NeuLog® GSR
Emotional Stress Measurement & Biofeedback System

Research-Grade Precision. Real-World Insight.
User Guide

1. Introduction

NeuLog® GSR utilizes Galvanic Skin Response (GSR) technology to monitor the autonomic nervous system. Emotional or sensory stimulation activates the sympathetic nervous system, causing micro-changes in sweat gland activity. These changes alter skin conductivity, which the NeuLog GSR measures in real time.

This system provides objective insight into stress, emotional arousal, and physiological activation long before these responses become visible through behavior.

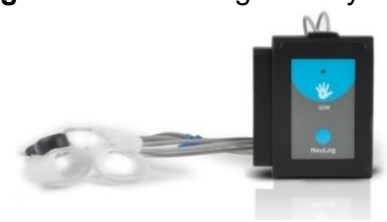
2. Key Advantages

- Research-Proven Reliability – Used in academic and clinical research environments.
- High Sensitivity – Detects subtle micro-fluctuations in skin conductance.
- Synchronized Video Analysis – Export CSV data and correlate with MP4 recordings.
- Ecological Validity – Portable for real-world research outside laboratory settings.
- Clinical Integration – Suitable for CBT, anxiety management, and biofeedback training.
- Performance Optimization – Ideal for public speaking and presentation training.

3. System Components

BLT-202 USB/Bluetooth Module – Connects NeuLog logger sensors in a chain, to any computer platform (Win, Mac, Chromebook, iPad, iPhone, Tablet, Smartphone) via USB or Bluetooth (BLE); includes rechargeable battery.

NUL-217 GSR Logger Sensor – High-fidelity skin conductance measurement with reusable electrodes.



NUL-208 Heart Rate Sensor (Optional) – Measures BPM or raw pulse waveform for complementary autonomic data.

4. Software Ecosystem

NeuLog Multi-Sensor Application – Cross-platform data acquisition with graph, table, and export functions.

NeuLog GSR App – Real-time stress monitoring for Windows and Mac.

NeuLog GSR Analytic – Advanced analysis with video synchronization and peak detection.

5. Measurement Modes

GSR Modes:

- **µS** (Micro-Siemens) – Absolute conductivity measurement.
- **Arb** (Arbitrary Units) – Amplified relative changes for emotional reactivity.

Heart Rate Modes:

- **BPM** – Beats per minute.
- **Arb** – Raw pulse waveform.

6. Standard Operating Procedure

1. Clean and lightly moisten fingers before attaching electrodes.
2. Minimize movement to avoid artifacts.
3. Record a baseline before stimulus exposure.
4. Start recording and mark significant events.
5. Export CSV data and save associated video files.

7. Applications

- Virtual Reality Exposure Therapy (VRET)
- Cognitive Behavioral Therapy (CBT)
- Public Speaking & Investor Pitch Training
- Behavioral & Academic Research
- Biofeedback & Emotional Regulation Training

Conclusion

NeuLog GSR is a complete emotional analytics platform designed for researchers, clinicians, educators, and performance professionals. It transforms physiological responses into measurable, actionable data.

Testing Procedure

NeuLog GSR App displays a graph depicting the changes in the subject's mental stress.

During the testing, the subject should not look at the graph, as this will affect his reactions and the data will not be real.

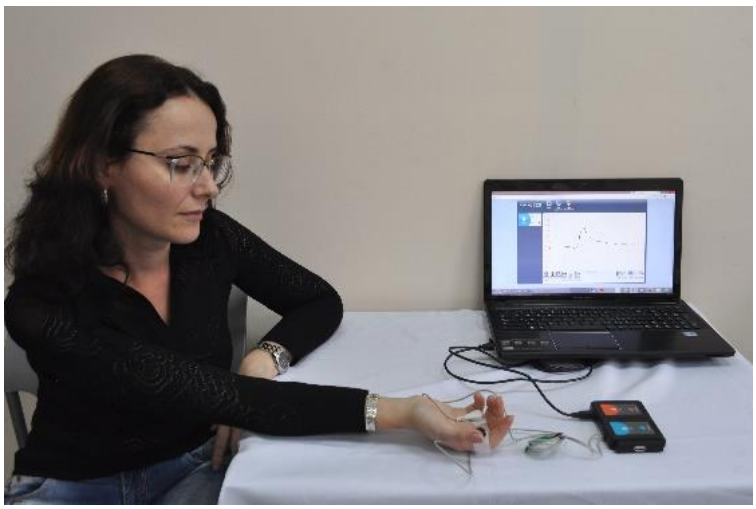
The NeuLog GSR electrode should be attached to the subject and someone (the experimenter) should monitor the developing graph.

The software allows you to mark special events on the graph, for later measurement analysis.

NeuLog GSR App can operate over a wireless connection using Bluetooth communication, so that the disturbance to the subject is minimal.

The following instructions are for experimenter.

1. Ensure you have a cotton bads, alcohol and a glass of water.
2. Turn off the air-conditioning system in the room.
3. Instruct the subject to **warm hands** by rubbing them together.
4. Clean the two fingers with alcohol and wet them and the electrodes using a **wet cotton pad**.
5. GSR sensors are very sensitive to movement (artifacts). If the subject use hands to gesture while speaking, make sure the sensor is placed on his/her less dominant hand or on fingers that are not constantly moving, to avoid getting false "pressure" readings that are actually just physical movement.
6. Attach the GSR electrodes to the moistened areas.



7. Ensure that the **GSR sensor**  is properly connected to the BLT-202 module.
8. **Ensure that the subject cannot** see the computer screen.
9. If the experience is a rehearsal in front of an audience or psychology meeting, arrange a video camera to film the audience and presenter throughout the experience.

Neulog App

Neulog App software has several versions for Windows, Mac (can be downloaded from www.neulog.com), for iPhone and iPad (in Apple store) and for Android Chromebook, tablet and smartphones (in Google play store).

All versions have the same human interface and work the same.

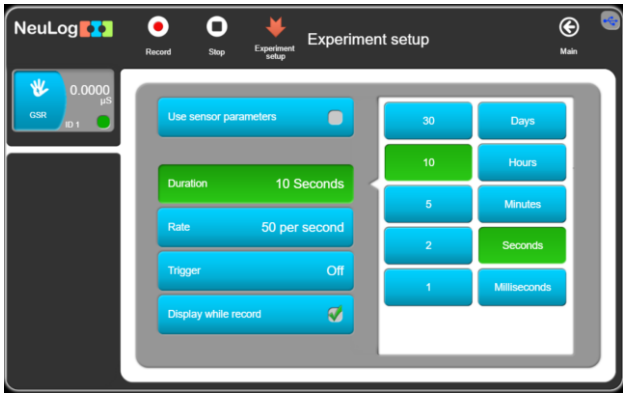
This program enables also to use the GSR sensor with other NeuLog sensors, like the heart rate (pulse) sensor, the ECG sensor and/or with the coming soon, EEG sensor and others.

Use this software especially for outdoor experiments, as done in some researches, in which the NeuLog GSR was connected to subjects with camera.

1. Double-click the NeuLogR shortcut icon 

to display the following:

2. To run an online experiment, click on the Run experiment icon and select the experiment duration and sampling rate and then click on the Record icon.



3. You can run the NeuLog sensors offline and load the measurement data from the sensors' flash memory.
4. The measurement data is saved in each of the connected flash memory. The minimal severe sampling rate is 5 samples per second, so the maximum sampling duration is 1 hour.

NeuLog App software is a very rich. How to use all its functions, online and offline, is described in NeuLog user manual that can be found in www.neulog.com.

NeuLog GSR App

This software is for online experiments with Widows or Mac computers. It is especially aimed for VRET or for psychology meeting or for presentation meeting while recording the meeting and the emotional stress measurements.

This software was tested on entrepreneurs on their rehearsals before their meeting with investors. The saved data and the recorded camera video were analyzed by AI, which helped them to improve their performance.

The measurement data is saved in the computer memory, so, there is no limit of the measurement duration, but the sensor should be connected (by USB or wirelessly) all time to the computer. The sampling rate is 10 samples per second.

1. Run **Win_Neulog_GSR_App** for Windows or **Mac_Neulog_GSR_App** for Mac and observe the application screen. The programs can be downloaded from www.neulog.com.

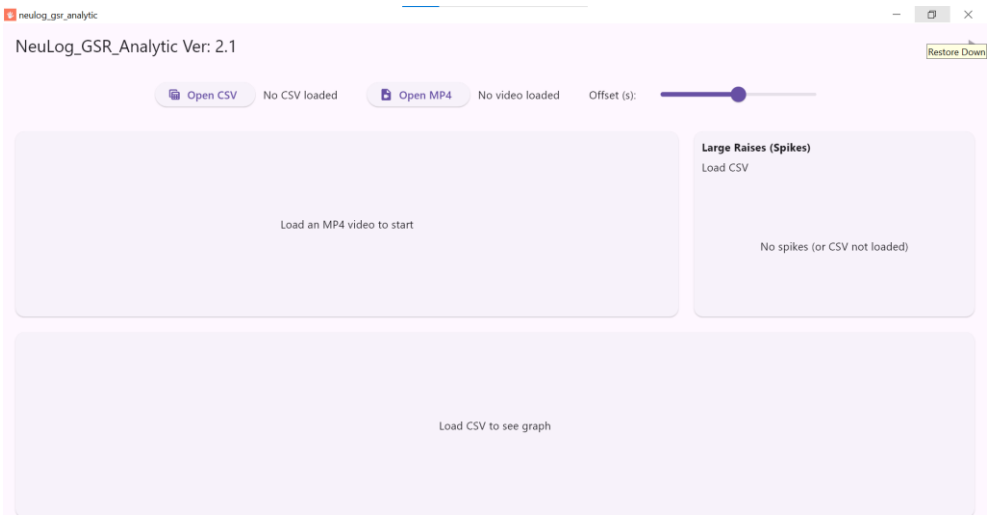
2. Turn on the BLT-202 by pressing he button on its panel. The module waits for communication by USB wire or wirelessly Bluetooth communication.
3. If the BLT-202 is connected to the computer by USB cable, press the '**USB**' button and check that the GSR module is identified and the GSR sensor icon appears on the top on the left.
4. For wireless connection, check that your computer has Bluetooth BLE connection and it is enabled.
5. Every BLT module has an ID number on its rear panel. Write this number on the **No**. field and press ENTER. The number will be saved in your computer.
6. Press the '**BLT**' button and check that the GSR module is identified and the GSR sensor icon appears on the top on the left.
7. Select the **µS** button to change the sensor's mode.
8. The **µS range** measures absolute conductivity in micro-Siemens (µS), which varies between individuals.
9. The **Arb range** amplifies conductivity changes, making variations more noticeable and eliminates the absolute value of the GSR. It is good for lie detecting experiments.
10. Instruct the subject to sit quietly for a few moments with eyes closed, head down, legs uncrossed, and arms resting either on the armchair supports or on their lap. Ensure that no pressure is applied to the finger electrodes. This is the subject "Baseline".
11. Press the '**Start**' button and turn on the video camera (when it is a presentation or a psychology meeting) or the video (when it is VRET experiment).

12. Tell the subject to start the presentation or to watch the VRET dideo.
13. Follow the graph on the screen. You can mark special points by pressing the '**Event**' button.
14. You can change the limit values of the graph in order to have better resolution. Pressing '**Apply'** or ENTER, saves these values.
15. When the presentation ended, stop the video camera and press the '**Stop**' button.
16. Press the '**Export**' button and save the data. The data is saved as a CSV file and can be imported at any time.
17. Save also the taken video as a file.
18. Turn off the BLT-202 by long pressing the button on its panel. Disconnect the NUL-217 from the BLT-202 to save the battery of the BLT-202.

NeuLog GSR Analytic

This special GSR analytic software for Windows and Mac enables to analyze the measured results and to view the correlation between the camera video or the VRET video with the measured results graph.

1. Run **win_neulog_gsr_analytic** for Windows or m**ac_neulog_gsr_analytic** for Mac and observe the application screen.



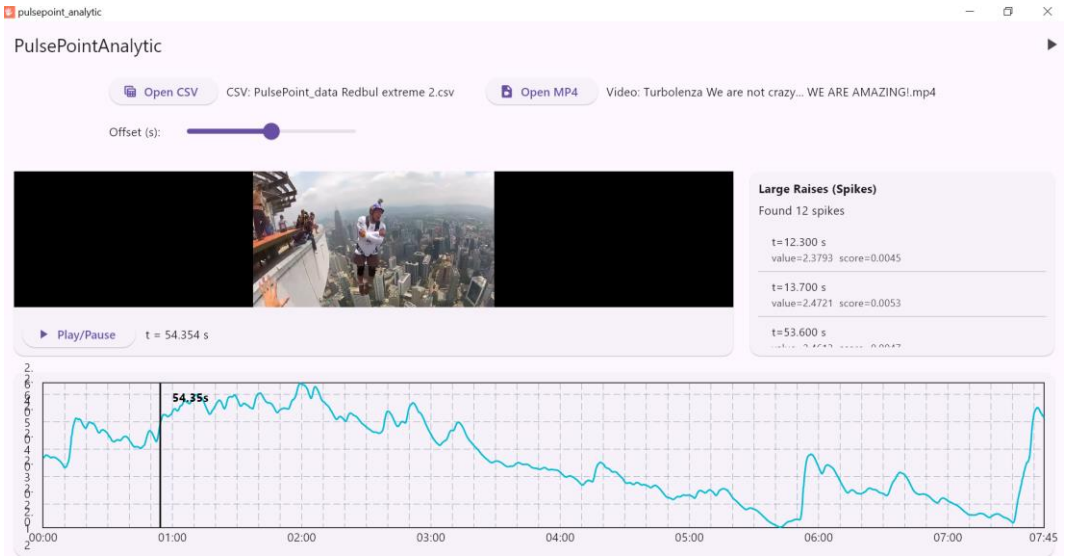
2. There are two buttons for opening the test files – the CSV file and the MP4 video file.

   Press the '**Open CSV**' button and select the test CSV file.

3. The graph of the CSV file is displayed and you can move along the graph and see the value of each point

   On the right side are indicated the large raises peaks.

4. Press the '**Open MP4**' button and select the test video file as the following example files.



5. These two files are for VRET experiment of a subject who has a little fear of heights (acrophobia) and he was watching for 7 minutes a video of extreme skydiving from a tower called 'Turbolenza We are not crazy... WE ARE AMAZING!'.

   The subject was connected to the NeuLog GSR while the the NeulogGSRApp program recorded and saved his signals.

6. Press **Play** and see the correlation between the video and the graph.

7. The **Offset** bar enables you to synchronize between the video and the graph, up to ten seconds, forward or backward.

8. We can see that my emotional stress is high from the beginning and started to drop down after about two seconds, although there were a lot of different skydiving.

   The highest spike rate happened when they did a frightening jump.

NeuLog API

This Application Programming Interface (API) specifies how any software should interact with NeuLog sensors. It enables (how it was done in NASA for example) to develop a new application software with NeuLog logger sensors.

The Neulog API software can be downloaded from www.neulog.com.

The API is based on HTTP protocol and can be accessed from any software like C, C++, Python, JS, Java and many more. Also, Microsoft Word™ and Acrobat™ can be used to control the sensors.

The NeuLog API protocol:

- The API is based on HTTP protocol and uses the standard “GET” type communication
- Each communication must be initiated by the user
- Each communication looks like this:

http://localhost:22001/NeuLogAPI?SetSensorRange:[Light],[1],[1]

  - Http header
  - Port
  - Communication header
  - Command
  - Parameters

- The received command and the result will be shown on the API screen.
- Make sure you are using the right port number.
- The command is case sensitive.
- The answer is a JSON string such as: {"SetSensorRange":"True"}
- Do not use any spaces in the command string.

Minimum requirements:

- NeuLog sensor(s)
- NeuLog USB module or Bluetooth module
- NeuLog API software

Getting started:

- Install the NeuLog API software on your PC
- Run the NeuLog API
- The API local host port number will appear on the software screen

  The initial port number is 22001

  If from any reason this port is not available then port number + 1 will be open.
- Run your software and contact the NeuLog API via the http “GET” command
- Use --quiet to run the API in Silent mode.
- On the opened window, press the ‘**i**’ button and you will get the API user manual with all the communication commands to the sensors.