

STEREO VEP

Principles and Clinical Examples

Jacques Charlier, PhD, Metrovision

Sébastien Vermandel, PhD, Metrovision

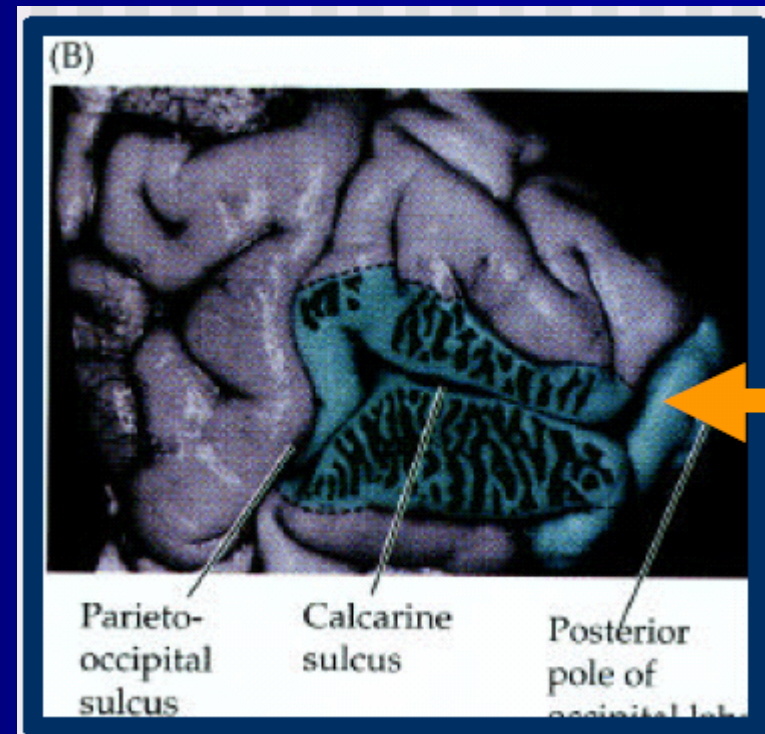
Sabine Defoort, MD, Lille University Medical Center

STEREO VEP: Why study binocular vision?

- Binocularity develops at an early age: onset of sensory fusion and stereopsis occur between 2 and 5 months
- Normal development is frequently disrupted in infancy and early childhood (strabismus, amblyopia, ...)

STEREO VEP: Why study binocular vision?

- Ocular dominance columns
(Hubel & Wiesel, 1981)



STEREO VEP: How?

Dichoptic Visual Stimulation

Dichoptic = separate stimulation of the 2 eyes



STEREO VEP: How?

Dichoptic Visual Stimulation



Ferro electric crystals
(< 1 millisecond switching time)

STEREO VEP: How?

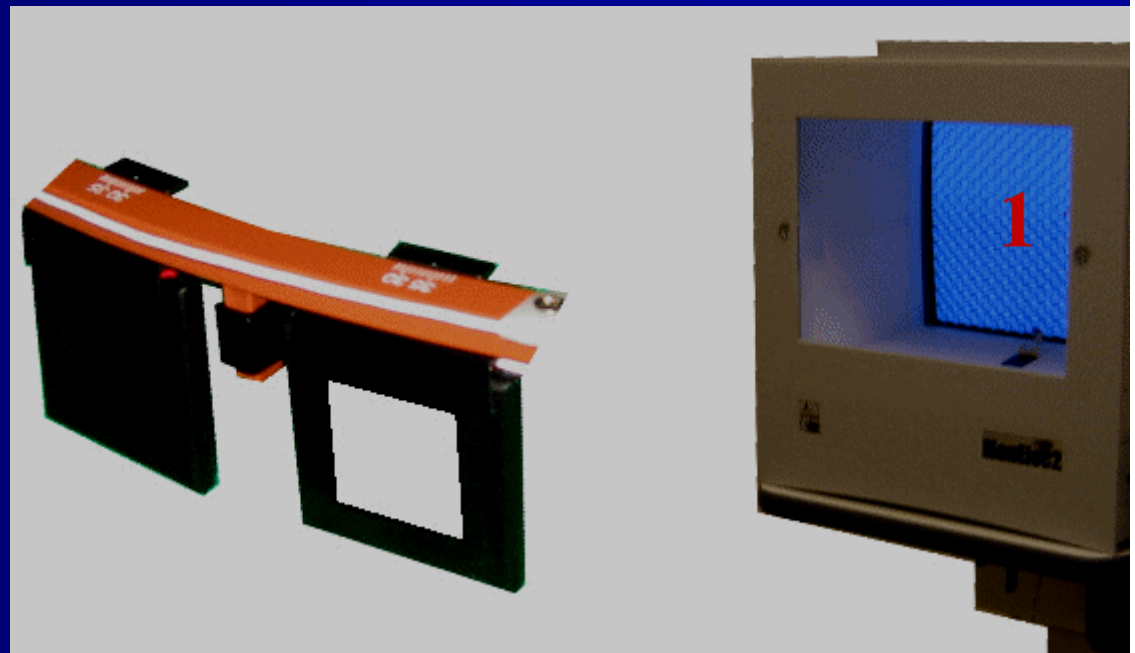
Dichoptic Visual Stimulation

120 images per second

Right eye (OD) = odd number images

Left eye (OS) = even number images

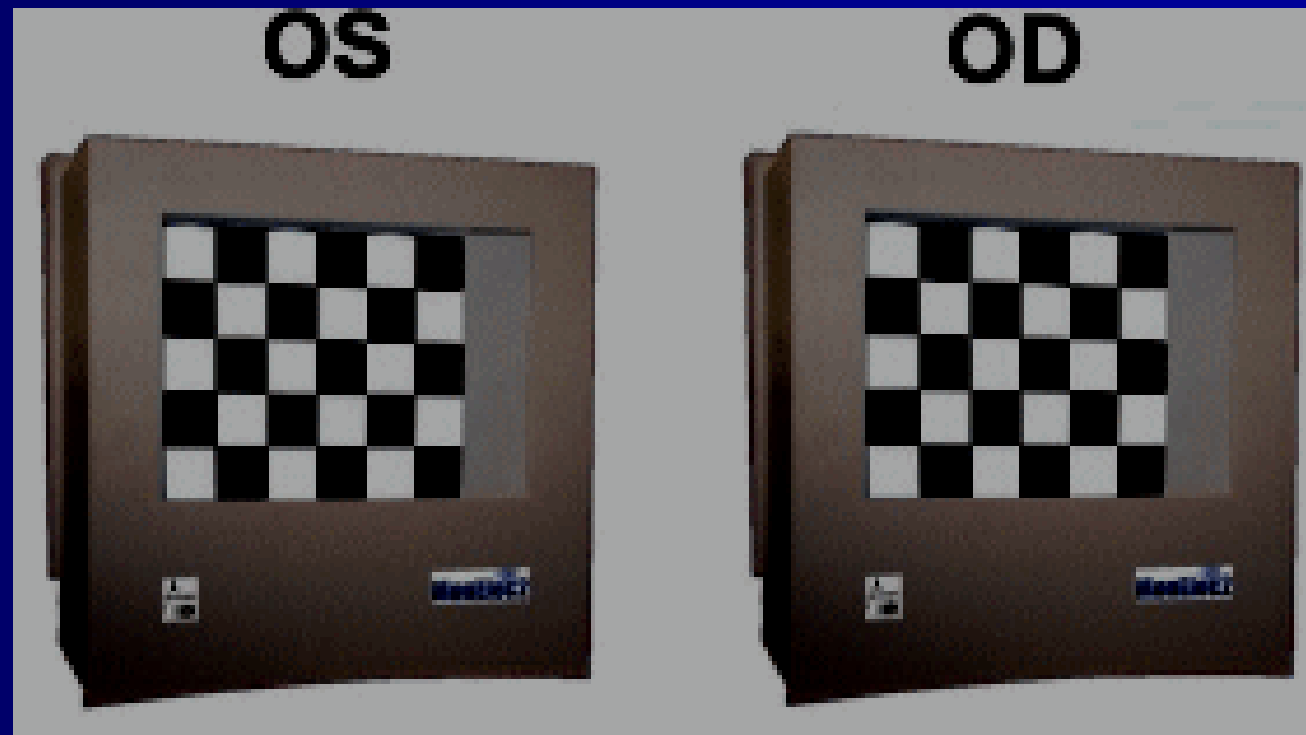
OS



OD

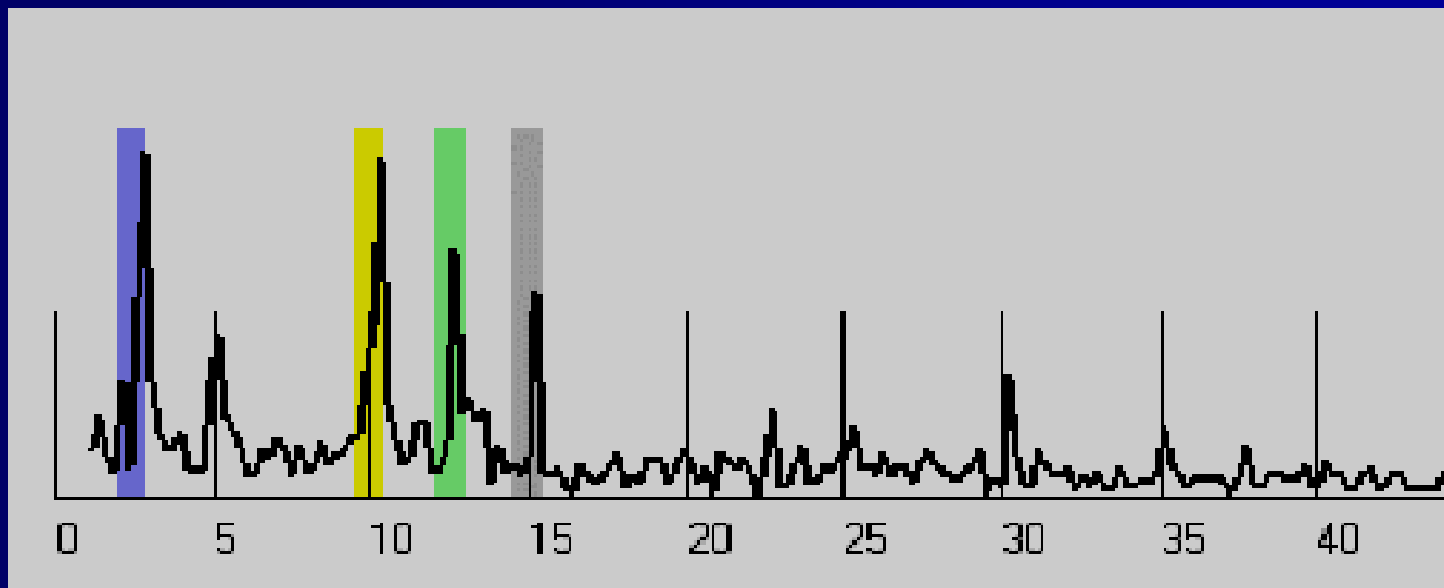
STEREO VEP: binocular beat

- 10 Hz = right eye
- 15 Hz = left eye



STEREO VEP: binocular beat

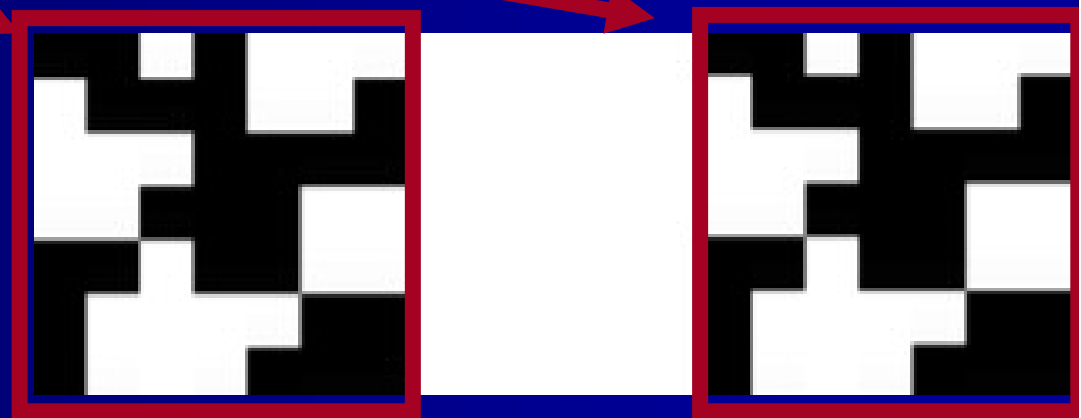
Responses are specific of cortical neurons responding to:
RE only, LE only and binocular stimulations



- RE response = 10 Hz
- LE response = 15 Hz
- binocular beats = 2.5 - 5.0 - 12.5 Hz

STEREO VEP: correlogram

- 30 Hz = dynamic random dots
- 5 Hz = alternance between correlated and anti-correlated

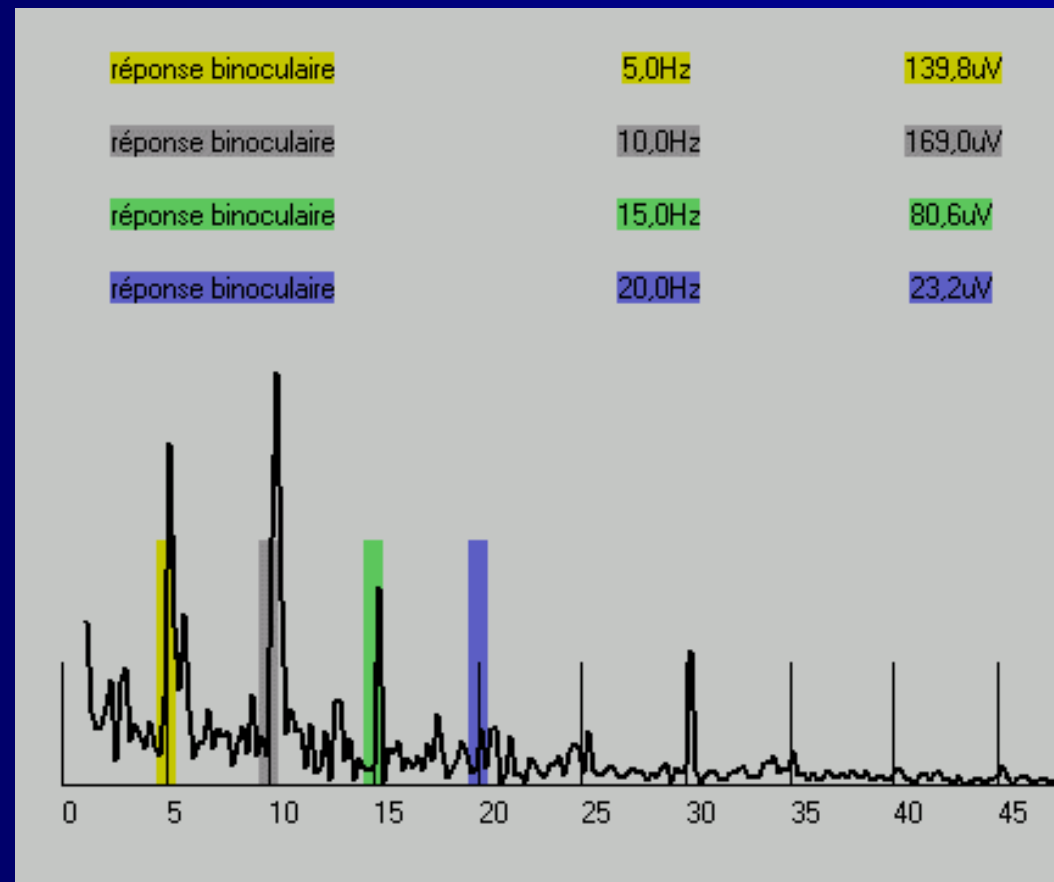


OS

OD

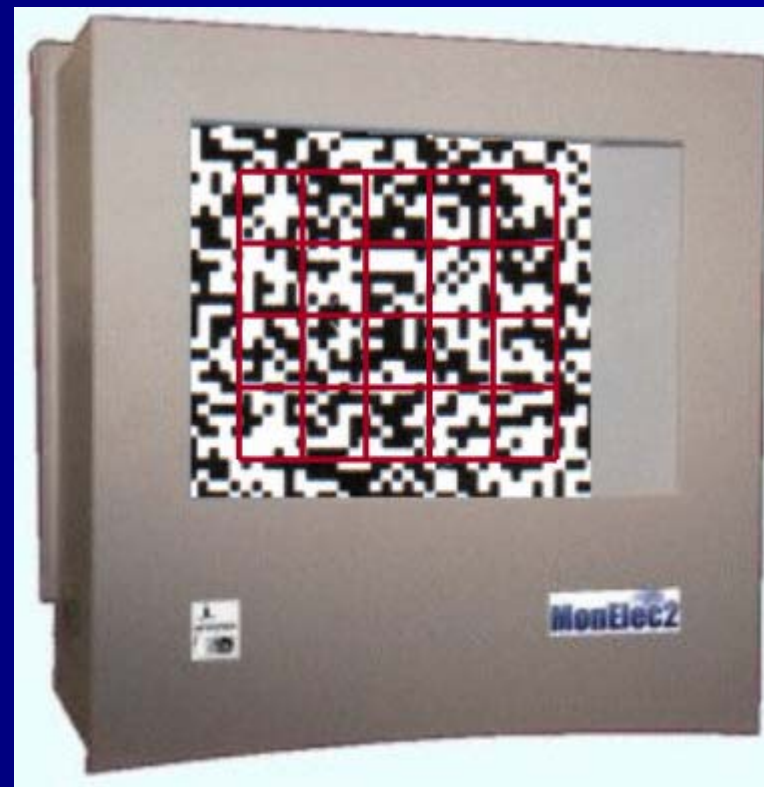
STEREO VEP: correlogram

Responses are specific of fusion



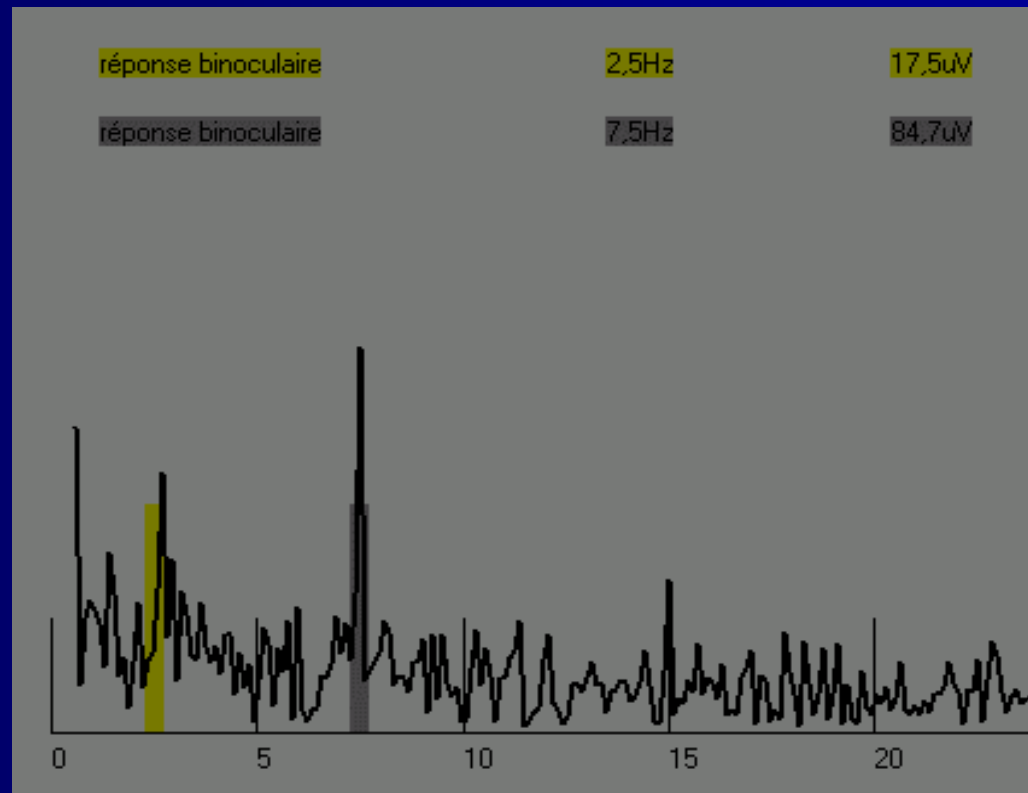
STEREO VEP: stereogram

- 15 Hz = dynamic random dots
- 2.5 Hz = alternance between 2 disparities



STEREO VEP: stereogram

Responses are specific of stereopsis



	Detect binocular neurons Evaluate ocular balance	Fusion	Stereopsis
Binocular beat	X		
correlogram		X	
stereogram		X	X

STEREO VEP: normal subjects

- 11 subjects with normal stereo vision
- all with easily detected binocular beat responses
- all with easily detected correlogram responses
- 8 (72 percent) with significant stereogram responses
- stereogram responses take time to build up, fluctuate and in some subjects do not show up

STEREO VEP:

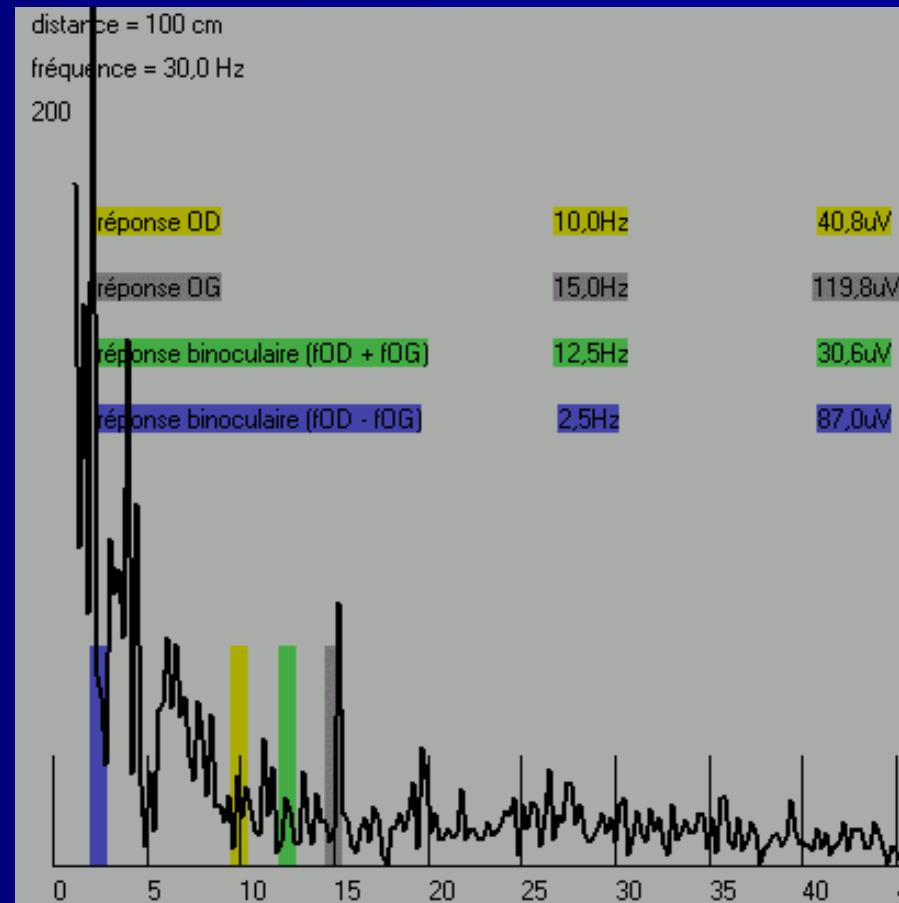
Florian, 8 months old, suspicion of amblyopia RE

STEREO VEP:

Florian, 8 months old, suspicion of amblyopia RE

binocular beat

- response from LE (15 Hz)
- no response from RE (10 Hz)
- no beat response

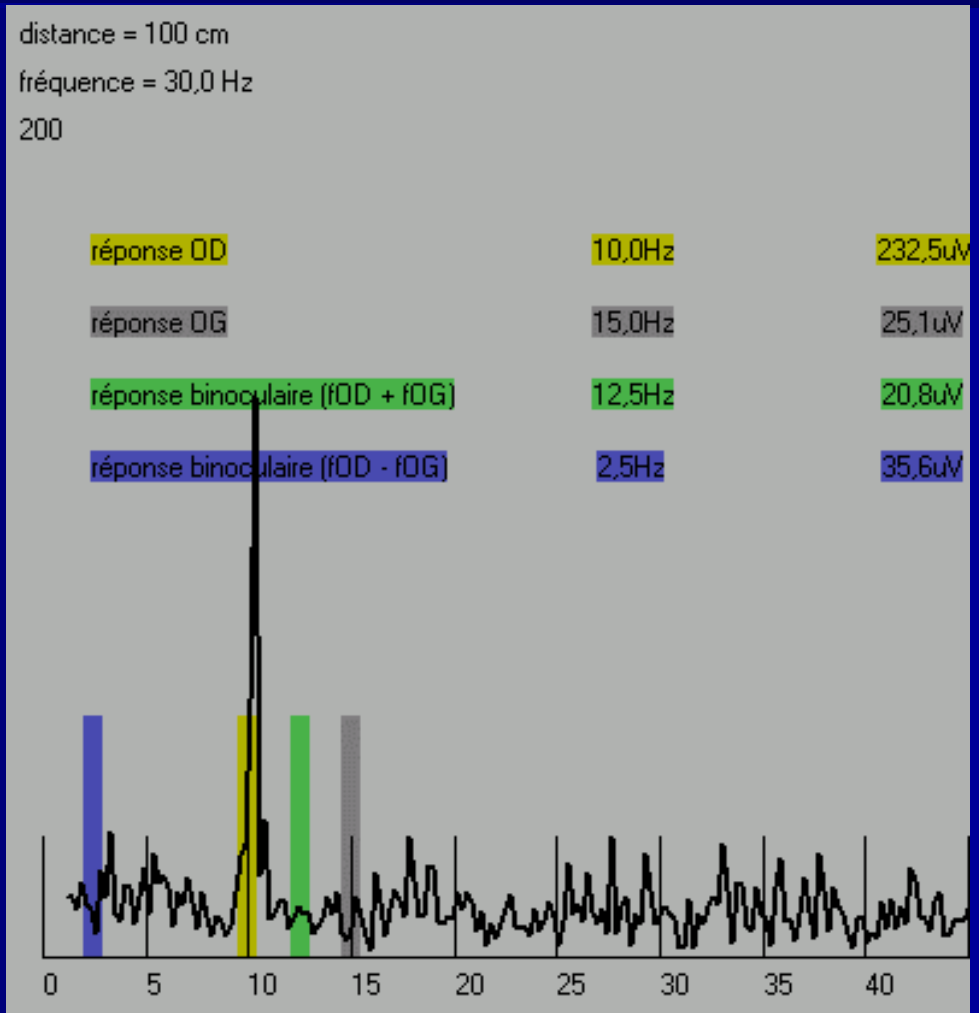


STEREO VEP: clinical examples

Julien, LE optic nerve section

binocular beat

- RE response only

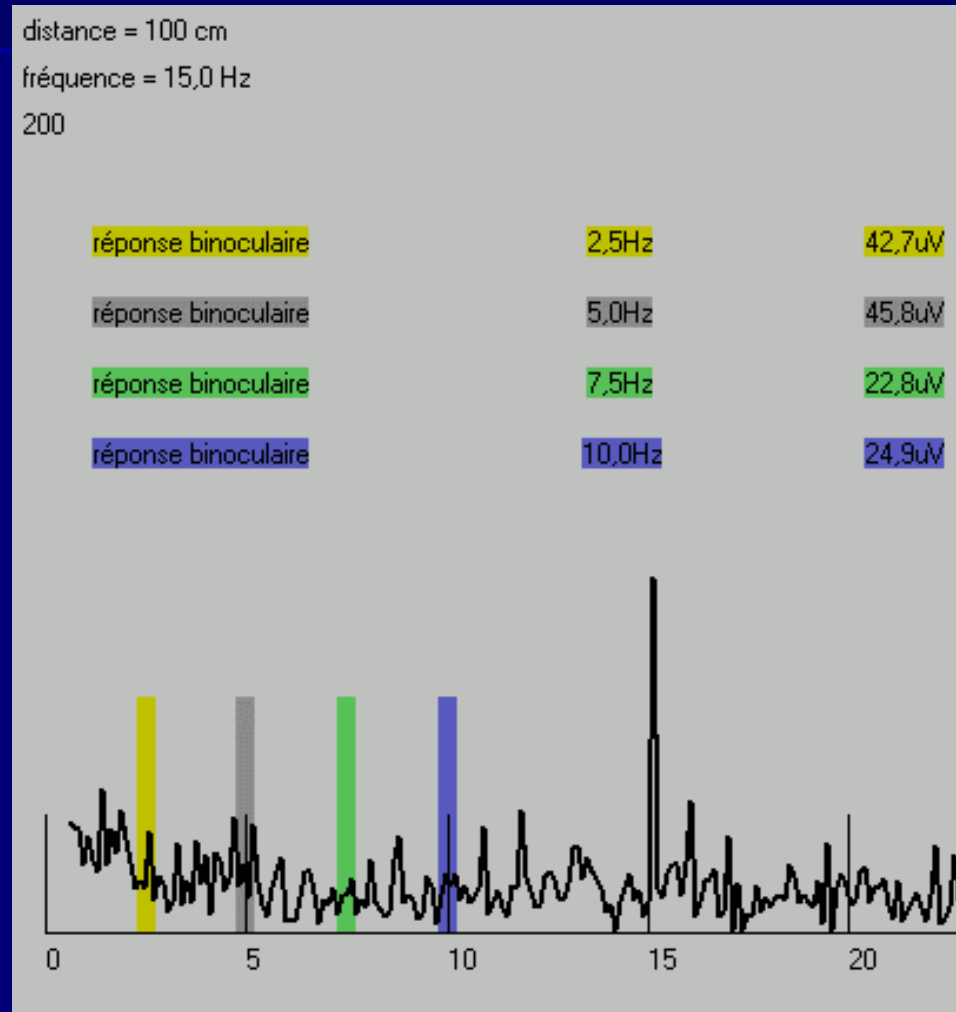


STEREO VEP: clinical examples

Julien, LE optic nerve section

correlogram

- no fusion response



STEREO VEP: clinical examples

Julien, LE optic nerve section

stereogram

- no stereopsis response



STEREO VEP:

Charlotte, 21 years old, LE amblyopia
« after orthoptic reeducation »

binocular beat

120' checkerboard pattern:

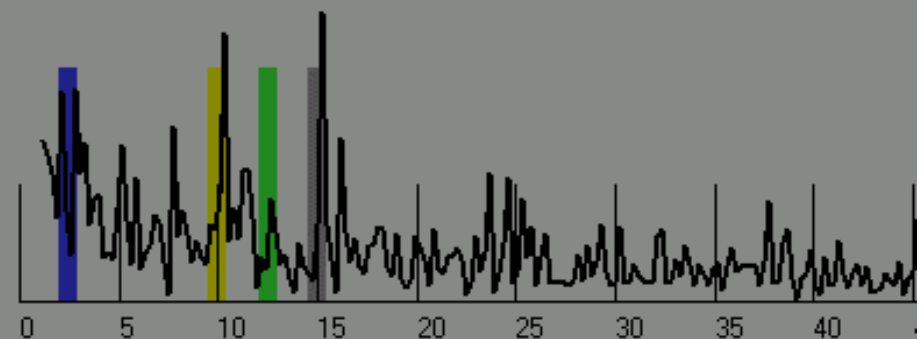
- response from RE and LE
- small beat response

distance = 100 cm

fréquence = 30,0 Hz

100

réponse OD	10,0Hz	57,5uV
réponse OG	15,0Hz	61,8uV
réponse binoculaire (fOD + fOG)	12,5Hz	21,8uV
réponse binoculaire (fOD - fOG)	2,5Hz	45,3uV



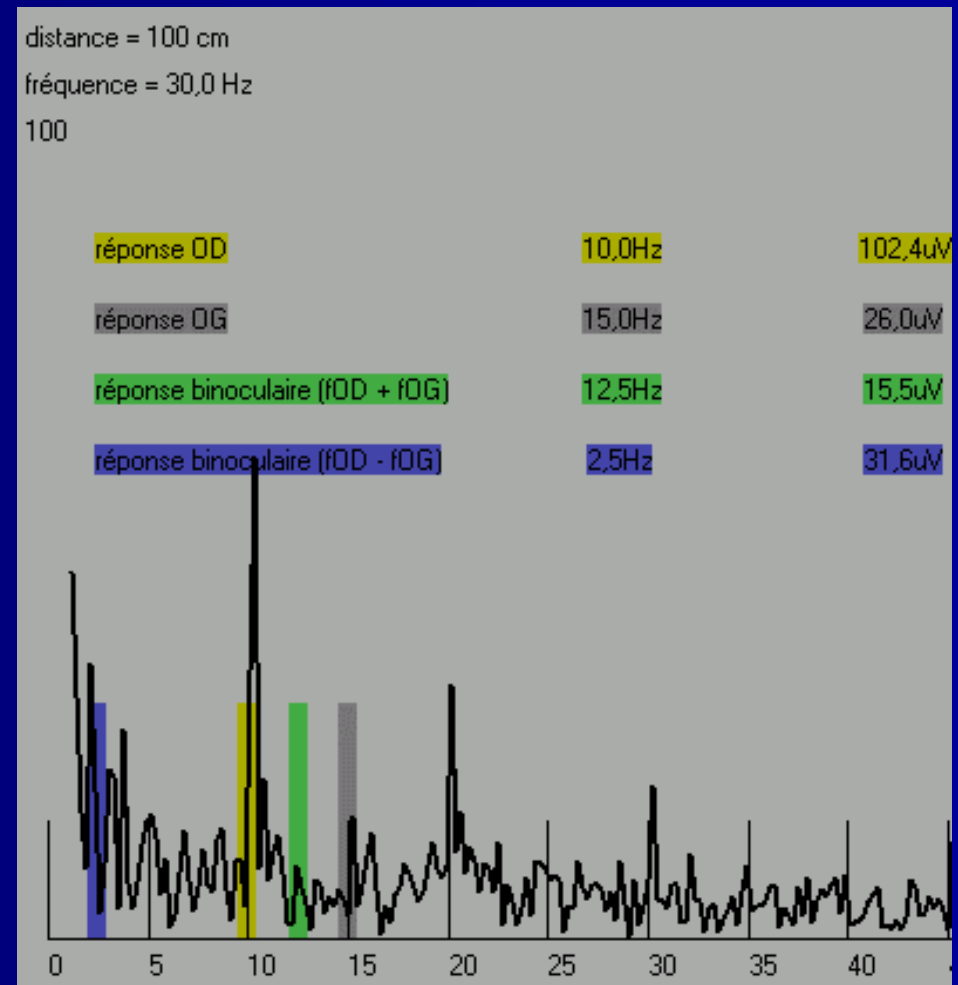
STEREO VEP:

Charlotte, 21 years old, LE amblyopia
« after orthoptic reeducation »

binocular beat

15' checkerboard pattern:

- RE response OD >> LE response
- no beat response

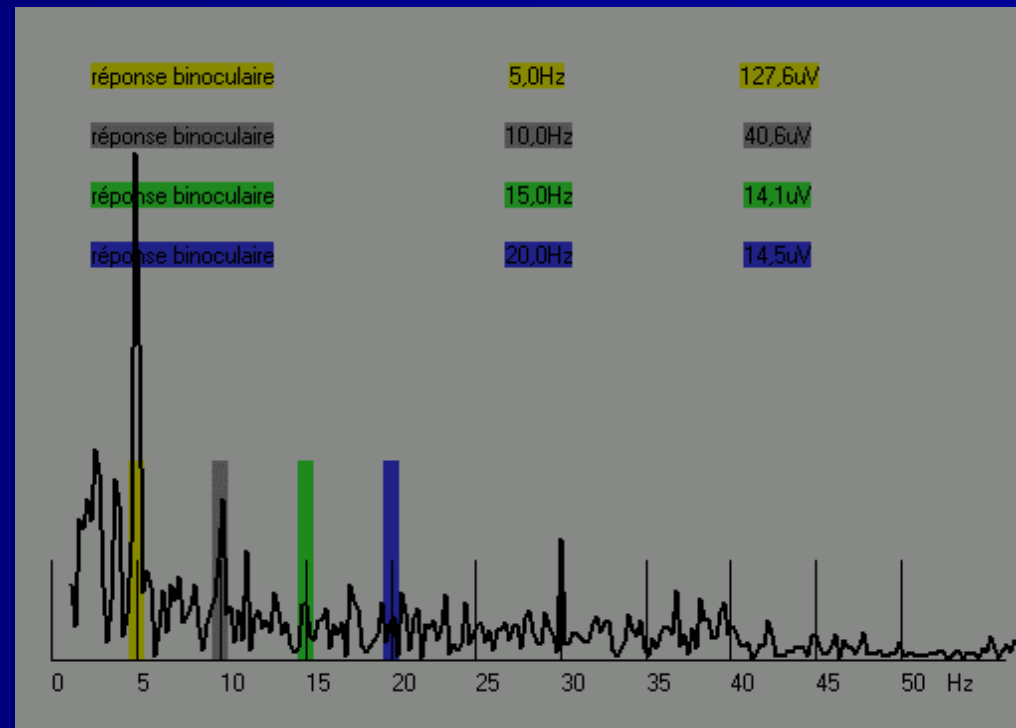


STEREO VEP:

Charlotte, 21 years old, LE amblyopia
« after orthoptic reeducation »

correlogram

- fusion response



STEREO VEP:

Charlotte, 21 years old, LE amblyopia
« after orthoptic reeducation »

stereogram

- no stereopsis response

