# Tips for using the EyeLink 1000+ Eyetracker

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Overall Setup

- ***Important Note.*** In the testing rooms with the EyeLink 1000+ (i.e., testing room HS/011) there are the *tapes* on the testing tables to mark the distance for each piece of equipment. Use those markers and put back any equipment pieces according to the markers - if anything is moved. **Do not remove the tapes** (and we need to make sure that the tapes are always there – we will reapply the tapes as needed).

- Again, the eyetracking camera, the chinrest and the display desktop are all placed within a certain distance from each other at specific positions on the desk (more info below). You need to make sure these positions on the desk remain constant and it's good practice to check these measures at the beginning and end of every testing day. If the relative positions of the equipment accidentally change then the relative eye-to-desktop distance will change and this will affect the perceived dimensions of experiment parameters (for instance, the radius of a circular stimulus).

- *General set up tips for all participants in your study: It's best to keep consistent the eye height across the participants. Therefore, 1) place the top piece of the chin rest (for the forehead) as high as possible. 2) Adjust the chair height to accommodate participants of different heights. 3) Adjust the bottom piece of the chin rest (for the chin) to accommodate different head sizes of the participants. 4) After that, adjust the camera as high as possible without blocking the monitor.

- The camera needs to be about 55 - 60cm away from the participant's eyes (see arrow C). The eye height should be aligned with the point between the middle and the top of the screen (see arrow A in the image below). The usual distance between the edge of the table and computer display is approximately 90cm. These setups ensure proper eye tracking, especially if you use the full screen.

- It would be useful to check out the setup tutorials for EyeLink 1000+ on SR Research: https://www.sr-support.com/thread-29.html (e.g., Desktop mount – Head-Stabilized (Chinrest) mode – Participant Setup – Youtube Link)
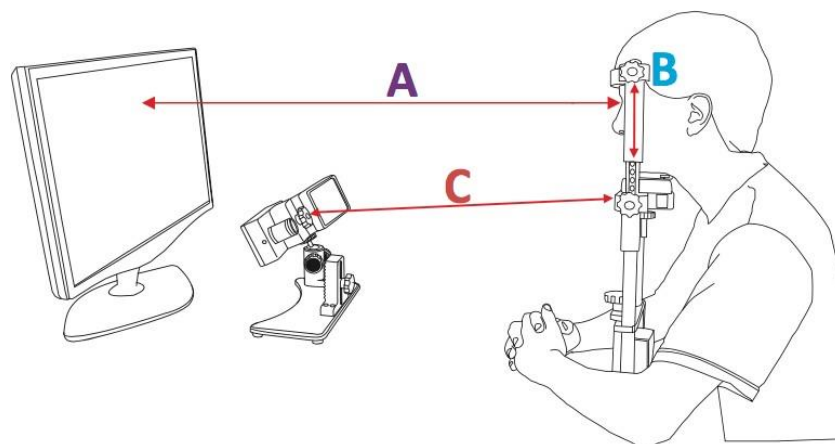
Camera set up
- Ask your participant to sit on the participant's chair and position their chin on the chinrest, looking at the desktop.
- Check the set-up menu on the host's desktop, the participant's eye should be in the centre of the camera square. You can choose which of the two eyes you want to track, just make sure if you're tracking the **left** eye, the eye tracker tracks this eye on the "Left eye" camera window. It does not matter if you can see the other eye on the screen.
- If you choose to track the **right** eye, use the mouse to click on the centre of the right eye. This means it will only track the right eye.
- Make sure that the pupil must be visible at all times on the host's settings.
- When you zoom in on the eye during camera set up, and ask the participant to look at the four corners, make sure the pupil is still tracked.
- You need a straight-on view of the eye, not from a side angle. Otherwise, the pupil will be an oval rather than a circle. In that case, you will not be able to calibrate. Look at the nose – it might look like a slight side view. Move the camera to achieve this.
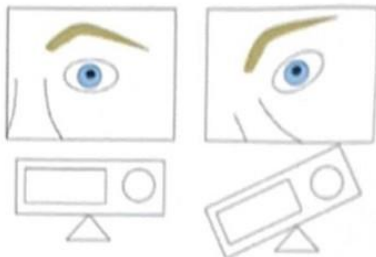
Smearing of the light blue for the corneal reflection
- Try moving the eye so it is in the bottom corner of the camera set up square. Whether the camera is one the left or right will change which bottom corner.
- This can also happen with glasses. Try tracking the other eye.

Make up
- The make-up problem is a myth, do not exclude people automatically or ask them to remove it.
- You can adjust the illuminator value on the host EyeLink screen. It is set as 75% standard, but you can choose 50% or 100% to deal with lots of makeup.

Tall people
- You want the participant to sit up straight. This means having the chair seat low if the participant is tall.
- You want the camera as high as possible, so slant it so the camera lens is at the top.
- You may find that they need more breaks and more calibrations due to (dis)comfort.

Eye issues
- If someone has a lazy right eye, track the other eye. In camera set up, just position for the left eye and click to the left eye.
- If someone has small or squinty eyes, their pupil might not be tracked at all times. You could try ellipse rather than centroid. When you are testing it, the participant should be relaxed rather than opening their eyes wide as they cannot do this for the whole experiment and it will lose them as soon as they relax.

Quality

- For calibration we want values less than 0.5 when validation is completed. This can be achieved with good instructions to the participant. You should not accept any values higher than this.
- When running the trials, check the drift correction for evidence of poor calibration – (i.e., if the fixation is consistently off to the side when the participant is looking at the fixation dot).
- You may also see problems if participants think they are looking at the preview dot but the trial of 8 dots will not start. If this happens and it will not move on, press the 'y' key and re-calibrate.
- Check the threshold values on a trial screen. It will say average and max. If the max is above 1, time to re-calibrate.

Top Tips for improving tracking quality

- Use the Alt and arrow keys to adjust the size of the search limits (the red circle around the eye). For participants wearing glasses, you can adjust the circle to be smaller than the glasses, this way the frames of the glasses will not interfere with the tracking.
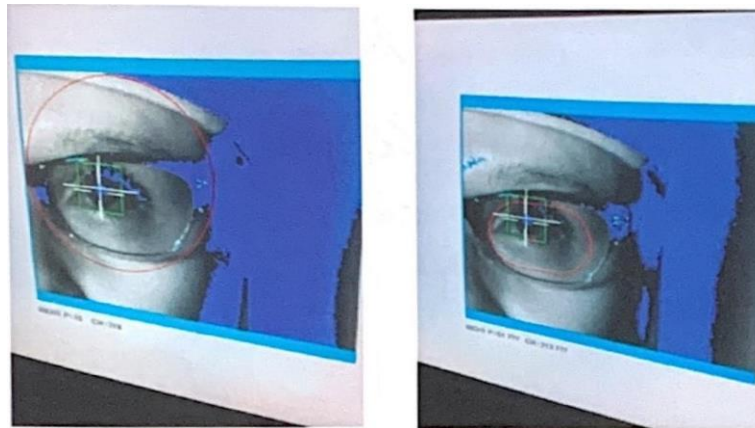
- When focusing the camera, a good indication is to aim to have the corneal reflection as small as possible.
- Leave force manual accept on.
- After using auto correct, you can then manually adjust the threshold values of the pupil (+ and - keys) and the corneal reflection (up and down arrow keys). This is particularly useful for detection of the pupil to make sure the entire pupil is highlighted blue, while avoiding any blue in the rest of the display. For the pupil the threshold value can lie anywhere between 70 and 175.
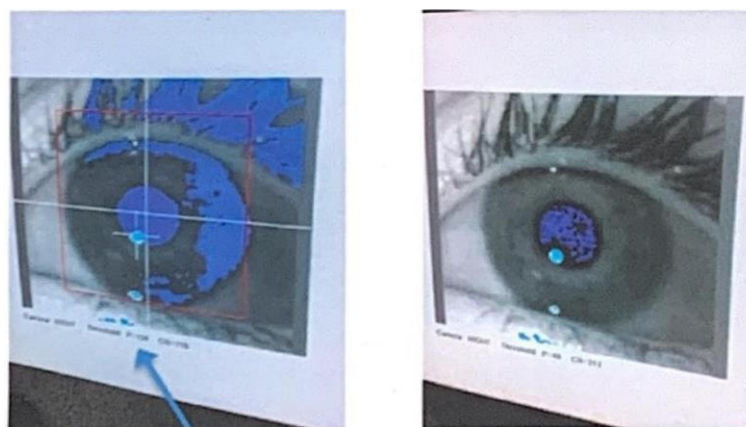
Threshold value

- When running a calibration/validation, you can use the backspace button to redo the last point, and the space bar to continue. This saves time to re-do all the points from scratch.
- When setting up the monitor, the best position of the monitor will be to have the participant's eyes in line with the top of the monitor (rather than the centre as often done previously).

How to : Turn on, set up and run a study using the EyeLink 1000+ eyetracker

Turn it on.

Turn on power to plug sockets.

Press **Power** buttons on the host and the display PC and wait for them to load.

On Host PC select Eyelink and Enter.

On Display PC click on the Eyelink username.

Both should now be loaded and ready to run the experiment.

Load experiment.

Transfer your experiment to Display PC, or locate it on the hard drive. Each researcher should have its own folder on the desktop. In each folder, create a folder for each experimenter.

If you are using the Experiment Builder, you will want to run the *deployed version* of your experiment; this is normally the icon of a large blue eye. Just double click it to run the experiment.

Check camera focus and light levels.

The Camera Setup will be a blank screen on the Display PC to begin with.

Press **Enter** to see the participant's eye on the screen.

Press the **Right arrow** key to zoom in on the eye

From this screen you can see if the lens needs to be focused, you do this by gently turning the top edge of the camera lens, do not touch the actual lens, only the sides. The lens is focused when the image is crisp and you can make out the eyelashes clearly.

Once focused you can press **A** on the keyboard to auto adjust the light levels.

Now ask the participant to look at the four corners of the screen and make sure the tracker has there pupil while they look at all four corners. If this is fine, you can move onto calibration. If it is not fine, then reposition the participant and the camera again from the beginning and try again.

Calibrate.

To calibrate a participant press C on the keyboard, or click on Calibrate under Camera Setup on the Host PC.

Dependent on your calibration type you will see a dot on the display PC either in the centre or at the edge.

For the calibration you need to ask the participant to look at the first dot and then look at each dot as they appear.

Press the **Spacebar** to begin calibration, the dots will appear and disappear and on the Host PC you will see crosses indicating the dot fixations.

If it looks ok you can accept the calibration by either pressing **Enter** on the keyboard or **Accept** on the Host PC screen

Validate.

Now you can validate the calibration either by pressing **V** or by pressing **Validate** on the Host PC under **Camera Setup**.

A similar thing will happen as in the calibration, dots will appear which the participant has to follow. You will see on the Host PC screen that there are number next to each fixation which tells you the quality of the calibration, the error of the visual angle. Dependent on your type of study you will need to know the tolerance of this (*see below). If this looks ok you can accept the validation either by pressing **Enter** or **Accept** on the Host PC.

Your participant is now calibrated and ready to take part in the experiment.

Start Experiment.

To start either press O or Output/Record on the host PC.

*Dependent on your type of study you will need to know the tolerance of your calibration, the error of the visual angle. You want to be sure that what the eye tracker is recording is what your participant is actually looking at. For most visual search studies this will be 0.5 (half a visual angle), but for reading boundary experiments you may want closer to 0.33(1/3 of a visual angle). This is because 1 visual angle is normally 3 characters on the screen and you want to be able to distinguish between each character accurately.

When you're done with data collection for the day, you should power off the eyetracker, and preferably also turn off the switch on the power socket. Once again, make sure you don't move any equipment from their original positions.