

## Facial electromyography (fEMG) protocol

### General information

fEMG is measured in millivolt [mV].

### Necessary equipment

- fEMG machine;
- 5 electrodes (not disposable electrodes);
- Electrode stickers (size small);
- Electrode gel (Signa gel);
- Plastic syringe;
- Scrub gel (NuPrep);
- Cotton bud/cotton wool pads;
- Gloves;
- Alcohol wipes;



### Cleaning/preparation

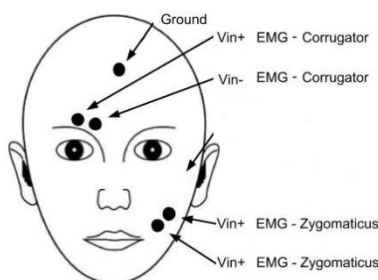
You can put the gel on the electrodes before the participant arrives. Fill the syringe with a little electrode gel. Then fix the electrode stickers to the electrodes, so that the hole in the sticker is above the electrode cavity. Next, squirt a little electrode gel into the cavity. It is best to use a syringe made entirely of plastic for this. Ensure that the electrode cavity is filled entirely with gel, but that it does not overflow. Just before you apply the electrode, remove the protective plastic from the sticker (achieving this while wearing gloves requires practice).

**Important:** Always wear disposable gloves when you clean the participant's skin and apply the electrodes. After use, remove the gloves and dispose of them.

Before applying the electrodes it is important to reduce the impedance (resistance) of the skin by removing oils and dead skin cells. It is recommended to use a scrub gel (NuPrep). The gel is gently rubbed onto the skin using a cotton bud or pad. Afterwards, the skin is dried with a clean cotton pad. Apply the electrodes directly after cleaning the skin.

### Placing the electrodes

fEMG often measures the corrugator supercillii muscle ("frowning" muscle) and the zygomaticus major muscle ("smiling" muscle). In order to measure these, you will need 5 electrodes. Place two electrodes on the zygomaticus major. It is situated along the imaginary line from the corner of the mouth to the ear (see picture). Place two electrodes on the corrugator supercillii, which is just above the eyebrow. Place 1 electrode at just about the start of the eyebrow and 1 electrode a little further along (around 2cm) just above the eyebrow. The last, grounding electrode can be applied in a variety of different places, but the recommendation is to place it in the middle of the forehead just below the hairline.



If you are using the wireless Biopac system (BioNomadix) you can attach the strap with the transmitter to the participant's head. Ensure that the strap is between the Biopac transmitter and the skin, so that the transmitter does not make contact with the skin. Then attach one pair of leads (red/white) to the corrugator electrodes and one pair to the zygomaticus electrodes. The red lead should be attached to the outer electrodes and the white leads to the inner electrodes. Attach the black lead to the grounding electrode.

**Important when using Biopac devices:** when attaching the leads, you must squeeze the plastic lock connector at the end of the lead. When disconnecting the leads, squeeze the lock connector again. Never pull on the lead itself. This material is very fragile and breaks easily. Similarly, when the leads need to be attached to or detached from the wireless module, you should use the plastic squeezable connector and refrain from pulling on the leads. Afterwards, loosely coil the leads and tuck them into the appropriate pocket. Do not knot or twist the leads, as it may damage them.

### Afterwards

Remove the leads and the wireless module. You can then carefully remove the electrodes. Removing the electrodes can be painful for some people. Depending on the sensitivity of the participant's skin, there may be red marks visible. These will normally fade within a few hours. Give the participant a tissue to remove any excess gel, or allow the participant to wash the areas in question with water and soap.

Remove the electrode stickers from the electrodes and dispose of them. Clean the electrodes as soon as possible after use. Dried-up gel is more difficult to remove and diminishes the electrical contact with the skin. Run the electrodes under a luke-warm tap and use a soft toothbrush to gently remove the gel out of the cavity. Do not immerse the electrodes in a solution. Ensure that all the gel has been removed. After cleaning, dry the electrodes thoroughly with a paper towel before tidying them away. After each participant, you should also clean the equipment that has been in direct contact with the participant. This could be the leads that were attached to the electrodes and, in the case of the wireless Biopac module, the transmitter and the strap. Clean these components carefully with an alcohol wipe. Ensure that no liquid gets into the equipment. The strap must be cleaned after use with Incidin Plus.

### Tips to ensure useful data

- Check the electrodes and the leads are properly attached;
- Before you start the experiment, ask the participant to smile and frown briefly. This will allow you to check if you get a signal and whether the electrodes are placed correctly.