MEG PROTOCOL

In black: general setup

In grey: setup of Polhemus, Eyelink, EEG, auditory tubes, and fast-projection mode of the projector (follow those instructions as well if you want to use it)

Preparation before Participant arrives

- ☐ As soon as you enter the room: put everything out of your pockets – just to be sure
- ☐ Computers:
  - ☐ Turn on all *screens* you need
  - ☐ Turn on general usage *computers*
  - ☐ Turn on computer and screen for *Polhemus* if you want to use it
    - ☐ Put the chair already in a position, so that the participant can easily sit down
- ☐ Check/turn on *intercom system*
- ☐ Restart '*Stimulus PC*' and in the meanwhile:
- ☐ Partly fill out and lay out *Informed consent* form
- ☐ Open the MEG door and prepare the *MEG room*
  - ☐ Turn on the *light* (and adjust the brightness however you want it)
  - ☐ Turn on the *projector*
  - ☐ Check whether the *filter* is in front of the projector (remove if you do not want to use it)
  - ☐ Unscrew the *mirror* and *screen* and bring them into position
  - ☐ Check position of the *back-rest* and the '*non-slip mat'*
  - ☐ Check whether there is *tape*
  - ☐ Put the *response buttons* into position
  - ☐ Check whether head-position *coils* are disentangled
    - ☐ Attach the ear-tubes to the coils if you will use auditory stimuli (red with red and blue with green)
  - ☐ Check the *focus* of projector on the screen
  - ☐ *Eye-tracker system*
    - ☐ Screw the camera and IR-led onto the contraption
    - ☐ Unscrew the lens-cap
    - ☐ Place it inside the MSR and connect the three *cables* (two thick black ones and the orange one)
- ☐ Only when you connect the cables turn on the *Eyelink PC* (otherwise you will get a mildly annoying error signal)
  - ☐ On the '*Eyelink PC*': If it's not on main-interface, enter 'elcl'
  - ☐ Check by clicking 'set options' whether:
    - ☐ The calibration is set to 9 dots
    - ☐ Analog output is set to 'gaze'
- ☐ On the '*Stimulus PC*'
  - ☐ Set to 'lab profile with network' if you want to use MATLAB
    - ☐ Otherwise choose your favorite lab profile
  - ☐ Open MATLAB and set up your *code*
  - ☐ Check the projection mode of the screens (If you want to use the fast projection mode you will need to set it to 'extend'; however, if you also want to record Eyelink-data, you need to leave the mode on 'duplicate' until you did the calibration of the eye-tracker (instructions how and when to do that follow below))
    - ☐ Right mouse-click – 'Screen resolution'

- ☐ Select ‘Duplicate’ – ‘apply’
- ☐ On ‘advanced settings’ - check whether it is set to the correct refresh rate for your experiment (usually 120 Hz)

☐ Open *Popup eye-tracker calibration* (‘eye’ button on the taskbar)

- ☐ ‘File’ – ‘new session’
- ☐ Choose name and your folder (D:/Users/”your name” (make a folder with your name if you do not have one yet)
- ☐ Click on ‘Eyelink’ – ‘Camera setup’, then press ‘enter’
- ☐ Then press the right arrow key to zoom out
- ☐ This enables you to check and adjust the camera later when the participant is sitting in the correct position

☐ If you use Linux: set the connection to the ‘Eyelink PC’ using the Eyelink connection script – attached file

☐ On the ‘*Real-time PC*’

- ☐ Open MATLAB and open “ft_realtime_headlocalizer”

☐ On the ‘*Acquisition PC*’

- ☐ If the software already started, close all small windows if open
- ☐ If the acquisition software not started yet, open it with the ‘CTF…’ button on the desktop
- ☐ Push ‘1 – Initialize’, wait until it is ready
- ☐ Push ‘2 – Start real time’
- ☐ Push ‘3b – Acq’
  - ☐ It will automatically enter the file name as the one you entered when scheduling the session; if you want to adjust it, you can do that here
- ☐ Click ‘Acquire data’ (which doesn’t acquire data yet, remember to press ‘START’ later!!)
- ☐ (adjust Speed and Amplitude if you want to)

☐ On ‘General Usage PC’:

- ☐ Start audio mixer software and load your configurations
- ☐ Start Castor and open page for correct participant

☐ Prepare neck brace by wrapping soft tissues around it

☐ Prepare electrodes

Preparation with the subject

☐ Pick up your participant from the waiting room

☐ You can ask the participant whether he/she participated in a MEG study before; you could potentially show the room already

- ☐ Ask whether he/she has got any metal on/in the body. Both to see whether pockets are empty and also as a check whether participant really has no metal (such as permanent retainers) in his/her body

☐ Shortly explain what the participant can expect from your study

- ☐ If applicable in your study, you probably want to stress that the participant should blink as little possible and does not move during the experiment

☐ Ask the participant to fill out the *form and/or Castor*

☐ Now ask the participant to change *clothes* with metal (pick the size of the MEG compatible clothes with confidence, or just ask for the size) and take off shoes and no bra

- ☐ Check for jewelry, hairband, bra etc.

☐ Choose ear molds (size ‘M’ is a good start for most people)

☐ Go to the *Polhemus PC* and ask the participant to sit down

- ☐ Ask the participant to put in the *earmolds* and put on the *glasses*

- ☐ Start the Polhemus software
- ☐ Click on ‘Define head coordinates’
- ☐ Take the pen and take off the cap
- ☐ Push the button gently once (on the pop-up screen it should say ‘Nasion’ now)
- ☐ Go to the Nasion first and press the button gently again
    - ☐ Next it should tell you to go to the *left* site. If it says ‘right’, you probably clicked twice (start anew then)
- ☐ So, press the button for the *left* earmold and then the same procedure at the *right* earmold
- ☐ Put on the cap again
- ☐ Click on ‘Digitize start/stop’
- ☐ Go with the pen along the scalp/head while holding button (it is important that the button is only pressed while the pen is in contact with the scalp)
- ☐ Get about 200 points
- ☐ In the end, collect some points by going over the nose as well
- ☐ Click again on ‘Digitize start/stop’
- ☐ Press ‘File’ – ‘Save data’
    - ☐ Put it under ‘Users’ – “your name”, save with the sessions name (sub000sess000)

☐ If using electrodes (EEG system, EOG, ECG, etc)

- ☐ Clean particular places with alcohol
- ☐ Scrub particular places
- ☐ Dry the skin to remove excessive gel
- ☐ Attach electrodes to skin with stickers
- ☐ Put gel in electrodes
- ☐ Check conductivity of electrodes
- ☐ Use q-tip to fix gel
- ☐ Put more gel
- ☐ Put tape over electrodes

☐ Take out the earmolds and take them with you into the MEG room

☐ Also take neck brace

☐ Now set up the participant in MEG room

- ☐ Ask to put on the *neck brace* (not *too* tight, but should not be too loose either)
    - ☐ Explain that in this way the participant can feel when he/she moves his/her head; because it is very important for the measurement to sit as still as possible
- ☐ Plug electrodes into input box
    - ☐ Ground electrode into green
    - ☐ Vertical EOG into A
    - ☐ Horizontal EOG into B
    - ☐ ECG into C
- ☐ (Potentially you can say that the participant can move and stretch during breaks and guide them back with the real-time head position monitor. However, it is difficult to guide the participant when you are doing your experiment in the fast projector mode in which you cannot switch to the ‘Real-time PC’ to show the participant where to move. So, probably then better tell him/her to move as little as possible)
- ☐ Put the *coils* into the correct ear molds and tape the nasion-coil on the nasion
    - ☐ Tape the wires above the participant’s left shoulder
- ☐ Ask if the participant is sitting comfortably (potentially if he/she wants a pillow for under the knees or behind the lower back, etc.)

- ☐ Put the *chair* with the participant into position
  - ☐ First check where the head is, maybe you will need to adjust the back-rest before moving the participant upwards
  - ☐ Explain that the participant should feel the helmet both on top of the head as well as on the back
  - ☐ The participant should still be able to see the screen obviously, maybe lower the screen by repositioning the mirror
- ☐ If you are going to use the eye-tracker: you can check now whether you need to adjust the camera (and focus) (if you followed the steps so far you should see the eyes of the participant on the screen now)
- ☐ Explain that you are going to leave the room and close the door. And that you will start (first the calibration of the eye-tracker and then) the experiment in a few minutes, but that you can still communicate via the intercom system
- ☐ Emphasize that you can always hear the participant, so if anything comes up, they can always speak to you right away
- ☐ Close the door

☐ Switch on the '*kritische meting MEG*' next to the 'Acquisition PC'

☐ Check whether the beamer is projecting the PC 1, stimulus, screen

☐ Via the intercom system:
- ☐ Tell that we are going to calibrate the eye-tracker now
  - ☐ (The monitor should be on 'duplicate' as you checked before)
  - ☐ Click on the participant's eye to have the box around it (which adjusts the thresholds automatically as well)
  - ☐ Ask the participant to follow the dots
  - ☐ Start the *calibration* by pressing 'C' and press 'space'
  - ☐ 'accept' or 'validate' depending on the outcome

☐ Then start *recording* with Eyelink - Windows
- ☐ Click on 'Output/record'
- ☐ Click on 'Output/record' again
- ☐ Then click 'RECORD'

☐ Then start *recording* with Eyelink - Linux
- ☐ Press ESC
- ☐ At the end, you will have to stop the acquisition by running 'export eyelink file'

☐ On the 'Stimulus PC' if you want to use the fast projector mode:
- ☐ Close MATLAB
- ☐ Right click – 'screen resolutions'
- ☐ Select '*extend'* mode – click 'apply' and 'keep changes'
- ☐ On 'advanced settings' - check whether refresh rate at 120Hz for both screens
- ☐ Start MATLAB again

☐ Explain to participant that the experiment will start in a few seconds with the instruction screens and they *should not move from now on*

☐ Some checks you can do before the acquisition:
- ☐ Ask the participant to breathe deeply to check for metal on body
- ☐ Ask the participant to blink (should be visible on channel 57) and move their gaze (channel 58 if using electrodes or UADC 5 (horizontal position), 6 (vertical position), 7 (pupil diameter) if using Eyetracking)
- ☐ Heart beat should be visible on channel 59 if using electrodes

☐ On the '*Acquisition PC'*
- ☐ Click 'localize head' – 'accept' fitting errors and 'do not show again'
- ☐ **CLICK ON START**

☐ On '*Real-time PC*':

- ☐ Run the “ft_realtime_headlocalizer” script. Do it along with the above “Acquisition PC” step
- ☐ As soon as head-models appear, press "U" on the keyboard for updating the coil-positions to the current ones
- ☐ The quicker this whole procedure is performed, the more comparable the two "movement-indications" from the ACQ-software and the Real Time head localizer are

☐ On the ‘*Stimulus PC*’: start running your script on the ‘Stimulus PC’

While recording

☐ Check *eyeblinks*
☐ Look at triggers (channel UPPT001 (under Stim Ref in ACQ-software) and different channels
- ☐ You can ‘customize’ and draw to select channels

☐ Check the *head position* (needs to be below 5mm on the ‘Stimulus PC’ and green to yellow on the ‘Real-time PC’), adjust the participant if necessary during breaks
☐ Look for *muscle tension* or other *artifacts*
☐ Make your *entry* in the *log book*
☐ If you are the first one measuring that day, make the *earmold cleaning solution* in which you can put the earmolds after usage
☐ You can transfer the file from the Polhemus PC with FileZilla already
☐ Tip: talk to your participant during longer breaks, ask if he/she is okay (to make sure they know you’re still with them)

When the experiment is done

☐ Tell your participant to stay seated while you will stop the MEG acquisition
☐ On the ‘*Acquisition PC’*:
- ☐ Click ‘Abort’ – ‘Save’ yes

☐ On the ‘Real-time PC’ quit the real-time head localization
☐ Stop recording at the ‘*Eyelink PC*’
☐ Take out the *participant*
- ☐ By putting seat into lowest position (and don’t forget to lock the seat again)
- ☐ Ask them to take out the earmolds (then put the earmolds into the cleaning solution)
- ☐ Tell him/her that he/she can change again

☐ ‘*Stimulus PC*’:
- ☐ In popup calibration window: click on ‘file’ – ‘close’ to transfer the data (FileZilla)
- ☐ Switch the screen projection back to ‘duplicate’
- ☐ Close programs on every PC you used
  - ☐ Shut down ‘Eyelink Computer’, and ‘Stimulus PC’ if you’re the last one for the day
  - ☐ *Never* shut down ‘Real-time PC’ and ‘Acquisition PC’
  - ☐ Turn off *Screens* of all the computers if you’re the last one for the day
- ☐ Use FileZilla to transfer the data you need (saved results like responses, reaction time etc.) to your home folder
  - ☐ Don’t forget the Eyelink data (.edf file) if you used it

☐ On ‘*Acquisition PC*’:
- ☐ ‘File’ – ‘close window’
- ☐ A window will probably pop up, asking you to report any errors; if there was no error click on ‘cancel’

    - ☐ Transfer your MEG (.ds) file through the Terminal by using *scp –r filename.ds paujoh@mentat001:/project/project#/MEG* or by following the instructions on the papers hanging on the wall above the ‘Acquisition PC’
    - ☐ In case you have your PPM-number, this will be done automatically
- ☐ Switch off the ‘kritische meting MEG’ sign
- ☐ Put back and clean up everything you used – check: general according to DCCN guidelines
- ☐ Do not forget to rinse the earmolds (using gloves) with tap water after they were in the cleaning solution for 15 minutes and put them on the paper cloth
- ☐ EEG
    - ☐ Put back any dry electrodes
    - ☐ Put electrodes in distilled water
    - ☐ Leave electrodes to dry