



## **Vestibular-Ocular Motor Screening (VOMS)**

by Shelly Fetchen DiCesaro PhD, LAT, ATC California University of Pennsylvania and  
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**Presented by the NATA Foundation Educational Resources Committee  
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### **INTRODUCTORY INFORMATION**

Sports-related concussions continue to be at the forefront of concern for both athletes and athletic trainers alike. Each concussion is different and symptoms vary between individuals, therefore, an individualized clinical approach in regard to assessment and management is required to optimize patient-centered and clinical outcomes. A large number of symptoms and impairments can be noted following concussion and are specific to each individual. It has been observed that dizziness, a potential sign of vestibular and/or ocular motor disturbance, is a complaint reported in nearly 50% of concussed athletes. Dizziness may be related to prolonged recovery. Aside from balance assessments such as the BESS, there has not been an effective clinical screening tool to specifically assess for vestibular and/or ocular motor involvement following concussion. Recently, the inclusion of vestibular ocular motor screenings (VOMS) has emerged as a clinical assessment tool that may fill this gap. This assessment tool, along with physical examinations, clinical interviews, symptom reports, and neurocognitive and balance tests, is part of the multi-faceted approach necessary in assessing the athlete's sport-related concussion. Following the comprehensive assessment, an individualized rehabilitation approach can be established for each athlete targeting his/her predominant clinical presentations.

### **VESTIBULO-OCULAR SYSTEM**

The vestibular system, consisting of the vestibulo-ocular and vestibulo-spinal systems, includes the sensory organs of the inner ear, connections to the cerebral cortex, cerebellum, brainstem, ocular system, and postural muscles. Overall, the vestibular system is responsible for communicating posture and head movements to maintain visual stability and balance control. Dysfunction of the vestibulo-ocular component of the vestibular system presents with dynamic symptoms, such as dizziness and visual instability. Balance, which is a static symptom, is more indicative of dysfunction associated with the vestibulo-spinal component of the vestibular system, and has been assessed with static tests, such as the Balance Error Scoring System (BESS). However, static assessments do not address the symptoms related to dynamic aspects of the vestibular system. Symptoms vary among athletes that sustain concussions with many of them reporting dizziness (50%), visual disturbances (30%), balance issues (40%), or any combination of these. Additionally, individuals may experience other symptoms including fogginess, anxiety, derealization (feeling as if surroundings are not real), nausea, motion sickness, difficulty in the classroom, and an intolerance for busy environments. One specific test is unlikely to assess all of the potential impairments and symptoms associated with the vestibular system. The frequency in which sports-related concussed athletes report symptoms of the vestibulo-ocular motor system warrants a comprehensive assessment tool such as the Vestibular/Ocular Motor Screen (VOMS).



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### **VESTIBULAR/OCULAR MOTOR SCREEN (VOMS)**

The Vestibular/Ocular Motor Screen (VOMS) is a brief, reliable, and easily implemented assessment developed by clinicians and researchers from the University of Pittsburgh Medical Center. It assesses vestibular and ocular motor deficits in athletes following sport-related concussion. The VOMS consists of five components including:

- smooth pursuits – tests ability to follow a slowly moving target
- saccades (horizontal and vertical) – tests ability of eyes to move quickly between targets
- vestibular ocular reflex (horizontal and vertical) – assess ability to stabilize vision as head moves
- visual motion sensitivity – tests visual motion sensitivity and ability to inhibit vestibular induced eye movements using vision
- near point convergence (NPC) distance – measures ability to view a near target without double vision

Following each component of the screen, the athlete is asked to rate changes in headache, dizziness, nausea, and fogginess, on a scale from 0-10. Near point convergence (NPC) distance is also measured using the average of 3 trials with values  $\leq 5$  cm considered normal. The test, which takes approximately 5-10 minutes to administer, is performed pre-season to establish a baseline. Then immediately following a concussive event and prior to the performance of the five components, the athlete is again asked to rate the four symptoms to establish a pre-assessment baseline. The baseline ratings are used to determine if any of the five components of the VOMS provoke symptoms.

Preliminary findings support the use of VOMS showing a high sensitivity in identifying athletes who have sustained a sport-related concussion and a relatively low rate of false-positives. Based on the findings of the VOMS, clinicians can determine if any additional testing and/or referrals are indicated. Also, concussed athletes with specialized therapy needs can be identified and treated early. Further research is warranted to determine the ability of the VOMS to detect impairments over time including sideline assessments, as well as assessments in the clinic days after the initial injury. The subsequent pages detail the specific VOMS assessments in detail.

### **CLINICAL APPLICATION**

As stated previously, each concussion is different and symptoms vary between individuals, therefore, an individualized clinical approach is needed. Following a comprehensive, multi-faceted assessment, specific symptoms and impairments can be determined and the information used to guide clinical management. With respect to the VOMS, athletes with provocation of vestibular and ocular symptoms should be referred for additional vestibular and vision assessments, and specialized vestibular and/or vision therapy. Clinicians specially trained in these areas can intervene early as needed, thereby enhancing the recovery period. The concept of rehabilitating concussions is still in the development stage, however there is evidence to support vestibular and ocular rehabilitation as beneficial to concussed patients challenged with balance, dizziness and vestibulo-ocular impairments.



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