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Calibration Module

PRODUCT INSIGHTS

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This document offers an in-depth guide on executing the calibration process, a foundational procedure for achieving accurate diagnostic results, with the NYSTALYZE system. Notable for its versatility, the NYSTALYZE system provides both wireless and wired mask options to accommodate the varied requirements and preferences of users. Operating with the SYNAPSYS VNG Module, both in its basic and plus versions, NYSTALYZE streamlines the calibration process, making it both efficient and effective.

GENERAL CONCEPTS ABOUT CALIBRATION

The calibration is an empirical operation which consists of measuring the displacement of the centre of the pupil image corresponding to a real ocular deflection whose angle is known.

The different calibration modes are distinguished above all by the degree of precision they offer; following an order of increasing precision, they are: statistical calibration, geometric calibration and visual calibration.

CALIBRATION SETUP AND METHOD

Prior to calibration, a default calibration value is assumed for the selected mask. During “calibration” test (in saccades module) VNG software calculates the visual calibration value. This assumes that the angle of the visual stimulus provided by the video projector or monitor has been correctly set up and the patient is at the correct distance from the screen. Appropriate care is therefore necessary when positioning the patient.

STATISTICAL CALIBRATION BY DEFAULT

For a given mask, either a VOGUE, a VISIO or a VNS type, a statistical study gives the average visual calibration value and a dispersion parameter (for instance the standard deviation). If a visual calibration is not possible with the current patient, the average statistical value (a default value) may be used in the VNG program. The uncertainty depends on the value of the dispersion parameter, and in our experiments, the standard deviation is in the region of 10%.

USE OF CALIBRATION BY DEFAULT

This calibration is used by default during the first acquisition and it will be automatically replaced as soon as the user makes one of the other calibrations because the calibration by default has got the worse sensitivity.

For NYSTALYZE system the priority of the applied

calibration is ordered as Visual > Geometric > Default. It means that the available calibration with the highest priority will be automatically used for eye movement analysis.

STANDARD VISUAL CALIBRATION

The second type of calibration available with NYSTALYZE system is the visual calibration which represents the usual (and preferred) mode of the calibration procedure. It is preferable for the following conditions will be meet each time for at least one of the two eyes:

- A visual field which is sufficient for an estimation of the successive positions of the target through the peripheral retina.
- Penetration of the central vision sufficient for foveal fixing.
- Motor stability of the foveal fixing (that is to say absence of any fixing nystagmus).
- Sufficient oculomotricity to steer the eye in the direction of the foveal vision of targets successively presented at a given angle, normally +/-20 degrees.

Ask the patient to position his/her head so that he/she can see both the right and left edges of the stimulation screen frame.

Ask the patient to look at the central point.

Check that the eye is centred in the Oculoscope. If it is not properly centred, start the “eye detection and centring” procedure again.

Start the test by asking the patient to follow the target closely, without moving his/her head.

Once completed, the visual calibration replaces the previous calibration within the VNG for all measurements to be made subsequently.

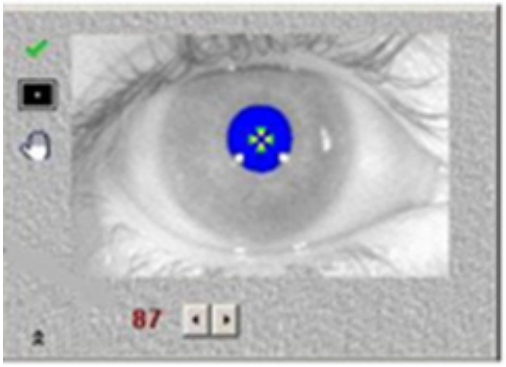
SET UP OF THE VISUAL CALIBRATION

Process to follow:

- Select “Saccades” module.
- Ask the patient to fix his head so that he can see at the same time the right and left frame side of the stimulation screen.
- Ask the patient to stare at the central point.
- Check out the centring of the eye in the Oculoscope. If it is not well-centred, press « F4 » or restart the process “Eye Detection and Centring”.
- Start the test and ask the patient to follow the target carefully without moving his head.

In case of a standard mask “VNS”, the first three positions of the target correspond to the calibration test. With a VISIO, it is the first five positions. After this acquisition, the stimulations carry on according to the stimulation parameters displayed on the right side down in the VNG screen.

If the calibration is accepted by the software, it becomes active, and the red point of exclamation on the top left side of the Oculoscope becomes a green mark as shown in the image below.



During the test of calibration, the NYSTALYZE system waits until the eye trace becomes stable before going to the next target. If the position of the eye is never stable, the test of visual calibration fails and the calibration by default will be used automatically by the system.

The eye trace can be unstable for 3 reasons:

- The detection is not well regulated.
- The head of the patient is moving.
- The patient does not stare at the target properly.

It is possible to restart the test by correcting one the 3 main points above. However, if the visual calibration fails again, the user must carry out a geometrical calibration or set the calibration by default in the system.

If you purchase the VNG Basic module, which does not include oculomotor exams, it will not be possible to carry out the visual calibration, you will therefore proceed with the geometric one, described below.

GEOMETRICAL CALIBRATION OR ABSOLUTE IRIS CALIBRATION

The third type of calibration available with NYSTALYZE system is the geometrical calibration. It is an operation that consists of measuring (in pixels) the iris diameter. We assume a certain diameter of the eye, which can be measured in ophthalmology, we can then deduce an ocular rotation angle corresponding to any movement of the image of the pupil's centre.

The iris calibration is said to be absolute when it is the only method of calibration used.

The absolute calibration of the iris is based on approximations relating to the actual diameter of the eye and of the iris for a given patient. It is consequently less precise than a visual calibration carried out in good conditions. However, when the visual calibration is not feasible it gives a better approximation than the statistical or default calibration because of the reduced dispersion (approximately 5 %).

Note: The geometric calibration is not possible with a VISIO mask.

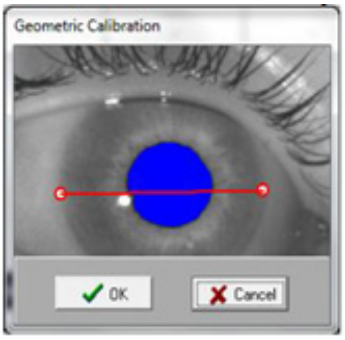
USE OF THE GEOMETRICAL CALIBRATION

The user must measure the iris diameter.

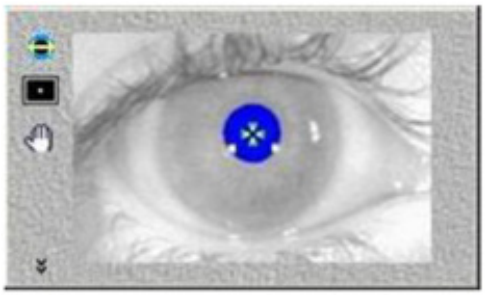
To do this, double click on the Oculoscope window (left mouse button) when the patient's eye is centred and well visible. On the fixed image of the eye place two dots on the edges of the iris by using the right button of the mouse. The measurement is entered with the "OK" key; the user can also check it by selecting the "values" key. It replaces in the VNG the default calibration for all subsequent measurements with the current patient.

SET UP OF THE GEOMETRICAL CALIBRATION

The user has marked the diameter of the iris to carry out geometric calibration procedure.



After having selected "OK", the geometrical calibration is visible and the icon of geometrical calibration  is displayed.



PI - Calibration Module_Rev01 • Date: 2024.01.29

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