Fall 2020 Plan – Vin Somasundaram

Meeting ID: XXX XXX XXXX
https://duke.zoom.us/j/XXXXXXXXXX

Recommended amount of time per week for independent study: 8-10 hours. The semester is more compressed now that covid-19 has made it so that we end before Thanksgiving, so there is no "December" month. This probably also means that on a week-by-week basis, you'll be more overwhelmed with the amount of work that your classes are putting on you. You'd said that the week-by-week structure of the VIP program schedule was probably not necessary, especially given the extra work of the semester, so I broke this into suggested "first/second" halves; these are only suggestions.

Overall goal: Running the contingency learning project on SONA (and possibly MTurk) as an independent study for fall semester, including full data collection, analysis, and write-up.

September:

Goals: set up your study in SONA, run and analyze your first set of participants, finalize the code and instructions, learn about inferential statistics, and familiarize yourself with the literature

First half:

- Christina meetings:
    - Go over how to create an online study on SONA with our typical JavaScript oriented links and how to approve the students
        - https://directory.duke.edu/directory/search
    - Once you've piloted your JavaScript all the way through, let's go over again how to create a .csv file for analysis from the output on our server
    - Any feedback related to the JavaScript code that you have or task
- Science Communication:
    - Finish the preregistration draft that you worked on in the summer. You have your poster and powerpoint presentation to guide you; if you're confused about any section, leave a comment and send it to me.
- Coding/Programming:
    - Finish up coding the JavaScript/HTML/CSS for the task
    - Extensively test code (and data that you receive) to make sure that the task is working as expected (i.e., the assignment of high contingency matches what you experience when you're doing the task)
    - Comment on your files so you (or others) can understand what each part of the code does and what would need to be edited in the future
    - Have Christina look through your code to make sure all looks OK – this review is a normal part of any kind of coding
    - Consider having a friend or two give you feedback on the instructions – would they know what to do? We've already gotten feedback from Tobias, but one thing I learned from running a "usability test" is that our instructions are not always as

clear as we researchers think they are, especially when people haven't done these kinds of tasks before.

Second half:

- Christina meetings:
  - Review some of the statistics material together – any questions?
  - Feedback on and/or post the preregistration for the project
    - We will need to post this before doing any sort of analysis
  - Discuss version control for the project
    - We want to make sure to incorporate this not just because it's a good open science practice, but also if you ever want to refer to "portfolio" style work in any of your applications, online repositories will help
  - Discuss questions on the readings
  - Analyze or discuss the results together?
- Statistics:
  - Read chapters 3-5 (https://crumplab.github.io/statistics/)
  - (The goal is to make sure that by the start of November, we have discussed repeated-measures ANOVAs, so that when you write up your independent study project, you will know why we've run that analysis on these data)
- Continued familiarization with the literature:
  - Read some of the articles from the end of the document; you'll have to write up the independent study, including a proper introduction and literature review
  - We can also continue our discussion re: principles of good science communication – if you'd like?
- R Analysis:
  - Suggested: let's have you analyze the first batch of participants using the R script that we developed over the summer, then go over it in our meeting, and then I provide you with an R script that branches off the one that you have. That way, we'll be able to walk through what each part of the script is doing again, plus you'll have guiding questions for what to do next in R
    - I'll focus the R script on "data visualization" and different ways of analyzing the data so that you can choose the lines of code for yourself

October:

Goals: run and analyze your next set(s) of participants, adjust the code as needed, apply knowledge of statistical techniques read in the textbook to your dataset, probe deeper into the research literature

- Christina meetings:
  - Review some of the statistics material together – any questions?
  - Discuss questions on the readings
  - Discuss results and next steps in the experiment (and towards the end of October, what might make it into the Independent Study outline/final paper)
- Statistics:

- Read chapters 6-8 (https://crumplab.github.io/statistics/)
- Through Chapter 8 gives you experience with repeated-measures ANOVA; chapter 9 goes over the ANOVA and rm ANOVA a little more, but at least with these chapters, you'll have an understanding of the math underlying the stats
- We can also start asking questions of the data you've collected so far and what types of questions you would be "asking" given the test being run – i.e., applying what you've been reading in the textbook to your data beyond the R code
  - I will include this in the R script tutorials
- R Analysis / Editing JavaScript code
  - By October, I hope we'll have gotten some pilot results collected and analyzed, so we'll know how to best adjust your code (e.g., do we move onto the between-subjects version? Do our results make sense? Can people do the task?)
- Continued Familiarization with the literature

I didn't create first/second halves here so that we could allow for "wiggle" room and also flexibility with regard to how the results turn out.

<u>November</u>:

Goals: advance science communication skills through feedback on independent study initial and final write-ups and continue running and analyzing the experiment(s) as needed

First Half:

- Christina meetings:
  - Review or feedback on the outline of the introduction + results write-up
  - Review some of the statistics material together – any questions?
- Statistics (Optional):
  - Read chapters 9-12 (https://crumplab.github.io/statistics/)
  - These are optional because they would probably be covered in the actual class version, but you have other work, especially I imagine in November when things will get more hectic due to the compressed semester. This goes over "power analysis" (which you've asked me about, 12) and more details on ANOVAs (9, 10) as well as more "proper" or current ways of analyzing data via simulation (11)
- Science Communication:
  - Write up the results and an outline of the introduction regarding what you've done thus far this semester. I suggest doing this in the first half of November so that I can give you feedback and so that you won't have to write up your Independent Study Paper all at once, at the end of the semester
- Continue running/analyzing/editing experiment as needed

Second Half:

- Christina meetings:
  - Address lingering questions about the project, where to go next
  - End of semester discussion:

- Suggested: try to enroll for NEUR 382L "Functional Neuroimaging" if they offer it in the spring, as a preparatory
- Either at this point or by early January, we should talk about a spring project so that you can work with someone in lab who has an fMRI project for your thesis – also potentially what the next project is, what your research interests are
- Whether or not to continue with this particular project and pilots, future experiments, etc. will depend on the results and which way they go and if we can replicate our findings. We'll have to have a discussion at this point as to the future of the project – e.g., is the independent study paper actually a manuscript draft for publication? Which journal? Etc.
- Finish your Independent Study Project paper & send to Tobias and me; also may depend on whether we're aiming for publication in an academic journal & how far along the project is at this point

Research literature:

- Braem, S., Bugg, J. M., Schmidt, J. R., Crump, M. J. C., Weissman, D. H., Notebaert, W., & Egner, T. (2019). Measuring Adaptive Control in Conflict Tasks. *Trends in Cognitive Sciences*, *23*(9), 769–783. https://doi.org/10.1016/j.tics.2019.07.002
  - I think you may have already read this over the summer?
- Bugg, J. M., Jacoby, L. L., & Chanani, S. (2011). Why it is too early to lose control in accounts of item-specific proportion congruency effects. *Journal of Experimental Psychology: Human Perception and Performance*, *37*(3), 844.
- Schmidt, J. R. (2013). Questioning conflict adaptation: Proportion congruent and Gratton effects reconsidered. *Psychonomic Bulletin & Review*, *20*(4), 615–630. https://doi.org/10.3758/s13423-012-0373-0
  - Schmidt has a lot of papers on a kind of contingency learning perspective. You can read a review – this review paper should summarize some, and you may see others still cited in papers like Peter's publications (i.e., may not need to read every single one).
- Whitehead, P. S., Brewer, G. A., & Blais, C. (2017). ERP evidence for conflict in contingency learning. *Psychophysiology*, *54*(7), 1031–1039.
- Whitehead, P. S., Brewer, G. A., Patwary, N., & Blais, C. (2018). Contingency learning is reduced for high conflict stimuli. *Acta Psychologica*, *189*, 12–18. https://doi.org/10.1016/j.actpsy.2016.09.002
- Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen, J. D. (2001). Conflict monitoring and cognitive control. *Psychological Review*, *108*(3), 624–652. https://doi.org/10.1037/0033-295X.108.3.624
- Bugg, J. M. (2017). Context, Conflict, and Control. In T. Egner (Ed.), *The Wiley Handbook of Cognitive Control* (pp. 79–96). Wiley-Blackwell.
- Bugg, J. M., & Diede, N. T. (2017). The effects of awareness and secondary task demands on Stroop performance in the pre-cued lists paradigm. *Acta Psychologica*. https://doi.org/10.1016/j.actpsy.2016.12.013
- Blais, C., Robidoux, S., Risko, E. F., & Besner, D. (2007). Item-specific adaptation and the conflict-monitoring hypothesis: A computational model. *Psychological Review*,

114(4), 1076–1086. https://doi.org/10.1037/0033-295X.114.4.1076
- Verguts, T., & Notebaert, W. (2009). Adaptation by binding: A learning account of cognitive control. *Trends in Cognitive Sciences*, *13*(6), 252–257. https://doi.org/10.1016/j.tics.2009.02.007
- Note that these papers may have relevant citations as well that you might want to look up along the way. For instance, Egner (2014) is often cited in the learning literature, and it was in your list from previous semesters.

May also want to review papers from previous semester, as they should again give a good look at the lay of the learning literature:

- Egner, T. (2014). Creatures of habit (and control): A multi-level learning perspective on the modulation of congruency effects. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.01247
- Bugg, J. M., & Crump, M. J. (2012). In support of a distinction between voluntary and stimulus-driven control: A review of the literature on proportion congruent effects. *Frontiers in Psychology*, *3*.
- Abrahamse, E., Braem, S., Notebaert, W., & Verguts, T. (2016). Grounding cognitive control in associative learning. *Psychological Bulletin*, *142*(7), 693.

Ziwei's suggestions:

1.Freitas&Clarck,2015 (attached here)
2.https://journals.sagepub.com/doi/full/10.1111/j.1467-9280.2007.02022.x?casa_token=3S0_CeBOJv8AAAAA%3AADCCtysOEHKnz72YhTi-AARKH-T4iHmnlyvn1SkXedjFSEj-91TAn976hEg2Epu9NyHJ9dSdtRQX&
3.https://biblio.ugent.be/publication/8023501/file/8023508.pdf

If you end up reading these and a few others, we could also think about looking at statistical or more associative learning literatures outside of cognitive control.