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Effects of Mild Traumatic Brain Injury on Retinal Ganglion Cell Light Adaptation

Principal Investigator: HARTWICK, ANDREW T

Institution Receiving Award: OHIO STATE UNIVERSITY, THE

Program: VRP

Proposal Number: VR190135

Award Number: W81XWH-20-1-0933

Funding Mechanism: Investigator-Initiated Research Award - Funding Level 2

Partnering Awards:

Award Amount: \$590,630.00

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PUBLIC ABSTRACT

Many people develop an intolerance to light after a head injury. With this condition, typical indoor light levels can cause discomfort, resulting in these individuals having to wear dark sunglasses even while indoors. We do not understand why this occurs and how it is linked to head injuries. It is our speculation that cells in the retina of the eye become unable to adjust appropriately to changes in environmental light levels, the result being that they signal the brain that it is brighter than it actually is. In this work, we will study individuals who had a recent brain injury and developed light intolerance, individuals with a recent brain injury who do not experience light intolerance, and a comparison group of people who have never had a brain injury. We will measure the function of certain retinal cells by recording their electrical activity, which can be detected with a probe placed near the eyelid, when the eye is stimulated with light. We will also measure the function of a different group of cells in the retina by measuring how the pupil changes size in response to different light exposures. These techniques could provide new approaches for clinicians to use, allowing them to quantify the magnitude of the light intolerance experienced by these patients, rather than just asking patients whether lights bother them. This would also enable clinicians to better track whether the light intolerance is improving over time. It could shed light on why this symptom occurs after brain injury and stimulate ideas on new approaches for treating the condition. This research could benefit both Veterans who suffered a head injury in the line of duty and members of the American public who experience this symptom after falls, car accidents, athletic mishaps, and other types of trauma.

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