(SD2022-066) Simultaneous assessment of afferent and efferent visual pathways using multi-focal steady-state visual evoked potenital method to facilitate the diagnosis and prognosis of individuals with neurological diseases.

Tech ID: 33389 / UC Case 2021-Z08-1

ABSTRACT

Researchers from UC San Diego have developed a patent-pending wearable device for concurrently assessing afferent and efferent visual functions. The invention details novel mobile brain-computer interfacing methods and systems for concurrently assessing afferent and efferent visual functions.

FULL DESCRIPTION

Multiple sclerosis (MS) is a leading cause of neurological disability. An autoimmune disorder, MS targets the optic nerves, brain and spinal cord, primarily damagingthe myelin sheaths of neurons in these structures with secondary neurodegeneration. Both the afferent and efferent visual pathways are strongly impacted by MS pathology. Over 50% of MS patients will present with acute optic neuritis during their disease course, with 20% having optic neuritisas their first symptom. Up to 70% of patients also experience efferent visual dysfunction, including ocular misalignment, nystagmus and abnormal eye-tracking. Both afferent and efferent functions can be precisely measured to aid diagnosis, estimate treatment responses, and follow the course of neurodegeneration/disability accumulation. Unfortunately, the equipment and analytical capacity to make these measurements are typically only found in special care facilities, and even then, few centers can accurately quantify both afferent and efferent dysfunction. There is no current availability to make these measurements in acute care centers such as emergency room, urgent care, and hospital floors.

APPLICATIONS

With this invention, both afferent and efferent functions may be precisely measured to aid diagnosis, estimate treatment responses, and follow the course of neurodegeneration/disability accumulation. There is no current availability to make these measurements in acute care centers (ER, urgent care, hospital floors). The disclosed technology can address these gaps via the application of an integrated wearable device capable of capturing both high-resolution afferent function and eye-tracking measurements in the MS population.

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OTHER INFORMATION

KEYWORDS

Brainwaves, eye tracking, dementia, Parkinson's disease, multiple sclerosis, TBI, Alzheimer's disease, brain trauma/concussion, Visualization, Electroencephalography, Electrooculography, Electrodes

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Diagnostics
  - Disease: Central Nervous System
  - Research Tools

RELATED CASES

2021-Z08-1

Additional applications include highly prevalent diseases of brain trauma/concussion, Alzheimer's disease and Parkinson's.

ADVANTAGES

Among other benefits, the disclosed methods and systems can facilitate research on the correlations between the afferent and efferent measures and support the development of new and novel indices of multiple sclerosis (MS) -related visual dysfunction.

STATE OF DEVELOPMENT

INTELLECTUAL PROPERTY INFO

Patent rights are available for commercial licensing.

https://patentimages.storage.googleapis.com/37/2b/b8/012e18a2758ffc/WO2023039572A1.pdf

WO 2023/039572 A1

(54) Title: SIMULTANEOUS ASSESSMENT OF AFFERENT AND EFFERENT VISUAL PATHWAYS

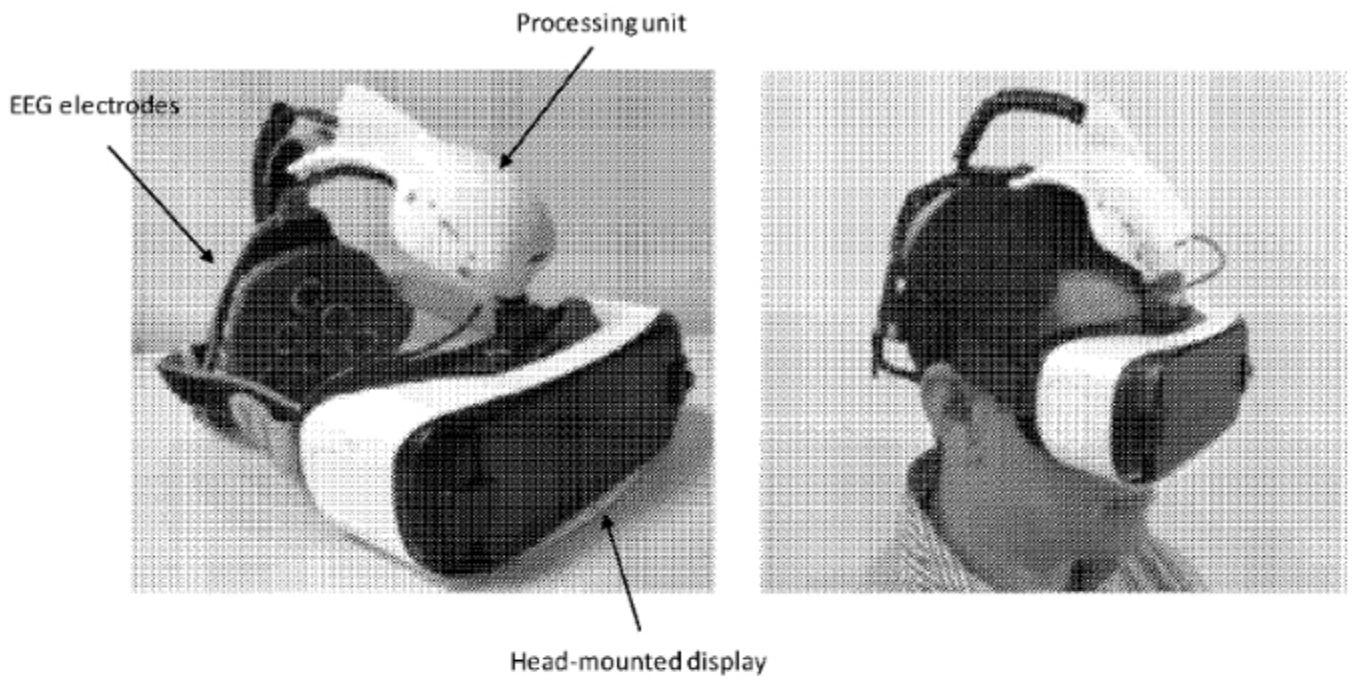

FIG. 5

(57) Abstract: Methods and systems for assessing afferent and efferent visual functions are disclosed. In one aspect, a wearable system for concurrently assessing afferent and efferent visual functions includes a display configured to be placed in front of a face of a user and provide visual stimuli to the user to elicit eye movements, an electroencephalography (EEG) sensor configured to be placed on a head of the user to measure electrical activity in a brain of the user that occurs in response to the visual stimuli, an eye-tracker configured to track the eye movements, and a processor coupled to the display, the electroencephalography sensor, and the eye-tracker to: cause the visual stimuli to be presented on the display; obtain an electroencephalography signal from the EEG sensor; obtain eye-tracking measurements from the eye-tracker; and determine, based on the electroencephalography signal and the eye-tracking measurements, information associated with the afferent and efferent visual functions.

RELATED MATERIALS

- Nakanishi M, Miner A, Jung TP, Graves J. Novel Moving Steady-State Visual Evoked Potential Stimulus to Assess Afferent and Efferent Dysfunction in Multiple Sclerosis. IEEE Trans Neural Syst Rehabil Eng. 2023 Feb 8 - 02/08/2023

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