Optokinetic

Module tutorial

Table of contents

1. GENERAL 3
1.1. Description 3
1.2. Required accessories 3
1.3. Patient setup 3
2. Settings 3
2.1. Session settings 4
2.1.1. Settings 4
2.1.2. Specific settings for certain environments 7
2.1.3. Orientation 10
3. Module 11
3.1. Session 11
3.1.1. StaticVR and MotionVR plateforms tare and statokinesigram 11
3.1.2. During the session 14
3.2. Shortcuts 15
3.3. Results 18
3.3.1. Summarized results 18
3.3.2. Graphs and report 18

1. GENERAL

1.1. Description

OPTOKINETIC is an immersive 3D simulation software based on virtual reality technology, meaning a person can be immersed in a digitally created artificial world. **Optokinetic** is used for the rehabilitation of balance and vestibular system disorders by stimulating the optokinetic reflex (horizontal, vertical or rotatory visual scroll in various possible environments).

Optokinetic puts the patient in various environments which can be set in motion using the "**speed**" section.

1.2. Required accessories

VR headset or VR headset paired with a platform (StaticVR force platforms or Motion VR dynamic rehabilitation and posturography platform).

1.3. Patient setup

Patient standing on stable ground.

The patient can be seated depending on their needs.

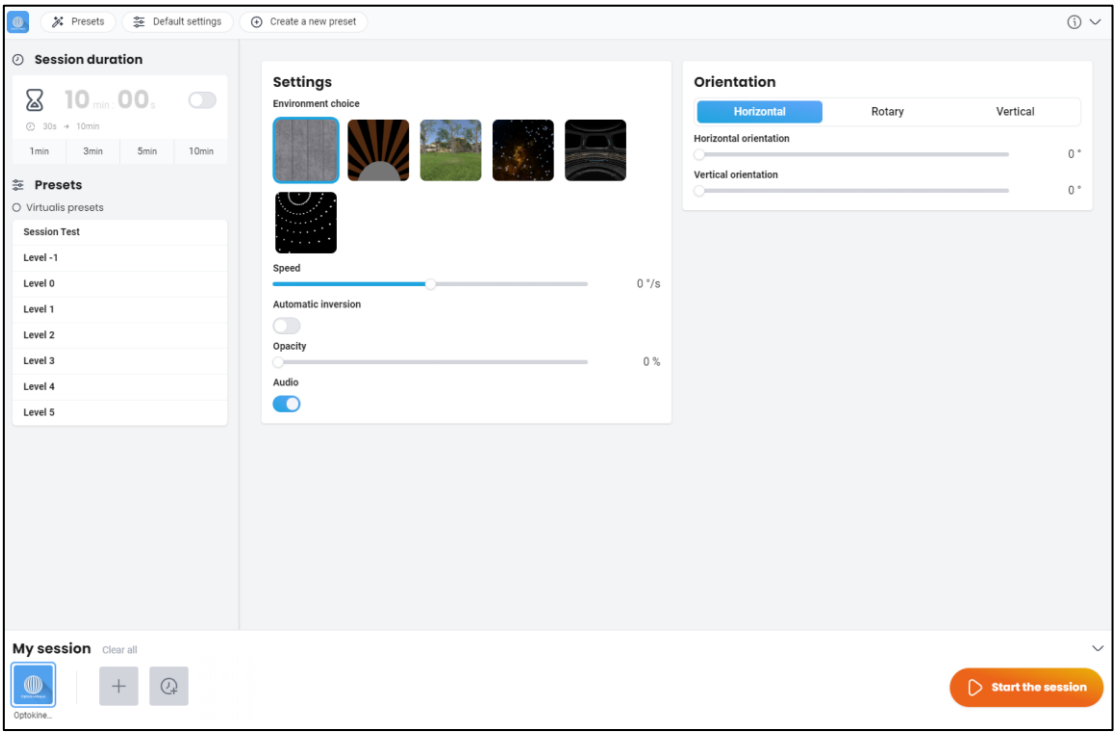
At a later stage, some use a foam block or pitched plane depending on the therapeutic goals.

WARNING

Stay in contact with the patient who is at risk of falling during vertical stimulations, regardless of whether they are standing on a dynamic posturography platform.

2. Settings

2.1. Session settings



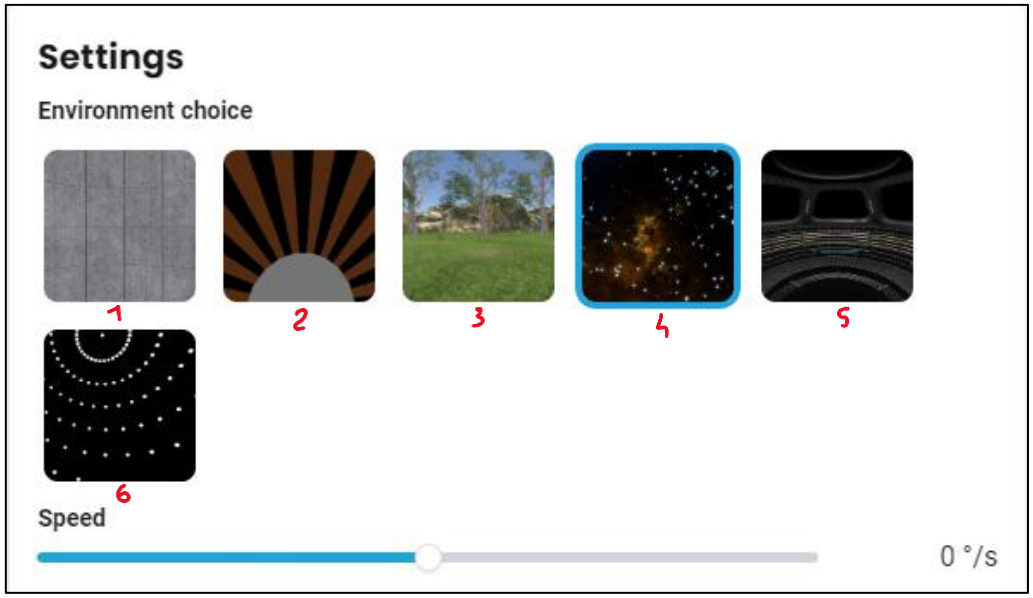
Presets are available by default. You'll find a test session and seven presets ranging from level -1 to level 5. These presets are provided as examples.

RECOMMENDATION

Start with a "Session Test" to measure patients' tolerance to the stimulation and the proposed VR environment

Parameters are already defined for each preset. Select one and start the session.

2.1.1. Settings



Defines the “decor” or stimulation environment.

The “power” of stimulation is progressive according to environment and orientation.

Vection is the erroneous sensation of moving while standing still. It's the scenery, the environment or an element of the environment that's moving. To guide you, here's an evaluation of the disturbances felt as a function of the vection provoked.

Environments:

1. **3D Sphere**: moderate disturbance.
2. **Barany drum:** strong disturbance. Intended for research (configurable spatial frequency).
3. **Optotree**: slight disturbance. Horizontal vection at low speed: 4 to 8 °/s.
4. **OptoSpace**: strong disturbance. The skyline is gone. Vection can be horizontal, vertical or rotating.
5. **Optostation**: moderate disturbance. Scrolling of a "space station" environment in a horizontal, vertical or rotational direction.
6. **Planetarium**: moderate disturbance. Corresponds to the classic optokinetic ball environment, which can be largely configured in virtual reality.

Nebulae can be removed from the Optospace environment using the "W" key for a stimulation closer to the traditional "optokinetic ball" type of Optokinetics.

A bright red spot (dynamic element in optokinetics) can be obtained using the controllers (see the "Shortcuts" section). The patient has to look for it and fix it while the VR environment is running.

Speed:

Environment's rotating speed: by convention, anticlockwise rotations are negative and clockwise rotations are positive.

RECOMMENDATION

For an optimum vection sensation, prefer low speeds (4 to 8°/s) during horizontal stimulations. To cause anteroposterior instability, prefer moderate speeds (15 to 30°/s) for vertical rotations

Automatic inversion:

This is used to automatically reverse the rotation direction every X seconds.

Click the corresponding box to activate it and select an **inversion interval** (in seconds) using the cursor.

Value: 10 to 600 s.

Opacity:

Varies the transparency of the environment (adds an opaque filter in front of the patient's eyes).

Allows the stimulation to appear progressively for the most sensitive patients.

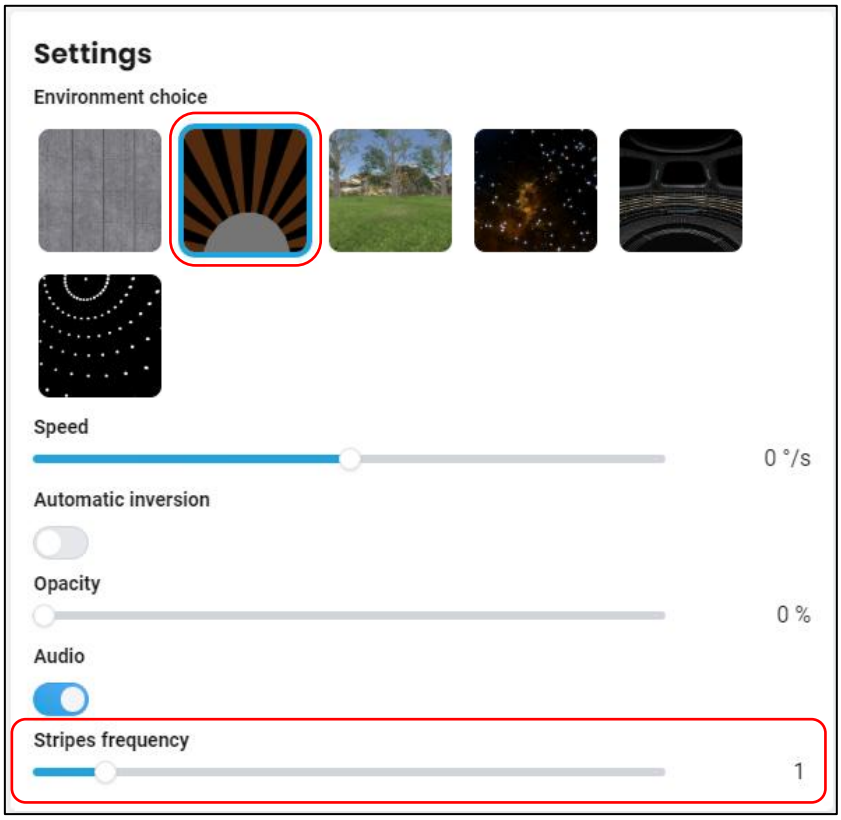
Value: 0 to 100 %.

Audio:

By default, background music is turned on, spatialized and follows the rotation of the environment.

2.1.2. Specific settings for certain environments

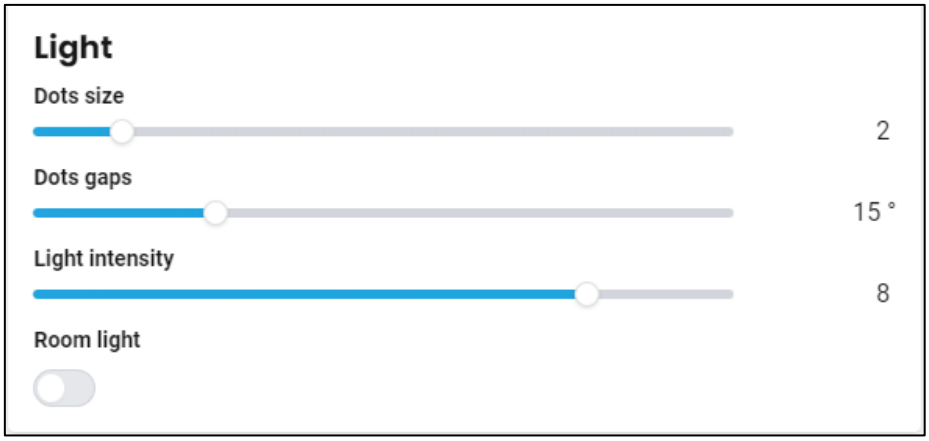
2.1.2.1. Stripe frequency (Barany drum)



Used to adjust the stripes' width using the cursor.

Value: 0 to 10.

2.1.2.2. Light (Planetarium):



- **Dots size:**
  Value: 1 to 10.

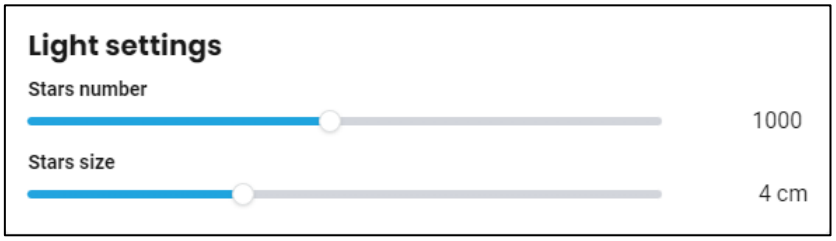
- **Dots gaps:**
  Adjusts the distance between dots.
  Value: 5 to 45°.

- **Light intensity:**
  Adjusts the brightness.
  Value: 0 to 10.

- **Room light:**

Switch on this setting to see the room.

2.1.2.3. Light settings (Optospace)



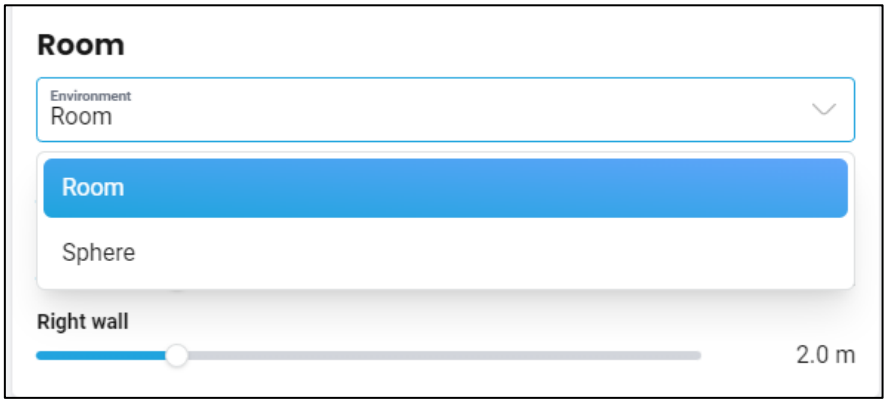
- **Stars number:**
  Value: 100 to 1997.

- **Stars size:**

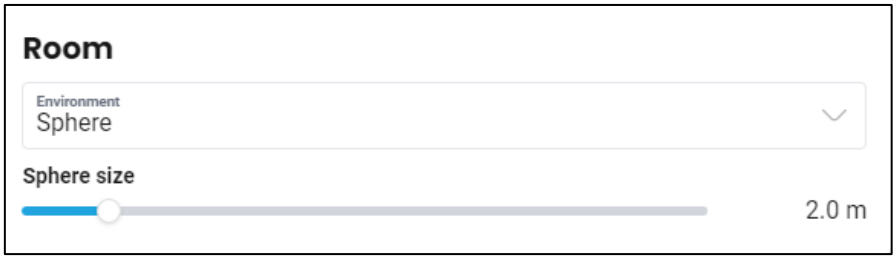
Value: 1 to 10 cm.

2.1.2.4. Room (Planetarium)

- **Environment:**



There are two types of environments: **Room** (cubic room) and **Sphere** (spheric room).



In the "**Sphere**" environment, the size of the sphere can be adjusted using the cursor.

Value: 1 to 10 cm.

In the "**Room**" environment, the distance between the patient and the **front wall**, the **left wall** and the **right wall** can be customized using the cursor.

Value: 1 to 6 m.

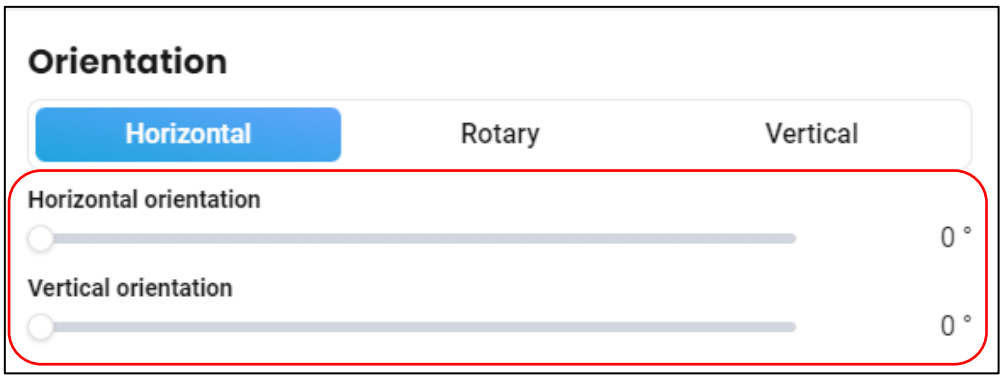
These settings can still be modified during the session.

2.1.3. Orientation

In this software, the patient's visual environment moves in all directions: right, left, up, down and rotate to the right or left. The **Orientation** parameter determines the direction: horizontal, vertical or rotational.

Settings are made according to therapeutic objectives.

The **Optotree** environment (which simulates a field, trees and mountains) can only be rotated horizontally to the right or left, for better visual consistency.



A rotation can be selected on a predefined axis: **Vertical** (X-axis), **Horizontal** (Y-axis), or **Rotary** (Z-axis), or on a custom axis. For "**Sphere**" type environments, the tilt can be adjusted using the Xbox joystick Pad (see the Shortcuts).

- **Horizontal orientation**: The axis that will "move" the environment forwards or backwards, in the sagittal plane.
  Value: 0 to 360°.

- **Vertical orientation**: The axis that will "move" the environment in the frontal plane.
  Value: 0 to 360°.

TIP: The choice of orientation has a strong impact on the patient's tolerance to stimulation and induced instability.

- **Horizontal** orientation: “Low” disturbance.
- **Vertical** orientation: moderate to high disturbance (high instability, risk of falling).
- **Rotary** orientation: Strong to extreme disturbance (to be reserved for certain cases only).

Reminder: The **Optotree** orientation cannot be modified and remains horizontal (stimulation realism).

3. Module

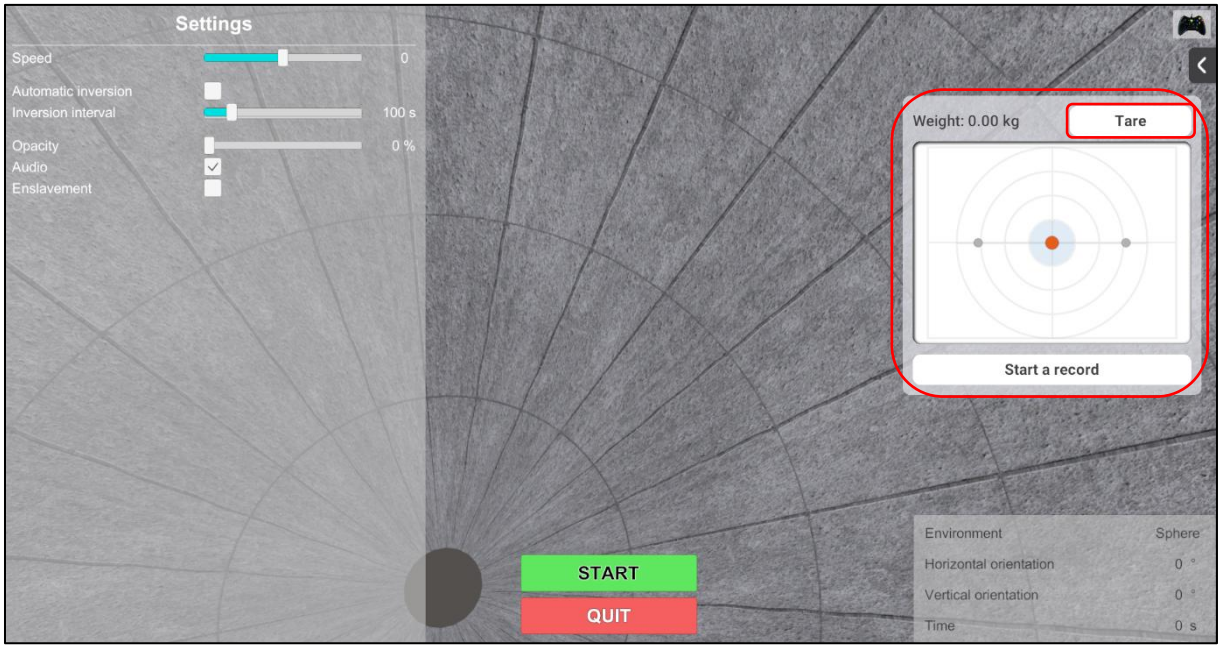
3.1. Session

Once the presets have been defined, click on "**Start the session**" in the bottom right corner of the screen.

3.1.1. StaticVR and MotionVR plateforms tare and statokinesigram

The Optokinetic software is compatible with the StaticVR and MotionVR platforms. To use the software with one of these platforms, follow these steps:

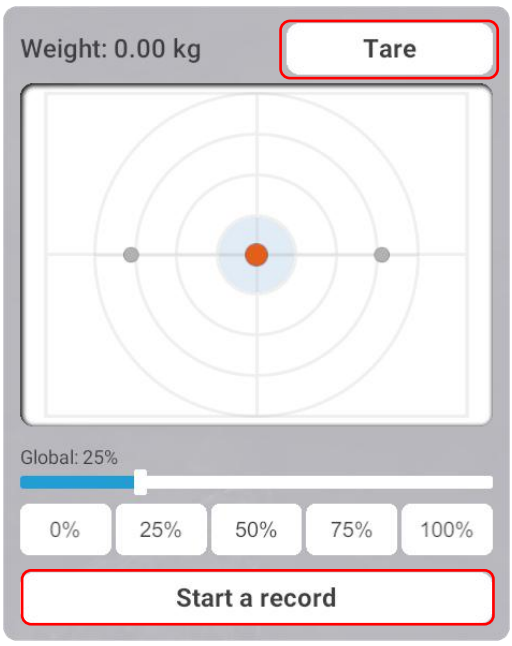
1. Click on the "**Tare**" button **before letting the patient step up onto the platform** (StaticVR or MotionVR).



2. Help the patient onto the platform.

3. Click on “**Start a record**” to record the patient’s statokinesigram.

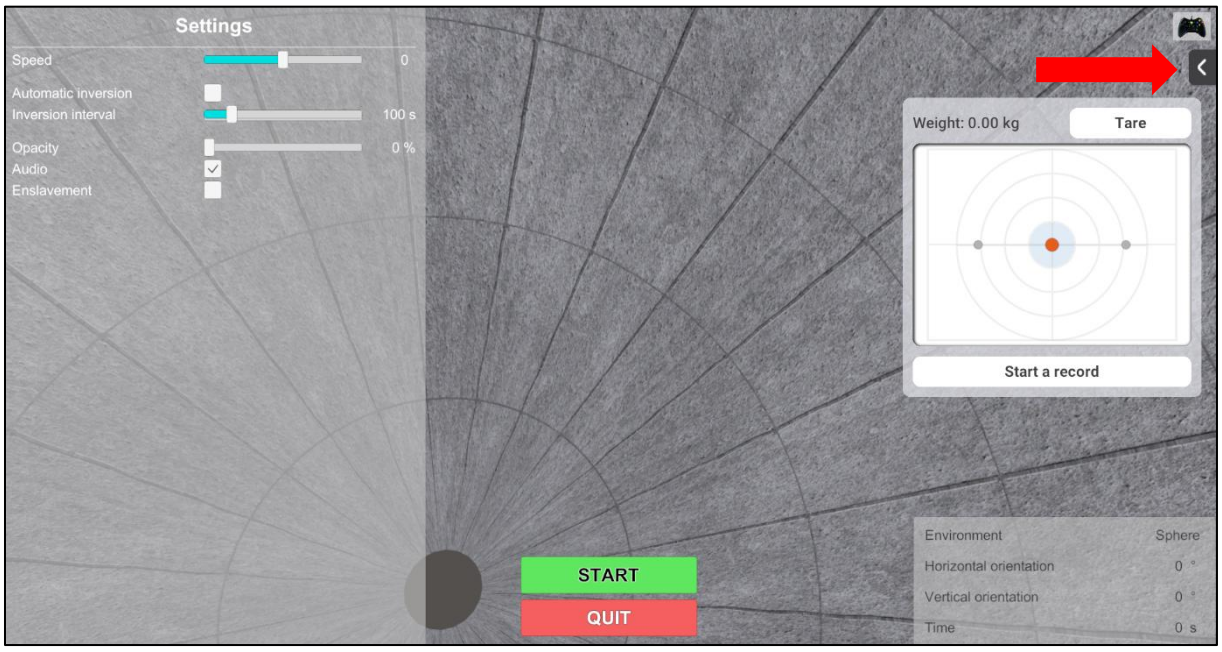
MotionVR display



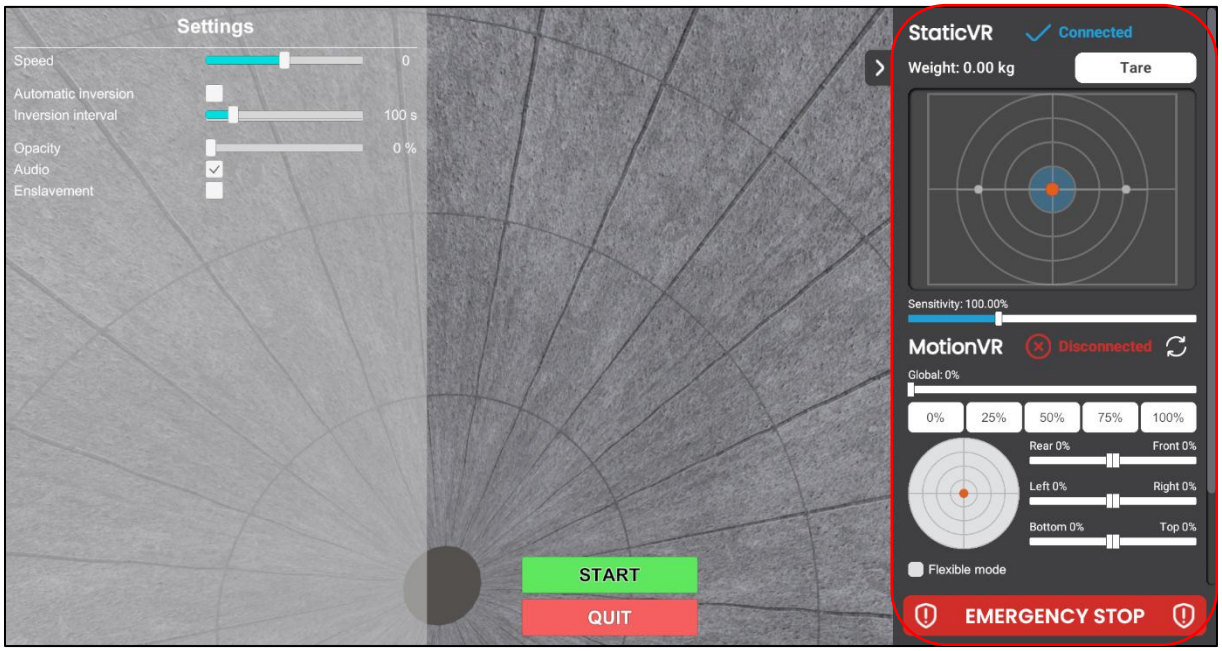
StaticVR display

4. Click on "**Start**" to begin the session.

5. Click on the arrow **in the upper right corner of the screen** to display the MotionVR or StaticVR platforms' settings.



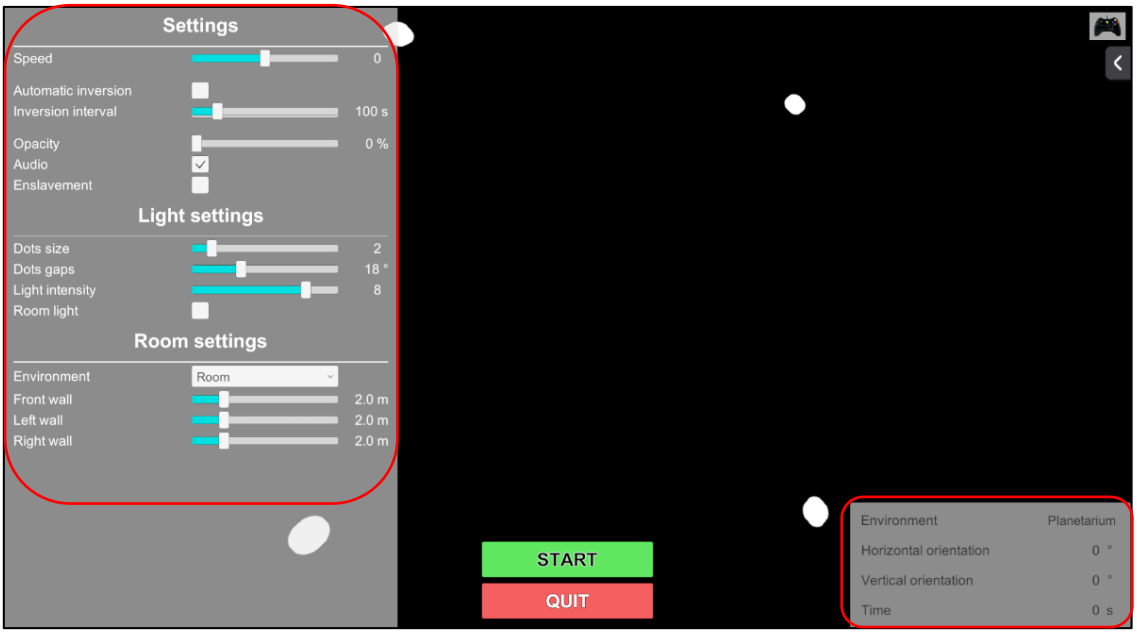
6. Modify the platforms' settings at any point during the session.



7. At the end of the session, click on "**Stop record**".

8. Choose which folder to save the statokinesigram in.

3.1.2. During the session



During the session, the user can modify the parameters from the **left-side of the screen**. They are not visible to the patient.

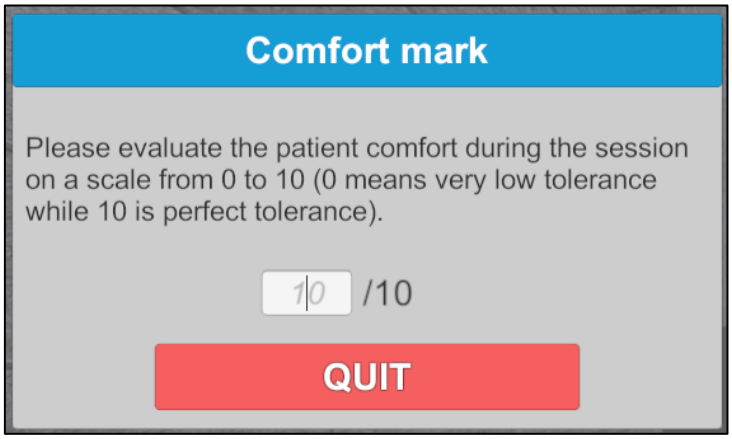
The setting **Enslavement** is accessible from this interface:

The image is coupled to the head movements. It appears “stabilized” in front of the patient.

In the bottom right corner of the screen, the user can consult the chosen parameters of the session, as well as its duration.

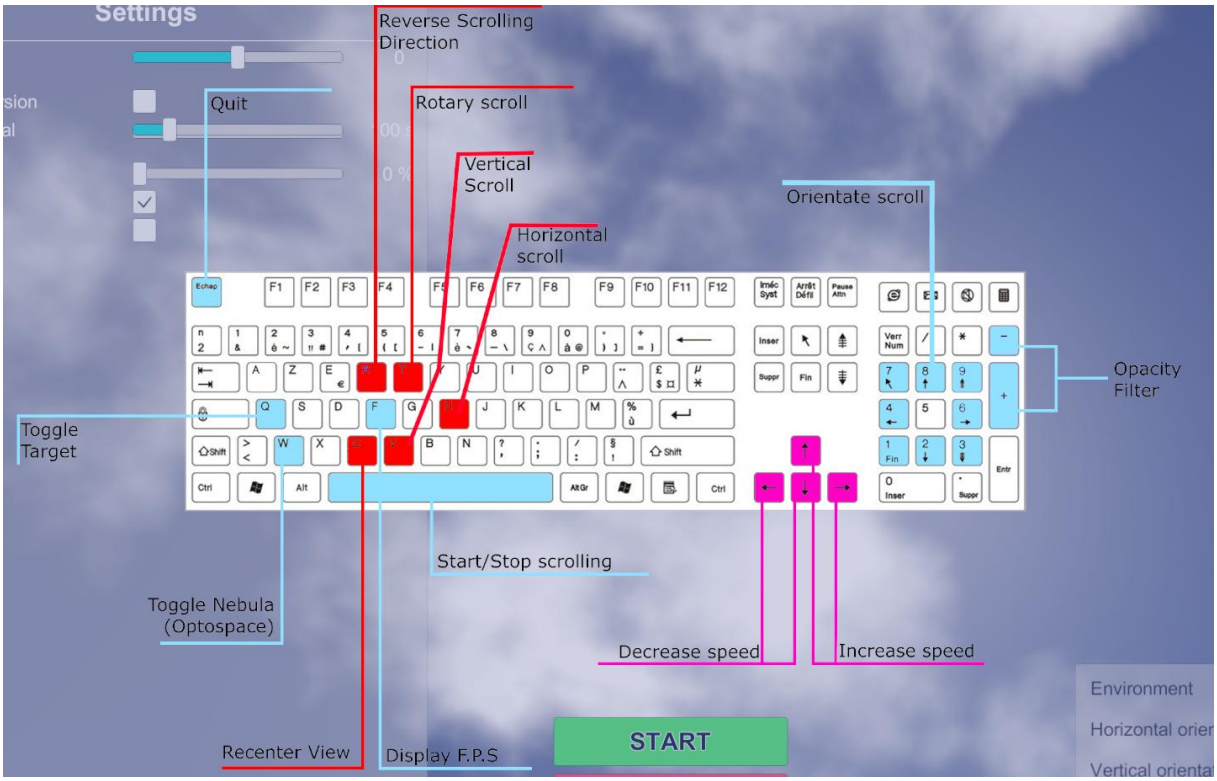
Click on the “**Quit**” button to end the session.

A window appears: enter the patient's “**Comfort mark**”, from 0 to 10.



3.2. Shortcuts

During the session, the shortcut list is found by clicking on the Xbox controller icon in the upper right corner of the screen.



The **left and right arrows** on the keyboard are used to rapidly increase and decrease the rotation speed of the environment, while the **up and down arrows** increase and decrease it slowly.

0
Vertical scroll
Toggle Nebula
(Optospace)
0 %
Toggle Target
Decrease speed
Increase speed
Rotary scroll
Horizontal scroll
Environment
rotation
Switch rotation
direction
Set opacity filter
Start / Stop scrolling
Recenter

Laser
VIVE

3.3. Results

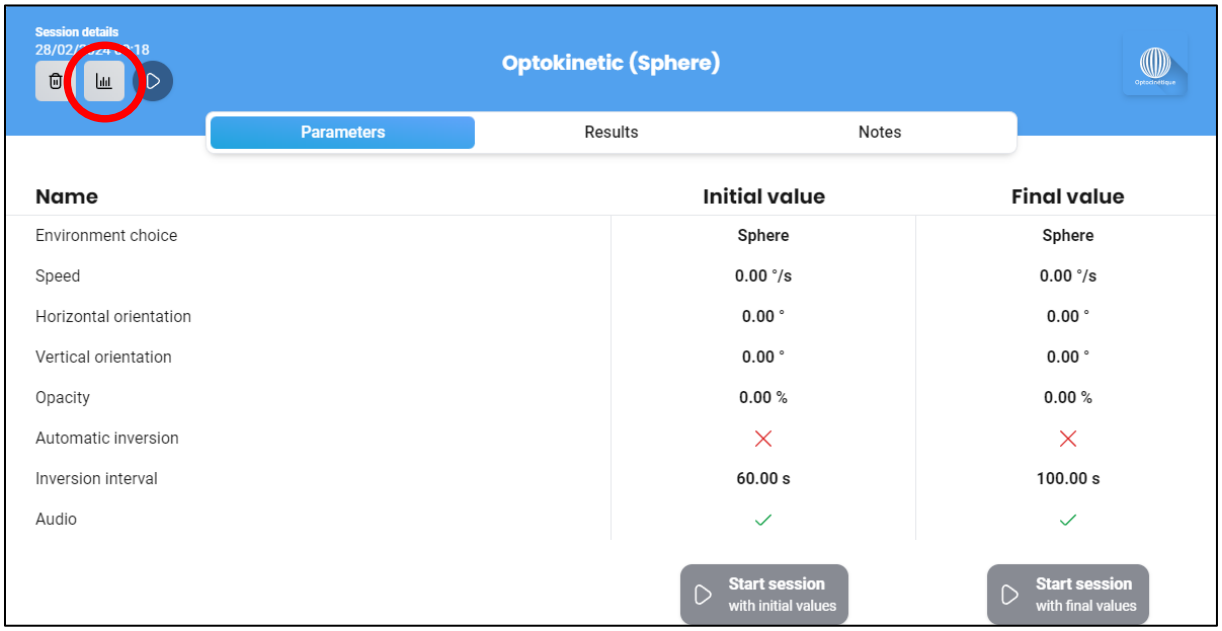
Once the session is over, you can view the results.

3.3.1. Summarized results

At the end of the exercise, if the practitioner has entered the patient's "**Comfort mark**", it will appear in the session's results.

If a force platform (StaticVR) or a dynamic rehabilitation and posturography platform (MotionVR) is connected, a statokinesigram corresponding to the patient's movements can be recorded.

The results of the statokinesigram are saved in the folder of your choice.

3.3.2. Graphs and report

To find the detailed results and to generate a report, click on the histogram icon.