

# OPTOKINETIC module

## PRODUCT INSIGHTS

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This document provides a comprehensive overview of how to perform optokinetic (OKN) tests using the NYSTALYZE system in conjunction with the SYNAPSYS VNG Module Plus software. Unique for its adaptability, NYSTALYZE offers both a wireless mask and a wired version, catering to the diverse needs and preferences of users.

### **GENERAL CONCEPTS ABOUT OPTOKINETIC (OKN)**

The optokinetic Ny is evoked only in the case in which a large portion of the peripheral retina is stimulated and for this reason the area occupied by the projection of the pattern must be as large as possible; it is also good that on this surface there are no landmarks such as to induce a fixation of the same.

The pattern image must be as neutral as possible, to avoid the intervention of the voluntary pursuit of one or more objects of interest. It is a stimulation that must involve above all the peripheral retina: for this reason, the image must be in black and white, since the sensitivity of the retina to the colours is reduced the more one moves away from the foveal field of vision. The ideal, therefore, is to get as close as possible to Barany's drum with its

alternating black and white bands. The VNG goggle limits the cone of vision to  $\pm 55^\circ$  thus producing good peripheral stimulation; moreover, the projection of the image on the screen induces an environmental luminosity which can favour the fixation of immobile spatial landmarks possibly present in the field of vision. It is for these reasons that the result is no longer a true optokinetic reflex but a mélange between this and a voluntary pursuit. However, and despite previous restrictions, the study of optokinetic Ny remains a useful complement to the sinusoidal pursuit. It is in fact possible to re-evaluate the gain and symmetry as well as the functionality of the nystagmogenesis can be observed under the influence of the visual inputs alone, unlike the VVOR in which the vestibular entrance is active.

The video projection technique of the image flowing on the screen requires compliance with certain constraints related to the image projection frequency. Thus, for high velocities the width of the bands must be automatically adapted to maintain a subjective effect of continuity of the movement of the image. The standard velocity is that of  $30^\circ/\text{sec}$ .

The normal values of the optokinetic Ny are related to the measure of the gain which must be greater than 0.75.

## PATIENT INSTRUCTIONS ABOUT OPTOKINETIC

Before starting the exam with NYSTALYZE system it is necessary to provide some simple instructions to the patient.

Do not move the head for following the target. Avoid any head tilt, pitch, roll before and during the test.

The stimulation proposed by the VNG is a series of blank tasks.

Faced with this type of stimulation, the instruction given to the patient is very important: it will be something like “look indirectly in front of you” or “follow and count the bars that pass in front of you”. Each of these two instructions will trigger a different reflex in the patient. We will therefore examine the usefulness of each one.

- **The “look indirectly...” instruction.** This instruction assumes that there is an interest in the optokinetic reflex, the term “reflex” clearly indicating the involuntary aspect of this type of ocular motor pursuit. It must however be considered that in order to generate a true optokinetic reflex pursuit, accompanied with a sensation of movement, two conditions should ideally be fulfilled:

1. First, the largest possible area of the visual field of at least one eye must be capable of stimulation for this pursuit.
2. Secondly, at no point in the visual field should there be the smallest stable reference point likely to cause voluntary foveal fixation.

It is noted that the mask used, and the principle of projection of sliding images onto a screen or monitor, will not satisfy the two preceding conditions. Therefore, this instruction will only provide relevant information in very specific conditions.

- **The “follow and count the tasks” instruction.** With this type of instruction, the patient’s intervention is voluntary, and we are in an intermediate situation between the reflex pursuit and the smooth voluntary

foveal pursuit. This form of pursuit is however especially important, to evaluate the performance of the horizontal and vertical nystagmogenesis system in response to an extra-vestibular stimulation.

We therefore accept that as an original nystagmus and visual finality, the optokinetic is characterized first and foremost by its slow phase velocity. In fact, this velocity must be equal to the angular displacement velocity of the stimulating panorama. The real-time analysis of this type of nystagmus with NYSTALYZE system therefore places the stress on instantaneous comparison between the velocity of the target and that of the eye.

### INTERPRETATION OF OPTOKINETIC TEST

It is necessary:

- Ensure good linearity of the OKN (paying attention to the presence of square waves due to inaccuracy or pathological type, of a fixation Ny, of blinking and of eye closure, of the instability of the centring in the lateral positions of gaze and of heterophoria of the slave eye).
- Eliminate anticipatory saccades or other artifacts from the evaluation window.

Pathologic findings:

OKN gain

- Decreased gain
  - Consistent with central dysfunction, low vision, or oculomotor dysfunction.
- Increased gain
  - Consistent with central dysfunction.

*Adapted from “Interpretation of Video Electronystagmography (VNG)”, Elliot Michel, M.D., Neurology*

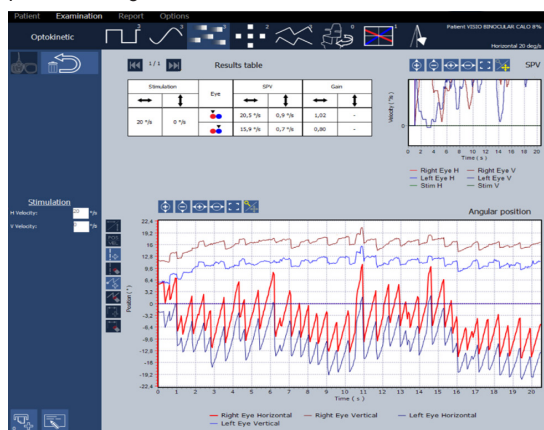
### GENERAL PRESENTATION OF OPTOKINETIC MODULE

The optokinetic module is represented by the icon:

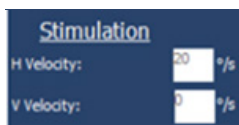


This module allows simultaneous management of an optokinetic module the direction of which may be horizontal, vertical, or oblique, and recording and analysis of ocular-motor responses that correspond to that stimulation.

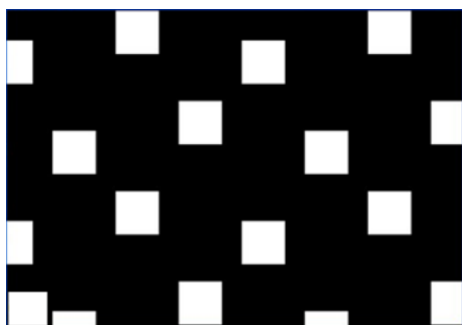
The optokinetic Ny study is carried out after the pursuit study.



### STIMULATION PARAMETERS



This window allows individual adjustment of the horizontal and vertical scrolling speeds of the panorama in the following image:



this command allows interruption followed by resumption of the stimulation in progress



this command helps keep the same velocity and direction parameters for the stimulus by reversing the direction of scrolling



by using these buttons, the operator can increase or reduce the horizontal scrolling velocities by increments of 5%/sec, during the input process.

### SETTING DEFAULT TEST

The settings you will find when you launch the software are the default settings.

### DISPLAY OF RESULTS

The results are displayed in a results table and in the position and velocity graphs.

The results displayed correspond to the zone displayed in the position graph. In other words, only the sine waves visible on the position graph are taken into account for the purpose of constructing the gains graph and results table.

### POSITION GRAPH

The input window allows simultaneous observation of the progress of the horizontal and vertical coordinates of the ocular position, that is, the progress of the ocular nystagmus.

### VELOCITY GRAPH

The velocity graph displays, both simultaneously and in real time, the progress of the slow-phase velocities of the horizontal and vertical components of the nystagmus and of the stimulation velocities.

### RESULTS TABLE

Stimulation	Eye	SPV		Gain	
		Horizontal	Vertical	Horizontal	Vertical
40 %/s	0 %/s	31,8 %/s	1,6 %/s	0,79	-
		23,9 %/s	1,4 %/s	0,60	-
-40 %/s	0 %/s	-26,0 %/s	1,1 %/s	0,65	-
		-30,9 %/s	0,9 %/s	0,77	-

The table is filled automatically, a new line is created whenever a stimulation is maintained for more than 5 seconds.

	Horizontal
	Vertical
	Right eye
	Left eye
	Allows the various pages in the table to be run through.
<b>Stimulation</b>	Velocity of displacement of decor in horizontal and vertical planes.
<b>SPV</b>	Average slow phase velocity
<b>Gain</b>	Value of gain calculated as ratio between slow phase velocity and stimulation velocity.

## NORMATIVE VALUES ABOUT OPTOKINETIC

With system NYSTALYZE for the optokinetic module, when the visualization of normative data is enabled, reference tables appear. It is important to underline how the normative data can in fact be modified by the user and are associated with the patient's age groups. The tabular results of the tests, if the "Highlight normal/abnormal values" option is enabled from the VNG settings, appear in green or orange, depending on the normative data that have been set.

The normative parameters of the VNG were drawn from the volume "*Balance function assessment and management – third edition – Gary P. Jacobson, neil T. Shepard*".



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