

## Electrodermal response (SCL/EDA/GSR) protocol

### General information

When you measure electrodermal response, you are measuring how ‘well’ the skin conducts electricity. Often the skin will conduct electricity better during higher arousal.

- Electrodermal response is measure in micro Siemens [ $\mu\text{S}$ ];
- Electrodermal response levels usually vary between 2-20  $\mu\text{S}$ .

### Necessary equipment

- 2 disposable electrodes (see picture; the electrodes for measurements such as ECG and ICG cannot be used for this);
- If necessary, isotonic gel.



### Cleaning/preparation

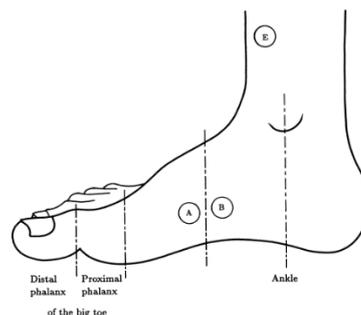
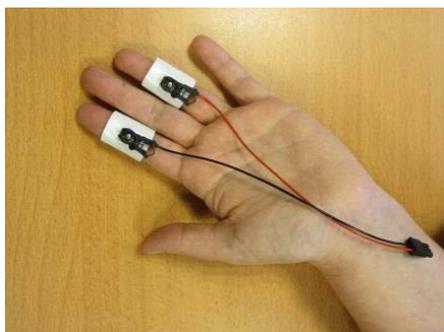
**Do not** clean the skin beforehand using alcohol, abrasive substances (such as scrub gel), or soap. If the participant needs to wash his/her hands, just use lukewarm water **without** soap. The disposable electrodes come with gel, but should they be dry isotonic gel can be applied.

### Placing the electrodes

**Important when using Biopac:** 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.

**Important:** Place the electrodes at least 10 minutes before you start taking measurements, so as to allow the gel to work.

The placing of the electrodes can depend on the type of research. Before the start of the research project you should consult the literature and discuss the best approach with your supervisor. The best signal is measured on smooth, hairless skin. Active electrodes are placed on the inside of the fingers of the non-dominant hand (see figure). The electrodes can be attached to the distal phalanges (fingertips), as there is a greater responsiveness and the greatest sweat gland activity in that area. Another option is to attach the electrodes to the middle phalanges, as the fingertips are often callused. Place the electrodes on the index finger and middle finger, or on the index finger and ring finger. After you have attached the disposable electrodes you can attach the leads to the electrodes. It does not matter which leads you attach to which fingers. If using the Biopac module, you can attach the strap with the transmitter to the participant’s wrist before attaching the leads to the electrodes. Ensure that the strap is placed between the Biopac transmitter and the skin, so the transmitter does not make contact with the skin.



When neither hand can be used (for instance if both hands are needed for the experiment, or with babies who are likely to pull on the electrodes), the inside of the foot can be used. In this case, the electrodes are placed on the musculus abductor hallucis (big toe abductor), bordering on the sole of the foot and halfway between the proximal phalanx of the big toe and the spot directly below the ankle (see figure, electrodes A and B). For more information about possible sites for measuring electrodermal response, see van Dooren, de Vries, and Janssen (2012).

### Calibration

In the case of EDA it is necessary to calibrate before carrying out measurements. How this is done will differ according to the type of equipment. Always check how this should be done.

### Afterwards

When you are finished, remove the leads and, if using, the wireless modules. The participant can then remove the disposable electrodes him or herself, and wash hands. The disposable electrodes can be disposed of in the bin. After each participant, you should clean any equipment that has been in contact with the participant. This may apply to the leads that were attached to the electrodes and, if using the wireless Biopac module, the transmitter as well. Clean these components carefully with an alcohol wipe. The strap must be cleaned after use with Incidin Plus.

### Tips to ensure useful data

- Check whether the electrodes and leads are attached properly;
- The participant should breathe slowly and regularly;
- The participant must move as little as possible to prevent artefacts in the data;
- The participant must be comfortable and sit in a natural posture with both feet on the floor;
- Before you start, ask the participant to hold his/her breath briefly. That way you can check whether you are getting a good signal and whether the electrodes are attached properly;
- When the data looks irregular or shows a flat line, check whether the leads are properly attached and whether the electrodes are still properly attached;
- If the quality of the data remains poor, it could be that the participant is a non-responder. This occurs in 10% of people.

### Literature

Boucsein, W., Fowles, D. C., Grimnes, S., Ben-Shakhar, G., Roth, W. T., Dawson, M. E., & Filion, D. L. (2012). Publication recommendations for electrodermal measurements. *Psychophysiology*, *49*, 1017-1034.

Van Dooren, M., de Vries, J. J. G., & Janssen, J. H. (2012). Emotional sweating across the body: Comparing 16 different skin conductance measurement locations. *Physiology & Behavior*, *106*, 298-304.

<https://www.biopac.com/webinars/eda-faq/>