

I-Portal® Test Battery:

Smooth Pursuit (Oscillating Tracking Test), Horizontal and Vertical

Test Description:

Smooth Pursuit tests are also referred to as Oscillating Tracking Tests. These oculomotor tests task a patient with tracking a dot moving with a sinusoidal motion profile. The moving dot is projected by the Pursuit Tracker™ laser target generator mounted on top of the I-Portal® NOTC patient chair.

Smooth Pursuit is a fundamental oculomotor test and is commonly included in all NKI test protocols. Tests are often run multiple times at gradually increasing frequencies, both horizontally and vertically. During the test, the saccadic movements of the patient's eyes are measured and the gain and phase of the eye movements are analyzed relative to the corresponding time position of the stimulus.

Clinical Outcome:

- Smooth Pursuit is used in conjunction with other tests to investigate the integrity of the oculomotor system; specifically in following a slowly moving target. The most common abnormality is low gain (eye velocity/target velocity) where the pursuit is broken up into small catch up saccades.
- Testing can provide information that supports a diagnosis of a vestibular system abnormality or suggests a central nervous system abnormality.
- A patient with a peripheral vestibular ailment will display asymmetric pursuit where they have difficulty pursuing away from the side of lesion.
- If an abnormal spontaneous nystagmus response is absent, asymmetric low gain pursuit usually occurs as a result of a lesion in the ipsilateral parietal lobe, thalamus, midbrain tegmentum, or dorsolateral nucleus of the pons and vestibulocerebellum.
- Pursuit testing is also used to evaluate brainstem disorders, cerebellar disorders, multiple system atrophy, congenital nystagmus, visual disorders, obsessive-compulsive disorder, progressive supranuclear palsy, post-traumatic stress disorder, Schizophrenia and Parkinson's Disease.

NKI test battery advantage:

- Pursuit Tracker™ laser diode stimulus provides true smooth pursuit, as opposed to light bars and projectors which induce a mini-saccadic response and introduce artifacts to testing data.
- The human smooth pursuit system is an extremely accurate position controlled system. The fovea has only 1 degree of arc and the image of a moving object can easily slip off of this region. The precision of laser target generation provides tighter stimulus control for more accurate data collection and patient assessment.
- VEST™ software analysis provides quantitative information for diagnosis not found in any other test battery, including separate leftward and rightward gain calculations and % of saccade.
- High frame rates of video eye tracking (100 frames per second) combined with superior tracking algorithms allow objective assessment of what constitutes saccadic pursuit.
- Neuro Kinetics system requires no manual adjustments to change from horizontal to vertical motion.

Reimbursement:

- Medicare Fee Code 92545 – Oscillating Tracking Test
- Reference 2010 Medicare Fee Schedule and Hospital Outpatient Prospective Payment System for Audiologists

Relevant Research Articles/Books:

- Furman, Joseph M., Martini, Alessandro, and Stephens, Dafydd, Textbook of Audiological Medicine; Clinical Aspects of Hearing and Balance, 2003.
- de Brouwer, S., Missal, M. Barnes, G., & Lefèvre, P., Quantitative Analysis of Catch-up Saccades During Sustained Pursuit, 2002, Journal of Neurophysiology, 87(4), 1772-1780.
- Hartje W., Steinhauser D., Kerschensteiner M. Diagnostic Value of Saccadic Pursuit Eye Movement in Screening for Organic Cerebral Dysfunction. J Neurol 1978; 217: 253
- Leigh, RJ., Zee, DS., The Neurology of Eye Movements, 1996.
- Levy, D. et al., Eye Tracking and Schizophrenia, Schizophrenia Bulletin 1994; Volume 20(1).
- Ohashi, N., & Mizukoshi, K. (1992). The Relationship Between Smooth and Saccadic Components in Smooth Pursuit, 1992, European Archives of Oto-Rhino-Laryngology, 249; 153-156.
- Sharpe, J.A., Neurophysiology and Neuroanatomy of Smooth Pursuit: Lesion Studies, 2008, Brain and Cognition, 68, 241-254.

Screen Captures:

	<p>Smooth Pursuit impairment is recognized clinically by observing saccadic movement and quantifying it by reducing velocity pursuit gain.</p> <ul style="list-style-type: none"> • Above graph shows normal smooth pursuit response. • Below graph shows abnormal smooth pursuit response. Patients with a lower gain during smooth pursuit tracking tests use catch-up saccades to correct accumulating position error (abnormal saccadic substitution).
--	--

	<p>VEST™ Software working data tab allows operator to clean up the raw data by deleting sections, such as blinks, and removing transition overshoots. Eye velocity limits (deg/sec) and sine filters can be adjusted and activated.</p> <p>Binocular eye data can be viewed separately (right eye and left eye), combined (average response from left and right eye), or both left and right both plotted on the same graph.</p>
--	--