Physiological Measures

Overview

In the LIVELab, the wired gTec system enables simultaneous collection of 8 channels of physiological data from up to 32 audience members (or 16 channels from up to 16 audience members) and 72 channels (64 EEG plus 8 physiology) from up to 4 on-stage performers, all sampled at up to 4800 Hz.

In a specially designed lab room off the performance hall, participants are fitted with appropriate sensors for the desired physiological measures – EEG (scalp electrodes to detect neural activity), heart rate, EMG (electrodes to measure muscle activity), breathing rate belt, and/or GSR (galvanic skin response from the finger). In the LIVELab, the ability to simultaneously record from such a large number of participants allows the study of interactions between people. Compared with other neuroimaging techniques, these physiological measures are non-invasive, virtually risk-free, and relatively inexpensive. Furthermore, the EEG data can be time stamped and coordinated with presented audio and/or visual stimuli as well as with other technology systems in the LIVELab

In addition to the gTec system, we have wireless (Bluetooth) Interaxon MUSE headsets. These units collect four channels at up to 500Hz.

Our staff will assist in reviewing a research design to ensure you get the most out of your LIVELab experience.

All research conducted in the LIVELab is subject to appropriate ethics guidelines and secure data handling procedures.

Technical Specifications and Software Output

Electroencephalography (EEG)
• Make/Model: g-Tec (g.USBamp/g.HIamp); also Muse (7.2.5)
• Quantity: gTec: 32 low density caps, 4 high density caps
• Resultant files: .hdf5, .mat

Electromyography (EMG)
• Make/Model: Noraxon Wireless DTS
• Quantity: 8 wireless EMG, 4 wireless bio-monitors (ECG, BR, RR int., HR, and Temp.)
• Resultant files: .tsv, .mat

Galvanic Skin Response (GSR)
• Make/Model: gTec (g.GSRsensor2)
• Quantity: 30
• Resultant files: .hdf5, .mat

Technical Synchronization

All technologies included in the LIVELab are built to interact with each other.

Research Examples

• Exploring physiological indicators of cognition and emotion
• Monitoring neural/muscle activity during listening or performing
• Studying interactions between musicians
• Studying interactions between musicians and audiences
• Analyzing heart rate and muscle tension in performance anxiety
• Determining best pedagogical techniques

Frequently Asked Questions

How many people can be monitored simultaneously?
In addition to the 4 high-density (64-channel caps) typically used on stage, there are 256 gTec channels available in the audience section of the theatre. How those channels are distributed among the technologies depends on the research design - for example, 6 channels of EEG, 1 channel of heart rate, and 1 channel of EMG could be measured simultaneously in each of 32 people.

What is the average set-up time?
A single person can be fully connected in about 10 minutes and we typically connect up to 5 people simultaneously, so 32 people can be connected in just over an hour.

What can you learn from physiological measures?
These measures enable perceptual and cognitive responses as well as arousal to be measured objectively. Physiological data can be collected alone or in conjunction with questionnaire data collected by the tablets (see Tablet page).

How sensitive are the sensors to movement?
The EEG sensors are quite sensitive to movement and the best signal to noise ratio will be obtained when participants are still. However, many signals can also be analyzed despite movements, and movement artifacts can be greatly reduced during post measurement signal processing.