Drafting and developing

Explores ways to:

- Manage anxiety
- Choose time and place carefully
- Get started
- Keep going
- Get unstuck
- Develop an incomplete draft

Manage anxiety

Even if you have a ridiculously detailed outline, sitting down to write can still be overwhelming. However, if you want funding or to be published, you have to do it, so finding a way to deal with the anxiety of writing is essential to getting the writing done without losing a lot of sleep. One way to do this is to remember that the first draft isn't the last draft, so it doesn't have to be perfect, and getting a whole page or a whole section written will feel a lot better than writing a really concise, exact sentence or a paragraph that flows beautifully. Another helpful thought is that no paper or proposal is ever perfect, and a few sudden topic switches or awkward phrasings won't ruin something that explains good science (which isn't to say that the writing isn't important, but the science is always more so). Finally, just because writing has been challenging in the past doesn't mean that it will always be that way; you may not have found the strategies that work best for you. This lesson covers a variety of approaches to the writing phase of the process of creating a paper or proposal.

→ *Writing and revising is easier than writing only one draft*
→ *A few imperfections won't ruin your paper*

Choose time and place

No matter what your motivation or anxiety level about writing, you will need time and space to do it. Plan ahead, and work with your advisor or colleagues to set aside enough time to allow you not only to write, but also to brainstorm and organize before you write and revise and get peer feedback after. There's no magic number of hours that this will require, so estimate based on your previous writing speed and how long you expect the document to be. It may be easier to make the time if you only take an hour a day, but if you know that you work best by writing for long stretches, find at least a few full days (maybe when your PI is out of town?). Knowing that you have time will make the writing less stressful and will allow you to put more thought into your decisions. Time isn't sufficient, however, if you're in a place that doesn't allow you to focus as much as you need to. This isn't to say that you need absolute silence—some people work better when they have to actively focus their energy by blocking out noise and movement around them. If you know a place where you work well, find a way to get the time that you need there; if you

haven't found one yet, try new locations—outside, at the Writing Studio, or in someone else's lab.

- → *Set aside time to plan, write, get feedback, and revise*
- → *Know how you work best*
- → *Try new schedules and locations*

Get started

So now you've found your time and space, but getting started writing might still present a challenge. If you find a blank computer screen intimidating, try writing on paper first or filling in your outline or list of topics by adding supporting information and gradually expanding on it. For those who prefer not to plan before drafting, even writing on paper may not work well since they might lose an idea before getting it down, so recording yourself talking about what you plan to say may help. You could use this monologue as a starting point, writing down the main ideas and expanding from those, or you could simply transcribe it and revise it to make it more organized and formal. If your problem is more that you procrastinate, try to time yourself—try to write two pages in an hour or a paragraph in twenty minutes. You may be less likely to click over to Facebook if you know that you've only got ten minutes left and you still have a paragraph to write, even if the deadline is self-imposed; meeting the goal is a reward in itself. Another way to make the beginning easier is to write the easy parts first—there's no reason to write the sections in the order they appear in the paper. For most people, the methods and results or preliminary data sections are least difficult (which is the reason the lesson on results is first in this course), since they follow formulas and the content is determined by what you have already done. Decide the order in which you'll write the other sections based on what has been easier to write in the past and how well you know what you will say in each one.

- → *Start informally—write on paper or record yourself talking*
- → *Time yourself*
- → *Write the easy parts first*

Keep going

So now you've gotten started, but your writing is slowing down because you've gotten bored, you don't find the results interesting anymore, you can think of ten other things you'd rather be doing, you're tired, or whatever. You might try taking breaks to renew your energy and allow some time for new insights into how to think about the experiments to make the paper or proposal more interesting to write. Such breaks could be as short as a fifteen minute walk or chat with a friend down the hall, or long enough to make some progress on an experiment. Allow yourself enough time to get away from what you were doing and think about something else without getting so caught up in something else that you can't get back to writing in the same day. Another way to regain interest in the material is to skip between sections—stop whatever section has become dull, and start working on one you haven't begun yet. When you reach a stopping point in that section, grow tired of it,

or have a new idea about the section you were working on before, go back. This also allows you to switch between stages of the writing process—you can go from drafting the preliminary data to planning the research plan and methods, providing variety in the sort of thinking you have to do as well as in the material you're thinking about. If you choose to take a break or skip to another part of the document, coming back to your current place may be easier if you know the next step. If you know what you need to say next, but aren't sure how to say it, sketch it out in a phrase or two what the next part of the section will say. For example, if I were to stop here, I would type something like "writer not sure what to say—options—reasons. Next ¶: writers' block strategies." If the reason you're stopping is that you're not sure what to say, jot down some possibilities along with the reasons you haven't been able to commit to any of them.

→ *Take breaks*
→ *When you get bored with one section, work on another section*
→ *Know the next step when you stop*

Get unstuck

Knowing the next step may not be possible if you're so unsure that even your options for what to say next aren't clear, but there are strategies that will help get over that feeling of being stuck. The simpler one is to talk about the problem with a colleague. His or her questions might help you think about the problem in a different way, or he or she might have had a similar problem in the past and share how it was solved. Such a colleague would not necessarily need to be familiar with your research; what's more important is that he or she listens and tries to understand what you're writing about. Alternatively, you could write around the problem—write about what the problem is, how your choices in writing so far led to the situation, and what's keeping you from solving the problem. This process might lead you to identify something you could change about something you'd written earlier or some information you could find to fill a gap in logic. Even if it doesn't solve the problem immediately, it will help you to avoid the feeling of not having accomplished anything, and will help you think about the writing more objectively.

→ *Talk it out*
→ *Write about the problem*

Develop an incomplete draft

The strategies described here should help you to produce a draft of a section with a beginning, middle, and an end, but that draft might still feel incomplete. If you feel that it's simply too short, but says everything you want it to, there may not be more writing to do—there's nothing inherently wrong with a short introduction or discussion, especially if the study itself is simple. If you feel that there's more to say, however, consider what someone outside the field would need to know to be able to understand what you've written. Non-experts are the audience most often neglected by scientific writers, and addressing their needs will likely make the draft

easier to understand for those who are familiar with related work as well. Since this may seem a bit vague, we'll use it on an example, a very short introduction.

Example: incomplete introduction

Our brains are remarkable in their ability to encode and store an ongoing record of our experiences. The prospect of using advanced brain imaging technologies to identify a neural marker that reliably indicates whether or not an individual has previously encountered a particular person, place, or thing has generated much interest in both neuroscientific and legal communities (1, 2). EEG-based memory detection techniques have been used to interrogate the brains of suspected criminals or witnesses for neural evidence that they recognize certain individuals or entities, such as those from a crime scene (3, 4). Given the rapid strides being made in cognitive neuroscience research, other parties will almost certainly eventually seek to exploit brain-recording data as evidence of a person's past experiences. The scientific validity of such methods must be rigorously and critically evaluated (5–12). Using multivoxel pattern analysis (MVPA) methods (16, 17) that can be applied to index memory-related neural responses (18–22), we capitalized on the rich information contained within distributed fMRI activity patterns to attempt to decode the mnemonic status of individual stimuli.

A substantial body of neuroscientific evidence demonstrates that an individual's brain responds differently when it experiences a novel stimulus as compared with a stimulus that has been previously encountered (23–26). Other fMRI studies have identified specific brain regions wherein activity appears to track the objective mnemonic history of stimuli, independent of an individual's subjective mnemonic experience (30–35). Neural correlates of past stimulus experience have also been revealed in fMRI and EEG studies of priming (23, 36–38). Although these rich literatures suggest that fMRI memory detection may be possible, it is presently unknown whether the subjective and objective neural signatures of old/new recognition can be reliably detected on individual test trials. Moreover, to the extent that memory detection is possible, the across-subject consistency of the neural evidence affording such classification is unknown.
Altered from Rissman J et al., *PNAS* April 2010

Let's go through from the beginning to identify places where more information or explanation would help us understand this section. That "memory detection techniques have been used" leads the reader to wonder how recently this happened, in what situations, and how it affected the case. Omitting information about when they were used leaves unclear how significant this problem is; if the evidence were never admitted in court, the reliability of these methods might seem less important than if it were. Adding this material after the general statement helps establish importance:

Example development 1: make a general statement specific
EEG-based memory detection techniques have been used to interrogate the brains of suspected criminals or witnesses for neural evidence that they recognize certain individuals or entities, such as those from a crime scene. Indeed, such data was admitted in a murder trial in India in 2008 to establish evidence that the suspect's brain contained

knowledge that only the true perpetrator could possess; this suspect was convicted (3). Results from a slightly different method were even admitted as evidence in a U.S. court case in 2001 to appeal for reversal of a previous murder conviction (4).

Memory detection has not only been admitted as evidence, it may have contributed to a murder conviction; further, such evidence can be used both to support knowledge of the crime and lack thereof. These examples not only help the introduction feel more complete, but also support the argument. In contrast, providing examples of the interest in such technologies would add detail, but would not advance the case for importance as effectively.

→ *Add examples*

At the end of the first paragraph, the focus suddenly switches from EEG to fMRI, which leads any reader, even one familiar with both techniques, to wonder why the authors chose to study something other than the method discussed earlier. This is another opportunity to provide more material, and in this case doing so would improve the narrative flow by filling in a gap in logic:

Example development 2: explain switch in topic
The scientific validity of such methods must be rigorously and critically evaluated (5–12).
Because EEG-based techniques have been argued to suffer several major limitations (SI Discussion), recent interest has focused on applying fMRI as a means to probe experiential knowledge (1). The greater spatial resolution of fMRI data may allow researchers to better detect and more precisely characterize the distributed pattern of brain activity evoked by a particular stimulus or cognitive state. Using multivoxel pattern analysis (MVPA) methods (16, 17…

→ *Fill in logical gaps*

Sometimes the opportunities to expand may not be so obvious, such as when an example is given, but without much detail. For example, in the second paragraph, "specific brain regions" suggests that which regions are activated is known. Stating their names would allow the reader to relate this background with what he or she already knows about them, making the example more informative:

Example development 4: make general phrase specific
Other fMRI studies have identified regions of the medial temporal lobe and posterior sensory cortices wherein activity appears to track the objective mnemonic history of stimuli…

→ *Provide details*

The last opportunity to develop the section might have been more noticeable, especially if you're unfamiliar with memory and learning research. The authors mention "priming," which may not be a familiar term to everyone who reads the paper since *PNAS* has a broad audience. Defining it would help those outside the

field determine how relevant this example of fMRI evidence of memory is to the author's argument:

Example development 4: explain jargon
Neural correlates of past stimulus experience have also been revealed in fMRI and EEG studies of priming, a form of nondeclarative memory in which a previously encountered stimulus is processed more fluently upon subsequent presentation in an indirect (implicit) memory test (23, 36–38).

→ *Define terms*

Another way to develop a draft that this example doesn't show is to elaborate on comparisons so that you provide the same number of pieces of information about each one. To make the comparison flow logically, you could make each piece of information about one item correspond to a detail about the other.

If the approaches for development identified here don't help you find ways to add more information or explanation, having someone unfamiliar with your work read it may help. Record all of his or her questions about the draft and add material that answers them to the section.