**Research Assistant Protocol**

**SONA: Decision making and cognitive control in different contexts**

Materials

* Master participant ID sheet, informed consent, debrief
* SONA
  + <https://utscpsych.sona-systems.com/>
  + Account: inzlichtlab
  + Password: pilot0615
* Behavioral lab computer login information
  + Account: inzlichtuser
  + Password: neurosocial162
* Links (saved as bookmarks in Chrome on the acquisition computer)
  + Questionnaires: HauseQuestionnaires bookmark on Chrome (EEG computer)
  + RA Log: Hause Efficacy Log (<http://bit.do/rewardefficacylog>)

What is this study about?

* You'll be running an EEG and eye-tracking Stroop task that studies how a sense of agency/control over the environment influences cognitive control and performance on a Stroop task.
* I'm using ASA for EEG recording, EyeLink 1000 eye tracker, and MATLAB to present experimental stimuli (and to synchronise timing across the three computers). So you'll have to be proﬁcient in operating these apps on three separate computers.
* You will run two different scripts with MATLAB—one to examine eye movements and the other to run the actual study.

What do you need to know about the computers in EEG3?

* There are three computers (3 CPUs and 3 monitors).
* **CPU/monitor closest to the main door that leads into the EEG room**
  + **EEG acquisition computer running ASA.**
  + New EEG data will be stored in the DATA folder (shortcut to it on the desktop). You might be able to access the Internet from this computer.
* **Middle CPU/monitor**
  + **Eye tracker computer with two partitions (OS EYELINK and WINDOWS XP).**
  + No Internet on this computer. No account or password. Eye tracking data will stored on the WINDOWS XP partition in the EYE TRACKER DATA folder (shortcut to it on the desktop).
* **CPU/monitor closest the room the participant is sitting in**
  + **Presentation computer running MATLAB.**
  + No Internet on this computer. Behavioral data (e.g., choices, reaction times, questionnaire responses) will be stored on this computer.

Location and position of equipment in the lab: Do not adjust the positions of the equipment in the lab space where the participant is seated, unless you're having problems calibrating the eye tracker! If you look on the table, I've marked the exact locations of the monitor, the eye tracker, and the chin rest. These positions and measurements should be very precise.

* The black knob on the eye tracker should be align precisely to the center of the monitor behind it.
* The distance from the chin-rest to the monitor is about 90 cm.
* The distance from the chin-rest to the eye tracker should be within 50-55 cm. Do not adjust this unless you have problems calibrating the eye tracker. If the eye tracker is too close to the participant, EEG recordings will be affected by the electrical interference from the eye tracker.

**Before the participant arrives**

Record the online log (Hause Efficacy Log; or <http://bit.do/rewardefficacylog>) if anything goes wrong or you're using experiment setups that deviate from the default procedure (e.g., didn't manage to set up eye tracker).

What should you do ﬁrst?

* Ensure you have informed consent form, pen, measuring tape, gel, syringe, pumice ﬁnger, lemon prep, alcohol pads, small washer adhesive for face electrodes, etc.
* Place the informed consent form next to the chin-rest and keyboard. Provide a pen.
* Check on SONA who is coming and write the participant's name on the participant list.

Load questionnaires on the EEG computer

* Open Chrome and click on the bookmark: **HauseQuestionnaires** (or <http://bit.do/rewardefficacyquestionnaires>)



Lighting in the room

* Do not use the lights on the ceiling. Instead, use the lamp on the floor.

Pause NextCloud background sync on the EEG acquisition computer.

* Right-click on the NextCloud icon at the bottom right of the task bar on the EEG acquisition computer. Click pause synchronization.

How to set up all the hardware (EEG and eye tracker)?

* EEG: Turn on the EEG ampliﬁer and attach the EEG cap to the amp. Push the connectors together snugly and hold them together for a few seconds.
* Eye tracker: Connect the black plug on the ﬂoor to turn on the eye tracker. Then, turn on the eye tracking computer, and select the OS EYELINK partition (not WINDOWS XP partition) when it starts.
* Once you've selected the correct partition, you should see, a few seconds later, the prompt C:\>
  + Press t on the keyboard (t = track) to start the eye tracker software.
  + Then the eye tracker should emit clicking sounds several times before the computer loads the eye tracking application.
* Make sure the black knob of the eye tracker aligns with the center of the monitor.
* Set up chin-rest on the desk if it isn’t already there. Following the markings on the desk.

How to set up ASA on the EEG acquisition computer (leftmost monitor/CPU)?

* Open ASA on the EEG acquisition computer (click on the red/yellow ASA icon on the desktop).
* Click 'Setup Recording'.
* In the new window with the blue background, set the following:
  + File Name (recording 1): **HauseEye001.cnt**, **HauseEye002.cnt**, and so on (the three digits at the back refer to the participant number)
  + File Name (recording 2): **HauseEfficacy001.cnt**, **HauseEfficacy002.cnt**, etc.
  + Sampling Rate: 512
  + Montage: **HauseEfficacy**
  + Leave everything else empty. All checkboxes at the bottom should be UNCHECKED. ⁃ Click 'OK'.
* A Dialog window with blue background should appear. It should have 'Check Impedances,' 'Show EEG,' and 'Proceed' on it. At the background, you should see a big 'Not Recording!'.
* Click 'Check Impedances'. Then > 30 red circles referring to different electrodes should appear:
  + > 20 electrodes on the head
  + 2 electrodes on the earlobes for referencing: M1, M2
  + 2 electrodes for eye movements: VEOG1 (above eyes/yellow wire) and VEOG2 (below eyes/green wire)



How to set up MATLAB to present stimuli on the presentation computer?

* Run MATLAB (icon image to the right).
* Close any existing opened tabs in MATLAB.
* Click and open the **Hause Efficacy Reward Study** on the desktop.
* Click on both scripts to open them in MATLAB.
  + OC (script 1)
  + runFXC (script 2)
* Do not rename or edit anything in the scripts or you'll crash everything! Beware.
* Later on, you can begin the study by clicking on the green right arrow icon at the top (under EDITOR panel).

Test the display switch box to make sure you can switch displays (to control/switch the display/monitor in the participant’s room).

If you've done everything above, then just wait for your participant to arrive.

**Setting up the participant**

What to do first?

* Welcome them to the lab and show them to the testing area. Introduce yourself and ask them for their names (so that you can check it's the correct participant —same as name on SONA).
* Tell the participant something about the study (something like that):
  + This is a neuroscience study. We’re going to take neural and eye recordings with an electroencephalogram, or EEG for short, and an eye tracker. You will do decision making tasks and will get 2 credits for completing the study. Also, you can earn money during the study. 10 outcomes and rewards will be randomly selected and you can receive anything between $0 and $10 (cash), depending on your performance during the study. We will be ﬁtting an EEG cap on your head with a small amount of gel and we will also track your eyes with an eye tracker. You can wash, style, and dry your hair in our lab at the end of the study. Any questions about anything?
* Then get them to read and sign the informed consent sheets.

What to do before ﬁtting the cap?

* Ask them to switch off their phones or make sure it's in Airplane mode. Explain this is to reduce interference with the EEG and eye-tracking systems.
* If female, ask if they're wearing mascara (this will seriously affect eye tracking; you won't be able to calibrate this person, and their eye tracking data won't be clean).
* If they are wearing it, ask nicely if you can get them to remove it. (We have already indicated on SONA that they should not be wearing mascara!)
* If they're wearing glasses, ask if they can see the words on the screen if they're not wearing classes. Participants without glasses are much easier to set up (eye tracker). If not, it's okay if they need to wear glasses. It might just take slightly longer to set up the participant so that the eye tracker is tracking their eyes.
* If they're wearing contacts, that's ok.
* If participant is wearing a watch, ask them to remove it and put it in their bag.
* If they need go to the washroom, let them go quickly.
* If chewing gum, ask them to discard it.
* If wearing earrings, ask them to take them off because you need to attach electrodes.
* If they have their hair up, untie it.
* Tell participant to adjust the height of the chair until they feel comfortable when their chins are resting on the chin-rest.

How to put on the cap and apply gel? (Just a few timesaver tips to make life easier for you and the participant!)

* Use the display switch box to show the EEG impedance display on the participant’s display.
* Often, it's much easier to get participants to put on the cap themselves. So you might want to get them to help you with that when you're trying to put on the cap. Show them the cap and tell them you're going to start ﬁtting it.
* Use your subjective judgement to ﬁnd the mid point of their head, press on that point, and ask them speciﬁcally, 'Does this feel like the center of your head?' We are usually really good at sensing whether someone or something is pressing down the center of our heads. Try it for yourself! If they say that's not the center, ask them where the center is. Then adjust the cap accordingly. After that, then use the measuring tape (ensure nasion to midpoint = inion to midpoint, and left pre-auricular to midpoint = right pre-auricular to midpoint) to check whether that's indeed the center and adjust accordingly again. At the end of the day, trust the measuring tape, not the participant because participants can get it wrong…
* Once cap is in the correct position, secure the strap under the chin.
* Tell participant you're going to start applying gel. Tell them you're going to use a blunt needle. Show them the needle's blunt.
* To avoid contamination, use separate needles on the participant’s scalp and the container with gel.
* Before you apply the gel, use the tip of the needle to scratch the scalp and to lift off the hair ﬁrst. THEN you apply gel. By scratching the scalp ﬁrst and trying to lift the hair, the gel makes better and more direct contact with the scalp immediately, making life much easier for you.
* First, gel the second electrode (this is the ground electrode) from the front, located on the midline. If you don't gel this electrode ﬁrst, you won't see impedances for all the other electrodes.
* Make sure all impedances decrease (becomes blue) when you start gelling. Continue gelling, twisting, and turning the needle to scratch the scalp until all impedances are below 5.
* Use lemon prep to clean the ears, around the eyes, and corrugator electrodes (only if using these electrodes). Wipe off lemon prep with alcohol pad and pumice ﬁnger. Make sure no lemon-prep debris is left over. Earlobes and face should be really clean now. Otherwise, we won't get clean recording.
* Attach electrodes to the ear, then eyes, and ﬁnally corrugator (if using these electrodes).
* **Ensuring the impedances are close to or equal to 0 for the ear electrodes is REALLY IMPORTANT!**
* To attach eye and corrugator electrodes, use the small washer adhesive.
* After attaching any electrode on the face (e.g., eye, corrugator), press and hold for at least 5 seconds before releasing. This will help stabilise the connection and keep the electrodes ﬁrmly attached. Refer to facial and corrugator electrodes manual for more information on how to attach these electrodes.
* Talk to the participant when you're gelling. Engage them. Get them to look at the image of their eyes on the display. Keep them happy. Happy participants = clean data = good results!
* Explain to participants we're measuring brain activity and tracking their eyes, so it's very important to keep still. Explain that any movement of the jaws, shoulders, and neck will appear in our measurements.
* Show participants their neural activity in the background. Get them to blink and look around to show them the effects of eye movements and moving. Remind them once to try not to blink or move too much during the experiment. Tell them to just be natural.

How to set up the eye tracker?

* Get the participant to rest their chins comfortably on the chin-rest.
* If the eyes are within the tracking range, you should see an image of the eye on the eye tracking computer display.
  + If you don’t see their eyes at all, get the participant to adjust the height of the chair, their glasses (if they're wearing them), their head position.
  + Only if necessary, adjust the lens of the eye tracker camera to refocus.
* If the eye is within the tracking range, you should see crosshairs immediately (red square box and white cross).
* If the eyes are on the display and the computer didn’t manage to locate the eyes, click on the eyes to locate it.
* Try to record from the right eye whenever possible. But if it’s easier to record from the left eye, select the left eye.

What to tell the participant and what to do next?

* Tell them you’re going to calibrate their eyes and the study will begin now.
* Close the door.

**Starting the experiment proper + during the study**

Make sure the participant is seeing the correct display (presentation display, not EEG display)! Close the door and start the experiment.

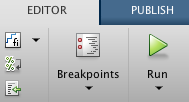
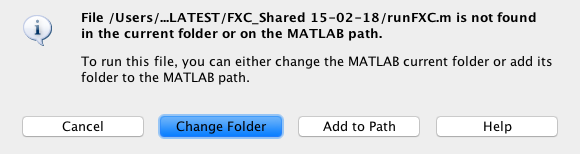
Tell the participant you’re starting the experiment now.

Start ASA EEG recording (Script/task 1; e.g., **HauseEye001.cnt)**.

* On the EEG computer, return to the window with 'Check Impedances,' 'Show EEG,' and 'Proceed' on it.
* At the background you should see the large 'Not Recording'.
* Click Proceed. Then click Start. The large 'Not Recording' should disappear, which means you're recording EEG now.

Run **OC** script

* Click the green arrow man icon (EDITOR panel) in MATLAB to run the study (see screenshots below).
* If a window pops up and says something about current folder and MATLAB path, click **Change Folder.**
* In the Command Window (bottom half of screen), provide the participant number (e.g., 1, 2, 3) after Participant number?
* This section of the study lasts about 5-7 minutes.
* When it says “This part is done. Please inform the experimenter,” press Escape on the keyboard.
* Stop EEG recording when this script is done.
  + In the Dialog window ASA EEG/ERP Recording, click 'Stop'. Then the large 'Not Recording' will appear again.

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Tell the participant to feel free to take breaks whenever they see “'Press any key to start the next block.”

Run **runFXC** script (this script lasts about 40-60 minutes)

* Click the green arrow man icon (EDITOR panel) in MATLAB to run the study (see screenshots below).
  + If a window pops up and says something about current folder and MATLAB path, click **Change Folder.**
* A popup dialog will ask you to provide the participant ID (enter 1, 2, 3, 4, etc.).
* The eye tracker computer monitor will flash once (really quickly!) and the presentation display will be black, which is telling you we’re in eye-tracker calibration mode.
* Calibrate the eye tracker. Refer to eye tracker manual.
  + Essentially, click auto-threshold (A), make minor changes to PUPIL and CR values, calibrate (C), and validate (V).
  + Then click Exit Setup (or press Escape) to begin experiment.

Start ASA EEG recording (Script/task 2: **runFXC**; e.g., ASA: **HauseEfficacy001.cnt**).

* Open a new ASA recording session and prepare it for the runFXC.
* On the EEG computer, return to the window with 'Check Impedances,' 'Show EEG,' and 'Proceed' on it.

Three practice blocks (no EEG and no eye-tracking)

* Whenever you see “You have finished this practice. Please get the experimenter,” press Space on the keyboard to proceed.

Before you begin the first ACTUAL block...

* There are 8 blocks (75 Stroop trials each) and you’ll re-calibrate the participant’s eyes before every block (you’ll see a blank screen on the presentation computer; eye-tracking display should also flash).
* Start ASA EEG recording on the EEG computer (make sure it’s HauseEfficacy001.cnt and so on).
  + At the background you should see the large 'Not Recording'.
  + Click Proceed. Then click Start. The large 'Not Recording' should disappear, which means you're recording EEG now.
* Calibrate (C) and validate (V) accordingly. Then click Exit Setup (or press Escape) to begin experiment.

Before each ACTUAL block...

* The eye tracker computer monitor will flash once (really quickly!) and the presentation display will be black, which is telling you we’re in eye-tracker calibration mode.
* Before we recalibrate the eye tracker, check EEG data quality
  + Re-gel electrodes if necessary (if you observe ﬂat or extremely noisy channels during the previous block).
  + Ensure mastoid (earlobe) electrodes are still ﬁrmly attached.
  + Ensure facial electrodes are still ﬁrmly attached.
  + If necessary, get participants to reposition and readjust themselves if their eyes are not being tracked by the tracker. Adjust their glasses, head position, chair height, and so on until you can see the eyes with the crosshairs on the eye tracking computer.
  + If you've lost their eyes or observed a lot of crazy movement artifacts on ASA during the previous block, tell them, very nicely, to try not to move too much.
* Recalibrate eye tracker: calibrate, validate, and then click Exit Setup to proceed.

After finishing the runFXC script, stop recording and present questionnaires.

* Stop EEG recording when this script is done.
  + In the Dialog window ASA EEG/ERP Recording, click 'Stop'. Then the large 'Not Recording' will appear again.
* Tell participant the main experiment is over. Now time for a few questionnaires.
* Open Chrome to show the questionnaires. Enter participant number.
* Press the display switch box to show them the questionnaires on the EEG computer.

**At the end of the study**

What to do at the end of the study?

* Direct participant to the sink, provide towel, and tell them how to go about washing their hair. Remember to tell them where the shampoo and everything else are!
* When they are washing their hair, check if all data have been saved:

On the acquisition (ASA recording) computer:

* Look within the DATA folder (shortcut on the desktop) to make sure the new EEG data (8 new ﬁles: .cnt, .sen, .evt, .trg) have been recorded and saved.
  + e.g., HauseEfficacy001.cnt, HauseEye001.cnt etc.
* Open the **Hause Efficacy Reward Study** folder on the desktop. Drag and drop all the new ﬁles created in the DATA folder for this participant to this folder.

On the eye tracker computer:

* Click EXIT EYELINK on the main window to restart.
* Then select the WINDOWS XP partition to load Windows XP on the eye tracker computer.
* Click on the EYE TRACKER DATA folder on the desktop and check that the new eye tracking data have been saved and recorded in that folder.
* Drag and drop that participant's data (e.g., 001, 002) into the **Hause Efficacy Reward Study**.
* If everything is there, SHUT DOWN this computer (this is the only computer that needs to be shut down when you leave the lab).

Unpause NextCloud background sync on the EEG acquisition computer.

* Right-click on the NextCloud icon at the bottom right of the task bar on the EEG acquisition computer. Click unpause synchronization.

How to debrief and pay participants?

* Show them debrieﬁng form. Ask if they have any questions. Let them know we're still running the experiment during the semester so don't mention our methods to anyone. Thank them for their time.
* Tell them they’ve earned $5 and get them to sign on all the forms to indicate they’ve received payment.
* What to do before you leave?
* Wash the cap and the face electrodes. After washing the corrugator electrodes, dry them and reattach them to the ampliﬁer and place them neatly between the monitor and eye tracker.
* Turn off the ampliﬁer.
* Turn off the eye tracker by unplugging the plug on the ﬂoor.
* Make sure the place is clean and tidy.

**How to assign SONA credits**

Options

* Participated: participant has participated and completed study
* Unexcused: participant didn’t show up
* Excused: participant didn’t show up but had a legitimate excuse for not showing up

Click **Update Sign-Ups** at the bottom.

