Writing your thesis:
A crash course in scientific writing

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Caveat

- My background is in psychology/neuroscience/cognitive science
  - Most examples here are from these fields
  - but most of these principles should apply to all scientific writing
  - And much of non-scientific writing too

  - *If you notice papers your field not following these principles, it might help to ask someone trained in your field (e.g. supervisor, subject librarian, writing center)
    - It could be just sub-optimal writing
    - Or it could be a norm you should follow

Overview

- What makes a well-written thesis?
  - Content & Structure
  - Communication
- Strategies for the writing and revising process

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- What makes a well-written thesis?
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  - Communication
- Strategies for the writing and revising process

What makes a well-written thesis?

- **Content & Structure**

Two broad types of thesis papers

- 1) Empirical
  - You discovered something based on new evidence
  - Structure: Intro – Methods – Results – Discussion (“IMRD”)

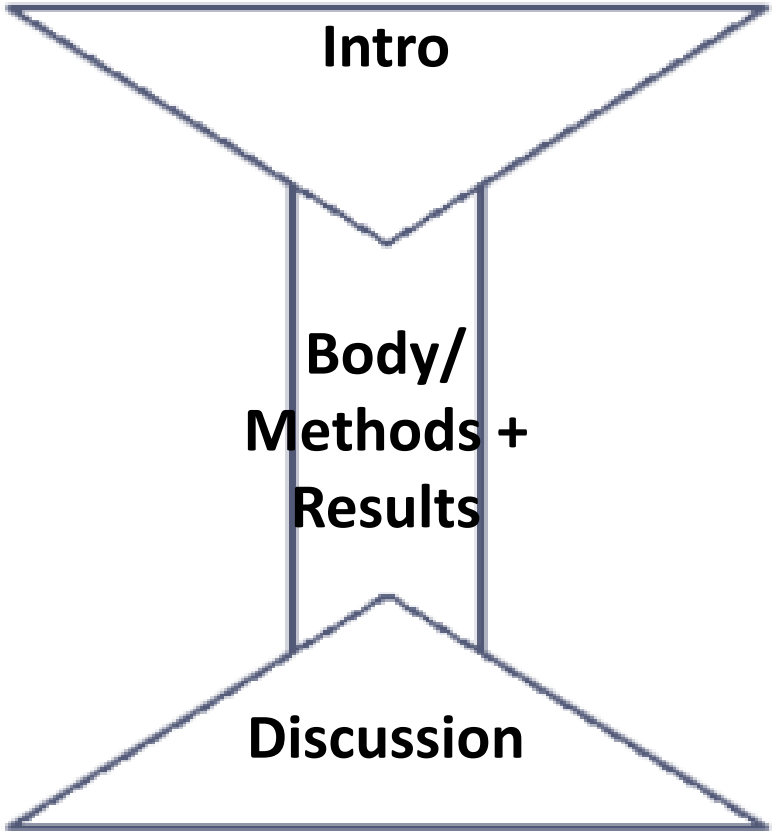
- 2) Theoretical
  - You are using existing evidence to argue for some new idea
  - Structure more flexible (often roughly goes: Intro – Body – Discussion)

- We will discuss both types here (similar principles apply)

What makes a well-written thesis?

- **Content & Structure:**
  - **Goal:** Show others your cool new idea/discovery
  - i.e. Your paper is an **argument** with the goal to convince your reader that your idea/discovery is **interesting** and **plausibly true**

Content & Structure



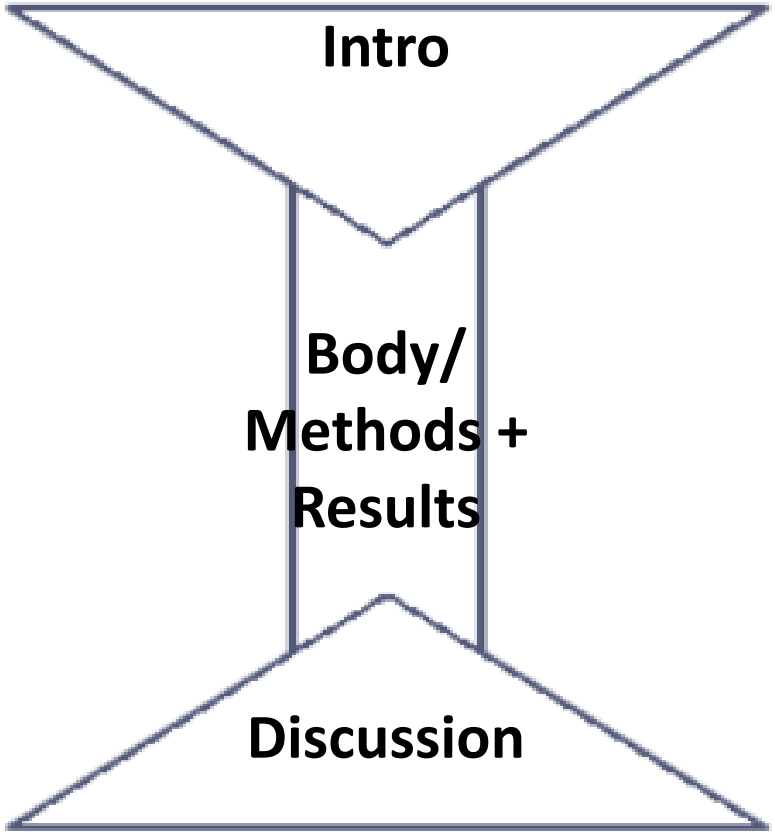
-Show why question is **interesting**
-Set up existing beliefs that will get updated

-Convince others that your idea/discovery is **plausibly true** by presenting evidence and arguments

-Discuss what we can **plausibly** conclude from this and why this is more broadly **interesting**

Content & Structure

Sections may blend more or be labelled differently for theoretical papers



-Show why question is **interesting**
-Set up existing beliefs that will get updated

E.g. this might be in body of a theoretical paper

-Convince others that your idea/discovery is **plausibly true** by presenting evidence and arguments

-Discuss what we can **plausibly** conclude from this and why this is more broadly **interesting**

- Your paper is an argument with the goal to convince your reader that your idea/discovery is **interesting** and **plausibly true**

- **What does this mean?**

What makes something **interesting**?

Something is **interesting** if:

- It's **important** (e.g. to people in general, people in the field)
- There is something **new** to be learned

What makes a claim **plausibly true**?

A claim is **plausibly true** if:

1. The evidence is consistent with the claim
2. Alternative explanations for this evidence are not as good

Claims should be made with **appropriate confidence** based on this

What makes a claim **plausibly true**?

Why these things? Bayes theorem! (i.e. probability math)

Degree of belief in claim **AFTER** considering your evidence

Belief in claim should **increase** if you evidence **is consistent with the claim**

Degree of belief in claim **BEFORE** considering your evidence

$$P(\text{claim} \mid \text{evidence}) = \frac{p(\text{evidence} \mid \text{claim})}{p(\text{evidence, if your claim or some alternative is true})} * P(\text{claim})$$

Belief in claim should be **reduced** if your evidence can be **explained by plausible competing alternatives**

What makes a claim **plausibly true**?

Different parts of paper focus on parts of Bayes theorem

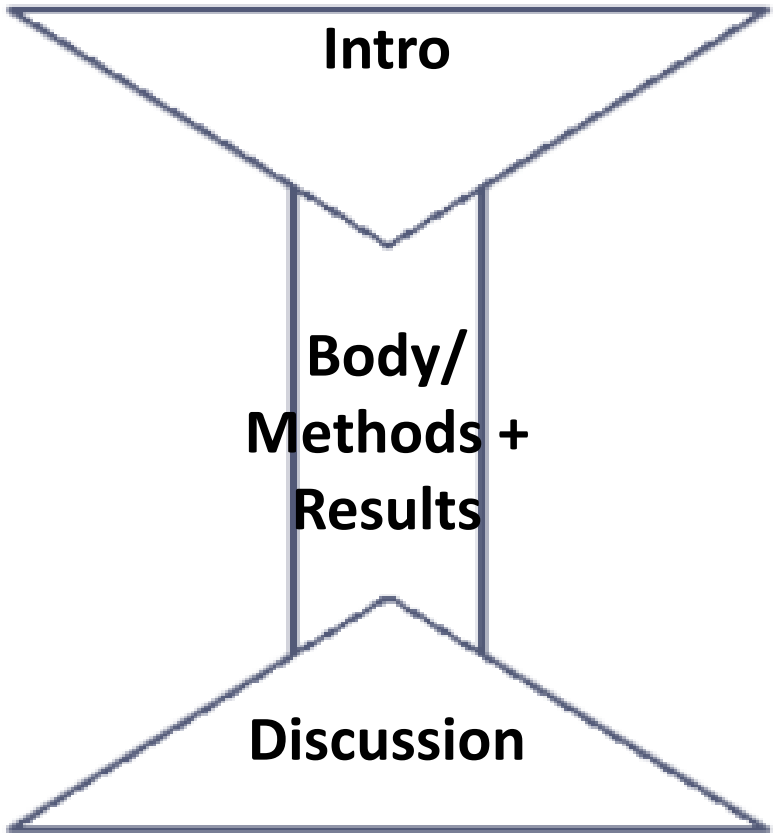
DISCUSSION
Tells us what we should believe after all this

BODY
Provides not-yet-considered evidence

INTRODUCTION
Tells us what field currently believes about something

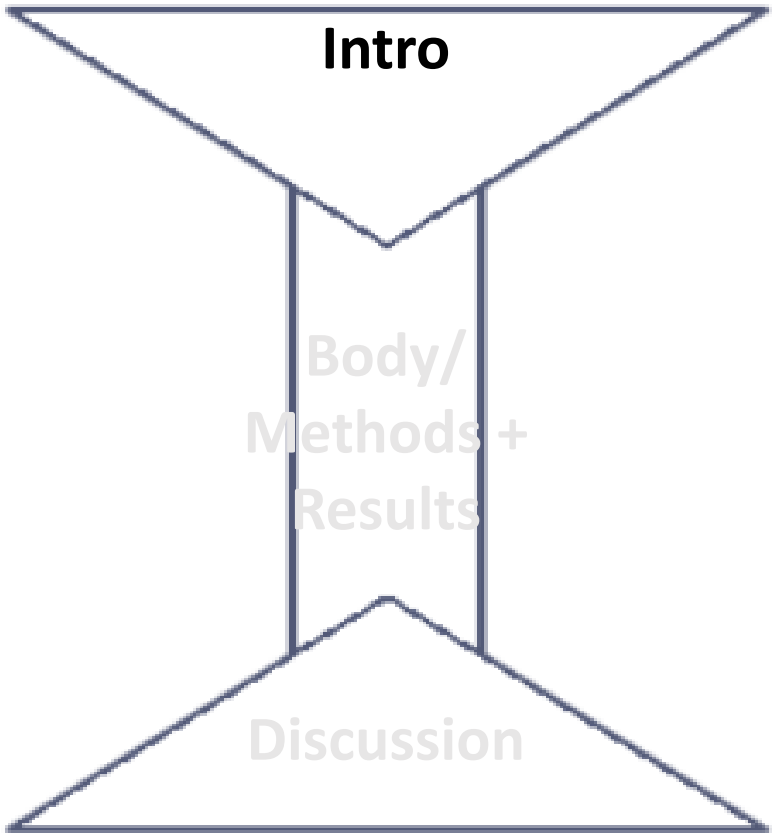
$$P(\text{claim} \mid \text{evidence}) = \frac{p(\text{evidence} \mid \text{claim})}{p(\text{evidence, if your claim or some alternative is true})} * P(\text{claim})$$

BODY/DISUCSSION
Tries to rule out alternative explanations



How do different parts of a paper address these goals?

Introductions



Introductions

- Goal of the content:
  - Show that there is something **interesting (new and important)** to learn here
  - **Set up existing beliefs** that will get updated by your argument

Showing interestingness: Show that the topic or question is **important**

- **Introduce the broad topic/question and show <u>why regular people should care</u>**
  - Does your work help understand some important but not-fully-understood real-world phenomena, or solve some important real-world problem? Tell this to the reader!
  - E.g. how do people learn so well with limited information? how do we stop racism?
  - E.g. Opening of paper on how people use simplicity when evaluating explanations:
    - "People often need to evaluate explanations: for example, consider a doctor evaluating possible explanations for a patient's symptoms, or a scientist comparing competing scientific theories. Indeed, evaluating explanations is a key aspect of human reasoning, with consequences for learning, inference, and beyond (e.g., Keil, 2006; Lombrozo, 2006, 2012, 2016)"
  - Sometimes starting with a striking, vivid, intriguing, or important real-world example can help hook readers, engage them with the topic, and see how it applies to the real world
    - "*The man intentionally gished the little girl, who cried.* Gish is not a real word, but when people read this sentence, they automatically judge the man to be doing something immoral.1 What causes this intuitive moral judgment?" (Schein & Grey, 2018)

Showing interestingness: Show that the topic or question is **important**

- **Introduce the broad topic/question and show <u>why regular people should care</u>**
  - Time spent to show this can vary (can sometimes skip if really obvious), but its especially useful where importance of the work may not be obvious to readers
    - (e.g. aimed at a broader audience, for obscure topics)
  - Don’t overstate the importance of the topic, or start too broad so that its largely irrelevant to specific topic.
    - E.g. “since the dawn of time…”
  - But don’t start too narrow or most readers will not care about the topic

Showing interestingness: Show that the topic or question is **important**

- **Introduce the broad topic/question and show <u>why regular people should care</u>**
  - Q: In explanation example (below), how might we make the opening more or less broad? When would this be appropriate or inappropriate?
  - E.g. Opening of paper on how people use simplicity when evaluating explanations:
    - "People often need to evaluate explanations: for example, consider a doctor evaluating possible explanations for a patient's symptoms, or a scientist comparing competing scientific theories. Indeed, evaluating explanations is a key aspect of human reasoning, with consequences for learning, inference, and beyond (e.g., Keil, 2006; Lombrozo, 2006, 2012, 2016)"

Showing interestingness: Show that the topic or question is **important**

- **Introduce your more specific question, and show why <u>people in that field should care</u>**
    - What broader debates, questions, theories, puzzles, or approaches in a field does your work contribute to?
    - What other beliefs might people in the field have to update based on your work?
- This also typically involves **setting up existing beliefs in the field** that will get updated by your argument
    - Providing **background/context** so reader can understand what you are adding that's new
    - Focus on what is **relevant** to setting up your contribution though
        - Don't review everything vaguely related
        - Its still part of an argument for why your work is interesting!

Showing interestingness: Show that the topic or question is **important**

- **Introduce your more specific question, and show why <u>people in that field should care</u>**
  - e.g. ‘Does heart rate variability correlate with sleep quality in this sample?’
    - Uninteresting on its own but maybe interesting if it tests between two competing theories about sleep quality and stress responses
    - If so, set up these competing theories first as context.

Showing interestingness:
Show that that there is something **new** to learn here

-E.g.

- Some gap you can address,
- Some knowledge you can extend to an understudied area,
- New or competing hypotheses to be tested,
- A possible new solution to a problem,
- A new method/technique that can offer new insights,
- Some new, unexplored connections between ideas
- A new criticism or counterargument

- Make sure its super clear and explicit **what your contribution is**

Typical introduction structure

- Structured to go from broad to narrow
    - 1) Broad topic/question and its importance
    - 2) Background context to set up more specific unknown you will address
    - 3) Your specific new contribution to address this unknown
        - Theoretical: thesis you will argue for, new approach you will take etc.
        - Empirical: specific question you will address, new hypothesis you will test, new approach you will take to test this, etc
- Often summarize these 3 things briefly in an opening paragraph
    - then expand on it afterwards in rest of intro (for empirical papers) or start of body (for theoretical papers)
- Last paragraph typically overviews how your work will address this
    - Often like an outline (e.g. in 3 studies we test …. Study 1 tests …)

Actually more like this

Example IMRD paper intro (summarized)

Poverty is widespread and very problematic. How do we get rid of poverty?

Despite the important focus on addressing poverty through structural changes, here we explore whether behavioural interventions might also be useful in reducing poverty.

Causes of widespread poverty are often structural (e.g. laws, policies), so most work has focused on addressing structural issues.

But even if the main causes are structural, changing personal behaviours (e.g. managing finances) might also help individuals in poverty

Behaviours might often be more easily changeable, but they haven't been considered as much as a target of intervention.

Here we examine whether helping people change their behaviours in terms of better managing their finances might be an effective way to help reduce their poverty levels.

As a first step in testing this, we test whether using a budgeting app might help lower-income people spend less money over the course of a month.

Broad question
(Shows importance to regular people & broad unknown)

Opening para. also briefly summarizes unknown and our new contribution in response to it

Background to set up the more specific unknown that will be addressed
(also shows why people in the field should care)

Moderately specific question/contribution
(and brief outline of our approach to answering it)

Most specific question /contribution
(and a slightly more detailed outline of approach)

Totally made up example.

Example opening paragraph from a theoretical paper

Emotion regulation, defined as 'all of the conscious and nonconscious strategies we use to increase, maintain, or decrease one or more components of an emotional response' [1], encompasses a wide array of strategies, ranging from implicit to explicit and reactive to effortful (see Glossary), that can be applied in anticipation of or in response to an emotional stressor [2,3].

Yet, despite the range of processes studied under the rubric of emotion regulation, including a number of attentional processes, **the affective biasing of attention is not typically considered as a form of emotion regulation**.

'Affect-biased attention' refers to selective attention processes [4] by which sensory systems are tuned to favor certain categories of affectively salient stimuli before they are encountered.

In this opinion article, we draw on evidence from cognitive neuroscience and clinical and developmental psychology to **argue that affect-biased attention is a form of emotion regulation**.

We argue that affect-biased attention, rather than being merely symptomatic of a reactive emotional response to a stimulus, is proactive in shaping perceptual experience.

We further argue that habitual deployment of affect-biased attention has the potential to influence emotional responses to stressful events.

- Todd et al. (2012)

'Affect' means 'emotion'

Introduce broad topic
presumes most readers find this broad topic important already

Background to set up more specific unknown that will be addressed
(also shows why people in the field should care)

Moderately specific thesis statement
(and brief outline of approach to answering)

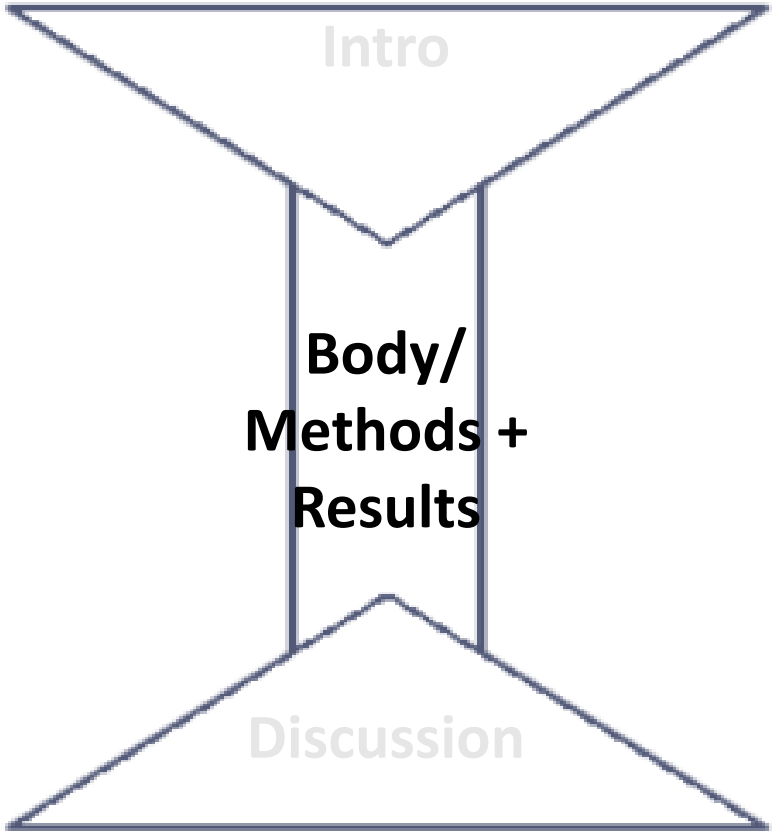
Most specific version of thesis statement(s)
(and a slightly more detailed outline of approach)

- 'Body' section could then start by elaborating on some of these 'introductory' ideas
  - (e.g. explain more about existing theories and how they are limited by not considering affect-based attention, why this may be especially important to consider)

Notes on introduction structure:

- Intros are not limited to 1 paragraph
- Your thesis/objective statement is not limited to 1 sentence
- Your thesis/objective statement(s) don’t have to be the last sentence of the first paragraph
  - But should be obvious to reader where it is, and around there is a good place to put it at least some version of it!

Body / Methods + Results



Body / Methods + Results

- Goal:
  - Convince others that your idea/discovery is **plausibly true** by presenting evidence and arguments

RECALL: What makes a claim **plausibly true**?

A claim is **plausibly true** if:

1. The evidence is consistent with the claim
2. Alternative explanations for this evidence are not as good

Claims should be made with **appropriate confidence** based on this

- Your ability to show that your claims are plausibly true depends a lot on the evidence you have available
    - Much of this is determined before the writing phase!
- So how can you address this goal while writing?

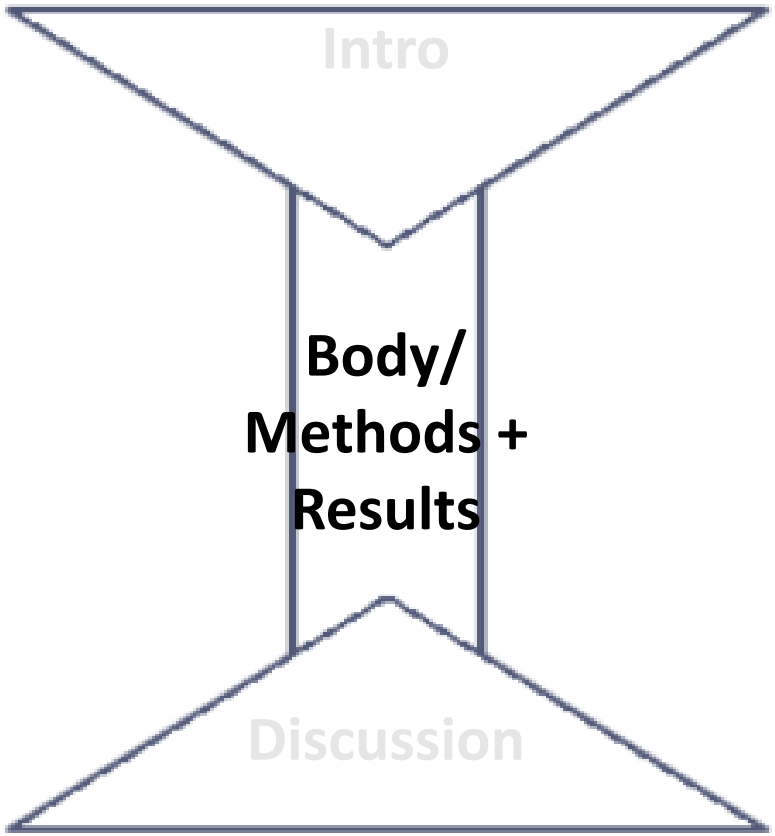
- Make sure the evidence is truly consistent with the claim, and convey this clearly to the reader
    - Some things to avoid:
        - Not making it clear to reader how your evidence fits with a claim
        - Selectively mentioning only evidence that fits with the claim, and ignoring conflicting evidence
            - E.g. not reporting a failed replication in your data. Citing only supportive studies and not conflicting studies

- Make sure alternative explanations for this evidence are not as good, and conveying this clearly to reader

  - Make sure you are ruling out ‘random chance’ as an explanation for data, as best you can
    - Some ways to do this:
      - Stats tests (p-values)
      - Show that there are consistent results across many different cases (e.g. multiple studies, different methods, samples, sub-groups, analyses, etc.)

  - Also take some time to brainstorm other plausible competing explanations (e.g. imagine what a very critical reader would think)
    - Then think about if/how you can address these in your work
      - Maybe something in your data, something in other research, or some argument makes this less plausible?
      - Maybe this wouldn’t fully change your conclusion even if it was true?
      - Maybe you can make a weaker, narrower, or slightly different claim, if you can’t rule this out fully?

- Make sure your claims are made with appropriate confidence given this
  - Often a weaker/narrower claim is justified where a stronger/broader one isn’t
  - But don’t under-state when something really is justified!



How do we structure methods + results / body sections to convey this?

IMRD papers

- Methods and Results

- I.e. cases where you are presenting your own new evidence

Methods

- Goals:
  - Clearly convey what you did so that:
    - readers can understand and evaluate how it addresses your question
    - and can understand and evaluate your results and conclusions
  - Bridge between intro and results/discussion

Methods

- Writing principles that help achieve this goal:

- Make sure **links to introduction** (your questions/objectives) are clear

  - For key aspects of methods, often helps to say **WHY** you did something, not just what you did

  - E.g. "**To measure explicit attitudes**, participants responded to …."

    - Don't need to do this for things that are less relevant to key question (e.g. fMRI scanner parameters)

Methods

- Writing principles that help achieve this goal:

- **Provide enough detail** about what you did so that readers can evaluate its relevance to the question and results
  - (while still being **concise**)

  - Put more detail for aspects of methods that are **more important** to question/conclusions, or are **less well-established**

    - E.g. for key questions you invented to test main outcome, list exact question wording
    - But if it's a well established survey, can just describe briefly and put a citation
    - Or if its not that important to your point (e.g. demographics, detailed instructions) don't need much detail
      - Extra details that might help someone exactly reproduce your experiment can be put somewhere else (appendix, online, supplementary materials)
      - **Check norms on doing this

Methods

- Structure of methods section:
  - Often helps to give a brief high-level overview at the start
    - (orients readers and links to intro)
  - Can split into whatever subsections are helpful

    E.g.: participants, materials, procedure.
    - And even subsections within these
      - (e.g. implicit attitude measures, explicit attitude measures, memory test)
  - If things happened in a specific order (e.g. procedures), it usually helps to write things in that order

Results

- Goals (similar to methods):
  - Clearly convey what you did (e.g. stats tests) and found so that:
    - readers can understand and evaluate how it addresses your question
    - and can understand and evaluate your results and conclusions

How to do this? Generic structure of results paragraphs

Example paragraph:

Hypothesis 1 predicted that wealthier people tend to be happier.

To test this in the current sample, a linear regression was performed, predicting participant's subjective wellbeing scale responses from their self-reported household income, while controlling for age and number of household-members (all variables standardized).

As hypothesized, participants with a higher household income on average reported greater subjective wellbeing (*B* = 5.29, *p* < .001; see Figure 1).

This suggests that wealth might be an important contributor to people's happiness in this context.

Next paragraph:

To further understand why this might be the case….

[Transition +] Conceptual question to be addressed

- Links to intro

How it was tested in terms of concrete variables

- In enough detail that a stats-educated person could understand, evaluate, and replicate if needed
  - May need more explanation for unusual stats methods

What the results were in terms of concrete variables

- Should be understandable by someone with no stats knowledge (if they ignore the stats in brackets)
- Say the actual finding (e.g. 'reported greater wellbeing' not just 'was associated with wellbeing')
- Figures often help make it easier to process and interpret

Conclusion at conceptual level [+ transition]

- Links to conclusions/discussion

Repeat for next question

When interpreting your own results (or results of other research) make sure you make your claims with **appropriate confidence**

- You can usually state **confidently** what happened in the **study** (e.g. for these specific participants), if statistics clearly support it:
  - "participants with a higher household income on average reported greater subjective wellbeing"

- However, when **generalizing** beyond this specific dataset (e.g. to 'people' in general), typically **lower confidence** is justified
  - "This **suggests** that wealth **might be** an important contributor to people's happiness in this context"

  - Examples of confidence-reducing phrases:
    - 'suggests' 'implies' 'is consistent with the idea that', 'It thus appears that' …

  - If evidence is even weaker than usual, should use stronger confidence-reducing phrases:
    - E.g. 'there is mixed evidence that…' 'this suggests that perhaps X, but it is unclear because…'

Order of paragraphs in results sections

- Use whatever order makes most logical sense. Something like this can often work:
    - Preliminary checks
        - Optional reasonableness checks on data
            - e.g. was independent variable successfully manipulated?
            - Descriptive statistics e.g. to check if there was reasonable task performance
            - Can also describe data preparation here – e.g. any reasons for excluding data
    - Main analyses
        - Generally start with key results that are most relevant to main question(s)
    - Secondary/Follow up analyses:
        - After main analyses, additional analyses may e.g.:
            - Help better understand why any expected or unexpected results occured
            - add additional support or nuance to conclusions (e.g. was finding robust across measures, analysis decisions, etc?)
            - try rule out specific alternative explanations (e.g. does finding hold when controlling for X?)

Using other people's work as evidence

(*Applies to theoretical papers, and in intro/discussion of IMRD papers*)

- Recall our goal: Convince others that your idea/discovery is **plausibly true** by presenting evidence and arguments

- When referring to other people's work, you are using it to **argue for some point you are making**

Using other people's work as evidence

- Writing principles to help do this (like when presenting your own evidence):
  - Make sure you **clearly link evidence** to the point you are making
    - E.g. Make sure you explicitly link evidence to your point
    - Your point may be different than original authors' – e.g. your point may be how previous work has limitations that you will address
    - Generally, organize paragraphs around the point you are making, not necessarily around a specific paper
  - Provide enough evidence or detail so reader can evaluate evidence and be convinced of your point
  - But be concise and focus on what is most relevant
    - Put more evidence or detail if its **more important** to your argument or **less well-established**

Examples of using other people's work as evidence

- **Very concise descriptions:**
  - "In addition to influencing judgment and decision-making, [emotions influence] how people process information. Such influences have been observed across a range of tasks, including problem-solving [18], stereotyping [19] and persuasion [20]." (Clore, Huntsinger, 2007)
  - Very abstract description here, good for less important or more well-established points

- **Moderately concise descriptions:**
  - "Studies of learning and memory have shown that brain oscillatory activity is relevant to [learning]. For example, successful memory formation is associated with the tighter coupling of the firing of individual neurons to the theta frequency [50]. In addition, stimulation during theta peaks is particularly effective in inducing long-term potentiation in the hippocampus, whereas blocking theta prevents the induction of long-term potentiation [51,52]. It thus appears that neural oscillations provide support for neural plasticity." (Knowlton et al., 2012)
  - Intro and conclusion sentence tie evidence to authors' high level point [in red]
  - Enough concrete detail that reader can get the gist of the results and evaluate relevance
  - Paragraph was organized around a key point being argued for, and contained multiple studies

Examples of using other people's work as evidence

- **More detailed description**

'Affect' means 'emotion'

"The affect-as-information hypothesis proposes that affective influences on judgment depend on the affect being experienced as a reaction to the object of judgment. An interesting test has come from a mock trial in which jurors' attributions for their feelings were varied.

Accountancy students served as jurors and rendered decisions about the culpability of an accounting firm in a corporate bankruptcy case [12]. Different versions of the trial transcript were presented with varying amounts of detail about the distressing consequences of the bankruptcy. The more distressed the jurors felt about the harmful consequences of the bankruptcy, the more they judged the accounting firm liable. Some jurors, however, had been asked before the trial began to rate their anxiety about being a juror. Those jurors were significantly less likely to reach verdicts that went against the firm, because their distress seemed to be about having to render a decision rather than about the effects of the bankruptcy.

[Here], we see that whether or not affect influences judgment depends on implicit attributions about its cause. Without a salient cause, affect tends to be promiscuous, attaching itself to whatever is available, which is why moods can influence even irrelevant judgments." (Clore, Huntsinger, 2007)

- Again, red text makes clear how evidence supports overall point being made
- More detail here helps support a key point that is not well-established (key prediction of the theory being argued for)
  - If multiple similar studies exist, it is sometimes helpful to illustrate one example in detail and then briefly cite others
- Q: why else might someone want this much when describing a study?
  - More detail may also be useful if specifics of methods are relevant – e.g. if you think there is an issue with existing methods/interpretations of results, which your paper addresses

Examples of using other people's work as evidence

- Using more detail and more evidence for less well-established claims

  - BAD:
    - "Implicit and explicit attitudes are based on separate attitude representations (Jones, 2001)"
      - This is controversial, so not convincing without explaining evidence

  - BETTER:
    - 'Existing work suggests that implicit and explicit attitudes may be based on separate attitude representations. **For example, even when people show implicit negative attitudes towards black people (i.e. faster reaction times when associating white-good than black-bad), these implicit attitudes have been found to be unrelated to people's explicit attitudes towards black people (i.e. reported liking/disliking)** (Jones, 2001; see also …other citations)'
      - A skeptical reader will be more convinced if you show them the evidence
      - Even if they reject your abstract claim they a least know what evidence they have to re-explain
      - Note how we also used confidence-reducing words in the abstract claim, and added extra citations to show that this replicates

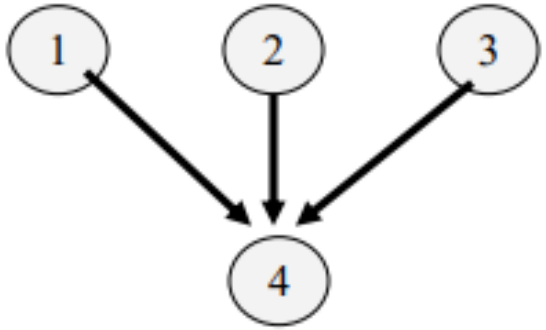
Theoretical papers - Body

Argument structure

- Much more flexible structure than methods/results sections
- Use what best fits your content and argument

Argument structure

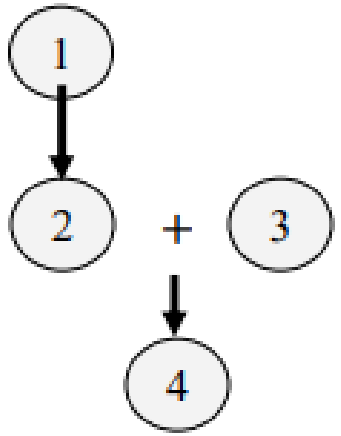
- Don’t be stuck in the typical high school essay structure
  - 3 independent points supporting conclusion



Argument structure

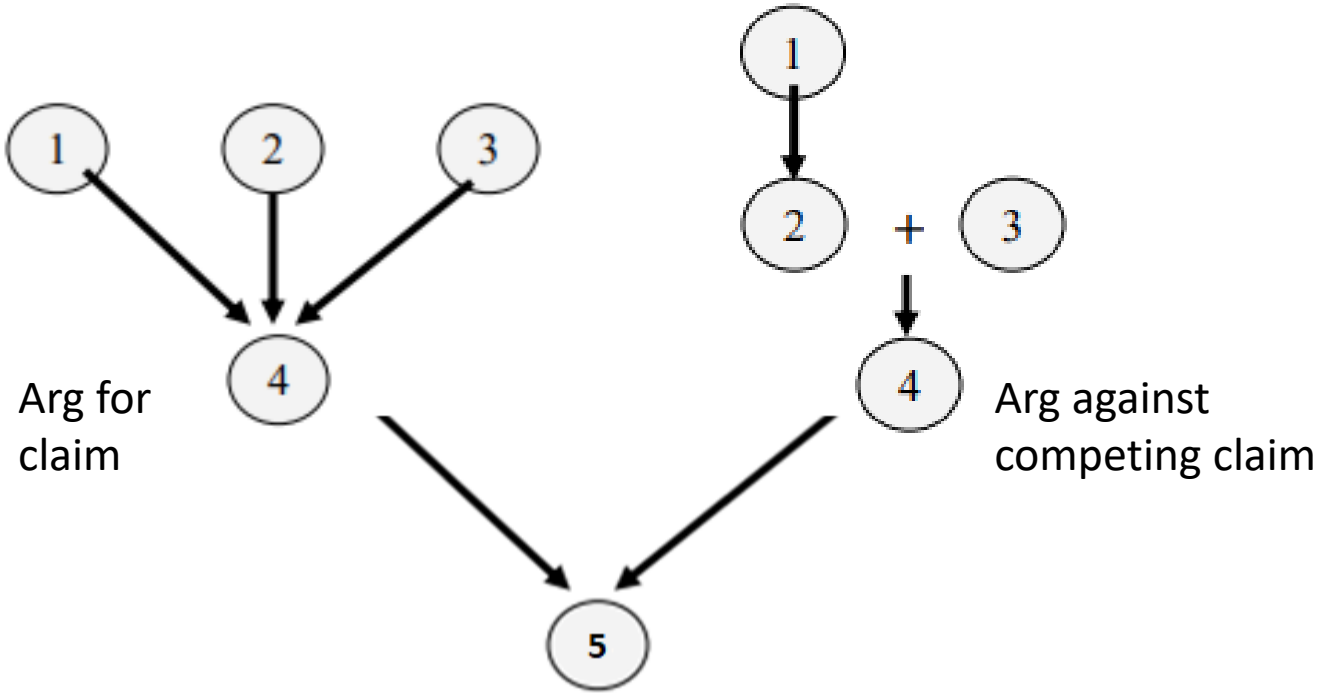
- Use whatever structure is needed to best support or explain your point

- E.g. arguments can contain:
  - subarguments
    - 1 supports 2.
  - linked points
    - 2 and 3 combine to support 4



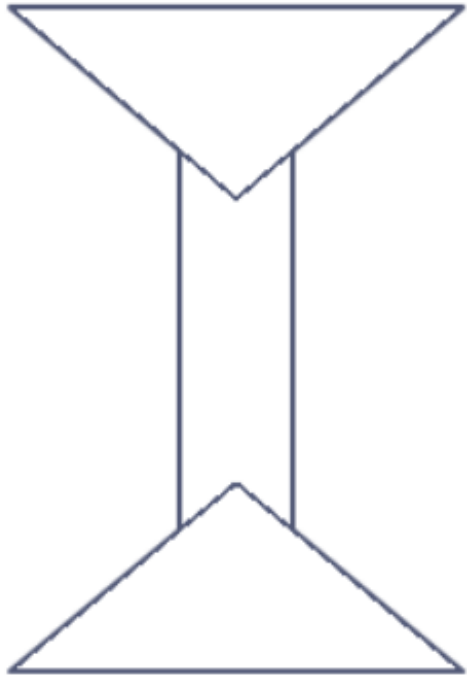
Argument structure

- Multi-part arguments:
  - E.g. also ruling out a competing claim



Ordering the body of your argument

- Use whatever order of ideas lets you convey things most clearly and compellingly
- Often helps to think roughly of the IMRD structure (where much of this could go in paper ‘body’)



- Intro paragraph(s)

****This structure is not always strictly followed****

- Body
  - Start by setting up an important unsolved question
  - Provide relevant background
  - Then present your solution + evidence for it
  - Address any alternative views, counterarguments etc
  - Discuss any broader implications (e.g. new predictions etc)
- Conclusion paragraph(s)

Example summary of a real theoretical paper

OPENING

Linking research on the brain with corresponding behaviours is important but difficult

BODY:

1) Typical memory experiments are limited because cognitive/neural processing is too rapid to be mapped onto slow behaviours (e.g. button presses)

2) Because eye movements can reflect rapidly-changing memory processes, they provide an ideal means to link cognitive and neural processing

3) Several studies have applied this approach, and show us various things about memory that we didn't know before

4) Some brain measures (e.g. fMRI) are also too slow for this approach to work. There are some techniques that can help with this, but also faster brain measures (e.g. in animals) can help in the future

5) There are several other approaches to measuring rapid cognition, which could be productively combined with this approach in future research

CONCLUSION (Summarized main points, broad future directions, and key broad takeaway)

OPENING:

Set up a broad important unsolved question

BODY:

1) Further set up the problem and context

2) Proposed solution

3) Providing evidence of how this solution is useful

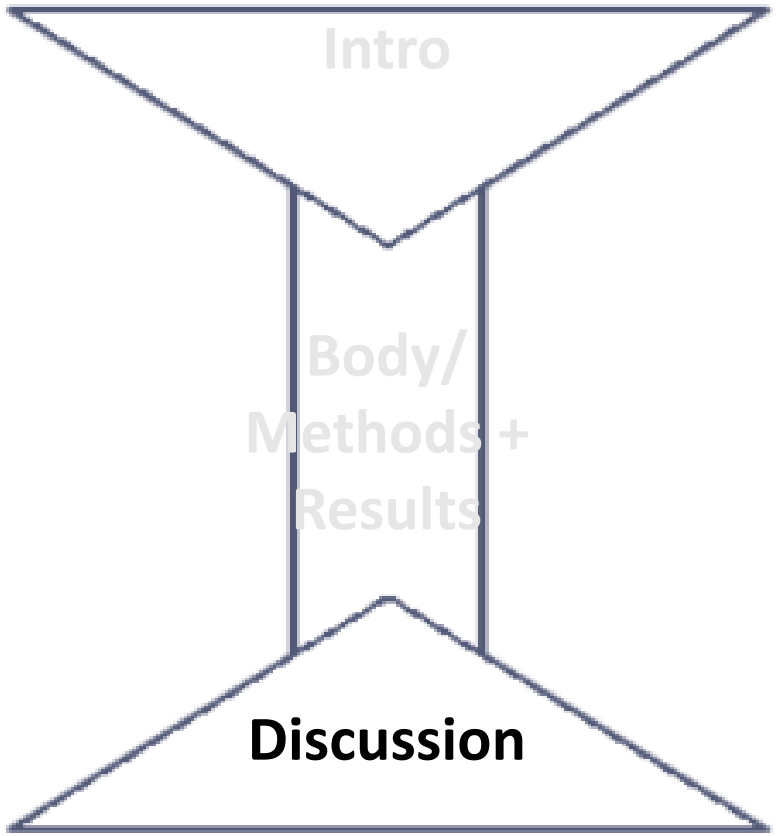
4) Addressing potential limitations

5) Future directions and relationship to other work

CONCLUSION

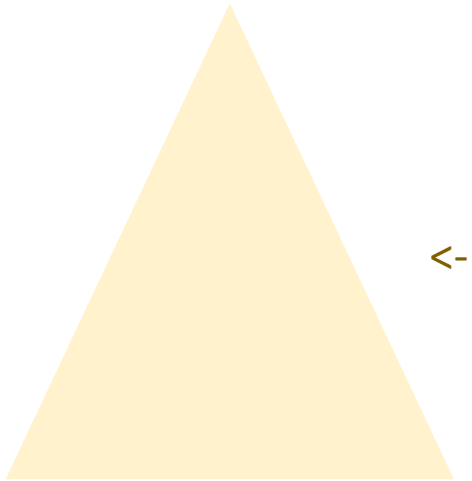
Kragel, J. E., & Voss, J. L. (2022). Looking for the neural basis of memory. *Trends in cognitive sciences*, *26*(1), 53-65.

Discussion



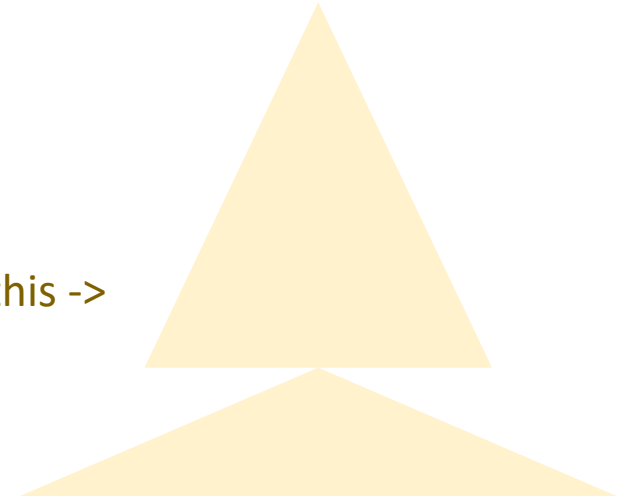
Structure and content of discussion section

- GOAL: Discuss what we can **plausibly** conclude from this and why this is more broadly **interesting**
  - Reverse of introduction - going from narrower to broader



<- like this

or this ->



For empirical papers:

1. Summarize results and narrow conclusions regarding your specific question
2. Discuss conclusions and implications for broader literature
   - i.e. How should people in the field update their beliefs?
     - E.g. what is consistent/inconsistent with previous work, what you add that is new, how to make sense of unexpected results, etc

Optional:

3. Potential limitations of this work
4. Practical implications of this work
5. Directions for future research

6. Last paragraph is often a high-level summary of main conclusions, implications, and take-home message

Order of these is somewhat flexible, can be mixed in with each other or #2 above

Generally put limitations in middle so first and last thing people think about to be strengths

#4 & 5 are often broader and more forward looking, so tend to be towards end

- For theoretical papers:
  - “Discussion”/”conclusion” section can vary in length
    - E.g. just a conclusion paragraph vs. several sections at end of body
  - Can often include the same types of content (but again more flexible)
  - e.g.
    - Summarize key points
    - Relationship to other work, and how you add to it
    - Addressing potential limitations/counterarguments
    - Practical implications
    - Directions for future work (new predictions your idea makes, new questions it opens up)

How to address potential limitations?

- Some examples of potential limitations:
  - possible methodological limitations
  - possible alternative explanations for results
  - things that may limit generalizability to other contexts
  - perspectives that have not been considered
  - counter-evidence from other work that seems to go against your claim

How to address potential limitations?

- Addressing limitations is part of making plausible claims
  - Don’t just state limitations
  - Instead use this discussion to try rule out competing alternative explanations, if possible
  - or adjust confidence in your claims appropriately

How to address potential limitations?

- Typically do some combination of…
  - Identifying limitations
  - Explaining how they might affect your conclusions
  - Arguing (if possible) why a limitation doesn't completely undermine the value of your research
    - E.g. problems are relatively minor, less serious than with other approaches, or previous work
  - Proposing a direction for future research to address this
  - Re-emphasizing what can be concluded despite this limitations (with appropriate confidence)
    - E.g. we know this occurs at least in the current context
    - These results support this idea, even if not definitive
    - we know that one of these two things is going on, both of which are interesting answers to the broad question

Example of addressing limitations

Some potential sources of bias in this study should be carefully considered. Errors in spinal forces estimated by our EMG-driven model may be due to factors such as cross-talk, bad representation of deep and wide muscles, EMG normalization, ignoring spine translations and considerations of L5S1 moments only (Arjmand et al., 2009; DeLuca and Merletti …). However, these sources of error are not likely to affect our comparison between control modes, as they are not likely to vary strongly between the control conditions.

Koopman et al. (2019). The effect of control strategies for an active back-support exoskeleton on spine loading and kinematics during lifting. *Journal of Biomechanics* Volume 91, pp. 14-22

In this example, the authors:

- Argue for why this limitation does not actually change what we can conclude

Example of addressing limitations

Even though our findings broaden the scope of understanding of multilevel factors and its influence on the association between school-related parental involvement and adolescents' academic achievement, this study must also be considered in light of several limitations. First, Add Health data are based on self-reports by adolescents. Although other researchers have used these self-reported measures, using self-report on all constructs could cause shared method variances (Marsiglio & Lamb, 2000)…. However, some studies have suggested good reliability of self-reports (e.g., self-reported grades; Tillman, 2008) and moderate consistency in parent- adolescent reports (Rescorla et al., 2013). Future studies may want to consider incorporating adolescents' reports as well as the perspectives of other individuals (i.e., parents) as this is likely to reduce the influence of shared variance…. Despite these limitations, this study addressed an important gap in the current literature. Findings from this study may facilitate practitioners…

Gordon, M and Ming Cui (2014) School-Related Parental Involvement and Adolescent Academic Achievement: The Role of Community Poverty. *Family Relations*, Vol. 63, No. 5 pp. 616-626.

In this example, the authors:

- Remind us of contribution
- Say how this is no worse than other work
- Say how self-report might not be so bad
- Remind us of how we still learned something important despite this

Overview

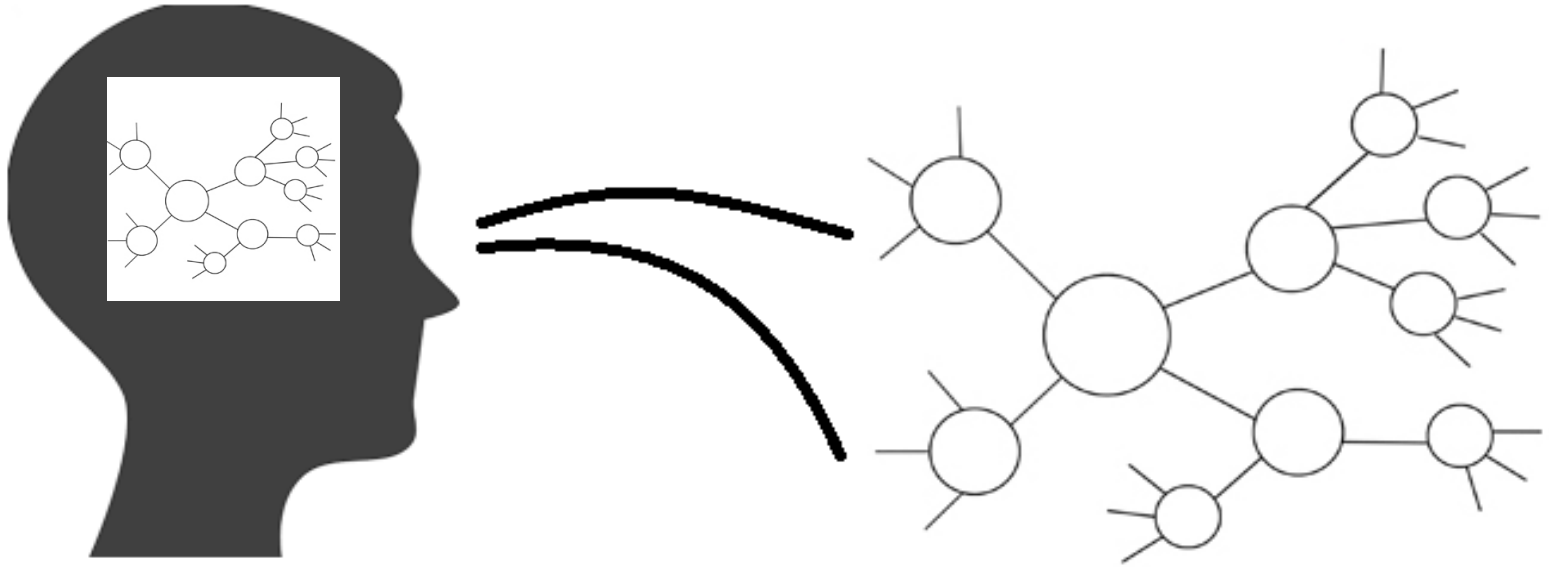
- What makes a well-written thesis?
  - Content & Structure
  - Communication
- Strategies for the writing and revising process

What makes a well-written thesis?

- **Communication**:
  - **Goal:** Communicate your ideas in a way that is easy for others to understand

Communication

- You may have this complex structure of ideas
  - But you need to communicate it to people in a way they can easily understand
    - **one word/sentence/idea at a time**
    - through the funnel of their **limited attention/working memory**
    - to get that same structure **rebuilt in the reader's long-term memory**

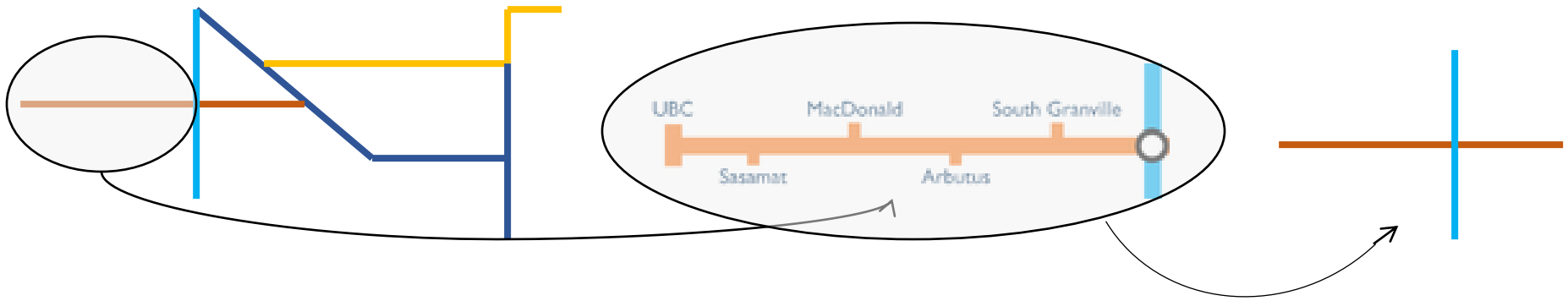


- Imagine you are trying to convey to someone the layout of a city
  - You can only show people part of it at a given time.
  - How do you do this?

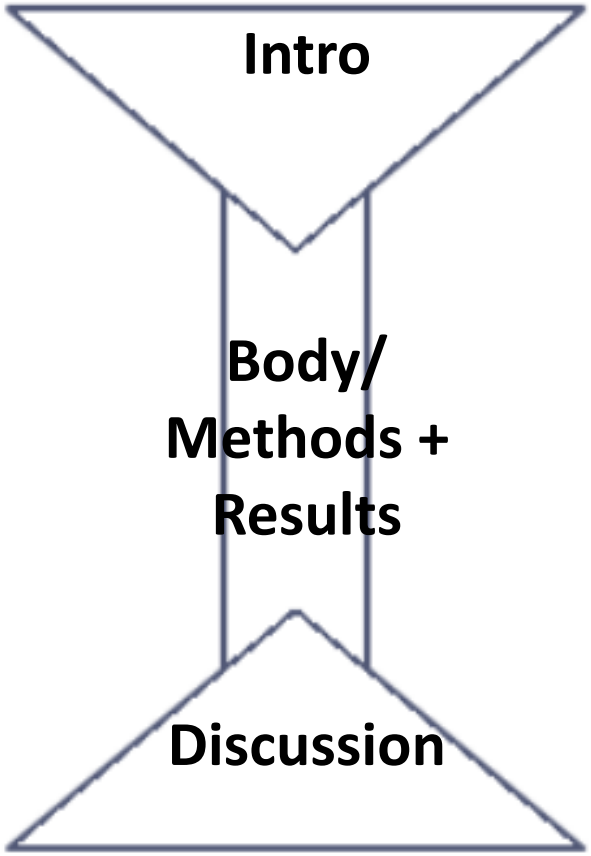
General principle 1:
Switch between levels of abstraction

- **Start zoomed out**: Give people a **big picture** overview
- Then **zoom in**: Give them **details** of one part at a time
- Then **zoom out** to see where we got to in the **big picture** (and transition to the next part)

  - Helps deal with limited working memory capacity (since can't think about big picture and details at once)
  - Giving the big picture first lets readers have somewhere to put the details as they get them
    - Can put them down into long-term memory, instead of holding it in working memory



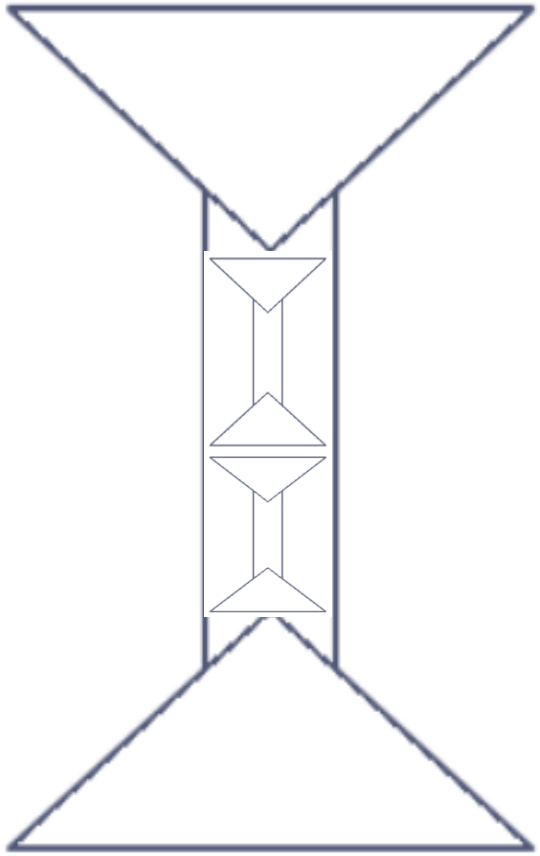
Hourglass structure



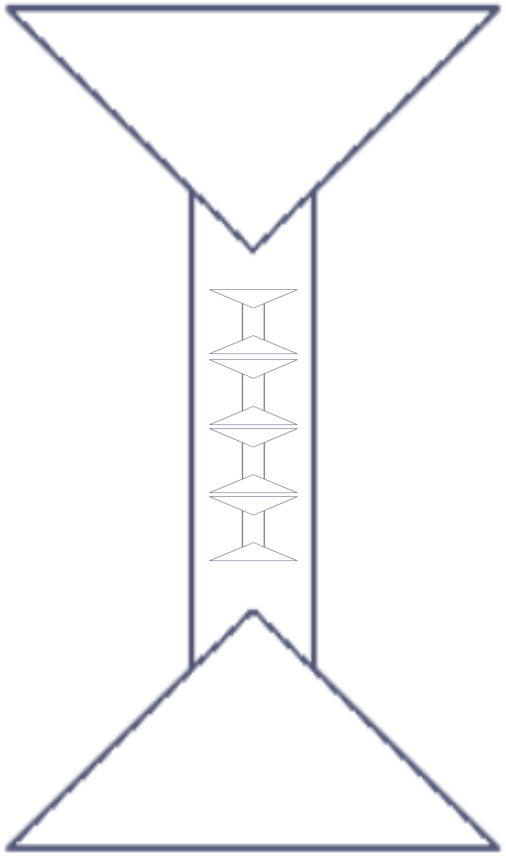
- Start with **bigger picture**
- **Details**
- Returns to **bigger picture**
  - And **transition** to what might come next (e.g. takeaways, future work)

Hourglass structure

Each section:



Each paragraph:



-Introductory sentence/paragraph **(big picture)**

-Body **(details)**

-Conclusion sentence/paragraph **(big picture + transition)**

Example paragraph from before:

"Studies of learning and memory have shown that brain oscillatory activity is relevant to [learning]. For example, successful memory formation is associated with the tighter coupling of the firing of individual neurons to the theta frequency [50]. In addition, stimulation during theta peaks is particularly effective in inducing long-term potentiation in the hippocampus, whereas blocking theta prevents the induction of long-term potentiation [51,52]. It thus appears that neural oscillations provide support for neural plasticity." (Knowlton et al., 2012)

Hourglass structure

- Even within parts of paragraphs or sentences, it often helps to follow each abstract claim with a concrete example

"People often need to evaluate explanations: for example, consider a doctor evaluating possible explanations for a patient's symptoms, or a scientist comparing competing scientific theories.

Indeed, evaluating explanations is a key aspect of human reasoning, with consequences for learning, inference, and beyond."

Keep the big picture versions **as informative as possible**

…without overwhelming people with details

Examples:

- The first sentence of a paragraph should state its main point
  - If main point is buried in the middle/end of a paragraph, often clearer if you move it up front
    - When editing, it may help re-read your paragraphs and highlight main point to see where it is

Keep the big picture versions **as informative as possible**

…without overwhelming people with details

Examples:

- Headers and figure titles should state the main point or conclusion
  - E.g. Headers:
    - “Background” – not informative
    - “The relationship of implicit and explicit attitudes” – better
    - “Implicit attitudes dissociate from explicit attitudes” – even better
      - now you told us the actual claim, and it didn’t take any more words to do it!

Keep the big picture versions **as informative as possible**

…without overwhelming people with details

Examples:

- Headers and figure titles should state the main point or conclusion
  - E.g. Figure titles
    - “Study 1 results” – not very informative
    - “The association of subjective wellbeing and household income” – better
    - “Subjective wellbeing increased with household income” – even better

Figures

- Figures or tables (plus informative titles and captions) can also help provide informative big-picture summaries

- Often include figures for:
  - Key methods, results, sometimes predictions

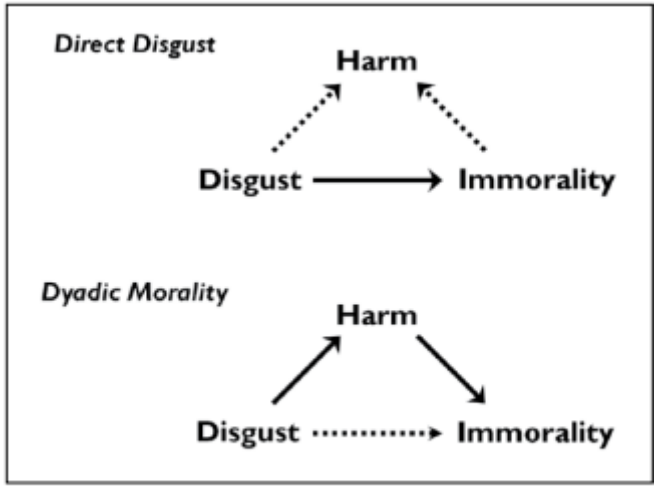
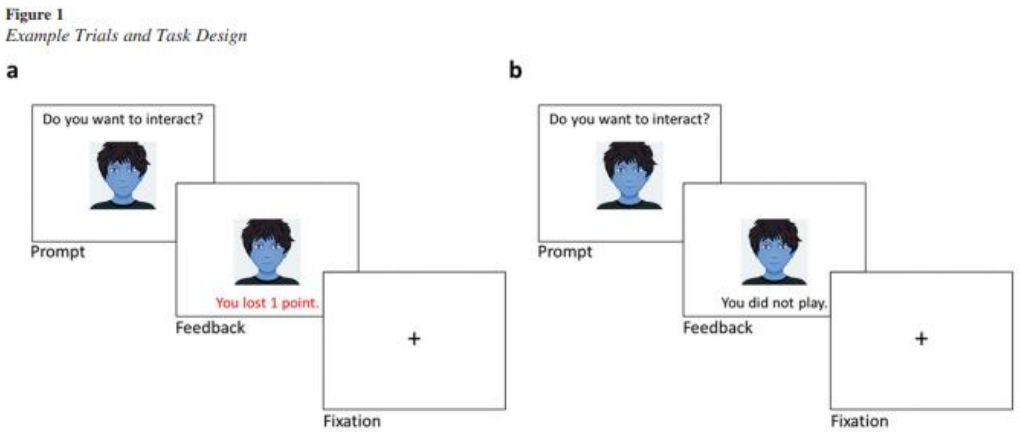
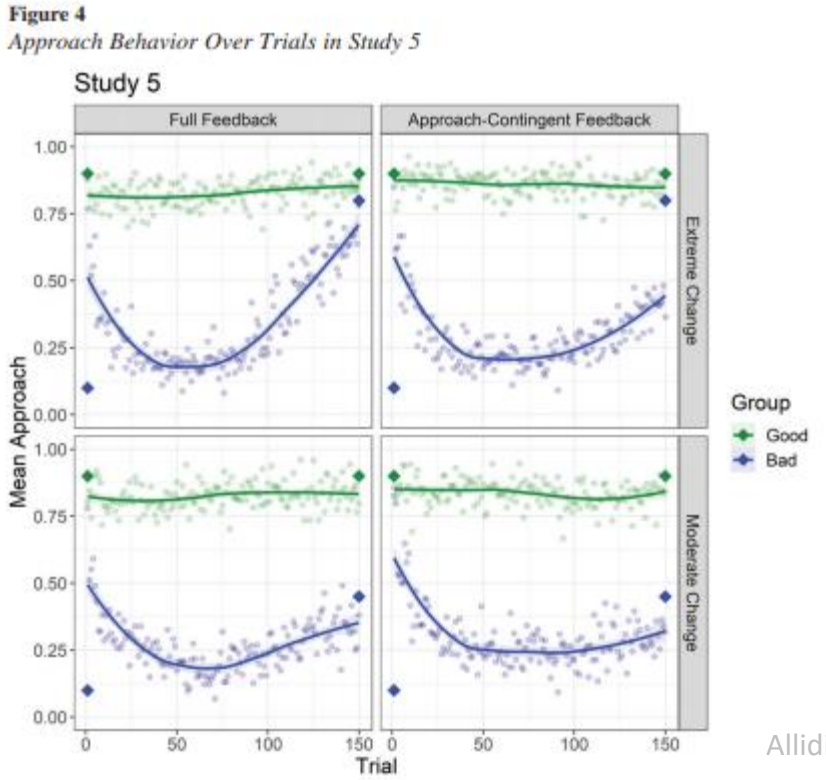


Figure 8. Two competing predictions about the mediational structure of harm, disgust, and moral judgment. "Direct disgust"

Schein & Grey (2018)



Allidina & Cunningham, 2021



Allidina & Cunningham, 2021

Figures

- Figures or tables (plus informative titles and captions) can also help provide informative big-picture summaries

- Often include figures for:
  - Key methods, results, sometimes predictions
  - Key parts of a theory

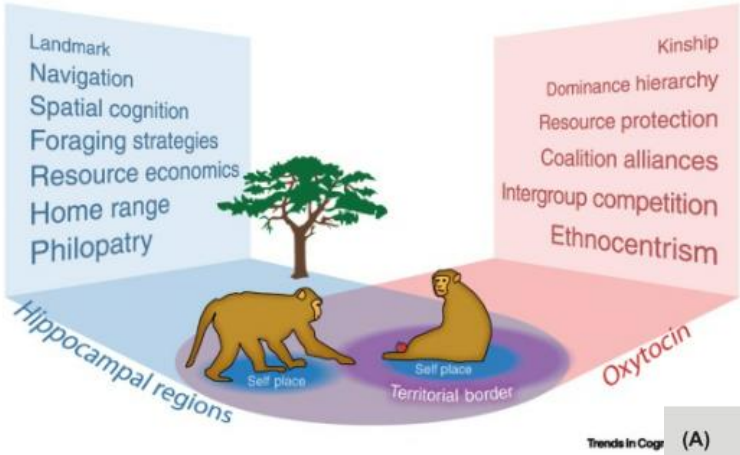
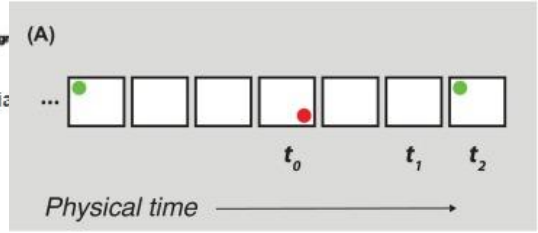
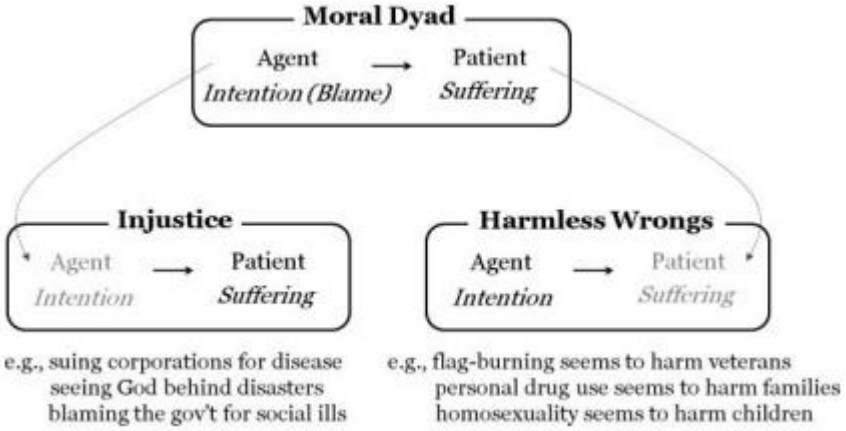


Figure 1 Conceptual framework of territorial coding interfacing spatia
social domains.

Wirth et al, 2021

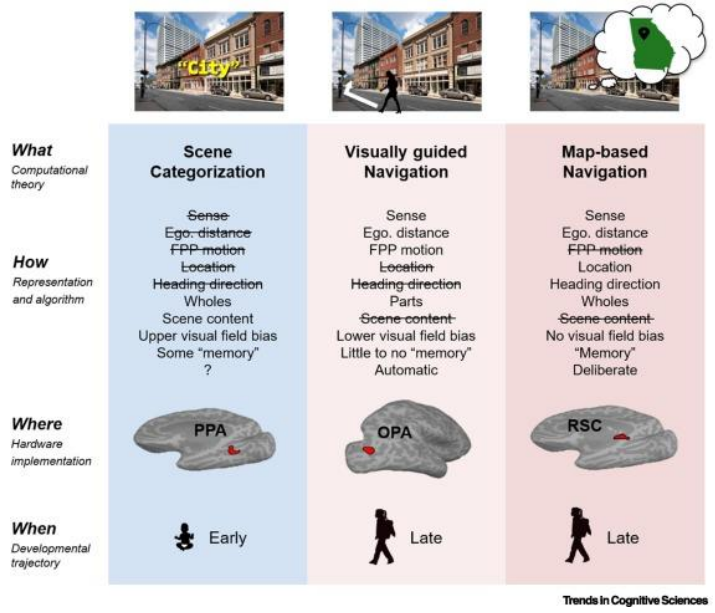




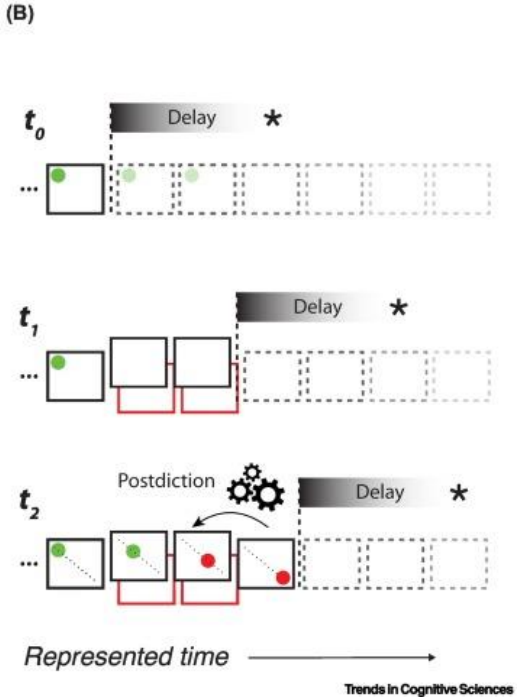
e.g., suing corporations for disease
seeing God behind disasters
blaming the gov't for social ills

e.g., flag-burning seems to harm veterans
personal drug use seems to harm families
homosexuality seems to harm children

Gray, Young & Waytz (2012)



Dilks et al 2021



Hogendoom, 2021

Another benefit of using informative big picture components

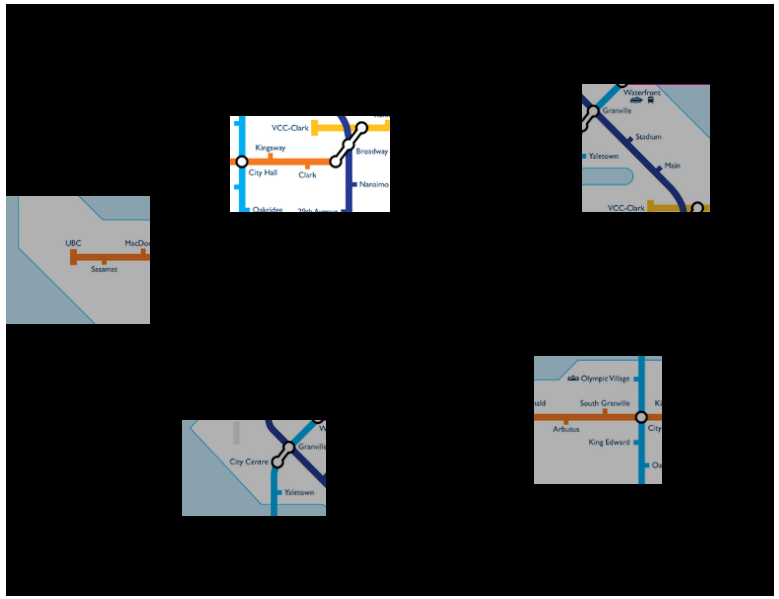
- In the real world, assume people will often skim read or read only parts of paper

- Putting informative big picture components in easy to find places….
  - Helps skim readers get the gist quickly
    - E.g. from abstract, figures + captions, headers, overview paragraphs (e.g. at end of intro and start of discussion)

  - Helps people evaluate upfront whether its worth reading more in depth (and motivate readers if it is relevant)
    - E.g. first paragraph of paper should summarize objective/thesis, headers tell you if you want to read the section in depth

General principle 2:
Help the reader connect the parts together

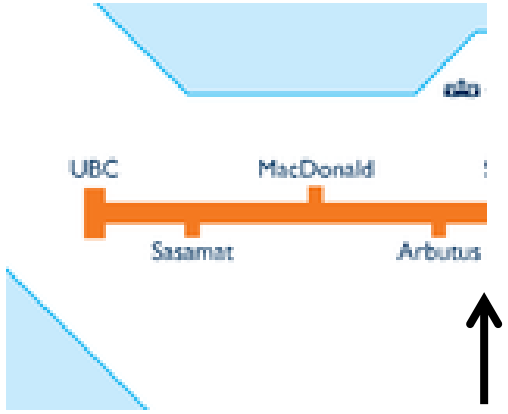
Don’t do this…


VCC-Clark
Kingsway
Broadway
City Hall
Clark
Nanaimo
Waterfront
Granville
Stadium
Yaletown
Main
VCC-Clark
UBC
Sasamat
Olympic Village
South Granville
Arbutus
King Edward
City Centre
Yaletown

General principle 2:
Help the reader connect the parts together

- Tell us where the new piece will go, then give us the new piece, and make it clear how it connects
    - So the reader can put the piece there right away
        - instead of holding it in working memory until they find out where to put it

- Check: is **old before new?** Are there **clear connections** between ideas?

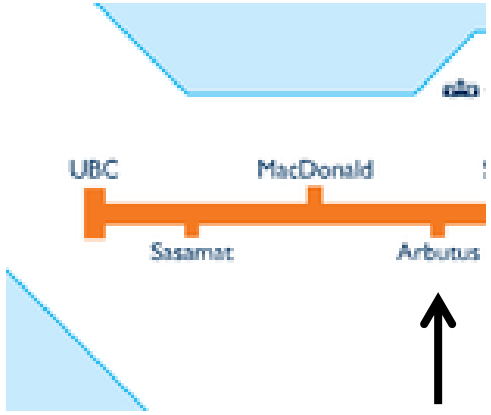


Old: You are here

New: This goes next (we and clearly see connection)

Don’t do this…

- Don’t give us new things before telling us where they go
- or without telling us how they connect to old things



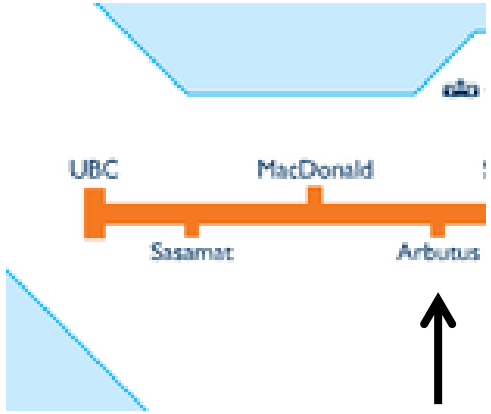
?????

New – But where do I put it?

Old: You are here

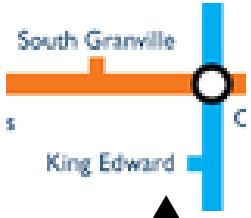
Don’t do this…

- Don’t give us new things before telling us where they go
- or without telling us how they connect to old things



Old: You are here

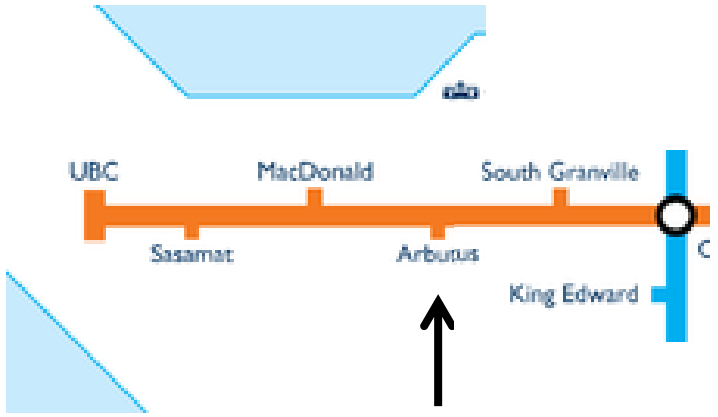
?????



Ok, expanding from this,
But now I’m still holding this and the old thing in mind and don’t know how they relate

Don’t do this…

- Don’t give us new things before telling us where they go
- or without telling us how they connect to old things



Old: You are here

Finally, I see where it goes.
(But why didn’t you tell me that first?
And why make me hold it in mind for so long?)

Old before new

NOUN → VERB → OBJECT

NOUN → VERB → OBJECT

NOUN → VERB → OBJECT

- When writing sentences, mention something **old** then tell us something **new** about it
  - Perceptual processing is influenced by emotion
  - Emotions can be broken down into more elemental processes
  - Although theories agree that these subdivisions are important, it is unclear what the right level of analysis should be…
- You can actually go highlight or colour code your writing like this to see if it lines up!
  - (Good way to learn this skill)

Bad Example

NOUN → VERB → OBJECT

NOUN → VERB → OBJECT

NOUN → VERB → OBJECT

- Emotions can be broken down into more elemental processes
- However, it is unclear what the right level of analysis should be when considering the sub-components of emotion

A lot of new stuff

now FINALLY we see the connection to the previous idea

Make connections between ideas clear

- Ideas or sentences can often be connected through transition words and phrases

- E.g.
  - Furthermore
  - In contrast
  - Because of
  - Therefore
  - For example
  - To summarize

Make connections between ideas clear

- But this can be done in a variety of ways

For fun, let's see what happens without these connecting phrases

Hypothesis 1 predicted that wealthier people tend to be happier.

To test this in the current sample, a linear regression was performed […]

As hypothesized, participants with a higher household income on average reported greater subjective wellbeing ($B = 5.29$, $p < .001$; see Figure 1).

This suggests that wealth might be an important contributor to people's happiness in this context.

To further understand why this might be the case, we then examined….

Hypothesis 1 predicted that wealthier people tend to be happier.

A linear regression was performed […]

Participants with a higher household income on average reported greater subjective wellbeing ($B = 5.29$, $p < .001$; see Figure 1).

Wealth might be an important contributor to people's happiness in this context.

We then examined….

Make connections between ideas clear

- Whole sentences or paragraphs can also serve to show connections between larger ideas

Hypothesis 1 predicted that wealthier people tend to be happier.

To test this in the current sample, a linear regression was performed […]

As hypothesized, participants with a higher household income on average reported greater subjective wellbeing ($B = 5.29$, $p < .001$; see Figure 1).

This suggests that wealth might be an important contributor to people's happiness in this context.

To further understand why this might be the case, we then examined….

<- This presumably connects back to introduction

<- This presumably connects to our broader question and conclusions

Make connections between ideas clear

- All parts of the paper should connect to form one coherent whole
    - If there are multiple topics, sections, or questions, be sure explain how they are relate to each other, and to the overall thesis or objective
        - If the paper feels disjointed:
            - Sometimes you may want to cut out part of the content
                - (e.g. focus on a single question, vs multiple)
            - Or clarify how the parts are related at a higher level

EXAMPLE OPENING FROM BEFORE:

In this opinion article, we draw on evidence from cognitive neuroscience and clinical and developmental psychology to **argue that affect-biased attention is a form of emotion regulation**.

We argue that affect-biased attention, rather than being merely symptomatic of a reactive emotional response to a stimulus, is proactive in shaping perceptual experience.

We further argue that habitual deployment of affect-biased attention has the potential to influence emotional responses to stressful events.

- Todd et al. (2012)

These last two points might be be sub-points of the main thesis in the first sentence.

But I'm not 100% how these relate to each other and the main point.
(It could be clearer here. Hopefully its clear in the main paper)

Another bad example

The default mode network (DMN) is a network in the brain that connects the medial prefrontal cortex (mPFC) with the posterior cingulate cortex (PCC) and the precuneus (Greicius, 2003).

The DMN is thought to play a part in the construction of a coherent sense of self.

The mPFC is specifically related to representations of the self, especially the autobiographical or narrative self (Gusnard et al, 2001).

The PCC is hypothesized to involve the regulation of attention, either narrowing or broadening it (Leech & Sharp, 2013; Brewer, 2013).

Attentional training through mindfulness meditation can permanently alter the PCC and the DMN, with experienced meditators showing less activity in both and showing changes in connectivity patterns (Brewer et al, 2011; Hwan Jang et al, 2010).

Overall, the DMN seems to be involved in introspection and is activated during mind wandering.

Ok. DMN definition

Ok. DMN -> self
(sounds like the main point here?)

Ok. DMN part -> narrative self

Huh?? I thought we were talking about DMN & self?

Huh??? Why are we on meditation???

What?? Where did this conclusion come from????

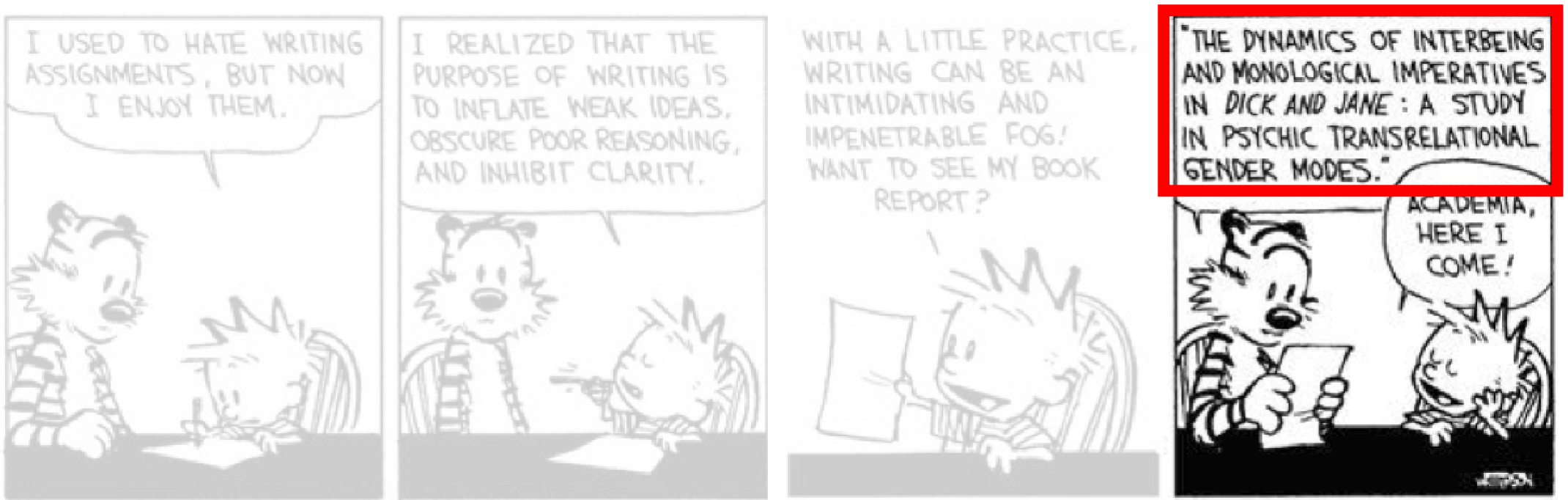
Q: What is wrong here? How might we fix this?

Note: to fix this likely requires thinking more about how these ideas are connected to each other and their argument

General principle 3:
Be easy to understand

- You won't sound 'smarter' by being hard to understand

- Try make your writing simple, concise, and clear/precise



Bad example:

> “The issue of cognitive rigidity and its caustic upheavals are noticeably evident in patients with severe mental illnesses, as substantiated by rather ineffective coping mechanisms, namely suicidal ideation and stringent adherence to prior conceptualizations and applications of solutions to present problems, proving feckless in navigation of the search-space”

- Q: What is wrong with this? How could we improve it?

Bad example:

> "The issue of cognitive rigidity and its caustic upheavals are noticeably evident in patients with severe mental illnesses, as substantiated by rather ineffective coping mechanisms, namely suicidal ideation and stringent adherence to prior conceptualizations and applications of solutions to present problems, proving feckless in navigation of the search-space"

- Q: What is wrong with this? How could we improve it?

- Use **simpler** words
  - E.g. 'Beliefs' instead of 'conceputalizations'?
  - (Other common examples – "use" is better than "utilize")

- And **simpler** sentence structures
  - E.g. could break this into several sentences, with **one** idea per sentence

Bad example:

"The issue of cognitive rigidity and its caustic upheavals are noticeably evident in patients with severe mental illnesses, as substantiated by rather ineffective coping mechanisms, namely suicidal ideation and stringent adherence to prior conceptualizations and applications of solutions to present problems, proving feckless in navigation of the search-space"

- Q: What is wrong with this? How could we improve it?

- If possible, try to say the same info more **concisely** (if extra words don't add anything)
  - E.g. "People with severe mental illnesses often show cognitive rigidity"
  - Instead of "The issue of cognitive rigidity and its caustic upheavals are noticeably evident in patients with severe mental illnesses"

Bad example:

> "The issue of cognitive rigidity and its caustic upheavals are noticeably evident in patients with severe mental illnesses, as substantiated by rather ineffective coping mechanisms, namely suicidal ideation and stringent adherence to prior conceptualizations and applications of solutions to present problems, proving feckless in navigation of the search-space"

- Q: What is wrong with this? How could we improve it?

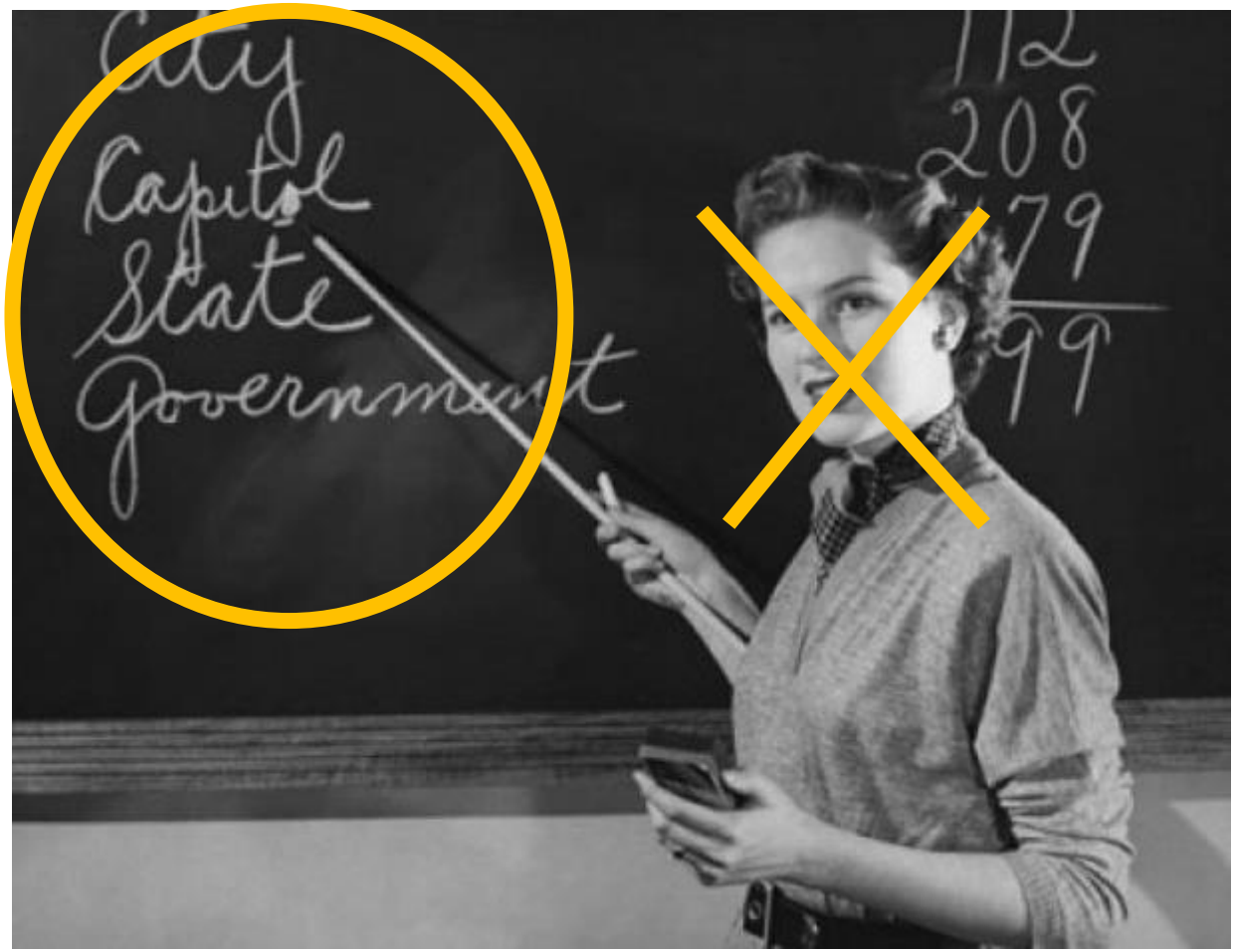
- Use **clear and precise** words -- e.g. avoid vague, unclear, or unfamiliar terms
  - E.g. "caustic upheavals", 'feckless'?
  - "navigation of the search-space" (Might need to define/clarify in this context)

- Try to reduce **jargon** unless they are important technical terms that add clarity/precision, in which case they should be defined clearly if potentially unfamiliar
  - E.g. 'cognitive rigidity' may be a useful technical term that should be defined here

- Make sure sentence structure also makes meaning **clear and precise**
  - E.g. WHO/WHAT is proving feckless in navigation of the search-space? (Unclear from sentence structure what this is describing)

  - (Other common examples: e.g. "This …. " What does THIS refer to? Usually better to say "This [something] …")

General principle 4:
Focus on ideas
(not yourself, your writing, other researchers, or other people's words)



In general, keep the focus on ideas, **not yourself or your writing**

- Generally avoid overuse of “I/we” or “this paper/section”, etc, to keep attention on what you are showing the reader
  - E.g. “**I have just discussed** evidence that insight relies on general problem solving mechanisms. **The next section will discuss** some conflicting evidence”
  - VS “In contrast, there is other evidence that implies insight does not rely on general problem solving mechanisms.”
    - This is better because it this keeps the focus on the relationship between the ideas (vs sections)

Another example of overusing “we”:

In our initial survey, we wanted to determine whether public attitudes were dependent on how issues are presented. We first questioned the survey participants to discover their attitude towards mixed-used housing. We put forward a number of scenarios which presented negative outcomes. When we wrote the follow-up questions, we changed the language, placing the emphasis on possible positive outcomes, rather than negative.

Better:

The objective of the initial survey was to determine whether public attitudes were dependent on how issues are presented. The survey participants were first questioned to discover their attitude towards mixed-used housing. A number of scenarios were put forward which emphasised potential negative outcomes. In the follow-up questions, the language was changed and the emphasis placed on possible positive outcomes, rather than negative.

In general, keep the focus on ideas, **not yourself or your writing**

- **Exceptions**:
- You can refer to yourself strategically on occasion, often to draw attention to what you are adding to existing work
  - E.g. “I propose/argue/hypothesize/suggest…” “This essay will argue …”

- Sometimes using “I”/ “we” can lead to clearer or less awkward sentence structures, so may be worth using
  - e.g. “We examined whether…” vs. “It was examined whether …”
  - *Fields/individuals differ in how acceptable this is

In general, keep the focus on ideas, **not other researchers**

- Don't do this: "**Bronson (2008) showed** that household income was a major determinant of nutrition awareness and dietary choices. **Poursee (2002) focused** on how education levels of consumers impacted how much they factored nutrition into their purchases."

- Do this: "**Education level (Poursee, 2002) and household income (Bronson, 2008) have** been shown to affect nutrition awareness and dietary choices."

- Some exceptions:
- If you want to emphasize a conflict or debate between researchers
  - "While Author X (…) concluded … from this work, Author Y (…) instead argued…
  - *Often still better to focus on their competing ideas, unless they are really important researchers

- Or where you are adding to what the authors said
  - "However, Author X did not note…"

In general, keep the focus on ideas, **not other people's words**

- Generally avoid direct quotes, and try to paraphrase instead
  - (*this differs in fields where the quote itself is evidence)

  - Very rarely, quotes can be used
    - E.g. For a particularly well-worded definition (though often still ok/better to paraphrase)
    - E.g. For a compelling quote to introduce your paper
    - E.g. In qualitative research, to demonstrate participants' verbal responses

Overview

- What makes a well-written thesis?
  - Content & Structure
  - Communication
- **Strategies for the writing and revising process**

Strategies for the writing and revising process

- How do you go about creating your beautifully well-written paper?

Strategies for the writing and revising process

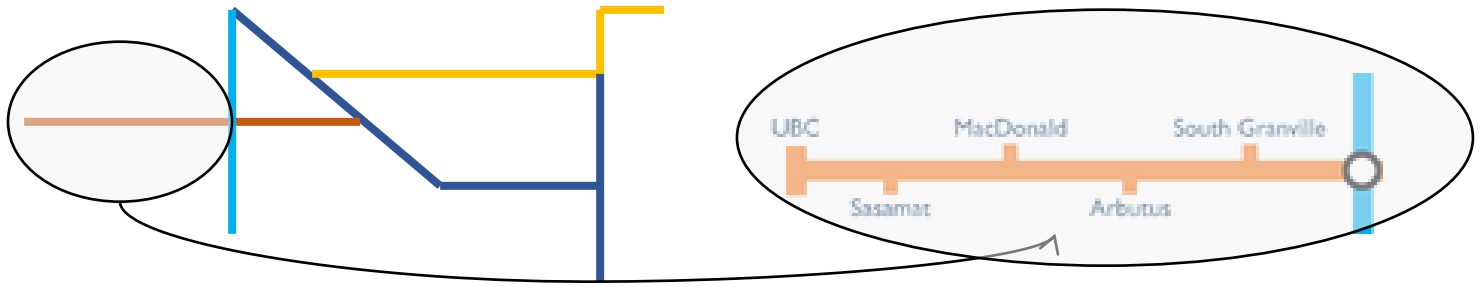
- How do you go about creating your beautifully well-written paper?
  - General writing process:
    - 1) Outlining/Drafting: Figuring out your structure and content
    - 2) Polishing: Making sure its clearly communicated

  - How to motivate yourself to write?
  - How to keep improving your writing?

Outlining/Drafting:

Figuring out your structure and content

- **General strategy #1: Think and write at multiple levels of abstraction**
  - Big picture:
    - E.g. write outlines (point form, or short summaries e.g. 1 para. abstract, 1 page summary)
  - Details:
    - E.g. write drafts (full paragraphs, or stream-of-thought style writing)
    - At early stages, don't worry about sounding nice (exact wording or grammar, etc.)
      - Focus on content/structure. Polishing comes later.



Outlining/Drafting:
Figuring out your structure and content

- Each has different benefits

  - Big picture (e.g. outlines):
    - Shorter to write, helps see key points, create a coherent overall structure
    - BUT sometimes only see issues with details (e.g. logical errors, lack of evidence)

  - Details (e.g. drafts):
    - Ideas can often flow more easily (esp. stream-of-thought), can develop ideas, check and think through details
    - BUT can sometimes lose a coherent overall structure, can take longer to write well

Outlining/Drafting:
Figuring out your structure and content

- Often it helps to alternate between these levels of abstraction
  - You can start in either place
    - And go back and forth between them as many times as needed
  - Different people prefer different strategies for doing this. I will present a few different strategies
    - Feel free to use these or combine them or do what works for you

Outlining/Drafting:

Figuring out your structure and content

- Starting from big picture (one strategy)

    1. Write out main thesis, or main question + answer
    2. Write topic sentence of each paragraph (main point)
    3. Then add in conclusion sentence of each paragraph
    4. Then fill in middle of each paragraph (evidence needed to support this point)

- Check that your argument is coherent and well structured at that each step.
    - E.g. just topic sentences should still convey your main argument
    - **don't just promise to say something (e.g. 'talk about theory X') – actually say it

- At any stage, you may decide its not the best structure. If so, back up several stages, edit, and try again from there.

Outlining/Drafting:

Figuring out your structure and content

- Starting from big picture (another strategy)

    1. Write a 1 paragraph abstract
    2. Write a 1-2 page version of full paper
    3. Write a full draft

(Again, check that it seems good at each stage, and edit as needed, or return to previous stage if you need a larger re-think)

Outlining/Drafting:
Figuring out your structure and content

- Starting from details (one strategy)

1. **Start writing** to get your thoughts out
   - e.g. stream-of-consciousness, can pretend you were going to write your whole paper/paper section/a one page summary of paper etc in an hour
   - Might be really messy/bad/unstructured the first time, but that's ok – you are just developing your thoughts for now

2. Look at what you wrote and try to create a '**reverse outline**'
   - Pick out the main points, try write them out again as an outline.
   - Rearrange and edit as needed until coherent

3. Then try writing a **new draft based on this outline**.
   - Don't look at original draft (this gives you more flexibility)
   - Don't feel stuck to this outline (modify in any way you see fit while doing this - use the writing as a way of thinking)

4. Repeat #2-3 as needed (reverse outline again, then draft again)

Outlining/Drafting:

Figuring out your structure and content

- **General strategy #2: Be willing to go back and forth between writing and evidence-gathering**
  - Evidence gathering can be e.g. reading other research, or further analyzing your data
  - Sometimes it helps to write something first, then look for relevant evidence
    - You might realize you need more evidence (reading/analysis) on some point as you write, if it is important to your argument
    - It also helps you realize what's not important so you don't need to read/analyze forever
  - Of course, you then may have to go change what you write based on the evidence you find
  - **Aside:** If your reading/citations are fresh in your mind, its helpful to include some form of citations in your writing as you go
    - Doesn't have to be properly formatted, just a pointer for yourself so you don't forget where the point came from

Polishing:
Making sure your ideas are clearly communicated

- Once you are happy with the content and structure ONLY THEN start polishing your writing
  - to make sure things are clearly communicated and easy for readers to understand

  - Don’t do this too early
    - (e.g. you might write the perfect sentence but then scrap the whole paragraph!)

Polishing:
Making sure your ideas are clearly communicated

Some strategies for this:

- Using ‘feel’:
  - Reread it and try to monitor your own sense of clarity/ease of understanding, then adjust so it feels better if needed
    - E.g. Did you find things difficult to process at any point?
    - Did you have to hold too many things in working memory?
    - Did you ever forget where something was going, get bored, or get lost in the details?

Polishing:
Making sure your ideas are clearly communicated

Some strategies for this:

- Using writing principles:
  - Check how well you have applied the specific principles discussed here, adjust to apply them better if needed
  - Can do this especially for sections that feel hard to process
    - E.g. Highlight old-new parts of sentences to check flow
    - Check if topic sentences convey main point of paragraph
    - Check if reading only topic and conclusion sentence of each paragraph conveys a coherent story
    - Check if your headers etc are informative

Polishing:
Making sure your ideas are clearly communicated

Some strategies for this:

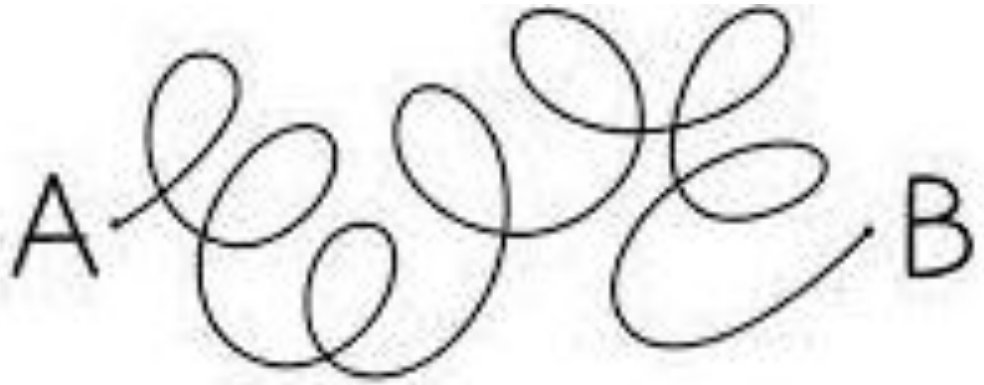
- Re-read your work after not having looked at it for a few days
- Get someone else to read it and give feedback
- Try read your final draft out loud to yourself
  - You will often catch e.g. weird grammar, sentence flow, overly abstract or complex sentences
  - E.g. Notice if….
    - you find yourself stumbling to read something,
    - or forgetting the start of a sentence by the end,
    - or not processing the content while you say the words

Polishing:
Making sure your ideas are clearly communicated

- Sometimes if you are struggling to convey something clearly, its because you are not clear on it!
    - It may help to stop and re-think, maybe adjust your content/structure
    - E.g. check your logic, try write it out in more detail, or talk it out with someone

Writing is often an iterative, non-linear process

- Its perfectly normal and often helpful to go through many rounds of outlines, drafts, evidence-gathering, and polishing



- Be open to new ways of thinking about or communicating your ideas
  - do not get too attached to any of one version
- Be open to learning while writing

Getting feedback

- Ideally you can get feedback (e.g. from your supervisor) throughout this process

- How someone willing to give feedback depends a lot on who you are working with, so its useful to have a discussion of what works for everyone!
  - Ask e.g.:
    - When and how often can they look over?
    - How fully written-out/detailed/polished should it be at each stage?
    - Do they want to read full drafts or sections?

Getting feedback

- Generally don’t wait until you have a polished draft to get feedback,
  - as they may suggest a complete restructuring and then you’ve wasted a lot of time!
- But your supervisor doesn’t need to/have time to read EVERY draft you write
- Some useful checkpoints:
  - Typically helps to initial feedback on a big picture version
    - (e.g. a reasonably well-written 1 para to 2 page ‘abstract’)
  - Once agreed on this, it may help to get feedback on a reasonably well-written full draft, before you do final polishing

Getting feedback

- Getting feedback doesn’t always involve someone reading/commenting on your writing:
    - Sometimes just talking through things together is useful (esp. for big picture ideas)
        - Useful if your writing or ideas are really messy/hard to understand at this point,
        - or you are not sure where to start and want to get on the same page with ideas first
        - or if your supervisor will meet with you but is slow on reading things outside of meetings
    - You can also ask your supervisor to point you to other helpful resources
        - E.g. example papers (say, for how some analysis was written up in previous work), resources for field-specific writing guidelines
        - This can be helpful to ask for e.g. if you don’t quite understand their feedback or if more details would help

Getting feedback

- Can also get feedback from other people throughout
  - E.g. writing center!!!
  - Even people not in your field can give general feedback on if its well-written, shows why this is important, conveys what you did clearly etc.

How to motivate yourself to write?

- How to get yourself to not procrastinate?
  - (*A bad idea for a large writing project!)
  - Q: What works for you? What challenges do you face doing this?

- Some strategies that might work:
  - Accountability and motivation
    - e.g. weekly check ins with your supervisor on writing goals
    - Or use writing buddies/groups, rewards/punishments etc
  - Set schedules/times
    - Block off time in your schedule and stick to it, or say you will write for X hours by end of week
  - Find a length of time that works for you
    - Smaller and more regular blocks can be less overwhelming/mentally demanding (eg every morning)
    - Longer blocks can sometimes help you get on a roll (e.g. full days writing)

How to keep improving your writing?

- Learn from yourself:
  - As you work on your writing, keep trying to pay attention to what works and doesn’t in your own writing
  - Practise applying the principles here

- Learn from others you know:
  - Get and use feedback from other people!
    - Your supervisor, AIs, the writing center, your classmates, friends, etc

How to keep improving your writing?

- Learn from other writers
  - Often the best way to learn about field-specific style, structure etc. is to look up examples and pay attention to the writing (like we did here)
    - Ask your supervisor for good examples:
      - E.g. well-written undergraduate thesis papers from past years,
      - Good examples of published academic papers to look at (theirs or others)
      - Or if there are academic journals that have a similar structure to what they are expecting (then you can look up papers in that journal)
    - Can also try find these yourself
      - E.g. Senior thesis bank through Princeton Library
      - E.g. The journal “Trends in Cognitive Science” (Opinion papers especially *label is at top of pdf) are good examples of short argumentative theoretical papers. Many field-specific empirical journals exist
  - But evaluate what works well or not in these examples
    - Often bad writing gets published because its good science!
    - And other undergrads may be bad writers

How to keep improving your writing?

- Learn from writing resources:
  - Online resources (google anything - so many exist!), the writing center, books on style.
    - E.g. The Sense of Style: The Thinking Person's Guide to Writing in the 21st Century (By Stephen Pinker) is a good general writing book - and easy/fun to read!
  - But evaluate if it applies to your field (e.g. don’t want to write like a creative writer!)

Have fun

- Writing can be fun!
- It can be a process of…
  - learning,
  - discovery,
  - developing your ideas,
  - clarifying and refining your thinking,
  - developing transferable life skills,
  - creating something beautiful that you can share with others

Questions?

- Please fill out a feedback form before you leave!

- Contact: tvrantsidis@princeton.edu

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  - (e.g. make sure my name and acknowledgements slide are included f you share them)

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  - The Sense of Style: The Thinking Person's Guide to Writing in the 21st Century (Book by Stephen Pinker)