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HIGHER EDUCATION

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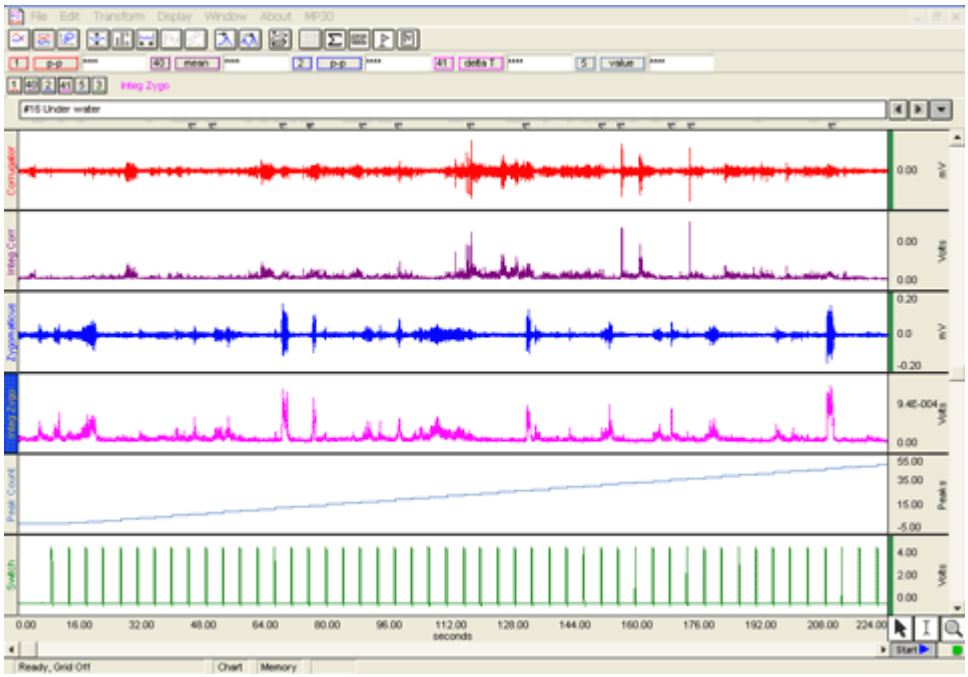
BSL *PRO* Lesson H27: Facial EMG



Standard Trial Facial EMG Data Using the BSL *PRO*

Abstract

Human facial expressions are of interest to both psychologists and psychophysiologists. Facial electromyography (EMG) is one of the ways to measure emotional expressions such as fear, surprise, happiness, disgust, sadness, and anger. There are differences in facial behavior on an individual level, based on subjective response.

Facial EMG can be distinguished based on the activity across specific facial muscles. Activities in the **zygomaticus major** muscle tend to correspond with positive emotions (happiness, surprise), and the **corrigator supercilii** muscle tends to correspond with negative emotions (anger, fear, disgust).

This experiment will test a subject's face muscle activities, especially the muscle corresponding with smiling and frowning, while the subject is exposed to a series of pictures or sounds. In order to record the signals accurately, it is important to place a pair of electrodes on the same muscle or muscle group. If possible, the electrodes should be placed on a line parallel with the muscle fibers.

The following website and publications offer further information about facial expressions and facial EMG:

http://www.sscnet.ucla.edu/anthro/bec/papers/Fridlund_Facial_Expressions.PDF

Fridlund, A. J., & Cacioppo, J. T. (1986). Publication guidelines for human electromyographic research. *Psychophysiology, 23,* 567-589.

Stern, R. M., Ray, W. J., & Quigley, K. S. (2001). Muscles. *Psychophysiological Recording, second edition*. 106-124. New York: Oxford University Press, Inc.

Objectives

1. Identify and record the muscle activities from both the corrugator supercilii and the zygomaticus major muscles as the subject reviews different pictures.
2. Observe changes in facial muscle response as the subject reviews different pictures.

Equipment

- BIOPAC Unshielded Touchproof Electrode Adapter (SS1A: Qty - 2)
- BIOPAC Reusable Electrodes (EL254: Qty - 1, EL254S: Qty - 4)
- BIOPAC 4 mm Adhesive Collar (ADD204)
- BIOPAC Electrode Gel (GEL1)
- BIOPAC Hand Switch (SS10L)
- Alcohol swabs
- Stimulus Presentation
- Computer running Windows XP or Mac OS X
- Biopac Student Lab *PRO* software
- BIOPAC Data Acquisition Unit (MP35/MP30)

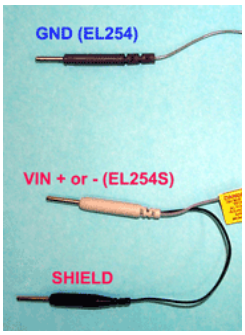
Setup

Hardware

1. Plug the electrodes into the electrode adapters.

   - No GND for CH 2

The electrode adapter with leads for CH 1



2. Plug the **electrode adapters** into **CH 1** and **CH 2** on the **MP3X** unit.
3. Plug the **hand switch** into **CH 3** on the **MP3X** unit.
4. Turn the **MP3X** data acquisition unit **on**.

Software

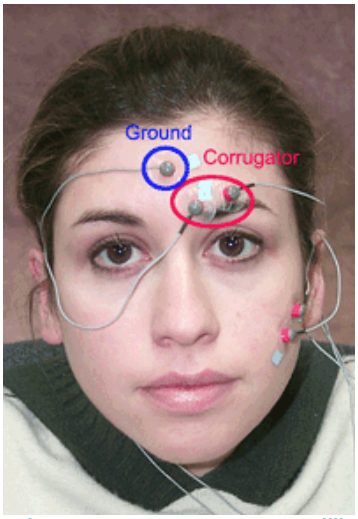
1. Turn the **computer on**.
2. Launch the **BSL *PRO*** software on the host computer.
3. Open the Facial EMG lab by choosing **File menu > Open > choose Files of type: GraphTemplate (*GTL) > File Name: h27.gtl**.
    - The file can be downloaded from the BIOPAC website *PRO* Lessons page.

Subject - Electrode Connections

Hints for minimizing data error

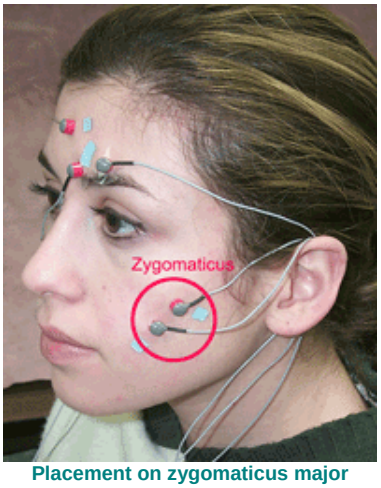
- Clean the skin with alcohol before placing electrodes.
- Wait at least 10 minutes after attaching the electrodes so the skin has ample time to absorb the gel.
- Press the hand switch every time the picture changes (to be used as a time marker).
- Remove all jewelry or other metal objects.
- Check all cable connections.

1. Attach the adhesive collars to the electrodes.
    a. Remove the adhesive collar from its waxed paper strip and carefully attach the washer to the electrode so that the center hole of the washer is directly over the electrode cavity.
    b. Fill the cavity with the electrode gel. No air bubbles should be present in the cavity.
    c. Remove the white backing from the washer to expose the second adhesive side.
2. Place the electrodes from the **CH1** lead on the **corrugator supercilii** muscle locations on the left side of the face as follows:
    - **Negative lead**—Slightly above the eyebrow, close to the nose.
    - **Positive lead—**Closely spaced to (1 cm between them) the negative lead over the same muscle. (Try to place it on the same muscle region.)
    - **Ground lead**—On the forehead.



Placement on corrugator supercilii

3. Place the electrodes from the **CH 2** lead on the **zygomaticus major** muscle locations on the left side of the face as follows:
    - **Negative lead**—Extends diagonally from corner of mouth to cheekbone.
    - **Positive lead**—Closely spaced to (1 cm between them) and slightly above the negative lead. (Try to place over the same muscle region.)
    - **Ground lead**—Not necessary.

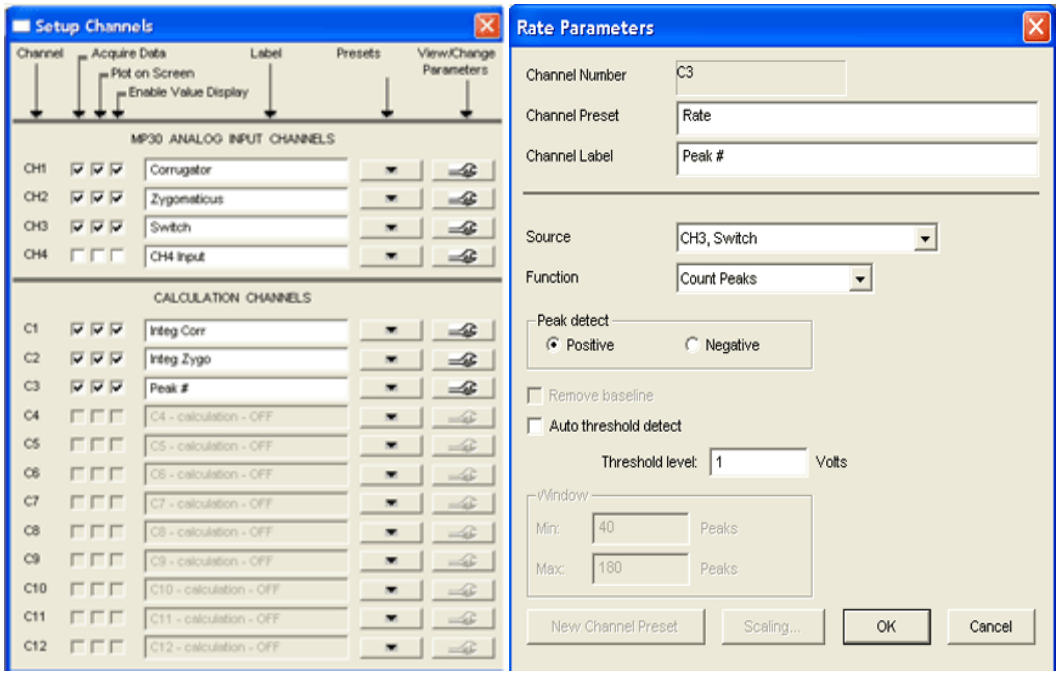


Placement on zygomaticus major

Important! Make sure that the electrodes are making good contact with the surface of the skin and do not allow the electrode wires to pull the electrodes loose.

Running the Experiment

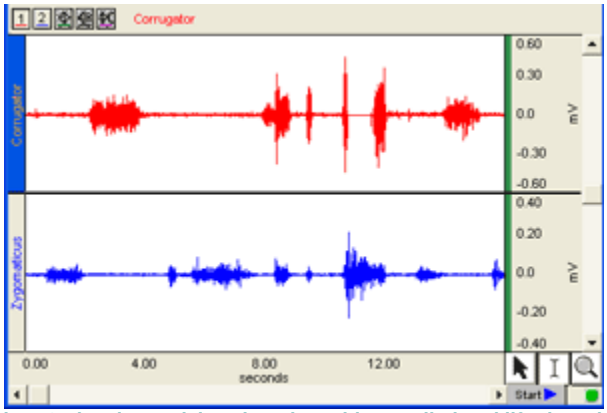
The template is set to display CH 1 Corrugator; CH 2 Zygomaticus; CH 3 Hand switch; C1 (CH 40) Integ Corr; C2 (CH 41) Integ Zygo; and C3 (CH 42) Peak # as shown below left. View/Change Parameters for C3 (CH 42) is set as below right.



Recorder will press the hand switch to mark when the picture changes.

Signal Check

1. Position subject approximately 2 feet directly in front of the computer monitor.
2. Make sure the subject is relaxed, then click “Start” to begin recording.
3. Have the subject smile and lift eyebrows.



Facial EMG showing activity when the subject smiled and lifted eye brows

4. Review the data.

   - If CH 1 and CH 2 display signal changes, as shown above, you are ready to do the experiment. If you do not see the changes, check all connections and repeat.

Experiment

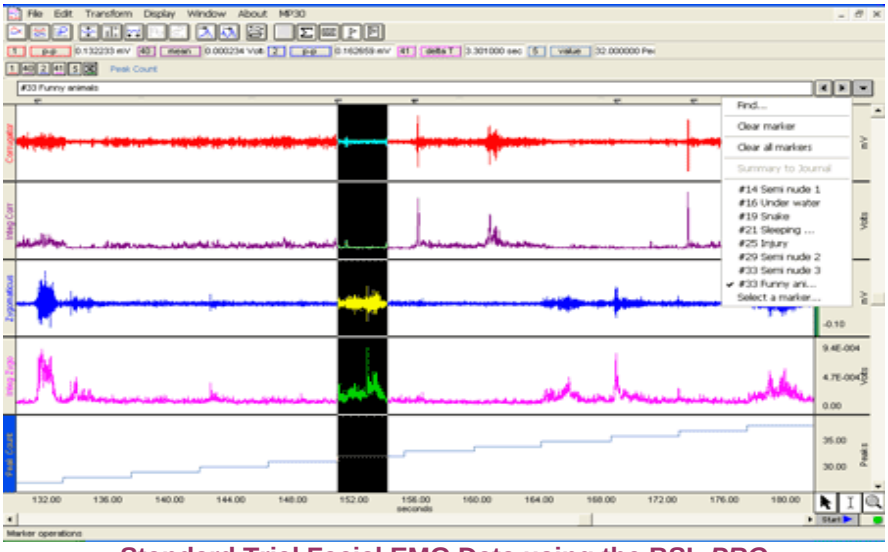
Note

- This experiment uses visual stimulation, such as a PowerPoint presentation. You may use any series of images or sounds which vary from each other and also contain some extremely aberrant components.
- You should create an image table to note image order and description, so you can correlate responses to the images that provoked them.
- Insert markers to identify points of response.

1. Have the subject relax and sit in front of the monitor.
2. Once the subject is set, begin your visual stimulation.
    - If running a PowerPoint slide show:
        - The BIOPAC screen will not be visible during the presentation.
        - Click **F5** to begin playing the slideshow (or select View Show from the Slide Show menu).
        - You can hit the "Esc" key to stop the slide show at any time.
        - At the end of the slideshow, close PowerPoint.
3. Recorder must use the hand switch to indicate when the picture changes.
4. Click on "Stop" to end the recording.

Data Analysis

- You can measure the facial EMG on different pictures (or sounds) as indicated by the markers. You should see increased facial activity when the aberrant pictures were presented.
- To correlate the responses with the pictures, select “value” in one of the measurement boxes for CH 42. The first peak is shown as “0.” However, there is a bug that sometimes counts the first peak as “-1.” Please always perform a manual check to make sure that your first peak number matches with your materials, or determine the required adjustment (i.e., if Peak -1 = image 1, then images correlate as Peak count +2).



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Appendix

GRAPH TEMPLATE SETTINGS

Click here to open a PDF of the graph template file settings. The BSL *PRO* Graph Template file automatically establishes the settings shown in the table.