Data acquisition protocol - 2025

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Data acquistion protocol for MEG experiment

Below follows the protocol for doing the workshop. Some steps can be done concurrently, but here we are doing them sequentially to make sure everyone sees what is going on.

Greeting and informing the patient

- Say hello!
- Go through the participant information (link), both orally and in writing
  - Make sure they have no metal in their body; e.g. no metal wires behind their teeth or underwire bras
- Ask for informed consent (link)
- Let the participant change to patient clothes

Creating the subject on the acquisition computer

- Load the *project* created for the course - this has information about where on StormDB data will be stored
  -
- Load the *settings* (default settings) - these have information about what sensors will be recorded and will also activate an online average that lets us monitor the data
- Create the subject on the acquisition computer (the one furthest to the left)
  - Lau will do this as it requires access to the StormDB database
- Save the *preparation* - this contains information about this specific subject; what project they belong to and what settings

Digitization and creating the head coordinate system

- Go to the computer connected to the Polhemus FASTRAK system (in the other room by the garden chair)
- Load the *preparation*
- Let the subject sit in the chair
- Clean and scrub the subject's face with a alcohol wipe around the eyes and on the collarbones and on the right wrist. This is where we will put electrooculography electrodes (EOG) electrocardiography electrodes (ECG) and the ground electrode, respectively.
  - Also clean and scrub behind the ears and on the forehead. This is where we will put Head Position Indicator (HPI) Coils; these can be used to register the positions of the subject's head inside the MEG, allowing for a transform between the *device coordinate system* and the *head coordinate system*; the former is a rigid system that expresses how sensors in the helmet are placed; the latter is a coordinate system that expresses how the very same sensors are placed relative to the head of the subject
- Put on EOG; one pair below and above the right eye; one pair next to each eye
- Put on ECG; on the collarbones on each side
- Put on HPI; two behind the ears and two on the forehead. Get as close to the hairline as possible (Don't use the yellow one)
- Put the "box" transmitter on the back of the chair
- Put the "forehead" transmitter on the forehead of the participant; use tape
  - Make sure that the cable from the "forehead" transmitter does not touch the "box" transmitter
- Start the digitisation programme on the computer
- Digitise the fiducials: the nasion and the left and right pre-auricular points (LPA & RPA)

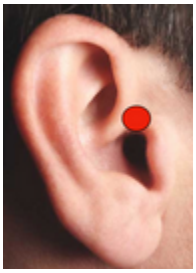

Figure 1: Right pre-auricular point

- The maximum difference between LPA and RPA should be 2 mm (see the x-coordinate)
- Digitise the HPI-coils
- Digitise the shape of the face and the head; start with the nose, then the eyebrows and finally the shape of the head
- Save the preparation on the Polhemus computer
- Load the preparation on the acquisition computer; note that the HPI-coils are now recorded as digitised

Preparing the subject for the experiment inside the magnetically shielded room

- Get the subject inside the magnetically shielded room (MSR)
  - do one last check for any magnetic materials
- Get the subject sitting in the chair
- Connect vertical EOG (above and below the right eye) to the first socket (001); connect horizontal EOG to second socket (002); connect ECG to third socket (003); connect the ground to *Gnd*. (Polarities do not matter)
- Wrap the respiratory belt around the subject
- Move the projection screen onto its spot 60 cm away (will be marked with tape)
- Make sure that the width of the screen on the projection is cm (will be measured by Lau)
- On the acquisition computer, check:
  - can we see eye blinks?
  - can we see horizontal eye movements?
  - can we see the heart beat?
  - can we see the respiratory pattern?
  - can we localise the head using the HPI-coils? (don't use the fit gotten here)
- Make sure that the subject is comfortable; use cushions if needed

- Give them the four-button response box
  - Instruct them how to use it

Setting up the experiment on the stimulus computer

- Open the terminal and go to the path where the experiment file is
- Run the experiment file `python subjective_experience_v0.py` (or the newest version)
- Fill in the details; 400 experiment trials, 20 practice trials, and the code of the subject (the number sequences from the acquisition computer)
- Don't click OK yet!

Closing the door, establishing contact over the Intercom and checking the sensors

- Close the door to the MSR
- Establish contact over the intercom
  - Click 11 to establish two-way communication
  - Tell subject that we are going to check the MEG sensors to see if they are behaving properly
  - Change the setting to one-way communication (press the T button for two seconds)
- Check through the MEG sensors; heat the ones that need heating through the *Tuner*

Running the experiment

- On the acquisition computer: click GO, run the HPI-fit; check the Online Average box and the Record Raw box
- Click OK on the stimulus computer to begin the protocol
- Check whether triggers are coming in on channel `STI101`
- Throughout the experiment; check whether sensors start misbehaving and note any bad channels
- Pay attention to the output on the stimulus computer
  - when there is break; ask whether the subject needs to move a little, or whether they can carry on; **No movement of the head**

Saving the data

- When the stimulus protocol has finished (thank you screen present), click STOP on the acquisition computer
- Now pay attention!
  - Discard (sic!) the first file. You will see, it is an *average* file; this cannot be uploaded anywat
  - Save the second file, using the name `workshop_2025_raw` (Make sure to get it exactly right)
- Use the Neuromag software Archive Subject to upload the raw files to StormDB
  - Lau will do this

Finishing the experiment

- Help the subject out of the scanner
- Clean everything that the subject has been in contact with, including the bed, the helmet, the HPI-coils, the cushions etc.
- Do make sure to say thanks for the help and answer any questions they may have