

# Lab 6: Cognitive Control II

## I. Creating a New Experiment in TeLLab

### Familiarization

Log in to TeLLab, Go to Experiments → Stroop Test. Find an experiment similar to the one you plan to create: participate in the experiment, then copy an editable version of the experiment into your account (how-to appears below), and explore the editing options. This will give you a clear sense of the finished product for your entire experiment construction process. To participate in an experiment, click the chain link icon. To copy a version into your account, click the two squares icon, then go to MyHome → MyExperiments, and find the copy under Experiments Designed. Click the edit icon (to the immediate right of the experiment name). Explore all the editing options and features, especially in the Frame navigation window.

### Getting Started

Join your group, and decide who will implement your group's design (with collaborative help from the rest of the team).

Go to Experiments → Stroop Test and then click the red circle with **E+** on the right side. This will create a new 'blank' experiment in your account.

Go to MyHome → MyExperiments. Under "Experiments Designed" there will be one labeled "New Experiment" and you can click the edit icon to begin designing.

Go to Settings → Name, and give your experiment and informative name that will be easy to recognize by everyone in your lab (there will be about 40 experiments under Stroop Test by the end of the week, so clear naming is important). E.g. You could name your experiment Face Flanker (Group A Monday afternoon). Write the name of your group's experiment on the whiteboard at the front of the lab room. (Everyone in lab will participate in your experiment today.)

Tips: After you start editing **Always choose Apply** after updating a Frame, and repeatedly click on **Save** (top right) to be sure all your edits are being saved. When your entire experiment is finished, you will choose Publish to make it available for participation.

### Creating Trials

Find the folder on your computer with all of the image files for stimuli, and double check that they are all sized to 640x480 pixels.

After naming your experiment, close Settings, and choose Frames. Click the green icon for **+Add Frames**. Choose **Image** for the type of frame. Click the green icon **Add Images**, then the green icon **Add Files**. Now you can upload all of your stimuli files at once. Choose all your image files, then click the blue **Submit** button (do NOT click Finish yet). All of your image files are saved to your account, so you can quickly use any one of them in new frames when choosing **Browse My TeLLab Library**.

You should now see all of your image files as small icons with red X's on the top left corner. Click the red X's to remove all except one of the images (the one remaining will be used to create your first trial). Click the blue **Finish** button. A stimulus frame as been created (for a single trial type), and can now be customized with response options and condition information.

**Response Options.** Inside the frames navigation window there is a little icon of an arrow inside a circle. When you click this icon, it lets you determine how this trial will be completed, either by a keypress or after a specified amount of time (in milliseconds, at the top). Select which responses are allowed. For example, if the trial displays MNM, click the radio buttons indicating that “N” is the correct response, and that “M” is wrong response. Only the keys you select will be accepted as responses. When a wrong response is pressed by your participants, a red X will appear and the trial will not advance until the correct response is pressed.

**Condition Information.** You can write your own Excel function following lab 4 to extract condition information (not recommended), or you can specify the condition information for every trial frame in the experiment. To add condition information, inside the Frames navigation window, click the star \* icon to add a description. For the description, label this trial with condition information (e.g. incongruent, congruent; or, matching, mismatching). Choose names that will be easy to remember and interpret.

**Repeat the steps above (and summarized 1-7 below) for all of your stimuli.**

- 1) **+Add Frames**
- 2) **Image**
- 3) **Add Images**
- 4) **Browse My TelLab Library** (or choose **Add Files** to upload new stimuli)
- 5) Select the Image file (for this new type of trial)
- 6) Add Response Options for correct and wrong keys (using the **arrow-in-a-circle** icon).
- 7) Add Condition Information by clicking the **star \* icon** to write a Description.

## Organization, Instructions, & Practice Trials

After all of your stimuli are uploaded as unique frames, you are ready to specify the number of trials (for each stimulus to appear) and randomize the order, using Blocks. Note, if your experiment involves more than one task (with unique instructions for each task), you will need create each task Block separately, and write instructions (**Text** frames, see below under Instructions) for each task to appear before the block.

**Blocks.** Click on **+Add Frames** and select **Block**. Check the box for Randomization, and click the blue **Next** button. Specify how many times each trial type (each frame with unique stimuli) will be presented to your participants. 8 is a good number for a short experiment (e.g. if you have 6 trial types and 8 trials per frame, it will be a 48 trial experiment, easy to complete in a few minutes). Click **Next** and then **Finish**. Now a Block frame will appear in the Frame Navigation window. Drag each one of your experiment frames into the Block.

**Instructions.** Instructions should appear as the first frame in your experiment (and any time the task changes). Click on **+Add Frames** and select **Text**. Text frames are labeled as html within the Frame Navigation window. Drag your html instructions frame to the top in the Frames

Navigation window. Use clear, concise instructions. It is often helpful to include one or two examples. For instructions frames, click the little arrow-in-a-circle icon and enable “Spacebar” to advance. Be sure to write “Press Spacebar to begin/continue” at the bottom of the instructions text frame. You can use the star \* icon to label this frame as instructions.

**Practice Trials.** (Optional) It is usually a good idea to include practice trials at the start of an experiment, to familiarize your participants with the task. You can do this by re-creating all of the trial frames, repeating the 7 steps above for each frame, but changing the Condition label to Practice for all of these frames. OR (there’s a faster option, if you are careful) you can go into your block, duplicate the frames one at a time using the little book icon, drag each duplicate out of the block and update the Description to read “Practice” for its condition information. Then make sure you have unique instructions corresponding to practice (before the first practice trial) and starting the main experiment (before the block that starts the main experiment trials).

**Final Steps.** Double Check Everything, then **Save** and **Publish**. Now go to Experiments → Stroop Test, find your experiment and participate. If you spot problems, go to MyHome → MyExperiments and edit. Repeat as necessary. If everything looks good, go to MyHome → MyExperiments and under Experiments Finished, download your data in Long Format. Then open the data file, look to see if everything appear correct (e.g. are your condition labels are there?), and analyze the results. If everything is in order, you are ready to collect data! Go to the white board and circle your experiment name, indicating it is ready for participants.

## II. Analyze Results

### Start with Pilot Data

You might finish creating your experiment before other groups are done, or finish participating in all the other experiments before everyone has finished participating in your experiment. It’s often a good practice to analyze data from a single participant or first few participants — yourself and/or your group members — this is called pilot data. Analyzing a small data set first often makes the larger data set, with data from many participants, easier to understand. Typically you ‘throw away’ the pilot data, excluding it from the main analyses — this gives you the freedom to explore the data with unplanned analyses, without biasing your results — and it’s probably also a good idea to exclude your own data because you might be biased by familiarity with the stimuli or hypothesis.

Questions to have in mind: Do you have a way to check whether participants performed the task versus just randomly clicking (e.g. while texting and listening to music, instead of really doing the task)? Do you have a procedure to exclude ‘outlier’ trials (often response times 3 standard deviations above or below the mean can be excluded, but you need to decide on this before analyzing your data)? Are you going to group all the trials together, ignoring whether there were errors, or only analyze ‘correct’ trials with no errors? Are you going to analyze the error rates as a dependent measure, along with reaction time? You might be surprised to learn that all of these choices are in the experimenters’ control — for statistical reasons, you should make all the analysis decisions before looking at your final data. Analyzing Pilot Data is important.

## Analyze Main Experiment Data

Everyone in your group should analyze the data individually, and compare results. You can also divide-and-conquer by choosing roles early (summary statistics, inferential statistics, figures).

If you implemented the experiment for your group, download the full data set (Long Format) after everyone has participated, and email the file to your other group members and to your lab instructor. Only the person who created an experiment has access to the whole data set from all participants. Open the .csv file in Excel. Create a new worksheet, copy all the raw data to the new worksheet and “freeze” the original so that it cannot be accidentally compromised.

A good procedure for within-subjects designs (when every participant performs in both conditions), is to compute the condition data for each participant (e.g. RT for Subject A for Incongruent Trials, and RT for Subject A for Congruent Trials), and then treat each participant as contributing two data points and run a t-test over the participants’ mean data by condition. You can do this using Pivot tables. Select/highlight all the data → Pivot Table Reports → Create Pivot Table, in new worksheet. Drag subject id to rows, RT to the main window, and condition to columns. Click RT and make the statistic “Average” to calculate means.

## Figures & Presentation

Still working as a team, make two informative figures summarizing your experiment results. Along with the two stimuli & experiment design slides (that your group made as homework), this will compose a 4-slide presentation to concisely summarize your experiment and results to the class (in about 4 minutes per group). Depending on how efficiently everyone works, presentations will happen today for all groups that are ready, and at the start of next lab for all groups that are not ready by 30 minutes before the end of lab today. So if you don’t have a presentation ready, finishing it will also be part of homework. With 30 minutes remaining in lab time today, presentations will begin.

## III. Homework

For homework this week everyone will **work independently to write up a lab report** on the experiment your group designed and conducted. Although every individual student must write up their own report, you are encouraged to share and all use the same Methods & Results sections, along with the figures your group made together. The lab report format will be QALMRI + Figures. You must individually write up the QAL\_\_I sections, and are encouraged to share MR sections and Figures with your group (you have the option to do everything individually, if you prefer).

Each section of QALMRI in the report can be about 500 words, or half a page, making your full report about 3 pages + Figures. It is due at 11:59pm the night before your lab meets next week. Name the file LastName\_ControlReport.pdf and upload to Blackboard.