

# Tobii Pro VR Analytics User's Manual

# 1. What is Tobii Pro VR Analytics?

Tobii Pro VR Analytics collects eye-tracking data in Unity3D immersive virtual-reality environments and produces automated visualizations and analytics for locomotion, interaction and gaze data. Its playback and analytics functionalities support individual and multi-participant recordings. Its metrics functionality computes and presents results instantly when the recording is finished.

Tobii Pro VR Analytics supports most Unity3D environments. Its gaze-based functionalities require a Tobii HTC Vive Integration HMD headset with integrated eye-tracking.

Use Tobii Pro VR Analytics for:

- market research
- human behavior research
- wayfinding
- training and performance optimization
- education
- medical research and testing
- automotive development
- design and architecture
- UX and interface design

## 2. Installing and launching Tobii Pro VR Analytics

This section outlines how you get Tobii Pro VR Analytics up and running in a Tobii HTC Vive HMD headset connected to a VR-capable PC.

### 2.1 HTC's Instructions for the Vive headset

HTC provides information on how to install and set up the Vive headset:

- The installation instructions are available here:  
[https://support.steampowered.com/steamvr/HTC\\_Vive/](https://support.steampowered.com/steamvr/HTC_Vive/)
- A Vive setup instruction video is available on YouTube:  
<https://www.youtube.com/channel/UCiw1w2kYUHWQOkWIZbMqcaQ/>

### 2.2 Virtual Reality and your hardware

Before running Tobii Pro VR Analytics on your computer, check whether your computer is VR-ready by using the Steam VR Performance Test at:

[https://store.steampowered.com/app/323910/SteamVR\\_Performance\\_Test/](https://store.steampowered.com/app/323910/SteamVR_Performance_Test/)

An immersive VR experience calls for a computer that meets certain system requirements. However, replay and analysis put less stringent demands on your computer, mainly determined by the complexity of the analyzed environment, such as its size, shading and level of photorealism.

Make sure that your computer utilizes a high-performance power setting and that Tobii Pro VR Analytics runs from the computer's dedicated graphics card and not from its regular processor card. Headsets and external monitors must also be connected to the dedicated graphics card.

If your computer has trouble running an environment, check whether you can select a lower graphics setting for it at launch.

### 2.3 Setting Up the Headset

In brief, this is how you get started:

1. Download the Tobii Core Software for VR: <http://developer.tobii.com/?wpdmdl=205>. It contains the drivers required for running the VR eye tracker.
2. Download and install Steam from the Steam website:  
<https://store.steampowered.com/about/>
3. Start Steam.
4. Set up Steam VR by clicking the VR icon in the user interface.
5. Connect your Pro VR Integration headset according to the instructions in Steam VR and set up your lighthouses and hand controllers.

### 3. Environments

A Tobii Pro VR Analytics environment is a Unity 3D world enabled with eye tracking analysis capability. Every environment may contain several versions to accommodate different conditions the environment may be tested in. For instance, in the figure below, the environment contains two versions, one called “Full” and the other called “Depleted”.

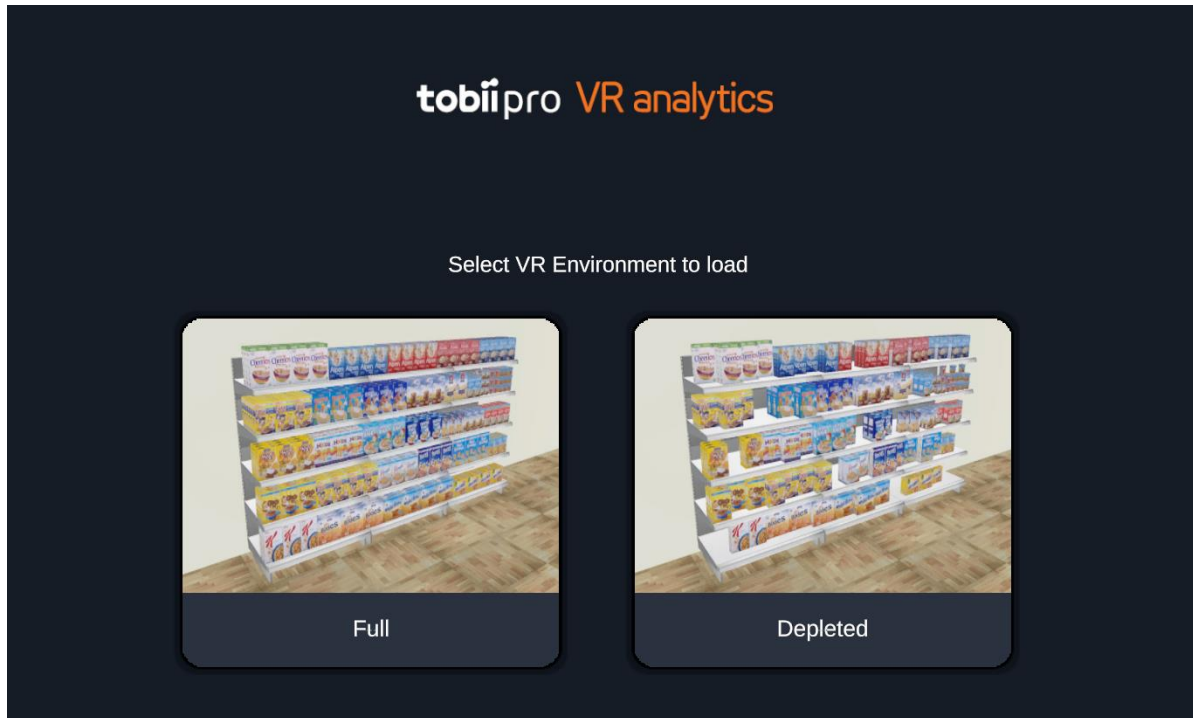


Figure 1. Home screen of Tobii Pro VR Analytics

This section explains how to open and close an environment, how to switch between environment versions, and how to copy files from one version to another.

The environment stores the recordings of the versions, and you can access metrics and export data for each (see section 6).

#### 3.1 Folder structure

An environment has the folder structure depicted here. The name of the executable file is the environment name. In this example, the environment is called NewYorkCity. The folders can be placed anywhere in your PC.

- 📁 Licenses
- 📁 NewYorkCity\_Data
- 📄 NewYorkCity.exe

## 3.2 Opening an environment

1. Launch the environment by clicking on the .exe file in the folder structure. In the example above, click NewYorkCity.exe.
2. The environment starts in one of two ways:
  - a. The environment loads in full-screen or windowed mode depending on its configuration.
  - b. A configuration dialog screen appears. Launch the environment by clicking “Play!”
3. A home screen appears (see Figure 1).
4. Open the desired environment by clicking it. If the environment has several versions, all appear here.

## 3.3 Closing an environment

- In windowed mode, close the environment by clicking the close button in the upper right corner.
- In full-screen mode, close the environment by:
  - a. returning to the home screen by clicking the home icon at the top left
  - b. clicking the closing icon (X)

## 3.4 Switching between environment versions

Environment versions can be switched at the home screen. In replay mode, you go to the home screen by clicking the home button.



Figure 2. The home button is placed in the upper left corner of the application window.

## 3.5 Copying recordings in an environment

You can copy recordings between different versions of the same environment, although changes in the environment made between recordings may prevent merging. For example, if you have recordings in several computers, you can merge them in one computer for analysis at an aggregate level.

Copy recordings in the same environment with the following procedure:

1. Open the environment folder.
2. Open the Data folder (commonly having the environment’s name appended by \_Data). In the example in chapter 3.1, the data folder is called NewYorkCity\_Data.
3. Open the Recordings folder. It contains separate folders for full and partial recordings. Keep this folder structure unchanged.

4. Recording files are stored in a JSON format. Select the desired recording files plus their META files.
5. Copy the selected files to the same folder on the destination PC for final analysis.

## 4. Recordings

This section describes how you record a participant's activities in an environment. Here are a few pertinent points:

- Tobii Pro VR Analytics has two modes: Replay and Record. An environment always opens in Replay mode. When you wish to make a recording, you switch to Record mode by clicking the Record tab. Mode-switching resets the environment and unloads the recordings, so when entering Replay mode after being in Record mode, you need to reload the recordings you intend to use.
- When Recording mode is active, the environment appears in real-time in the headset. The participant may move in the environment already at this stage, before the start of the actual recording.
- Before you start a recording, you may want to give the participant a few minutes to get familiar with the headset by exploring another environment.
- Each recording is automatically assigned a unique color. The color cannot be changed. The avatar heads are colored green for females and purple for males.

### 4.1 Preparing for a recording

Before starting a recording, go through this checklist

1. Set a starting point or orientation in the environment
2. Adjust the gaze point settings
3. Run a calibration
4. Verify accuracy
5. Instruct the participant what to do

#### 4.1.1 Set a starting point or orientation

Each environment has a pre-programmed default starting position that you cannot alter. However, a participant can move elsewhere in the environment before the start of the recording.

#### 4.1.2 Adjust the gaze point settings

The gaze point appears on screen when Recording mode is active and the eye tracker is tracking. The gaze point also appears in the headset, though there you can toggle it on and off by pressing Z on the keyboard or by clicking on the *HMD Gaze* button in the user interface. If need be, scale the size of the gaze point with the Gaze Point Size slider.

#### 4.1.3 Entering participant information

Enter a distinguishing name in the Recording Name field. Avoid long names or name duplicates.

If the name field is left empty or contains a duplicate, Tobii Pro VR Analytics automatically inserts a generic filler name and that may later make it hard to determine the participant's identity.

Therefore, if you make multiple recordings with the same participant, put a serial number at the end of the name to avoid duplicates.

Select the participant's gender. That determines the color of the avatar head: green for females and purple for males.

#### 4.1.4 Calibration

A calibration should be done for every new participant. If you do not run a calibration before starting a recording with a new participant, the resulting gaze may be off. This is because humans have different eye physiology and the software needs the calibration information so that the gaze ray can be calculated correctly for each individual. Calibrate your Tobii Pro VR Analytics for every new participant by using the following procedure:

1. Calibrate the headset by pressing C on your keyboard. A moving purple dot appears on the screen and in the headset.
2. Instruct the participant to look at the dot during the calibration.
3. Tobii Pro VR Analytics signals a successful calibration by "Calibration succeeded".
4. If the calibration fails, rerun the procedure.
5. Verify the calibration's accuracy by asking the participant to focus on a few distinct points in the environment. If there is a clear offset, rerun the procedure.

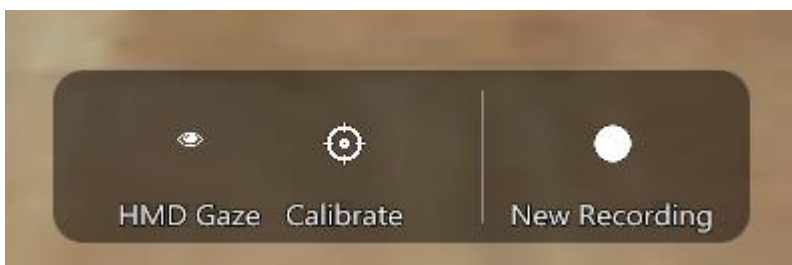
#### 4.1.5 Instructing the participant

Explain the tasks at hand to the participants. If need be, let them try out their equipment in another virtual environment.

Ensure that the participant does not look at any areas of special interest before the start of the recording. This is particularly important if you plan to measure their initial natural attention to such areas.

## 4.2 Starting and stopping a recording

Start a recording by clicking the New Recording button in the Record bottom control bar. A dialog titled New Recording appears. Enter the name of the recording and the gender of the participant and click Record.



*Figure 3. The New Recording button is the button to the right in the Record control bar located at the bottom of the application window in Record mode.*



Stop the recording by clicking the stop button in the Record control bar.

During analysis, the software aligns the starting points of the analyzed recordings. Therefore, make sure that all recordings use the same starting points. Avoid long delays between starting the recording and commencing its tasks.

### 4.3 Deleting recordings

To delete recordings, go to the data folder (described in chapter 3.1) and delete them. When you delete a recording file in the Recordings folder, it is permanently erased. Therefore, always make a backup of the folder before deleting a file.

## 5. Replaying recordings

### 5.1 Selecting recordings to replay

1. When entering Replay mode, a window with all available recordings appears.
2. Select desired recordings by clicking their checkboxes.
3. Load the selected recordings by clicking the Load button.
4. If you wish to load another selection of recordings, click the Load recordings button in the window's top control bar.



Figure 4. Select recordings to replay and click Load.

If you wish to see the participants' interactions with the environment, select a single recording. When you select multiple recordings, replaying will not display interactions, although visualizations and metrics still note what objects the participants interacted with.

### 5.2 Replaying recordings

Once recordings are loaded they can be controlled using the Replay controls in the bottom Replay control bar.

- start replaying selected recordings by clicking the Play button or pressing the space bar
- stop replaying by clicking the Pause button or pressing the space bar
- skip to a specific point in the recording by clicking in the timeline. Colored markers indicate the end of individual recordings.
- change playback speed with the speed slider

## 5.3 Replay options

When replaying recordings, select what replay functionalities you want to have active on your screen.

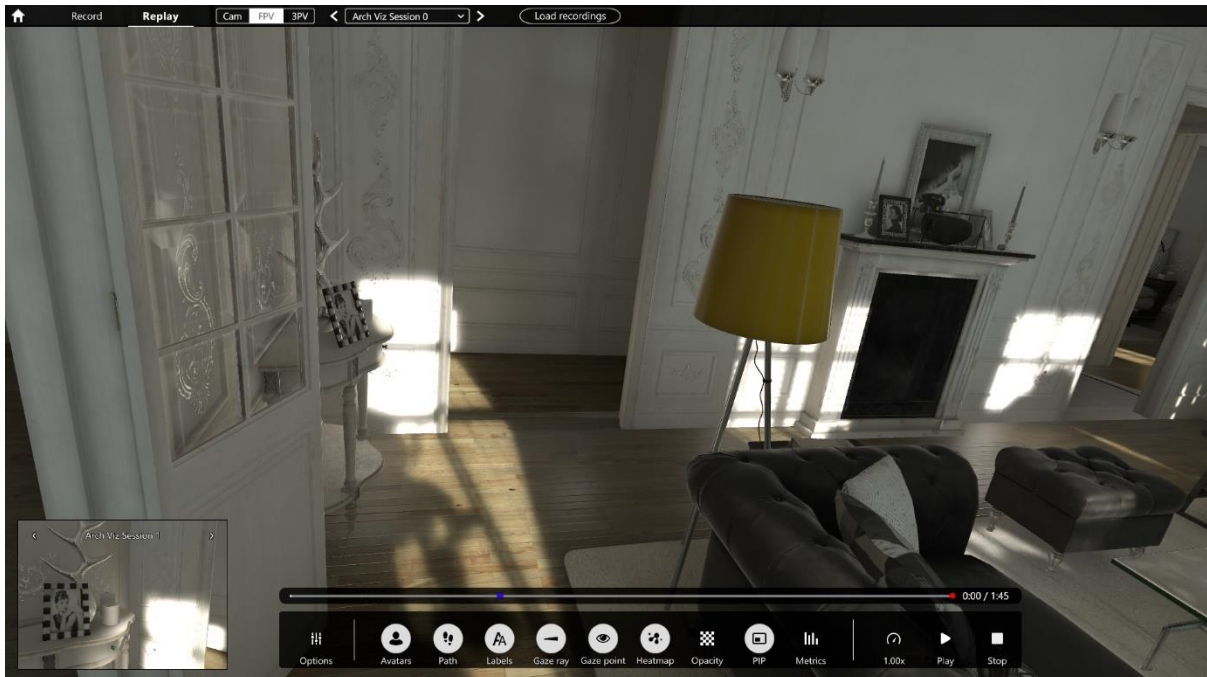


Figure 5. Bottom replay control bar containing replay functionalities.

- 1: Avatars – when activated, a participant is represented in the environment as a 3D floating head.
- 2: Path – when activated, a participant's path through the environment is depicted as a series of arrows whose shapes and sizes indicate movement and duration.
3. Labels – when activated, recording name is displayed above the avatar.
4. Gaze ray – when activated, a line is displayed between an avatar's eyes and focus of attention.
5. Gaze point – when activated, a circle is displayed at the point where the participant is looking.
6. Heatmap – when activated, a heatmap is shown in the environment.
7. Opacity – when activated, an opacity map is shown in the environment.

## 5.4 Using the View control and the Picture-in-Picture functionality

When you activate replay for a recording, it opens in a first-person view (FPV) for an avatar. Use the arrows in the view control shown in figure 6 to switch between recordings. To change perspective and view a selection of the loaded recordings from a camera in the 3D world, select the camera (Cam) option in the view button displayed in Figure 6. Then select camera in the dropdown. The

available cameras are those that are present in the Unity 3D world that was integrated with Tobii Pro VR Analytics. To view the participants from a 3<sup>rd</sup> person view, select 3PV.

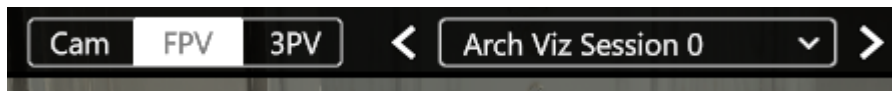


Figure 6. View control with first person view option selected.

A Picture-in-Picture (PIP) screen is visible in the bottom left corner (see Figure 5). It displays an FPV and you use it, for example, by crosschecking its FPV with a fixed-camera view on the main screen.

- Switch between recordings by clicking the left/right arrows.
- Display or hide the PIP window by toggling the PIP button in the button replay control bar.

## 5.5 Keyboard shortcuts

Your workload gets lighter if you memorize the following keyboard shortcuts:

### Shortcuts in replay mode

- A: toggle avatars on/off
- N: toggle name elements
- R: toggle Ray trace
- U: toggle hide/display user interface elements
- Z: toggle the Gaze point
- Space: play/pause
- Left/right arrow keys: forward/rewind

### Shortcuts in recording mode

- C: calibrate
- S: start/stop recording
- U: toggle hide/display user interface elements
- Z: toggle the Gaze point

## 6. Metrics

Metrics is used to analyze behavior at an aggregate level and to get insights into how much attention is paid to specific VR assets (objects or surfaces) in the tested environment.

### 6.1 Selecting recordings for analysis

1. As you enter Replay mode, a dialog appears where you can select recordings to load.
2. Select the desired recordings by clicking their checkboxes.
3. Load the selected recordings by clicking the Load button.
  - Load a different selection of recordings by clicking the Load recordings button at the top menu bar.
4. Open the Metrics window by clicking the Metrics button in the bottom Replay control bar. A window with a list of objects of interest appears.
5. Load the desired metrics for the selected recordings by clicking the name of the object of interest.

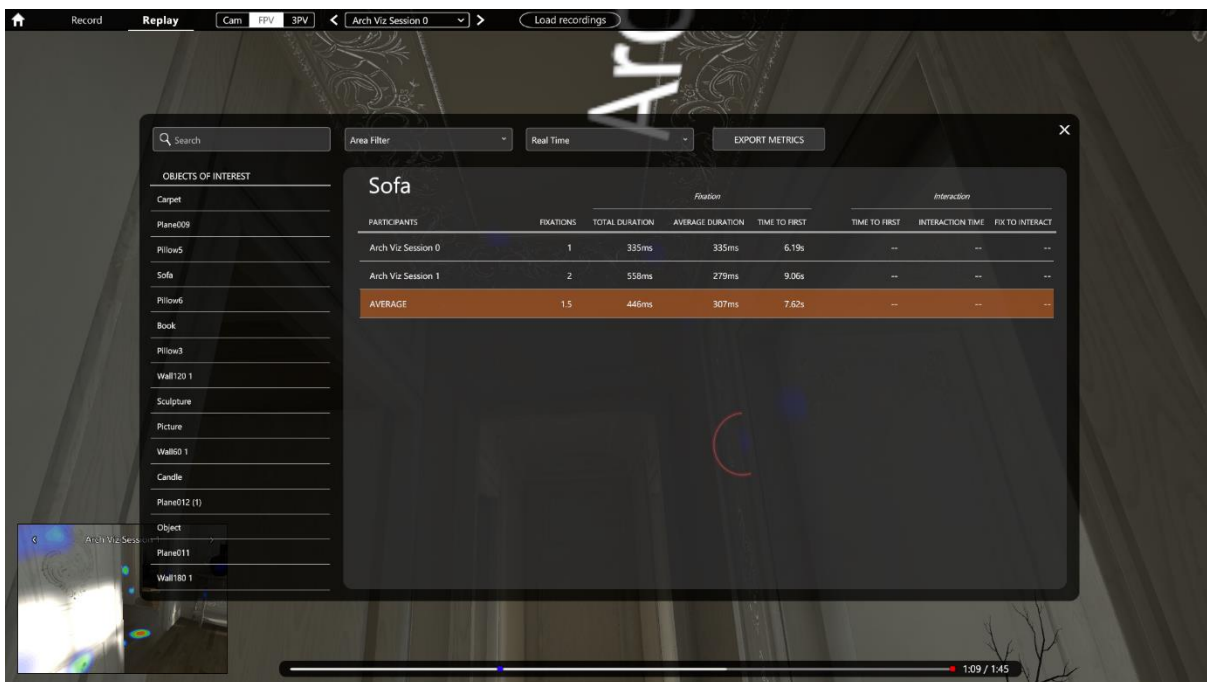


Figure 7. Metrics window with the Object of Interest named Sofa selected.

### 6.2 Real-time and Total metrics

Metrics can be displayed in real time or a total. Select Real Time or Total in the top bar of the Metrics window.

**Real Time:** When you use the Real Time setting, metrics get displayed up to the time limit you have set. For example, if you set the time line marker to 10 seconds, the program replays first ten seconds

from your selection of recordings with metrics getting updated continuously and objects of interest appearing as they get noticed by the participants. You can play, pause and rewind the replay while checking the metrics.

**Total:** The Total setting displays the complete data set of the selected recordings. All fixated objects of interest appear, regardless of position in the time line. Keep in mind that if your recordings have very different durations, you might get flawed averages.

### 6.3 Filtering objects of interest for metrics

When you study an environment with plenty of objects of interest, you can filter which ones to display by entering their keywords in the top left box in the metrics window.

You can also use the pre-programmed area filters that are listed in the Area Filters dropdown menu. Such an area may be restricted to a section of an environment, such as a room, or to virtual objects whose location, color and shape may be subject to change.

## 7. Creating replay videos and visualizations

If you want to create a gaze replay video you can do that by using a screen recording software while playing the recording in Replay mode with gaze point enabled. Hide the interface by pressing U on the keyboard.

### 7.1 Making and saving a heatmap visualization

1. Pause the replay at the desired point.
2. Unselect all options (path, avatars, gaze ray, gaze point, labels) in the Options menu.
3. Save the visualization by setting the desired heatmap mode and opacity and making a screenshot.

## 8. FAQ

- 1. Vive HMD or eye-tracking issues: the VR headset is not detected, not displaying an image, not tracking, etc. What should I do?**
  - a. The Steam Support page for HTC Vive contains more detailed setup instructions. Consult them first – [https://support.steampowered.com/steamvr/HTC\\_Vive/](https://support.steampowered.com/steamvr/HTC_Vive/)
  - b. Check that all cables are properly connected.
  - c. Check that the headset is connected to the dedicated graphics card.
  - d. Reboot your PC and headset.
  - e. Contact Tobii Support for persistent issues related to eye tracking, such as no tracking or calibration issues.
- 2. Environment issues, such as glitches in VR assets during replay or recording. What can I do?**
  - a. Reset the environment by switching from Record mode to Replay mode. Depending on what you were doing, either reselect your recordings or go back to recording mode
  - b. Reset the environment completely by shutting down Tobii Pro VR Analytics. That entails closing the window from the Home screen or force-quitting by pressing alt-F4. All recordings are saved automatically during the shutdown procedure.
- 3. No interactions with VR assets get displayed. How do I fix that?**
  - a. When you select multiple recordings, such interactions are not displayed. However, metrics remain unchanged with all interactions included. This arrangement avoids excessive clutter in the replay display. If you wish to see VR asset interactions, load a single recording for replay.
- 4. The environment is improperly positioned. How do I deal with that?**
  - a. The participant can move around freely in your test space as defined by the “Play Area” of your HTC Vive VR Headset covered by the HTC Lighthouse transmitters (max 5 meters apart).
  - b. You can move the initial position of the participant by using the Vive controller to move the position in the environment or by using the Move user control in the Record tab. It is recommended not to do this while the participant is wearing the VR Headset as it can cause nausea.
  - c. The initial orientation position of the environment is defined by how the View room setup is done and what is programmed in the environment (distance to shelf for example). You cannot control orientation of the starting position. This means that the desired starting position needs to be reset whenever the environment is reset, for instance when switching between Replay and Record modes. Once an environment is setup to fit a room it is therefore recommended to stay in Record mode until all recordings are made so that the environment remains in the same position.
- 5. Can I change anything in Tobii Pro VR Analytics, such as camera positions, VR asset names, avatars, and recording colors?**



- a. No, you cannot do that. All these factors are defined in the environment, so only its creator can change them.
- 6. What are arrows or paths? Can I derive data from them?**
- a. They indicate the headset's viewing direction and how long a participant stays in a spot.
  - b. Currently no data can be derived from them, but that will change in future releases.
- 7. Can I disable controls so that the participants don't accidentally press them?**
- a. No, that is not possible. Instruct the participants on how to avoid them and how to hold the Vive controllers.
- 8. If the recording data is offset, can I do a calibration afterwards?**
- a. No, calibration can only be carried out before you make a recording.
  - b. Therefore, always verify calibration before starting a recording, for example by asking the participants to look at a button at the Vive controller held in front of them. If you notice an offset, do a fresh calibration at once.
- 9. The headset image isn't sharp enough. How do I fix that?**
- a. Make sure that the headset is positioned correctly with the participant's eyes in the middle of the lenses.
  - b. Adjust the Inter-Pupillary Distance with the knob at the front right bottom corner of the headset and ask the participant whether the sharpness improves during the adjustment.
  - c. Ideally measure and adjust the Inter-Pupillary Distance (requires an IPD measure tool or ruler) to this measurement before calibration.
- 10. The environment freezes sometimes. How do I rectify that?**
- a. The most probable cause is a loss of tracking. Check whether the VR headset or the Lighthouses are obstructed and whether they are at the correct height above the floor, that is more than 2 meters and angled down 30-45 degrees.
  - b. It could be a performance issue in the computer. Check whether the computer is VR ready by using the Steam VR Performance Test at:  
[https://store.steampowered.com/app/323910/SteamVR\\_Performance\\_Test/](https://store.steampowered.com/app/323910/SteamVR_Performance_Test/)
  - c. Check whether other processes are diverting CPU resources. Close other processes or programs while running Tobii Pro VR Analytics.
- 11. The gaze point is invisible or frozen.**
- a. If the gaze point is invisible when you are in recording mode, check the hardware connections on the Vive (USB, HDMI, and power), check for Windows updates, check the Tobii drivers (reinstall them if need be), and restart your computer.
  - b. If the gaze point is not visible in the VR headset, toggle it on with the Z key. The gaze point can also become invisible if gaze point size is at the lowest setting. If so, increase its size till you see it.
  - c. If the gaze point remains invisible, close Tobii Pro VR Analytics and the Vive/Steam VR application. Restart the computer. Disconnect and reconnect the headset and restart Tobii Pro VR Analytics.