COGITATE DATA RELEASE

MEG Standard Operative Procedure (SOP)

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1.0 How to run a MEG session

1.1 Prepare Control Room and MSR

1. Check functioning of stimulus and response equipment (10 mins PK, 5 mins BU).
   - Replace the projector (only PK), remove the lens and mirror covers and turn the projector on.
   - Turn the response boxes on and test them.
   - In necessary, prepare earphones – only exp. 2.

2. Check gantry position and put chair in place (0-2 mins, depending on previous gantry

position).

3. Check experimental paradigm (5 mins).
   - Check that the stimuli and responses are as expected.
   - Check arrival of triggers in MEG recording.

4. Start subject preparation, items to have ready/available (1-2 mins).
   - Collect required materials, including the HPI coils and electrodes for EOG (2), ECG (2), REF(1) and GND(1).
   - Check (beforehand) the EEG cap over for damaged electrodes. Make sure it's clean and dry (if it is not cleaned, wash it).

1.2 Prepare MEG system

1. Prepare system (3 mins, also considering 3. and 4.).

2. Check quality of channels (1 mins if all good, 5 mins if tuning needed).

3. Select “COGITATE” project.
   - Load acquisition parameters.

4. Create subject

5. Record 3-min empty room data (3 mins)

1.3 Prepare subject

1. Explain preparation procedure (during MEG system preparation).

2. Explain experiment (during MEG system preparation).

3. Let subject read and sign informed consent (after pre-screening at PK).

4. Let subject fill out screening questionnaire (before pre-screening at PK).

5. Have subject remove metal objects, offer change of clothing (scrubs) and offer bathroom break if necessary. Before the session, check whether the participant had an MRI scan in the last 3 days. (5-10 mins)

6. Check quality of participant MEG signal (3-5 mins)

7. Do the practice. (2 mins exp.1, 2 mins for exp.2)

1.4 EEG cap montage *(30-40 mins, with the impedance check)*

1.Measure the participant's head circumference (measured after pre-screening at PKU; ask them to do it at home) and take the cap of the correct size. Size available: small (46-52), medium (52-58), large (58-64).

2. Put the cap on the participant, making sure the Cz electrode position is centered/halfway between the Nasion and Inion.

3. Make sure the cap is left-right symmetric and then close the chin strap.
The cap is fitted on the participant correctly when Fp1/Fp2 - O1/O2 - T7/T8, viewed from the side, are all in the same plane (with Fp1/Fp2 close to the eyebrows).

4. With the wooden end of a cotton swab, push aside the hair in the electrode opening until the skin is clearly visible.

5. Clean the skin with alcohol.

6. Dip the cotton end of the swab in alcohol and degrease the skin by rotating on the spot.

7. If possible, ask participants to arrive with their hair washed, without using any conditioner.

8. Scrape the skin with abrasive paste.

9. Dip another cotton swab into the paste and, again, rotate the swab on the spot in the electrode opening.

10. Rotating the swab fast but with minimal pressure.

11. Apply electrode gel through each electrode opening, using a syringe and a blunt needle.

1.5 Attach EOG/ECG electrodes (2-3 mins)

Rub skin where the electrodes and HPI coils will be attached.

1. hEOG: Attach an electrode on the outside of the subject's left and right eyes.
Make sure that the electrodes are in line with the eyes.

2. vEOG: Attach an electrode above and below subject's right eye.
Make sure that the electrodes are in line with the eyes.

3. ECG: Attach an electrode on the left and right collarbones (attach to the chest when signal is weak).

4. GND: Attach an electrode on the back of the subject's neck (GND).

5. REF: Attach an electrode on the subject's right cheekbone (REF).

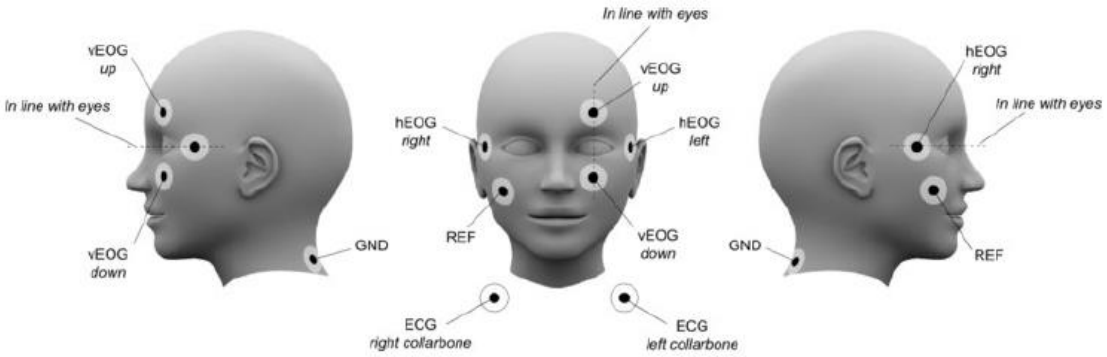

Figure 1. Standard locations of EOG and ECG electrodes

1.6 Check impedance of EEG/EOG/ECG electrodes

1. Take the impedance meter and connect it to the EEG cap.

2. Cycle through all your electrodes (EEG/EOG/ECG) and make sure the impedance is below 10kOhm.
   - If EEG cap impedance is too high, repeat the abrasive step by gently twirling with a cotton bud.

1.7 Attach HPI coils (2 min)

1. Attach HPI coils on the forehead below the hairline and behind the ears (where there is exposed skin) as shown in Figure 2.
   - The coils must be covered by the MEG helmet/sensor array, so place them as high on the head as possible.
   - The coils behind the ears as high up as possible, without being in the hair.
   - The coils on the forehead well separated, but not in the hair.

2. Tape the yellow coil to the participant. This one will not be used or digitized.

3. Have the subject carefully put on the Polhemus glasses.

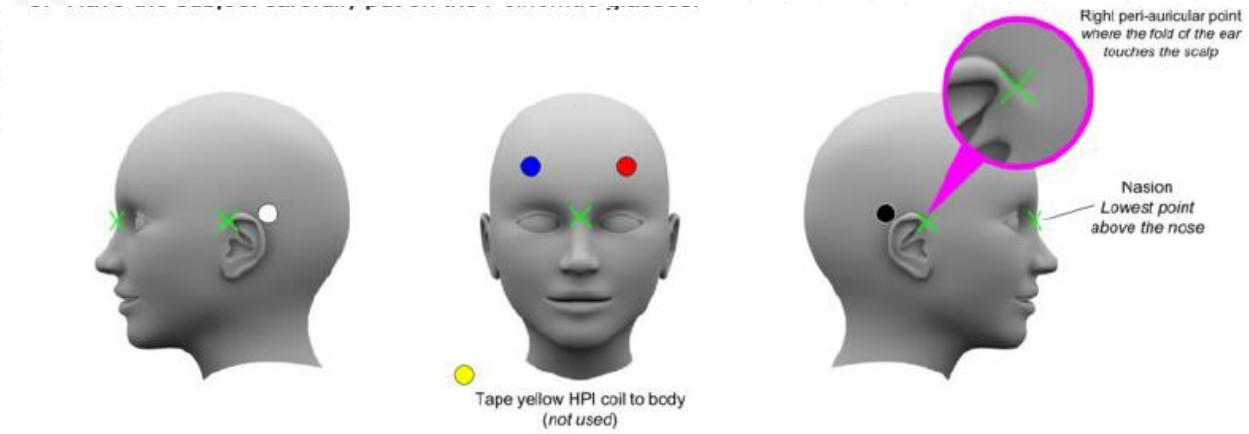

Figure 2. Standard locations of HPI coils.

Coil Numbers**:**

1. Blue
2. White
3. Red
4. Black
5. Yellow

1.8 Digitize head-coordinate system *(all digit steps, 10-15 mins)*

1. Turn on the Polhemus system (button on the back).

2. Make sure the Transmitter is in the chair with the cable pointing down.

3. Select digitization on the acquisition panel.

4. Click Coordinate frame alignment.

5. Remove the cap of the pen.

6. Rest the tip of the pen on the nasion or pre-auricular points (see green crosses in Figure 1) and press the button on the pen. Repeat for all fiducial points.

7. As a sanity-check see if the measured location of the pre-auricular points are in alignment (xvalues).

8. If necessary, redo measurement by clicking Coordinate frame alignment again and repeating procedure.

1.9 Digitize HPI coils

1. Click HPI coils.

2. The order in which the HPI coils are digitized does not matter.

3. Rest the tip of the pen gently on little hole in the middle of the coils and press the button on the pen. Repeat for all coils.

4. Stop the digitization after the fourth coil (if only using 4 coils) by holding the pen away from the receivers and clicking once. You should hear two beeps.

5. If necessary, redo measurement by clicking HPI coils again and repeating procedure.

1.10 Digitize EEG electrodes

1. Click EEG electrodes

2. Rest the tip of the pen gently on the hole in the middle of the EEG electrodes and press the button on the pen. Repeat for all electrodes, starting from the reference.

3. Stop the digitization after the 64th electrodes by holding the pen away from the receivers and clicking once. You should hear two beeps.

4. If necessary, redo measurement by clicking EEG electrodes again and repeating procedure.

1.11 Digitize head shape

1. Click Pen in the bottom right.

2. Gently stroke the point of the pen over several (especially bony) shapes of the head: eyebrows, nose, and along the skull, while pressing the button of the pen.

3. Stop when ready by holding the pen away from the receivers and clicking once.

1.12 Prepare the subject in the MSR (2 min)

1. Before moving the subject, ask the participant to hold the cables.

2. When the subject is seated, connect the cables of the sensors on the gantry to

the corresponding electrodes on the subject.

3. Attach HPI coils into the red plug at the left panel of the gantry.

4. Attach EEG cables into the yellow and green plugs at the left panel of the gantry.

5. Lift subject into helmet, using the foot pedal, until the top of the head touches the top of the helmet., making sure that the subject is comfortable.

6. Check communication using intercom.

1.13 Prepare the eye-tracker (EyeLink 1000 Plus) (10-15 mins)

1. EyeLink Batteries: use a fully-charged battery if possible.

2. Take battery into MSR. Place it as far as possible from the gantry.

3. Arrange power cable around the edge of the MSR, avoiding any loops. Attach power cable to battery and to FO Camera Head/IR Illuminator. Switch on battery.

4. Mount the 35 mm camera lens.

5. Tilt the camera to the 45° position.

6. Place FO Camera Head/IR Illuminator on small table. Position table as required.

7. Turn on EyeLink 1000 Plus Host PC.

8.Set up EyeLink FO Camera Head/IR illuminator as usual.

9. Position camera in front of the participant. Make sure it is pointing the eyes.

10. Adjust the camera lens focus. You should clearly see the participant's eyelashes.

11. On the EyeLink PC, select binocular mode.

12. Click auto-threshold on the EyeLink PC. If necessary, adjust pupil size and corneal reflex thresholds manually.

13. Make sure the EyeLink computer is NOT in "calibration mode" when starting the experiment

1.14 Start recording (1 min)

1. Instruct subject to remain still and relaxed, and announce the start of the experiment.

2. Start acquisition by pressing GO!
   - Tick record raw data

3. Check HPI accuracy

4. Check electrodes impedance
   - Untick it afterwards!

5. Record 5-min resting state (eye open and fixation) (5 mins)

6. Start experiment on Stim PC. ß Exp. 1 (80 mins), Exp. 2 (90 mins)

1.15 During recording

1. Ensure that the participant is doing fine and performing the task correctly.

2. Check participant's fixation on EyeLink computer.

3. Monitor MEG/EEG signal and triggers.

4. Make records when necessary.

1.16 Saving breaks (1 min each time, 6-7 min in total)

1. Press F5 to disable the response boxes (only Exp. 2).

2. During the saving break, stop the acquisition by pressing Stop.

3. Ask the participant to relax while you are restarting the acquisition.

4. Save the data by using the usual file-naming scheme.

5. Restart acquisition by pressing GO!
   - Tick record raw data

6. Check HPI accuracy

7. Check electrodes impedance

- Untick it afterwards!

8. Press F5 on Stim PC to unlock the experiment.

9. Tell the participant to continue the experiment.

1.17 Finishing recording session (3 + 3 mins for the questionnaire)

1. When the paradigm has finished, press Stop.

2. Tell the subject that the experiment is over but to remain seated, and that you will be in there shortly.

3. Name your files as per usual file-naming scheme.

4. Disconnect electrode cables and HPI coils.

5. Move subject to chair outside of the MSR.

6. Gently remove EEG cap, HPI coils and all electrodes.

7. Ask participant to fill out the end-of-experiment questionnaire.

8. Compensate the participant.

1.18 Uploading data on servers (3 min, only BU)

1. Check all data have been saved correctly.
   - MEG/EEG data on acquisition PC
   - Behavioral and EyeLink data on Stim PC

2. Transfer data from acquisition computer to institutional server.

3. Transfer behavioral and EyeLink data.

4. Anonymize data (afterwards).

5. Upload data to XNAT (afterwards).

Total duration (higher estimate): 233 mins; 3h and 53 mins*
Total duration (lower estimate): 198 mins; 3h and 8 mins*
*This numbers don't take into consideration any possible unexpected issue