NatMEG Lab Manual

NatMEG

2022-12-14

Contents

Electrodes (standard setup)

This is the first part of the preparation which is followed by the Digitization

The standard setup of electrodes includes: - 2 horizontal EOG - 2 vertical EOG - 2 ECG - 1 Reference - 1 Ground

Material

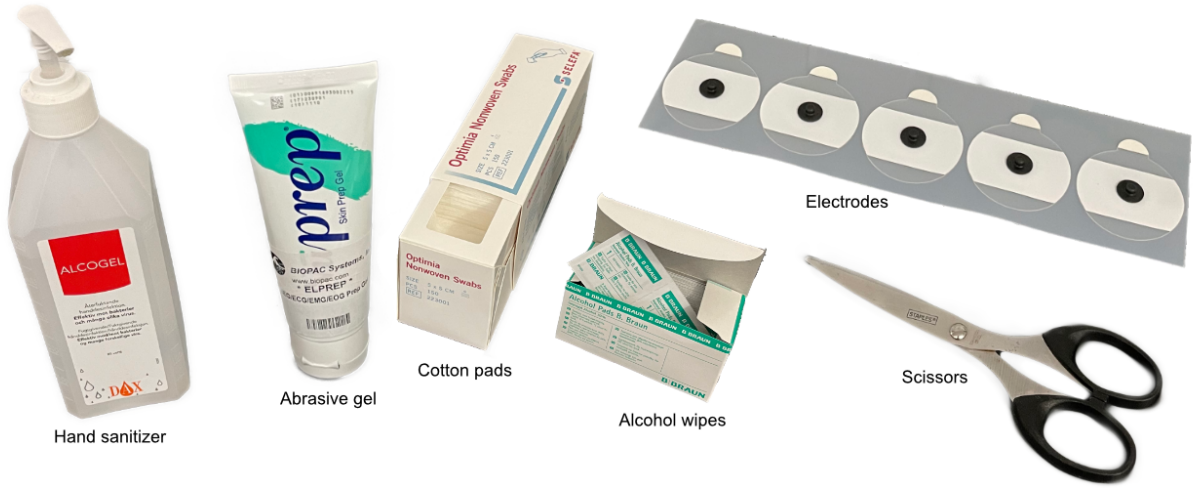

Figure 1: Material needed

Step-by-step guide

1. Place the participant in the wooden chair
2. Use abrasive gel to scrub where Electrodes will be placed. Usually a pie-sized portion on a cotton pad is enough for all electrodes, and 3-5 circular wipes will do. > ! Be careful and check with the participant so it does not hurt
3. Wipe with alcohol swaps to remove gel. Also wipe positions of the HPI coils. > ! Warn participant that if might sting a bit
4. After letting the alcohol dry a few seconds attach the electrodes at the location indicated by the picture. > ! You can cut away part of the electrode (not too much!) to avoid participant getting it in the eye.

Check impedance

When all electrodes are attached. Check impedance using the impedance meter.

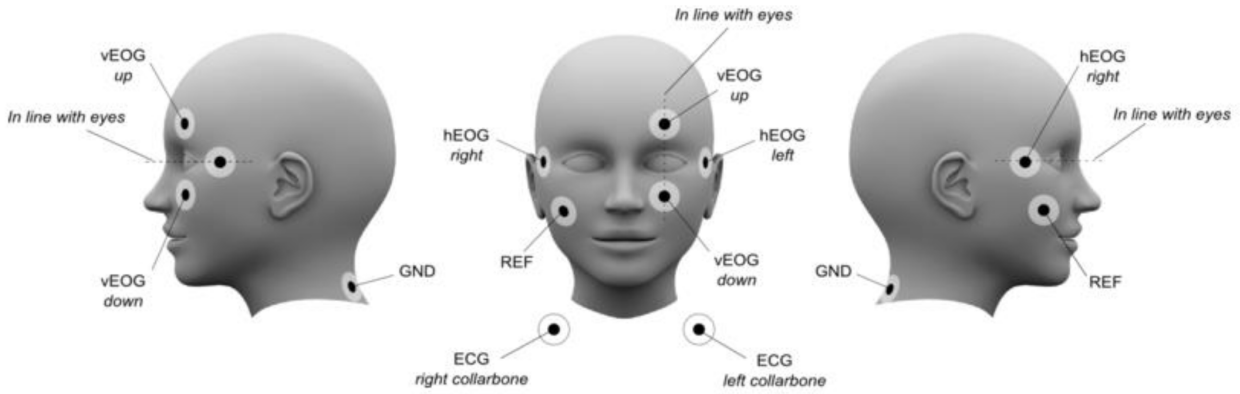

Figure 2: Electrode placement map

1. Connect the three cables to the electrodes according to their labels.
2. Click the middle white button to turn SIGGI on and select *Impedance Meter*. Press white button again.
3. Read impedance for each channel, by moving the connector to the different electrodes. **Impedance levels should not be higher than 20** $k\Omega$, but the less the better. If impedance is too high, try to press on the electrode. If the signal is still not good, remove the electrode, clean the skin and attach a new.

Figure 3: SIGGI impedance meter

When finished with the electrodes move on to the Digitization.

Digitization

The digitization is the second part of the preparation. The first part is the placement of electrodes.

Why

Head positioning should be monitored either continuously throughout the acquisition or at the start and end of the recording. The MEG acquisition is done only with respect to the MEG device, instead of the anatomy of the subject. Therefore, MEG devices include a subsystem to determine the position of the head with respect to the MEG sensors. As MEG (unlike MRI) cannot directly measure the position of the head, small coils known as Head Position Indicator coils (HPI) placed at known locations on the scalp of the subject, when energized, will generate a magnetic field that helps us to localize the position of head in a three-dimensional space, with respect to the MEG sensor array. If continuous head position tracking is enabled, generally small movements are acceptable with a maximum error of 5 mm.

Information about the patient's head position, orientation, and shape is obtained by digitizing (3D digitizer) the standard fiducial points, HPI coils, and the required additional points creating Cartesian co-ordinates in a 3D space. Digitization of four HPI coils, and landmarks, which include three bony fiducial points (Nasion, left, and right pre-auricular points), and additional points, is performed.

The HPI coil positions, and hence the head position, are estimated from the coil signals. This estimation is done several times per second, allowing the system to track also relatively fast movements. Once the head position is estimated, the MEG signals are transformed to a reference head position. This conversion is sequentially performed at each time point throughout the continuous (raw) data file.

Equipment

TBA

Step-by-step guide

TBA