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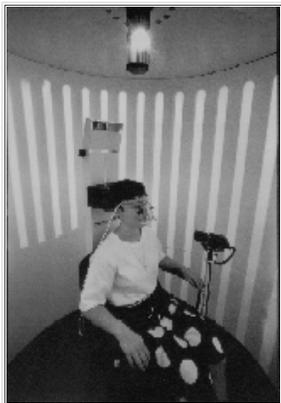
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OKN/OKAN TESTING

[Timothy C. Hain, MD](#) • Page last modified: May 8, 2011

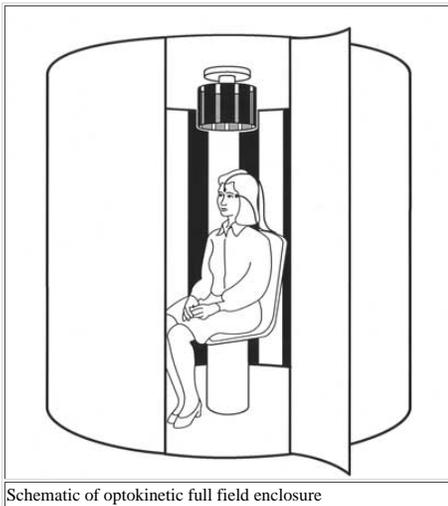
Optokinetic nystagmus (OKN)

Optokinetic nystagmus, or OKN for short, is the eye movement elicited by the tracking of a moving field. It differs from smooth pursuit which is the eye movement elicited by tracking of a single distinct target. As moving fields contain within them distinct targets, OKN generally contains within it smooth pursuit. As a consequence, usually OKN performance (gain -- ratio of eye tracking velocity to target velocity), exceeds that of smooth pursuit.



Example of OKN being elicited within a rotatory chair enclosure.

There are many ways to elicit OKN. The stimulus that most closely matches the definition of OKN is to use a full field surround such as is shown above and below. Even these are compromises as individual bars can be tracked, and there are usually distinct objects in the visual field that can be fixated. Accordingly, the "best" OKN stimulus is real, physical surround that rotates, containing a pattern which has no distinguishing features such as a random dot pattern.



Schematic of optokinetic full field enclosure

Questionable OKN stimulators:

It is not easy to build a good OKN full field stimulator and clinicians as well as commercial vendors have attempted to use other devices.

ENG vendors often sell a "light bar", consisting of an array of LED lights that can be controlled in such a way to produce moving bars of light. This stimulus is clearly not a full field, contains easily tracked lights, and mainly is an alternative method of eliciting smooth pursuit. In the author's opinion, this type of OKN has no diagnostic value over simple pursuit.

Another commercial variant is to use a video-projector to display a moving field on a portion of a screen. This method is a little better, as an appropriate pattern may have no individually trackable portions, but still it does not produce a full field and because of this is vulnerable to persons fixating on the edges of the projected image. In the author's opinion, this method of eliciting OKN is of unproven value but worth considering.

Clinicians sometimes may try to elicit OKN using simpler devices such as the drum below. This device, not even pretending to be a full field, is even more of a

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"pursuit" stimulus than the larger drum methods shown above. Still, it can occasionally be useful in evoking convergence retraction nystagmus. In the author's opinion, this type of drum very little utility.



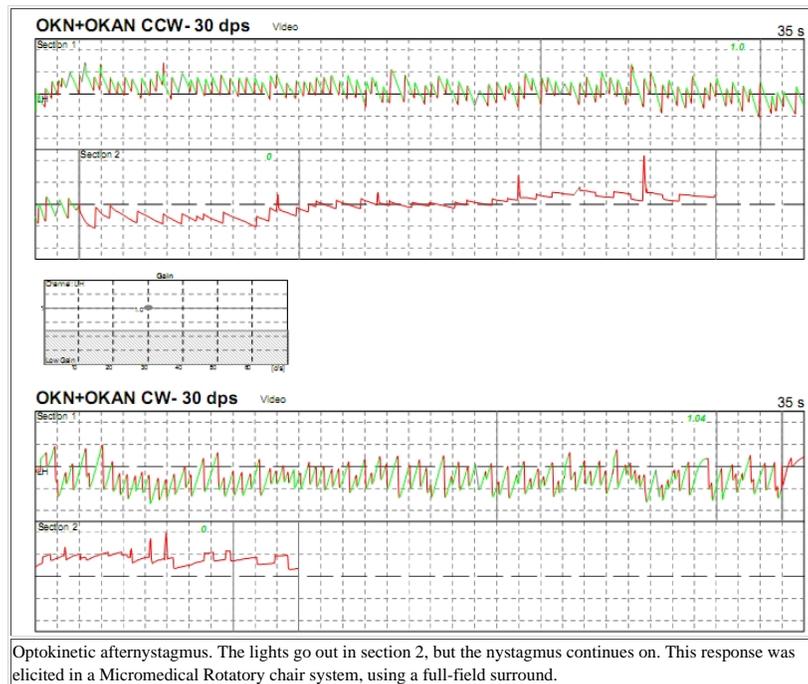
"OKN" can also be elicited by strips that contain squares of alternating colors, tape measures, and even busy ties. The usefulness of these devices, in the author's opinion, is questionable.

Both types of OKN stimulators can be obtained from "[good-lite](#)"

OKN summary:

OKN is much less useful than is rotatory chair testing as it is rarely affected substantially by disease. This is because it has redundant drivers -- the pursuit system and a lower level optokinetic following system that goes through the vestibular nucleus.

OKN may be useful for detection of malingering or lack of cooperation because it takes quite a bit of effort to block OKN.



Optokinetic afternystagmus. The lights go out in section 2, but the nystagmus continues on. This response was elicited in a Micromedical Rotatory chair system, using a full-field surround.

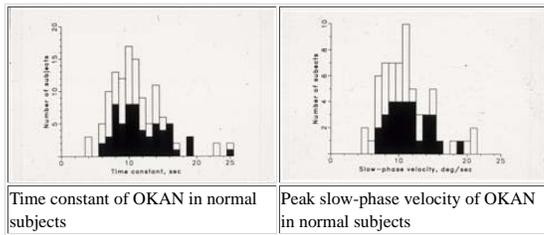
OKAN

Optokinetic afternystagmus (OKAN) describes the eye movements that occur after the lights are turned out for OKN, and the subject is in complete darkness. The darkness must be 100% -- **small light leaks will obliterate OKAN.**

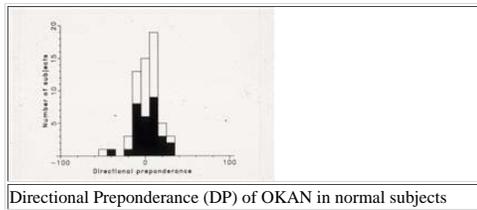
OKAN is **only elicited by large field stimuli.** It simply is not elicited by the typical, small field stimulators used in clinical laboratories. If you are thinking about doing OKAN in your lab, don't bother unless you can somehow surround the person with a full field.

It can be easily elicited by the complete surround methods shown above.

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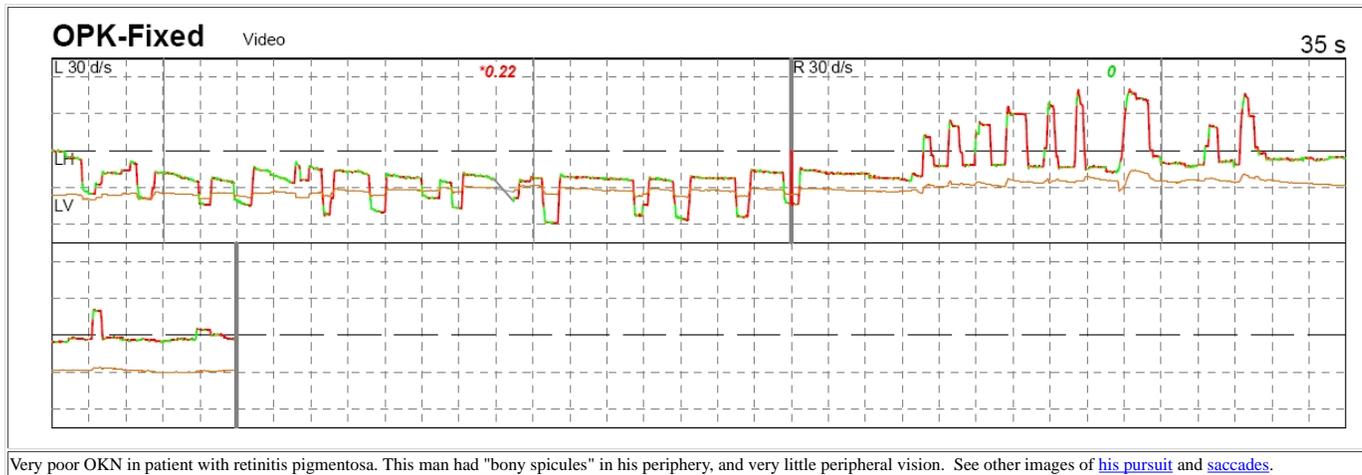


OKAN is more sensitive to disease than OKN, but it is variable in normal subjects, which limits its usefulness. The figures above show the distribution of normal values for OKAN time-constant and slow-phase velocity from Tijssen et al (1989).



OKAN in disease and malingering

OKAN is abolished in bilateral vestibular weakness, and becomes somewhat asymmetrical in persons with unilateral vestibular weakness (Hain and Zee, 1991; Hain et al, 1994). There are far easier ways to diagnosed these conditions than OKAN, and we do not recommend it for this purpose.



OKN may be reduced in retinitis pigmentosa.

OKN and OKAN have usefulness in detection of malingering, particularly in persons who are pretending to have [bilateral vestibular loss](#) in an attempt to obtain a legal result of some kind. Unfortunately, legal activity is common in cases of bilateral loss, because most are due to ototoxicity.

As noted above, OKN is difficult to stop and someone who has no OKN is probably (but not always) not cooperating. OKAN has utility in bilateral vestibular loss, as it should be absent. Thus the OKN/OKAN test can detect uncooperative subjects in two ways -- lack of OKN, and presence of OKAN are both suggestive of a person who is either uncooperative or who has substantial vestibular function.

References:

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Visual-vestibular interaction (VVI)

In VVI, a person is rotated with a visual surround or target also present.

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The most useful variant of this is to have a person look at (fixate) a laser that is fixed to the rotatory chair. This type of VVI is a good index of ones CNS's ability to suppress nystagmus, and thus it is a measure of cerebellar and brainstem function. If patients is not told to keep their eye on the chair-fixed target, the test is meaningless. This is a very common error.

Another type of VVI is done by simply rotating the person in the light. Here the person has both OKN and vestibular input. For this this type of VVI gain should be close to 1.0. If it is more than this, you have a technical problem. If it is less than this, at low-frequency, you either have a calibration problem or an uncooperative patient. Sometimes patients are poorly instructed and don't know that they are supposed to keep their eyes open.

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