Contents

I. Preamble

Staff training and error prevention measures

Before independently performing the procedures described in this SOP, Cogitate staff members will be trained as follows:

☐ Read this SOP.

☐ Observe the procedures, when performed by trained study staff or a Cogitate investigator, *two times*.

☐ Data monitoring team will visit once to train personal and to supervise data collection in one patient.

☐ Follow the procedures under the direct supervision of trained study staff or an Cogitate investigator *two times*.

II. Preparation of background documents for data collection

A. Create a participant folder (a physical one, with paper version of all the documents) containing:

1. Participant Cogitate ID (on the cover of the physical folder)
2. Make sure it contains the following documents:
    a. Case report form
    b. Checklist
    c. Exit questionnaire experiment 1
    d. Exit questionnaire experiment 2
3. Any other clinical background document collected so far can also be added to the documentation folder.
4. Make sure all dates are entered following this format: YYYY MM DD

B. Collect the regulatory binder[1]

1. Make sure it contains the following documents:
    a) SOP
    b) instructions experiment 1
    c) instructions experiment 2
    d) how to operate the eye tracker

C. Document the setup used for the patient (in the CRF):

1. Amplifier
2. Number of electrodes
3. Online filters

[1] The **regulatory binder** is shared for all patients as it contains information that applies to all of them. In contrast, a patient **physical folder** should be created per patient as it contains patient specific information.

4. Reference

D. Fill the CRF ahead of time

a. Date should be entered in the following format: YYYY MM DD
b. Patient Cogitate code
c. Document the participant status

III. Preparing experimental setup

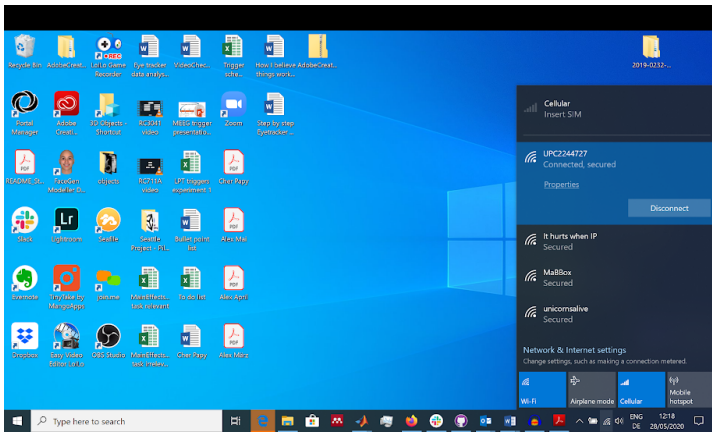
Prior to participant arrival

A. Collect all experimental materials necessary to run the task with the patient

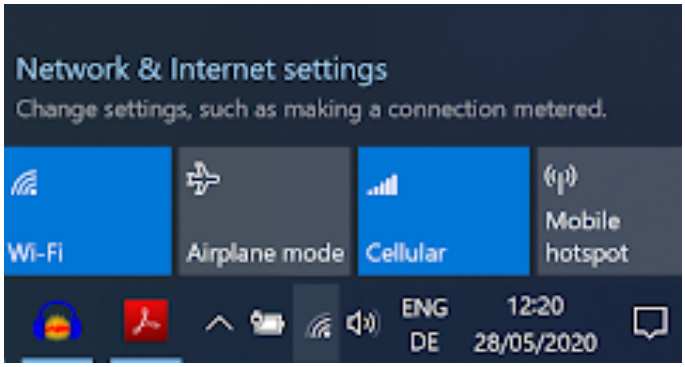
1. Participant Folder
2. Regulatory Binder
3. Presentation laptop
4. Response box
5. Photodiode
6. Eye-tracker
7. Microfiber cloth
8. Tape measurer
9. Cables:
    a. Eyetracker USB cables
    b. Isolator box
10. Disinfect the whole material before you bring it to the recording room

B. Preparing the experimental computer

1. Turn the computer on, and plug it in the isolator!!!
2. Disable wifi on the computer. click on the network icon on the bottom right of the screen



3. Click on the Airplane mode button to turn the wifi, cellular and bluetooth off



C. Setting experiment 1 script:

1. Go in the folder …\Exp1, locate the matlab function called: initRuntimeParameters.
2. Double click on the function to open it. This will open matlab automatically.
3. Check the following parameters:

a) RECORDING MODALITIES:

- Make sure that ECoG and EYE_TRACKER are set to 1, as shown below

```
% Recording modalities
MEEG = 0; % Set to 1 if recording with MEEG
fMRI = 0; % Set to 1 if recording with fMRI
EYE_TRACKER = 1; % Must be set to 1 if recording with Eyetracker
ECoG = 1; % ; Set to 1 if recording with ECoG
Behavior = 0; %Set to 1 if recording with Behavior only
```

b) HARDWARE PARAMETERS:

- REF_RATE_OPTIMAL should be set to 60
- Make sure that the SCREEN_SIZE_CM matches your display (measure it physically!)

```
37
38      %% Hardware and physical parameters:
39 -    REF_RATE_OPTIMAL = 60; % in Hz. Screen refresh rate.
40 -    VIEW_DISTANCE = 80; % Default viewing distance (if no viewDist argument
41 -    SCREEN_SIZE_CM = [34.5 19.5]; % screen [width, height] in centimeters,
42 -    viewDistanceBottomTop = [80 80]; % Distance between the participant hea
43
```

c) EYETRACKER PARAMETERS:

- Eyetrackerdummymode and head-fixed should be set to 0.
- HEAD_FIXED should be set to 0
- TOBII_EYETRACKER should be set to 1

```
%% Eyetracker parameters:
DISTANCE_SCREEN_TRACKER = 90; % Distance between the eyetracker lense and the cor
Eyetrackerdummymode = 0; % Dummy mode of the eyetracker: MUST BE SET TO 0 TO RUN
HEAD_FIXED = 0; % Head fixed must be set to 0 if remote mode
TOBII_EYETRACKER = 1;
```

d) TRIGGERS PARAMETERS:

- Make sure the trigger parameters are set as followed:

```
%% ECoG parameters:
BIT_DURATION = 0.020; % Duration of single bit in ECoG audio triggers
RESP_TRIG_ONSET=0.2; % Lower time threshold to send audio resp trigger (in seconds)

%% Photodiode parameters:
PHOTODIODE = 1; % Must be set to 1 for the photodiode to be presented
DIOD_ON_COLOUR = 255; % Color of the photodiode when turned on (255 white, 0 black)
DIOD_OFF_COLOUR = 1;  % Color of the photodiode when off (255 white, 0 black)
DIOD_SIZE = 900; % Size of the square where the photodiode is presented (in pixels)
DIOD_DURATION = 3; % Duration of the photodiode flash when turned on (in frames)
```

e) Debugging parameters:

- Make sure that all the parameters below are set to 0, except RESOLUTION_FORCE

```
%% DEBUG parameters
DEBUG = 0; % 0 = no debug | 1 = regular debug | 2 = fast debug
VERBOSE = 0; % Yoav: Katarina, if you have the time please encase the displays in if
VERBOSE_PLUS = 0; % for debugging duration balance only
NO_PRACTICE = 0; % skip the practice run
RESOLUTION_FORCE = 0; % the program will complain if optimal refresh rate is not pos
NO_FULLSCREEN = 0; % enable windowed mode for dubugging
NO_AUDIO = 1; % Disable audio for dubugging BIT_DURATION: duration of the single bit
NO_ERROR = 0; % Disable testing program error throws
% Q: Do I need to fill this out? Pixels? Yoav: only if you want the debug scree to b
WINDOW_RESOLUTION = [10 10 1200 800];
```

f) Matrix generation parameters

- Make sure the trial matrices parameters are set as follows:

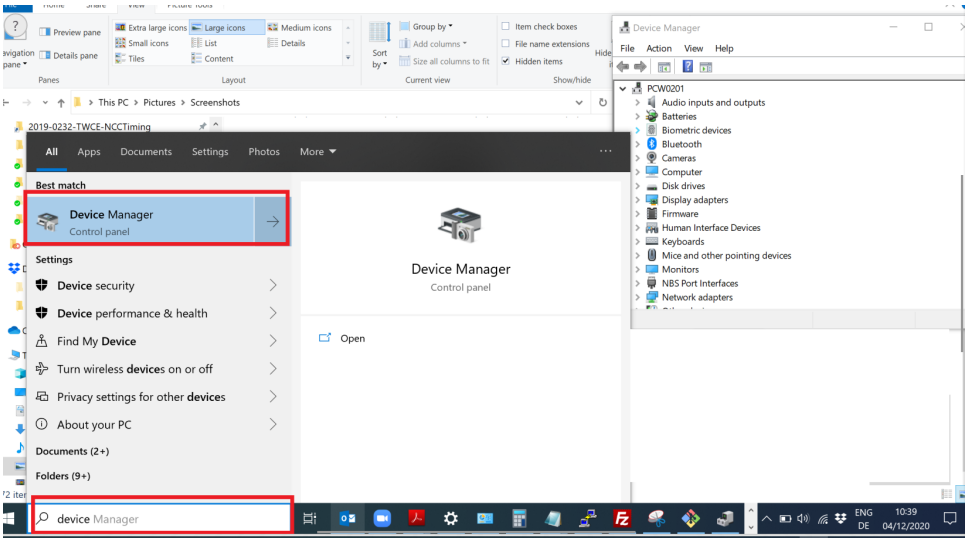
```
%% Matrix generation
MATRIX_GENERATION = 0;
PREEXISTING_MATRICES = 1;
```

D. Boot experiment 1 once

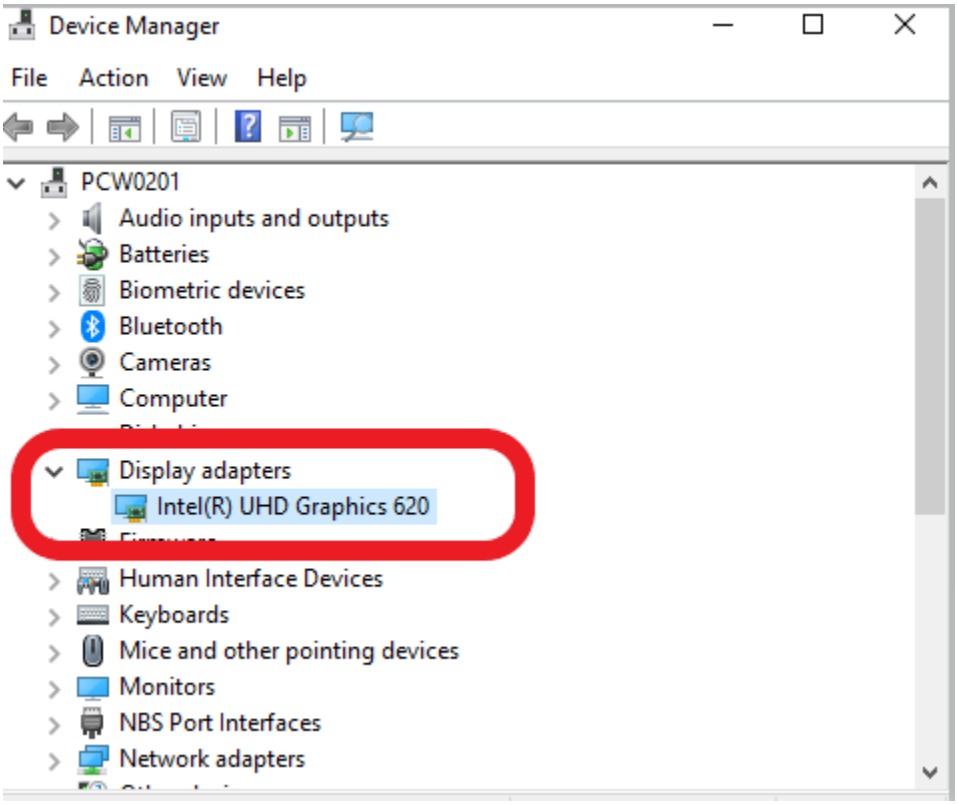
1. To make sure the experiment works correctly, try to start the experiment once, using the participant ID 300 (**runExp1(300, 80)**)
2. The experiment should start. Make sure you proceed through the instructions and see the first few trials, you can then hit escape
3. Note that it might tell you that the participant already exists. That's fine, just hit continue and resume

E. Troubleshooting

1. If experiment 1 doesn't boot, take the following steps
   a) Make sure the discrete GPU is disabled. To do so, open the device manager:



   b) In the device manager, o to Display adapters
   c) In there, right click on the NVIDIA graphic card (a.k.a. not the intel one) and hit disable
   d) Try to run the experiment again



Upon participant arrival

F. System check with participant

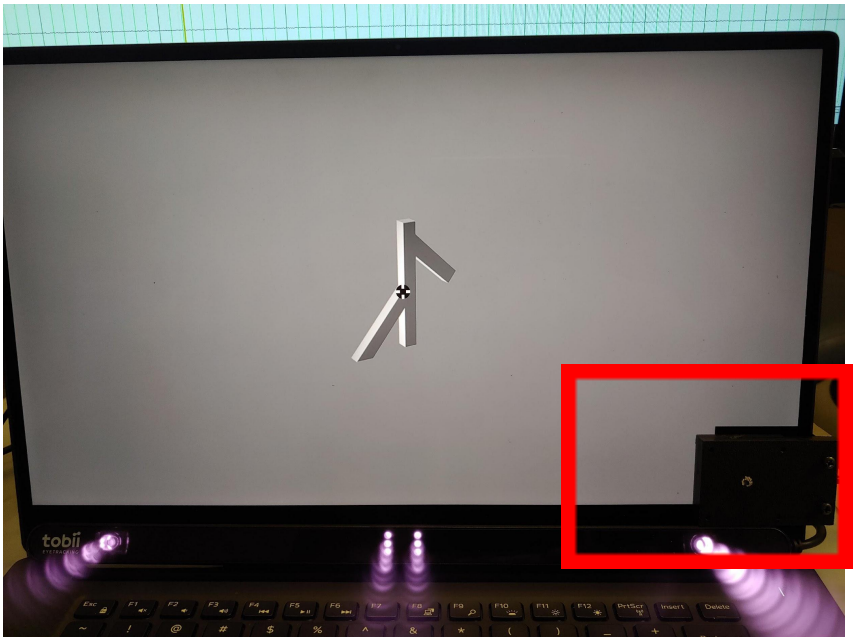
1. Disinfect your hands before interacting with participant
2. Greet the participant and introduce yourself
3. Explain the task and the purpose to motivate them, by reading the document called Experiment 1 General oral instructions.pdf
4. Close off the blinds after making sure that it is okay with the patient
5. Check the environmental hardware, fill the CRF accordingly.
6. Make sure the laptop is plugged in the isolator box!!!, and that the isolator is in the unit. All research equipment should be plugged in there!
7. Continue completing the CRF (ignore information already entered)
    - DC channel #
    - Photodiode
    - Eyetracker (NYU)

G. Setting up the experiment hardware

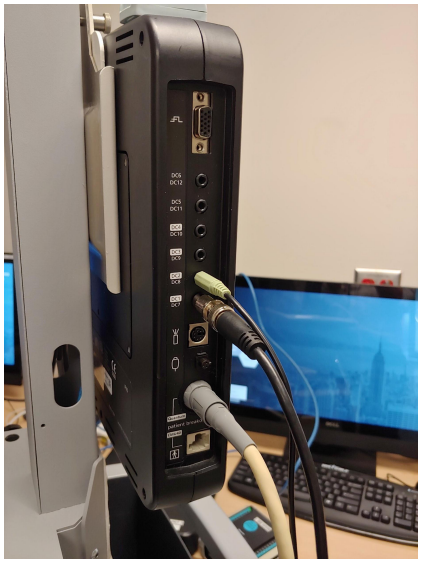
1. SET UP THE LAPTOP

Grab a table (e.g., the one used by the participant). If in use, either find a second clean one or clear the table from the patient. Use the cleaning wipes in the front door of the room to clean the table. Place the computer in front of the patient at a distance of 80 cms. Measured from the patient eye to the screen of the laptop. Ask the patient to sit comfortably and adjust the height of the table. Ideally the monitor should be placed at the same height as the patient eyes.

2. SET UP THE PHOTODIODE



The photodiode should be clamped to the bottom corner of the screen, such that it is in contact with the corner. You should then plug the photodiode into the DC channel 1. Bring extra battery



3. Plug in the response box in the USB port of the computer

The response box should be plugged in one of the USB port of the experiment computer. Give the patient the response box in this orientation:

The two red buttons are not activated, so the patient cannot use them!

H. Check the functionality of the experimental hardware

a) Response box test:

1. Open the script called ECoGaudioPhotoTest. The path is ..\Experiment1Development\setup tests
2. Enter ECoGaudioPhotoTest in the matlab command window. The following text should appear on a gray background
   - *'Welcome to the audio and photo test. You will start by testing the response box. Press any key to pursue'*;
3. Press any key to pursue. box test. Another screen will appear, instructing you to press the response key from the response box. When doing so, you should see the following appear:
   - *'This key is working'*
4. Repeat the procedure with the four response keys.
5. Press escape to proceed to the trigger test

Troubleshooting: if the text above does not appear, try the following:

1) Make sure that you are not pressing the red buttons!
2) Make sure that the USB cable is plugged into the computer correctly
   Note: you do not need to interrupt the script to do so.

a) Triggers test:

6. You should observe the following screen:
   - 'You will now enter the trigger test, press any key to pursue. Once you are done, press escape to terminate this script'
7. Press any key to proceed.
8. Instruct the participant to press the response key every now and then, for the next few minutes. In the meantime, head for the monitoring room
9. The script sends photodiode triggers automatically. You should therefore observe the following in the photo DC channels:
   a) Photodiode: you should see a square wave at regular intervals, every 4 seconds, lasting for a duration of 250ms.

Troubleshooting: If one or both triggers are missing:

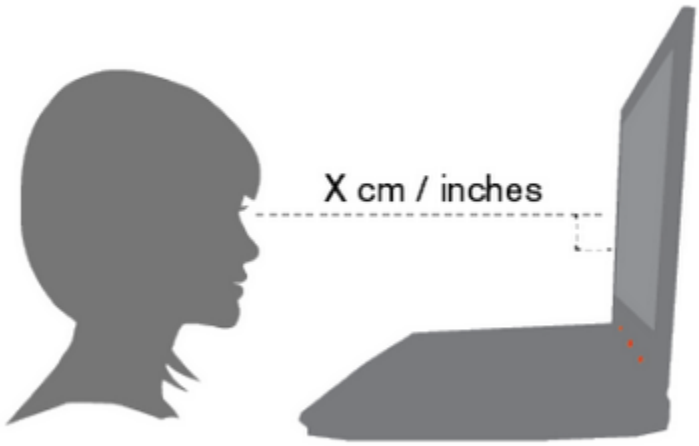
1) Check that the photodiode is placed exactly at the location in which the light flashed. It has to cover it completely, and thus NO light should be noticeable. If you can see some light, then the location of the photodiode is suboptimal. Plug it again until you see NO light.
2) make sure the DC channels are plugged in and activated.
3) run the test again

I. Setting up the eyetracker

Tobbii tracker

a. Plug the tracker in the USB port of the computer.
b. Clip the tracker in the middle of the bottom of the laptop screen, like so:

c. The distance between the tracker and the patient should be 80cm
d. Make sure that the patient is placed in the middle of the sensor field of view
e. The patient should be perpendicular to the screen, like so:



IV. Experiment 1

A. Starting experiment 1

1. Measure the distance between the participant nasion (where the middle bar of glasses is on the nose) and the middle of the screen (IN CM!!!) and note it down (you will need it to start the experiment)
2. Instruct the participant:
3. In the matlab command window, type runExp1(ID, ViewerDistance). E.g., if you are running participant 101, and the measured distance was 65cm, enter the following: *runExp1(101,65)*
4. Read the instructions to the participant as they go through the instruction slides*:*

"You will be presented with a stream of images that will be shown for variable amount of time. The images you will see will belong to 4 categories: faces, letters, objects and characters that resemble letters (avoid the term false-fonts, it doesn't make sense to them); and will be presented in different orientations. Only one picture at a time will be presented on the screen. The study is organized in small blocks, which last a couple of minutes each.

At the beginning of each of these blocks, you will be see two images, the so called targets. Your task is to 1) take notice of these two targets, and be on the lookout for them in the stream of images and 2) to press the ___ key whenever you see one of the targets.

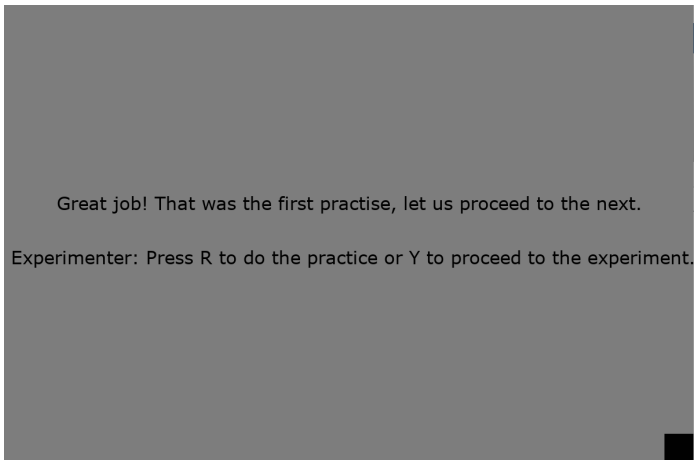
You should answer as fast as you can, but take your time to be sure it is the right stimulus. The two targets will be shown in three different orientations: straight, to the left and to the right. Whenever the stimulus comes during the stream, no matter the orientation, you should press.

Don't worry for now if that sounds complicated, but you will see that it really isn't. You will have a small practice run before we really start.

It is very important that throughout the study, you keep your eyes fixated at the cross in the middle of the screen as this affects out brain recordings. We will also be tracking your eye movements."

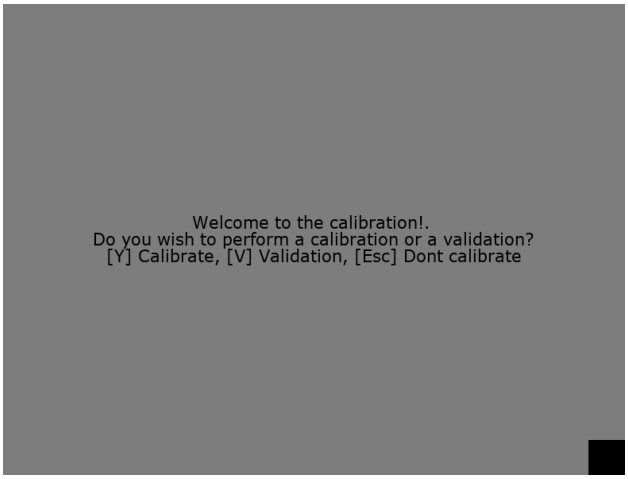
If you have any questions, please do not hesitate to ask!

5. Let the participant read the instructions and answer any question they may have.
6. The participant will then proceed to the practice. You should coach the participant through the practice. Stand next to them. When a target appears, let them know that they should have pressed (if they haven't). If they did, say WELL DONE!
7. At the end of the practice, if the performance weren't good enough, a screen will appear, saying that the participant did a good job and that you should proceed to the



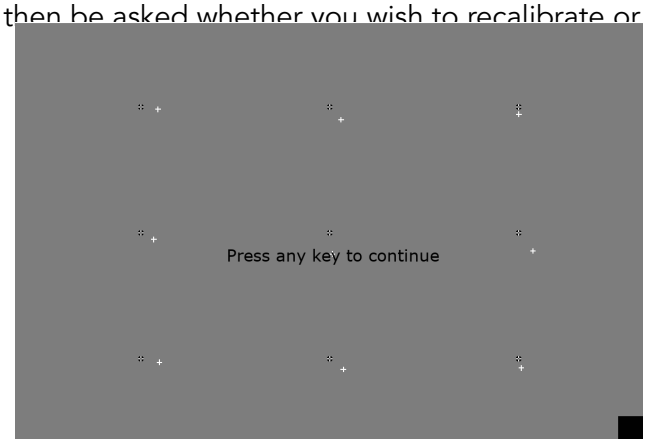
next practice:
This is a trick to avoid demotivating the participant. In reality, only one practice is planned, but if the performances are too low, we want to redo the practice, without letting the participant think he performed badly. When you see the following screen, it means that the performance were good and that you can proceed:

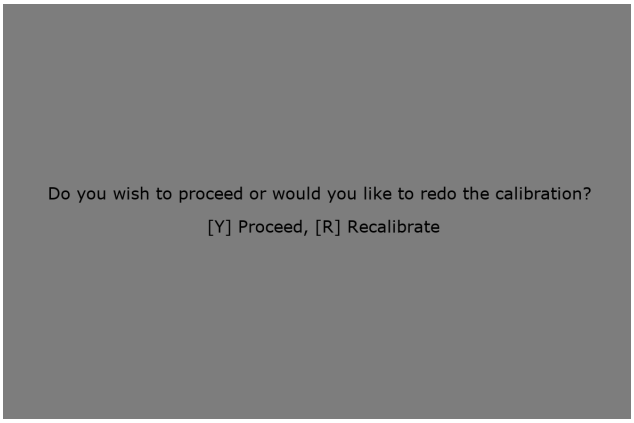
8. Once the practice is over, the eyetracker calibration will start:
    a. Tell the participant that a calibration will be performed, which is very important to determine where his/her eyes are looking at and to map that to responses of their brain.
    b. Instruct them to follow with their gaze the dots which will appear at different locations and to fixate once the dots are static.
    c. The calibration screen will appear:



    d. You should press 'Y' to do the calibration
    e. The calibration will start.
    f. In the calibration, in order to accept a fixation point as a calibration sample press the space bar when the participant fixates the dot.
    g. At the end of the calibration, a screen will be displayed, showing which the data points that were recorded are. You should use it to estimate whether you should perform the calibration again. Press any button to continue

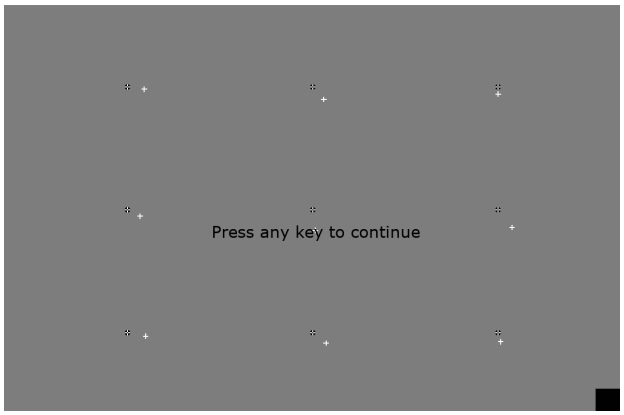
h. You will then be asked whether you wish to recalibrate or if you wish to pursue:





i. If the calibration was poor (as seen from the previous screen), press 'R' to recalibrate.

j. If the calibration was fine, you will pursue to the validation. The task will be the same for the participant. At the end of the validation, you should see this on the



screen:

k. If the white crosses are close to the white crosses in black circles, you can proceed. Otherwise, redo the calibration

l. See how to operate the tobii tracker for a more precise description of the procedure.

B. During the experiment

1. Note down the time of the beginning of the experiment on the CRF
2. Monitor the participant performances.
3. During the experiment, complete the CRF
    a. Note the time of the beginning of each block (5 in total)
    b. Note anything worth noting: medical personal walks in, participant needs to take a break… There is no taking too many notes
    c. Note the time if the participant takes a break
4. During the breaks encourage the patient. Tell them that they are doing great!
5. At the end of each block, the calibration screen will reappear. At the end of the second block, you should perform a validation by pressing 'V'. If the resulting validation is worse than the first time, perform the calibration anew! Otherwise, just proceed.
6. If the participant decides to take a break or to interrupt the experiment, press the key 'Q'. After pausing the experiment, you will need to decide how to restart. There are three options to restart: press 'q' again to resume, press 'r' to restart the miniBlock or 'esc' to completely close off the experiment. If you press 'r', the log files will be appended. If you press 'esc' however, a new file will be created. You should make a decision on how you restart based on how you will prune the ECoG data. You should follow these rules to decide what to do after interruption:
    a. If the participant decides to fully interrupt the experiment for now, press the escape key
    b. If the break lasts less than 30secs, proceed by pressing 'Q' again.
    c. If the break of the interruption takes more than 30secs, do not restart simply by pressing 'Q', use 'R' or 'Esc'.
    d. If the interruptions lasts more than 20 minutes, use 'Esc'. In such a case, you should also prune the ECoG data accordingly.
    e. ALWAYS WRITE IN THE CRF WHAT HAPPENED AND THE EXACT TIME OF THE INTERRUPTION!

V. Ending the experiments

1. Tell the participant that they have done an excellent job!
2. Ask the participant to fill in the experiment debriefing questionnaires
    a. "Experiment 1 Feedback form" for experiment 1 (see experimental binder)
3. Thank the patient for his/her participation. Explain the purpose of the study and what is being tested. Ask them whether they would want to be updated on the results
4. Unplug the audio and photodiode from the DC ports
5. Plug back anything you unplugged in the beginning

6. Finish filling the CRF. If anything is missing, it is really important you figure this out while you still can!
7. Collect all the equipment you brought with you.
8. Ask the patient whether you could assist them in anything (e.g. coffee, call their relatives….)
9. Smile again at them, thank them again, tell them they have done an amazing job and leave the room
10. Place the computer back where you got it as well as the experiment materials

VI. Compiling the data dossier

A. Prepare folders structure on the server (running the function createFolders('ParticipantID'). This will set up your folders on the server:

```
+---Experiment1
|   +---BEH
|   +---ClinBack
|   +---Code
|   +---CRF
|   +---CT
|   +---ECoG
|   |   +---Experiment1
|   |   \---FingerLocalizer
|   +---ElecRecon
|   +---ET
|   +---FingLoc
|   \---MRI
\---Experiment2
    +---BEH
    +---Code
    +---CRF
    +---ECoG
    \---ET
```

B. Secure the files generated by Experiment1 script (this should be done as soon as possible, ideally, directly after the experiment)

1. Experiment1

a. Log files:
   a. Go to the folder ..\Experiment1\Data\SFID. Copy the following files and folders:
      i. PatientID_Beh_V1_RawDurR1.csv
      ii. PatientID_Beh_V1_RawDurR2.csv
      iii. PatientID_Beh_V1_RawDurR3.csv
      iv. PatientID_Beh_V1_RawDurR4.csv
      v. PatientID_Beh_V1_RawDurR5.csv
      vi. PatientID_Beh_V1_SumDur.csv
      vii. Temporary (folder)
   b. Paste it in: …\NYUServer\COGITATEProject\SFID\Experiment1\BEH

b. Code:
   a. Go to the folder ..\Experiment1\Data\SFID\Code
   b. Copy the zipped folder Exp1_PatientID_output_code

c. Paste it in …\NYUServer\COGITATEProject\SFID\Experiment1\Code

c. Eyetracker:
   a. Go to the folder ..\Experiment1\Data\SFID. Copy the following files and folders:
      i. PatientID_ET_V1_RawDurR1.csv
      ii. PatientID_ET_V1_RawDurR2.csv
      iii. PatientID_ET_V1_RawDurR3.csv
      iv. PatientID_ET_V1_RawDurR4.csv
      v. PatientID_ET_V1_RawDurR5.csv
   b. Paste it in
      i. …\NYUServer\COGITATEProject\SFID\Experiment 1\ET

d. Exit questionnaire:
   a. Take a picture or scan the filled exit questionnaire
   b. Save it under …\NYUServer\COGITATEProject\SFID\Experiment1\BEH

C. Collect the neural data [2]

a. Go to [WHERE THE DATA ARE]
b. Prune the entire experiment recording (from start to finish of each experiment from the CRF)
c. The data should follow the naming conventions below
   a. Experiment 1 (you should have five files)
      - PatientID_ECoG_V1_DurR1.edf
      - PatientID_ECoG_V1_DurR2.edf
      - PatientID_ECoG_V1_DurR3.edf
      - PatientID_ECoG_V1_DurR4.edf
      - PatientID_ECoG_V1_DurR5.edf
   b. FingerLocalizer (you should have five files)
      - PatientID_ECoG_V1_Loc.EDF

   c. Experiment 2 (You should have three files)
      - PatientID_ECoG_V2_VGR1.edf
      - PatientID_ECoG_V2_VGR2.edf
      - PatientID_ECoG_V2_ReplayR1.edf

   a. The EDF files should be saved in the …\ COGITATEProject\SFID\Experiment1\ECoG\Experiment1 and …\ COGITATEProject\SFID\Experiment2\ECoG and …\ COGITATEProject\SFID\Experiment1\ECoG\ FingerLocalizer folders respectively

[2] This should be done as soon as you can get access to the ECoG recordings

VII. Preparing data to be uploaded to XNAT

☐ make sure all files adhere to the expected naming conventions:

A. Example data set

```
+---Experiment1
|   +---BEH ----------------------------------> zipped, upload add. file BEH
|   |   |   SE101_Beh_V1_ExQu.txt
|   |   |   SE101_Beh_V1_RawDurR1.csv
|   |   |   SE101_Beh_V1_RawDurR2.csv
|   |   |   SE101_Beh_V1_RawDurR3.csv
|   |   |   SE101_Beh_V1_RawDurR4.csv
|   |   |   SE101_Beh_V1_RawDurR5.csv
|   |   |   SE101_Beh_V1_SumDurR.xls
|   |   \---temporary
|   +---Clin Back ----------------------------> zipped, upload add. file
ClinBack
|   |   \---SE101_clinback
|   |       |   SE101_V1_iVEEG.docx
|   |       |   SE101_V1_MDC.docx
|   |       |   SE101_V1_ORMap.png
|   |       |   SE101_V1_Path.docx
|   +---Elec recon ---------------------------> zipped, upload add. file
ElecRecon
|   |   \---SE101_V1_ElecRecon
|   |       |   ...
|   |       \---images
|   +---Code ---------------------------------> Visit level
|   |       SE101_Code_V1_Dur.zip ------------> zipped, upload add. file code
|   +---CRF
|   |       SE101_CRF_V1_Dur.doc -------------> upload add. file CRF
|   +---CT -----------------------------------> rename series to naming conv.
|   |   \---SE101_CT_V1_Elec -----------------> upload desktop client CT
|   +---ECoG
|   |   \---Experiment1 ----------------------> anon, zipped, upload ECOG
|   |       |   SE101_ECoG_V1_DurR1.EDF
|   |       |   SE101_ECoG_V1_DurR2.EDF
|   |       |   SE101_ECoG_V1_DurR3.EDF
|   |       |   SE101_ECoG_V1_DurR4.EDF
|   |       |   SE101_ECoG_V1_DurR5.EDF
|   |   \---FingerLocalizer ------------------> anon, zipped, upload ECOG
|   |       |   SE101_ECoG_V1_Loc.EDF
|   +---ET -----------------------------------> zipped, upload add. file ET
|   |       SE101_ET_V1_DurR1.edf
|   |       SE101_ET_V1_DurR2.edf
|   |       SE101_ET_V1_DurR3.edf
|   |       SE101_ET_V1_DurR4.edf
|   |       SE101_ET_V1_DurR5.edf
|   +---FingersLocalizer ---------------------> zipped, upload add. file LOC
|   |   \---SE101_Finger_Localizer_LOG
|   \---MRI ----------------------------------> rename series to naming conv.
|       \---SE101_MR_V1_anat -----------------> upload desktop client MR
|
```

```
\---Experiment2
    +---BEH ----------------------------------> zipped, upload add. file BEH
    |   |   CumulativeAnalysis.csv
    |   |   dump.txt
    |   |   SF105_Beh_V2_ExQu.txt
    |   |   StimulusAnalysis.csv
    |   |   TriggerAnalysis.csv
    |   \---SF105
    |       \---A
    |           |   config.json
    |           |   SF101A_analytics.txt
    |           |   SF101A_module.txt
    |           |   SF101A_SessionInfo.txt
    |           |   SF101A_version.txt
    |           +---Details
    |           +---ExtraLogs ----------------> remove ET files
    |           +---FullLogs
    |           +---Progress
    |           +---Sequence
    |           \---Summaries
    +---CRF
    |       SF105_CRF_V2.txt -----------------> upload add. file CRF
    +---ECoG ---------------------------------> anon, zipped, upload ECOG
    |       SE101_ECoG_V2_ReplayR1.EDF
    |       SE101_ECoG_V2_VGR1.EDF
    |       SE101_ECoG_V2_VGR2.EDF
    \---ET -----------------------------------> zipped, upload add. file ET
            SX101A0X.edf (or csv)
            SX101A1X.edf (or csv)
            SX101A2X.edf (or csv)
            SX101AAX.edf (or csv)
```