E-Prime and Tobii

In general

When using a X2-60 or X3-120 Tobii eye-tracker, the eye-tracker needs to be configured after connecting it to a computer. This configuration needs to be performed each time the eye-tracker is connected to another computer.

- Go to Control Panel (in Windows task bar search, search for Control Panel)
- Click Tobii Eye Tracking (32-bit) (search for "Tobii" to find it)
- Select the eye- tracker
- Click Set Up
- Select the right monitor (when multiple monitors are connected)
- Click Next
- Click Start Mapping
- A Tobii bar becomes visible on the screen. Drag the lines to the correct position. For the X3-120, the lines need to be in line with the small lines on the eye-tracking bar. For the X2-60, the lines need to be in line with the edges of the eye-tracking bar.
- Click Done
- Close Tobii Eye Tracking Settings

See the following videos for more information about setting up Tobii eye-trackers and configuring them: https://video.leidenuniv.nl/channel/channelid/75411521

E-Prime 3 and EET 3.2

When building an E-Prime experiment with Tobii eye-tracking, using E-Prime 3.0.3.80 with EET 3.2 is recommended over using E-Prime 2. This is because the EET version is improved, the gazedata is saved faster, and building eye-tracking in your task is much more user friendly.

Help:
- **Sample tasks:** It is very helpful to use a sample task as an example when creating an E-Prime task with Tobii eye-tracking. When the EET package is installed on your computer, you can obtain the EET sample tasks by opening E-Studio, going to Tools → Options, and then click Copy Samples and Tutorials to My Experiments Folder. Samples are now located on your computer in Documents → My Experiments → 3.0 → Tobii Pro → Samples → TET. The TETPictureRT is a very basic experiment, which could be a good start for your eye-tracking experiment. Note that the TETWaitForFixation object and TETGazeReplay objects are usually not necessary.
- **User Manual:** Another helpful tool is the User Manual. This manual also includes tutorials. When the EET package is installed, you should be able to find the User Manual on your computer when you go to Start → E-Prime Extensions for Tobii Pro. When the User Manual is not located on your computer, ask SOLO for the right version of the EET User Manual.

Steps:
- Add the EET package to your experiment by going to: Edit → Experiment → Packages → Add → select TET and click OK. When the TET package is not available, EET is probably not (properly) installed.

- Add the TobiiEyeTracker device by going to: Edit → Experiment → Devices → Add → select TobiiEyeTracker and click OK. When the TobiiEyeTracker device is not available, EET is probably not (properly) installed.
- Double click on the TobiiEyeTracker device. Select your eye-tracker (when the eye-tracker is connected to the computer) under Eye Tracker. Also, select the right sampling frequency of the eye-tracker under Frequency. The Max Count is the maximum number of samples that can be collected during a trial. This should be at least the complete trial duration (including response time) in seconds times the sampling frequency of the eye-tracker. For example, when a trial lasts for 10 seconds, and the eye-tracker measures with a sampling frequency of 120 Hz, the Max Count should be set to at least: 10 x 120 = 1200. When multiple displays are used, select the right display under Display.
- At the start of the task, add a TETOpen, TETCalibRegular, and TETGazeDataOpen package call (see sample task and User Manual).
  - **TETOpen**: The TETOpen package call opens TET communication. The default parameters are usually sufficient.
  - **TETCalibRegular**: Performs a typical calibration. In the parameters you can set the number of calibration points. The default is 5.
  - **TETGazeDataOpen**: Opens the gazedata file. In the parameters you can set the user defined columns in the gazedata file. These are extra columns that are added to the gazedate file, next to the columns that are saved by default. Here you can for example specify the trial type or other trial information. For an example, see the sample task. It is very important to think carefully about what information to save as it can be very useful to add metadata columns. In the parameters, add columns within quotation marks, separated by a semicolon (e.g. "Prime;AOI1;AOI2").
- At the end of the task, add a TETGazeDataClose and TETClose package call.
  - **TETGazeDataClose**: Closes the gazedata file. No parameters to be set.
  - **TETClose**: Closes TET communications. The default parameters are usually sufficient.
- At the start of the trial procedure, add a TETGazeDataSetProperty and TETStartTracking package call.
  - **TETGazeDataSetProperty**: Writes values to the user specified columns when the gazedata is saved. Each column defined in TETGazeDataOpen can here be filled with a value. In the parameters of this package call, the column name is first written in quotation marks, followed by the value that needs to be written to the corresponding column. When referring to an attribute, the attribute should be written in square brackets. Then, the next column and value is specified. For example: "Prime", [Prime], "AOI1", [LeftImage], "AOI2", [RightImage]
  - **TETStartTracking**: Start the Tobii eye-tracker recording. The default parameters are usually sufficient.
- At the end of the trial procedure, add a TETStopTracking and TETGazeDataSave package call.
  - **TETStopTracking**: Stops the Tobii eye-tracker recording. The default parameters are usually sufficient.
  - **TETGazeDataSave**: Saves the gazedata from the Tobii eye-tracker's history to the gazedata text file. Here, an optional parameter can be specified to log the dependent measures of an object (e.g. "Stimulus"). That is, the ACC, CRESP, RESP, and RT are logged in the gazedata file of the object specified in this package call.
- Next to these basic package calls, there are other package calls available. See the sample tasks and User Manual for more information.

Data:

The eyetracking data is saved in a text file. This file is saved in the same folder as where the E-Prime task is located. The file holds the data per sample (for example, with a sampling rate of 120 Hz there will be 120 samples (rows) per second). The CursorX and CursorY variables hold the gaze position in pixels on the screen. Other useful variables are: CurrentObject, which is the E-Prime object that was running, and ComponentName, which is the component that the participant was looking at (see the user guide for more information on the variables that are saved). Only raw gaze data is saved, the gaze data is thus not categorized in fixations or saccades.

The PhysioData Toolbox can be used to analyze the data. The PhysioData Toolbox allows segmenting the data into epochs and can output pupil and gaze metrics per epoch. See the PhysioData website for more information: https://physiodatatoolbox.leidenuniv.nl/

E-Prime 2 and EET 2

Help:
- **Sample tasks:** Adding eye-tracking to an E-Prime 2 experiment can be quite tricky. Sample tasks are available and indispensable when creating an eye-tracking task in E-Prime 2. When the EET package is installed on your computer, you can obtain the EET sample tasks by opening E-Studio, going to Tools → Options, and then click Copy Samples and Tutorials to My Experiments Folder. Samples are now located on your computer in Documents → My Experiments → Tobii → Samples → TET. The TETPictureRT is a very basic experiment, which could be a good start for your eye-tracking experiment. Note that the TETWaitForFixation object and TETGazeReplay object are usually not necessary.
- **User Manual:** Another helpful tool is the User Manual. This manual also includes tutorials. When the EET package is installed, you should be able to find the User Manual on your computer when you go to Start → E-Prime Extensions for Tobii. When the User Manual is not located on your computer, ask SOLO for the right version of the EET User Manual.
- **Youtube:** For more information about how to add Tobii package calls to your experiment see: https://www.youtube.com/watch?v=-Vt1Utgf3og. For more information about setting up the whole task with eye-tracking, including information about the User Script and SaveGazeData inline, see: https://www.youtube.com/watch?v=0pJzPeVmE8k. Although E-Prime 3 is used in this last video, the steps taken are exactly the same as in E-Prime 2.

Steps:
- A task that includes EET package calls and the TobiiEyeTracker device can only be opened when the EET package is installed. Make sure you have the EET package installed on your computer. Sometimes, the task will not open unless an eye-tracker is connected to the computer.
- Add the package to your experiment by going to: Edit → Experiment → Packages → Add → select TET and click OK. When the TET package is not available, EET is probably not (properly) installed.
- Add the TobiiEyeTracker device by going to: Edit → Experiment → Devices → Add → select TobiiEyeTracker and click OK. When the TobiiEyeTracker device is not available, EET is probably not (properly) installed.

- Double click on the TobiiEyeTracker device. Here, the eye-tracker address should be entered in IP Address/Name. You can find the eye-tracker address in the program Eyetracker Browser. Go to Start → Tobii → Eyetracker Browser. Press copy to copy the address, then paste it in E-Prime in the IP Address/Name field in the TobiiEyeTracker device.
- At the start of the task, add a TETOpen, TETOpenGazeDataFile, and TETCalib package call.
- At the end of the task, add a TETCloseGazeDataFile and TETClose package call.
- At the start of the trial procedure, add a TETStartTracking package call.
- At the end of the trial procedure, add a TETStopTracking package call.
- After the TETStopTracking package call, add an inline and name in SaveGazeData.
- From the sample task, copy the User Script to the User Script of your experiment.
- From the sample task, copy the content of the SaveGazeData inline to the SaveGazeData inline of you experiment.
- In the User Script, the variables that are saved in the gazedata file are defined. This needs to be adjusted to your experiment, by removing or adding variables.
- In the SaveGazeData file, the variables are written to the gazedata file. The contents of this inline need to be adjusted to your experiment.
- See this video: https://www.youtube.com/watch?v=0pJzPeVmE8k for more information about the User Script and SaveGazeData inline.

Data:

The eyetracking data is saved in a .gazedata file. This file is saved in the same folder as where the E-Prime task is located. The gazedata file can be opened in Excel. The file holds the data per sample (for example, with a sampling rate of 120 Hz there will be 120 samples (rows) per second). The CursorX and CursorY variables hold the gaze position in pixels on the screen. Only raw gaze data is saved, the gaze data is thus not categorized in fixations or saccades.

The PhysioData Toolbox can be used to analyze the data. The PhysioData Toolbox allows segmenting the data into epochs and can output pupil and gaze metrics per epoch. See the PhysioData website for more information: https://physiodatatoolbox.leidenuniv.nl/

Important note:

When measuring pupil size, E-Prime 2 and EET2 cannot be used in combination with the X3-120 eye-tracker. This is because of the following:

The Tobii X3-120 eye-tracker uses two modes of tracking the eye: bright mode and dark mode. The order that the eye-tracker uses these modes in is: 1 bright – 2 dark. Pupil size should only be reported during bright mode (this thus results in a sampling rate of pupil size of 40 Hz). However, in combination with E-Prime 2, pupil size is reported in both bright and dark mode. It is unfortunately impossible to know which mode has been used for which sample. The interchangeable use of the two modes causes a lot of noise in the pupil data. Thus, we strongly advise against using the X3-120 eye-tracker in combination with E-Prime 2. In E-Prime 3 the issue is solved and pupil size is only reported during bright mode. The Tobii X2-60 eye-tracker also uses both bright and dark mode. However, during the recording only one of the two modes is used. The best tracking mode is established during calibration. Only when tracking is completely lost, (not during blinks, but when the participant looks away for a longer period of time), the tracking mode is reevaluated. Thus, all pupil size samples can be used when using a X2-60 eye-tracker. Note: Bright mode means that the pupil lights up. This is because the infrared light directly hits the pupil. In dark mode, the pupil is darker than its surroundings. This is because the infrared light hits the pupil under a certain angle.