A Brief Vestibular/Ocular Motor Screening (VOMS) Assessment to Evaluate Concussions:

If You Suspect a Concussion... MVA, fall, work injury, sports injury with collision or head injury (bruise, laceration, chipped tooth), loss of consciousness, etc. Or patient reports symptoms consistent with a concussion including, headache, dizziness, nausea, imbalance, sensitivity to light/noise, fogginess, difficulty reading or using computers, etc., then do a BRIEF VOMS.

Step 1 : Near Point Convergence (NPC - Normal < 8 cm)

Concept: **Normally when an object comes at you, your eyes are parallel when the object is 5 feet away. But as the object comes within 5 feet or less, your brain has to go to work and use the eye muscles to CONVERGE or pull the eye focus in and should have enough energy to focus down to 8 cm or less from the nose. Since concussions are an energy crisis, the brain does not have enough energy to focus down to 8 cm or less and thus the target doubles or blurs over 8 cm from the nose.**

Technique: **Put a target on a tongue depressor (2-3 mm dot or small picture) and hold the target 3-4 ft. away from the patients nose. Ask the patient how many "dots" they see. When they say "one" then bring the target in slowly toward their nose asking them to say when is "doubles or blurs." Repeat this three times. Record the distance each time. If the distances vary, continue until 3 distances are the same and record that distance. (If > 8 cm consistently pull the athlete from play... student from school, patient from work and refer patient for concussion workup).**

Step 2: SACCADES: Horizontal and Vertical (Smooth Pursuit)

Concept: **When a patient holds their head still and follows a target (finger) with their eyes or moves horizontally and vertically between 2 targets (2 fingers held up) with their eyes, the movements should be flawless and smooth locking in on each target sharp and effortlessly like a laser beam. But when the brain is bruised, and the nerve signal is delayed, this smooth and quick movement is interrupted by a notable stagger of the eye (wiggle) as it locks in on the target. This wiggle is called NYSTAGMUS.**

Technique: **Horizontal SACCADES - Hold your index fingers up at shoulder width between you and the patient about one foot from the patient. Ask the patient to watch you move your eyes steadily back and forth from finger to finger, side to side. Then ask them to do the same thing. Follow them for 15 seconds or more and record if you see any eye wiggling as eyes move back and forth. This technique takes a lot of practice to become accurate. Vertical SACCADES— Hold your two index fingers (fists closed) pointing horizontal or sideways about 1-1/2 feet apart vertically in front of your patient's nose. Ask the patient to watch you move your eyes steadily up and down from finger to finger. Then ask them to do the same thing. Follow them for 15 seconds or more and record if you see any eye wiggling as eyes move up and down. If positive, pull the athlete from play.**

Step 3: VOR: Horizontal and Vertical (Gaze Stability)

Concept: **This is the equivalent of a multitasking challenge for the brain. You are asking the brain to (1) hold the hand still while (2) turning the head and (3) keeping the eyes on the thumb (target). Since the concussion is an "energy crisis" for the brain, the VOR challenge is like trying to blow the electrical circuit with too much energy usage (like blowing the fuse with too many holiday lights).**

Technique: **Horizontal VOR - Ask the patient to hold their dominant arm outstretched and make a fist with their thumb pointed up. Then instruct them to hold their hand still while turning their head back and forth from right to left while keeping their eyes on their thumb. Vertical VOR - Ask the patient to hold their dominant arm outstretched and make a fist with their thumb pointed sideways. Then instruct them to hold their hand still while moving their head up and down (nodding) while keeping their eyes on their thumb. Record and irregularities including PAST LOOK (eyes drifting off the thumb with head movement), Movement of the hand (drifting, swinging left to right or moving up and down), or irregular rhythm of the head turning/nodding (change in speed, axis or range of the head turn/nod—overall cadence). If positive, pull the athlete from play.**

Visual Symptoms of a Concussion

Fluctuating/Blurred Vision
Double Vision
Reading/Computer Difficulties
Words Float/Move On The Page
Headaches/Eyestrain
Light Sensitivity

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Investigation performed at the University of Pittsburgh, Pittsburgh, Pennsylvania, USA Abstract - with NIH-PA Grant.

Background—Vestibular and ocular motor impairments and symptoms have been documented in patients with sport-related concussions. However, there is no current brief clinical screen to assess and monitor these issues. Purpose—To describe and provide initial data for the internal consistency and validity of a brief clinical screening tool for vestibular and ocular motor impairments and symptoms after sport related concussions. Study Design—Cross-sectional study; Level of evidence, 2.

Methods—Sixty-four patients, aged 13.9 ± 2.5 years and seen approximately 5.5 ± 4.0 days after a sport-related concussion, and 78 controls were administered the Vestibular/Ocular Motor Screening (VOMS) assessment, which included 5 domains: (1) smooth pursuit, (2) horizontal and vertical saccades, (3) near point of convergence (NPC) distance, (4) horizontal vestibular ocular reflex (VOR), and (5) visual motion sensitivity (VMS). Participants were also administered the Post-Concussion Symptom Scale (PCSS).

Results—Sixty-one percent of patients reported symptom provocation after at least 1 VOMS item. All VOMS items were positively correlated to the PCSS total symptom score. The VOR (odds ratio [OR], 3.89; P patients of 38% and 50%, respectively. Receiver operating characteristic curves supported a model including the VOR, VMS, NPC distance, and ln (age) that resulted in a high predicted probability (area under the curve = 0.89) for identifying concussed patients.

Conclusion—The VOMS demonstrated internal consistency as well as sensitivity in identifying patients with concussions. The current findings provide preliminary support for the utility of the VOMS as a brief vestibular/ocular motor screen after sport-related concussions. The VOMS may augment current assessment tools and may serve as a single component of a comprehensive approach to the assessment of concussions.

Post-Concussion Vision Changes

The key to diagnosis, The key to treatment