanging fruit that my students can hardly resist stating that their sample size was not large enough despite reaching their recruitment goals for ample statistical power. Restrict your discussion of limitations to those that are truly thought-provoking and have the potential to be addressed in future research.

Propose Future Research
Here comes the fantasy sequence of your movie. Derive ideas for future research by remedying limitations, following up exploratory analyses, or taking your research to the next logical step(s). Limitations are future research ideas ripe for picking complete with stock phrase: “Future research should address this concern.” Similarly, pursuing promising preliminary findings is a gimme: “Future research should further examine these promising results.” Dreaming up next steps is the money-maker. Leverage your curiosity and engage—even surprise—your readers.

Consider Practical Implications
All research can have practical applications. But the more “basic” your research question, the more removed it is from direct application. Excluding other researchers, consider who could use your findings—Teachers? Caregivers? Mental health practitioners? Also, note how these people might use your findings: “...the present results could help sex educators and clinicians counsel young people who are considering becoming sexually active within their romantic relationships” (Vancour & Fallon, 2017, p. 129).

Deliver the Take-Home Message
Every fiber of your being will want to repeat your main findings. Resist. Instead, remind readers why your findings matter. Bring them back to the big picture that you introduced in your hook. Take heed—just like your hook, it is easy to cop out with a soulless take-home message: “The present findings have important implications for ___. If that is your closer, fire up your preferred incendiary device. Do the hard work of developing a compelling hook and looping back to it at the conclusion of your paper. I stand by my words: “When deciding whether to give your report a thoughtful read or a cursory glance, your audience will scan the first and final paragraphs of your report. Give your readers every reason to explore all that lay between” (Fallon, 2016, p. 106).

APA Style and Format
Many researchers (including yours truly) have tried to sell the importance of writing in APA style and format (Fallon, 2016; Landrum, 2008; Silvia, 2015). Having a set format (e.g., IMRAD) may...
seem constraining, but knowing the overarching structure of your manuscript takes some of the guesswork out of organizing and allows you to focus creative energies on writing stylishly within a framework.

The sheer number of formatting rules and stylistic guidelines is mindboggling. The good news is that many resources can help you. In addition to the APA Manual (APA, 2012), open resources including the APA style blog (http://blog.apastyle.org/), an editorial from this journal (Hughes, Brannan, Cannon, Camden, & Anthenien, 2017), and YouTube tutorials (Fallon, 2014a, 2014b) expose the nigglier details of APA style and format.

How to Craft a Stylish Manuscript

Now that you know the “whats” of a rigorous empirical manuscript, here are some “hows” to help you add flair to your research story. But first, perhaps you are wondering why style matters. Pinker (2014) offered three reasons: (a) writers who clearly transmit messages produce thankful readers who not only “get it” but are spared the migraine of wresting meaning from impenetrable prose; (b) stylish writers earn readers’ trust—writing clearly and deftly conveys that you appreciate readers’ needs and are willing to put effort into communicating; and (c) stylish writing adds beauty and joy to life. Sold.

Classic Style

Most scientific manuscripts are written in practical style: the writer is the expert, the reader is a noob, the writer imparts knowledge to the reader, full stop. Pinker (2014) advocated moving toward classic style (Thomas & Turner, 1994), which assumes an equal relationship between writer and reader. The writer conversationally guides the reader to see something—some truth—that the writer has seen. In a nutshell, a practical approach defining constructs such as inattentional blindness quite differently. Practical writers would state that inattentional blindness is “the failure to notice unexpected but perceptible stimuli in a visual scene while one’s attention is focused on something else in the scene” (VandenBos, 2015, p. 529). Note the abstractions—stimuli, visual scene, attention. Classic writers might use a vivid example to illustrate inattentional blindness: “How could you make someone crossing the street fail to see an oncoming bus? Give him a smart phone.” Alternatively, classic writers could substitute concrete images for abstract terms: “Inattentional blindness occurs when someone intently looks at something but fails to see something else that is obvious but unexpected.” In short, classic style is the difference between saying “The independent variable affected the dependent variable” and “Exposure to vivid, concrete examples improved participants’ performance on a reading comprehension test.”

Although it seems straightforward enough to concretize the abstractions in your manuscript and call it a day, writers have their own form of inattentional blindness—what Pinker (2014) labeled the curse of knowledge. As people learn more about something, their thinking becomes more abstract and they cannot remember what their thinking was like before the “change.” Consequently, writers miss the abstractions—stimuli, visual scene, etc. when readers need abstractions explained; in the writers’ minds, the concepts are obvious. If you do not have the good fortune of someone else telling you that your writing is abstruse, set your writing aside (at least until after you have slept), imagine that you are completely new to this topic (but have a foundational understanding of scientific methodology), and read your manuscript out loud. You will be astonished hearing what you expected your readers to just “know.”

In addition to making the abstract concrete, classic stylists are students of form and structure. As a psycholinguist, Pinker (2014) thoroughly disemboweled arcane sacred cows of grammar—split infinitives and the like—that obstruct classic style. Again, you have to think deeply about the rules to know when to break them, and this process is not intuitive: “. . . the unconscious mastery of language that is our birthright as humans is not enough to allow us to write good sentences” (p. 78). I do not have the luxury of discussing grammar and syntax in
Writing With Rigor and Flair | Fallon

depth here (wait, was that a groundswell of relief?), but I implore you to deepen your relationship with language. When your relationship has fizzled, or becomes strained or downright antagonistic, Pinker (2014) is as good a couples’ counselor as they come.

**Tone.** Writing conversationally is achieved through crafting a tone that is informal, personal, collaborative, and confident (Silvia, 2015). Think of singers who give virtuosic performances—Lady Gaga, Beyonce, P!nk. Across (and often within) songs, they mold their vocal delivery and timbre to convey contrasting emotions and evoke reactions in their audience. Similarly, effective writers deliberately consider what tone works best for a given project and flexibly adapt it to create desired effects.

You may be surprised to learn that you should be working toward a more personal tone in your manuscript. Developing a personal tone is not the same as personalizing, or disclosing intimate details of your life. But a personal tone shortens the distance between you, your work, and your readers. An impersonal tone sounds like: “When participants appeared distracted, they were sternly redirected toward the task by the experimenter.” Assuming you are the experimenter, the third-person passive construction strips you of your agency. With a more personal tone, you would get: “When participants’ attention lagged, I verbally encouraged them to refocus on the task.”

You may be further aghast to learn that your academic writing should be less formal than traditional practical style would have you expect. If you write informally, people might not take you seriously (Sword, 2012). But consider the alternative: Writing too formally turns the reader off. Who wants to invest their time reading something dry and stodgy? An informal tone makes your intellectual thought process evident and accessible. You will not hit the sweet spot by writing like you talk: “I started reading Carol Dweck’s *Mindset* like 2 weeks ago and I—ya know—wondered whether college students who have a growth mindset like doing research and stuff.” You can sound informal and construct clear, concise, and coherent prose. They are not mutually exclusive!

Classic stylists invite readers into a learning experience; others might provoke readers into an intellectual duel. The provocation can be overt (“Anyone who thinks psychology is little more than pseudoscience has less than a 6th-grade education”) or subtly patronizing (“Obviously, psychology is not pseudoscience”). Perhaps your point was not obvious and now your reader feels pretty foolish for not seeing what you consider so plain. (Obviously.) Writing collaboratively—treating your reader as an equal—does not make you a dumdum. Writing pretentiously makes you a jerk.

Writing confidently is challenging. The more you know, the more you are acutely aware of everything you do not yet know, which compels you to pepper your claims with hedging qualifiers (e.g., somewhat, slightly). You do not want to come across as knowing everything, but you do want to assertively convey that you are sharing your best ideas at the moment. You can say something confidently while qualifying your claims: “I found a statistically significant, but weak correlation between magical thinking and the number of years that participants were avowed Cubs fans.”

To assess your tone, Silvia (2015) suggested rating yourself from -10 to +10 on these four dimensions (informal, personal, collaborative, and confident) with 0 being neutral. Consistently strive for the positive side of the scale for the personal, collaborative, and confident dimensions. The dicey informal-formal dimension depends on your manuscript’s eventual outlet. Nevertheless, I would aim between +3 and +6 toward informal. Viva la revolución! If you are concerned about setting the appropriate tone, ask someone who will be honest with you to read your manuscript and rate it using these scales.

**The Eight-Item Checklist of Stylish Writing**
Sword (2012) asked 70 academics across disciplines to describe what makes academic writing stylish. She distilled these interviews into eight lessons, which make a lovely checklist:

1. Express complex ideas clearly and precisely;
2. Produce elegant, carefully crafted sentences;
3. Convey a sense of energy, intellectual commitment, and even passion;
4. Engage and hold readers’ attention;
5. Tell a compelling story;
6. Avoid jargon, except where specialized terminology is essential to the argument;
7. Provide readers with aesthetic and intellectual pleasure; and
8. Write with originality, imagination, and creative flair. (pp. 7–8)

You have already read about most if not all of these lessons within this article. But presenting these gems within this crystallized, succinct, and
actionable framework was just too good to pass up. True confession: this list is on my office wall. Before I send off a manuscript, I read through the lessons, mentally checking my progress. When I believe my manuscript does this list justice, I hit send.

Final Thoughts
Writing an empirical manuscript is a big deal, and you want to do it well. But your quest for scientific rigor should not hamstring the goal of producing stylish prose. I fear that emergent researchers find writing empirical articles yet one more way to increase their fluency in academese, writing to the 2%. Instead, you should take Dawkins (1996) literally and “try to inspire everybody with the poetry of science” (p. viii) by conducting elegant research and communicating it lyrically in classic style.

Although I have not directly addressed the emotional or motivational aspects of writing, it bears mention that you do not wake up one morning suddenly capable of producing stylish and rigorous prose. You hone this skill incrementally over time and many, many drafts. You write when you do not really want to and think you are producing schlock. (Maybe you are, maybe you aren’t.) You fuss over what you write and how you write it.

With the benefit of hindsight, I can look back on receiving my thesis feedback with good humor and even nostalgia. At the time, I felt like my heart was ripped out of my chest and my brain was reduced to a single pulsating neuron repeating, “You can’t write.” Eventually I recycled that neuron (and the rest of the tree), but I wish I had kept that first attempt, emblematic of an evolution that only comes by doggedly chasing both rigor and flair.

Recommended Reading

References


Fallon, M. (2014b, August). Setting up your paper in APA format [Video file]. Retrieved from https://www.youtube.com/watch?v=00FZKHIE0g


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I thank all the emergent researchers and writers with whom I have worked over the years. I have learned so much from you. I also thank my undergraduate mentor, Andrea Halpern, and my graduate mentor, Sandra Trehub, for helping me become a better writer.

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