qCLS User Manual

qCLS is a categorical-loudness-scaling (CLS) test that was designed to efficiently measure loudness growth over a wide range of frequencies.

Installation

- A complete set of test materials (in a folder hierarchy) is available for download either as a compressed archive or a GitHub repository.
- This software is written in MATLAB code and has been tested on a PC under Windows 11 running MATLAB version 2021a.
- qCLS test materials are being distributed under a creative commons license (BY-NC-SA).

Starting the test

- In MATLAB, go to the qCLS folder, then open and run *addpathCLS.m* to add subfolders to the MATLAB path.
- Open the file qCLS_*App_new.mlapp* to initiate the App Designer with the qCLS app.
- Select the Run icon on the toolbar.
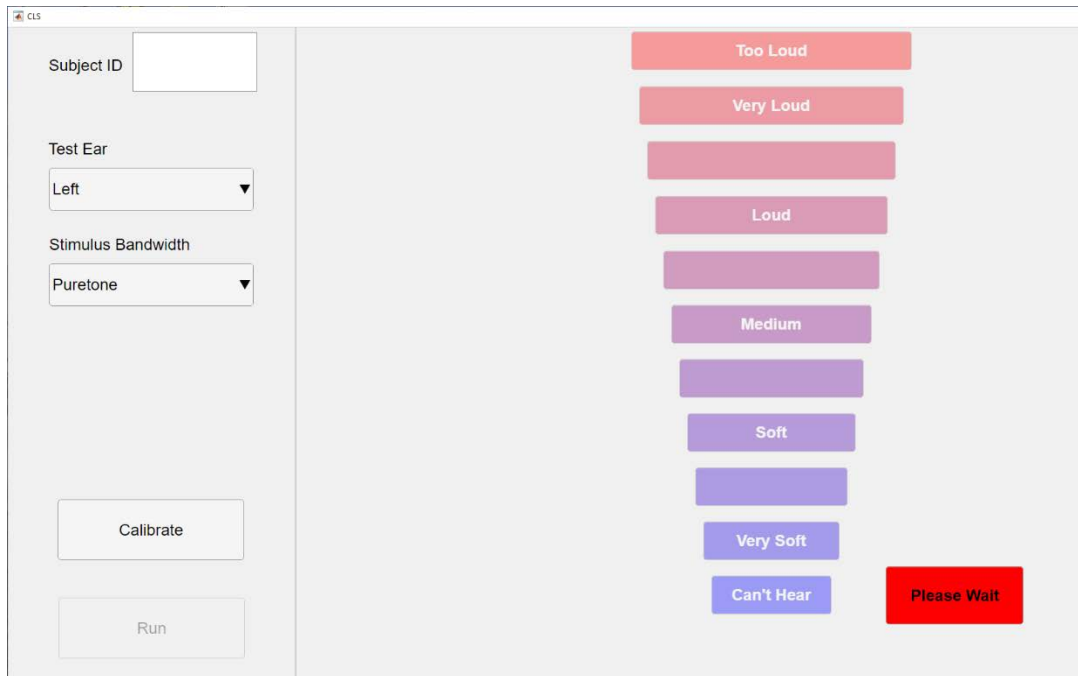- The main window of the graphical user interface (GUI) will appear, as shown below.

Figure 1. Main graphical user interface of *ConsonantTest.m*.

Calibrate Stimulus Level (as needed)

The stimulus levels must be calibrated with your earphones or insert earphones. The calibration tone is programmed to play a 1000 Hz pure tone at 80 dB SPL.

- Couple your transducer to your calibration coupler which should be connected to a sound level meter.

- Press the "Calibrate" button on the GUI and adjust output of the calibration tone with your hardware or digital audio workstation (DAW) so that the output level through the headphone measures 80 dB SPL.
- The tone will play for five seconds. Restart the tone as needed to complete the calibration.

Adding a Subject ID

- Enter Subject ID and test.
  - Subject ID must have one of the following prefixes, 'NH' or 'HL followed by three digits (the subject number) where,
    - NH=Normal Hearing,
    - HL=Hearing Loss,

Note that the subject ID prefix is used by analysis scripts to parse the data into groups.

Give Instructions to the participant

In this experiment, you will be hearing sounds and judging how loud you think they are. You will do that by touching the colored bars that you see on the screen. After you hear each sound, you will touch the bar that best matches how loud you thought the sound was. You can choose the bars that have labels, "Extremely Loud," "Very Loud," "Loud," "Medium," "Soft," "Very Soft" and "Not Heard", and you can also choose the bars in between that do not have labels.

First you will hear a sound. After it plays, the "Respond" box will turn green. At that time, touch (or click on) the bar that best describes how loud you thought the sound was. If you thought the sound was *loud*, you would touch the word "Loud." If you thought the sound was *medium* you would touch the word "Medium." Please also use the bars that don't have labels on them. If you thought the sound was in between loud and medium, you would touch the bar in between those two bars. If the "Respond" box lights up and you have not heard anything, touch "Not Heard." You should choose "Extremely Loud" when you think a sound is loud enough that you would not want to listen to it for very long.

The pitch of the sounds will be changing throughout the experiment. Remember, you are judging the loudness of the sound, not the pitch. Try to make each choice based on that sound alone. Try not to let the previous sound influence your choice. You may also hear the same sound more than once, so it is okay to make the same choice, such as choosing "Loud" twice in a row.

As soon as you touch one of the bars, the "Respond" box will turn white and you will hear the next sound. The sounds will be played 100 times in each set, which takes about 5 minutes. There are no right or wrong answers. What matters is how you perceived the loudness of the sound.

Do you have any questions?

Running the Categorical Loudness Scaling test

- Place the earphone in the listeners ear, then click 'Run'.
- When ready, click 'OK' on the pop-up box to start the test.
- The presentation of stimuli will commence, and the GUI will highlight the response categories.
- The session will be completed after 100 stimuli have been presented.
- Results are automatically saved as MATLAB data files in the 'data' folder.

Figure 2. The participant response window.

Analysis

- In the *data_analysis* folder, run *data_analysis_main* in MATLAB.