

Vestibulo-ocular dysfunction in children and adolescents with sports-related concussion

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Researchers from the Canada North Concussion Network in Manitoba investigated the frequency of vestibulo-ocular dysfunction in children and adolescents with sports-related concussion and found that its presence was predictive of a prolonged recovery. Findings in this study are reported and discussed in "Vestibulo-ocular dysfunction in pediatric sports-related concussion" by Michael J. Ellis, MD, and colleagues, published today online, ahead of print, in the [*Journal of Neurosurgery: Pediatrics*](#).

Normally, if you are asked to focus on an object while turning your head to the right or left, your eyes will continue to hold the object in sight by moving in the opposite direction of your head. As your head turns to the right, for example, your eyes move to the left at approximately the same speed. The same thing happens when you raise or lower your head: your eyes move in the opposite direction so that they can continue to focus on the object. This is called the vestibulo-ocular reflex, and most of the time it works quite well. In some patients following [concussion](#), however, this reflex is impaired.

The authors examined the prevalence of vestibulo-ocular dysfunction (VOD) in 101 patients 19 years of age or younger who were diagnosed with sports-related concussion (SRC) at a multidisciplinary pediatric concussion program. Seventy-seven patients had sustained the injury less than 30 days previously and were diagnosed with acute SRC; the remaining 24 patients continued to have three or more symptoms of concussion for longer than one month and were diagnosed as having post-

concussion syndrome.

The authors state that there is no standardized definition for VOD. For the purposes of this study, they define it as "more than one subjective complaint of intermittent blurred or double vision, [visual disturbance](#), gaze instability or difficulty focusing, dizziness, difficulty reading, or motion sensitivity" in conjunction with more than one abnormality in eye movements or vestibulo-ocular reflexes identified by a neurosurgeon during a physical examination.

The authors found a significant percentage of patients with VOD in the acute SRC group (29%, 22 patients) and a substantially higher percentage of patients with VOD in the post-concussion syndrome group (62.5%, 15 patients). These researchers also found that the risk of developing post-concussion syndrome was statistically significantly higher in patients with acute SRC who had VOD. This finding held true even when the authors controlled for other known predictors for developing post-concussion syndrome such as the severity of the injury and the presence of migraine headaches. This is an important finding because, as the authors point out, children and adolescents with post-concussion syndrome are at greater risk of developing other chronic medical conditions, such as depression, anxiety, and migraines, as well as poor educational performance. Early identification of risk factors can lead to early specific therapeutic interventions.

Commenting on the study, Dr. Ellis stated, "The physical examination tools used in this study are not novel and, in fact, have been part of the clinical armamentarium of neuro-ophthalmologists for decades. In this study we have simply used these tools to provide a window into the pathophysiology of specific concussion symptoms and investigated whether the presence of that pathophysiology is associated with the development of post-concussion syndrome.

"While these tools may help physicians identify those patients at an elevated risk of post-concussion syndrome, they should not be regarded as stand-alone tools to be used to diagnose or manage concussion. Indeed, many serious and life-threatening neurological conditions can present with vestibular and oculomotor signs and symptoms similar to those observed in patients with sports-related concussion. Optimizing care of concussion [patients](#) requires comprehensive neurological assessment by physicians with clinical training and experience in concussion and traumatic brain injury.

"Future research is needed to confirm the findings of this study, identify clinical predictors of vestibulo-ocular dysfunction, and evaluate the effect of targeted vestibular and oculomotor rehabilitation strategies on the objective findings responsible for persistent concussion symptoms."

More information: Ellis MJ, Cordingley D, Vis S, Reimer K, Leiter J, Russell K. Vestibulo-ocular dysfunction in pediatric sports-related concussion. *Journal of Neurosurgery: Pediatrics*, published online, ahead of print, June 2, 2015; [DOI: 10.3171/2015.1.PEDS14524](https://doi.org/10.3171/2015.1.PEDS14524)

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