Visual Information Restoration and Rehabilitation via Sensory Substitution Technology

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PUBLIC ABSTRACT

An estimated one million adults in the United States are blind, approximately 160,000 of whom are veterans. Eye injuries from blast exposure represent significant causes of blindness among servicemen and women participating in active military operations. Indeed, over 1,100 veterans of the conflicts in Iraq and Afghanistan have undergone surgery for damaged eyes (USA Today 11/14/2007). Many will recover some or all of their sight, but a portion will suffer irreversible blindness.

Sudden loss of vision is associated with substantial psychological and social consequences that can lead to severe depression and disability. Once doctors have done everything modern medicine can do and vision cannot be brought back, patients are faced with learning to cope with permanent blindness and are left to rely on aids such as the white cane or guide dog, both introduced in the United States in the 1930's. Soldiers whose lives are permanently altered as a result of an injury sustained in combat deserve to have the most advanced rehabilitative technologies at their disposal.

The BrainPort vision device is a visual prosthetic designed for those who are blind. It enables perception of visual information using the tongue and camera system as a paired substitute for the eye. Visual information is collected from a video camera and translated into gentle electrical stimulation patterns on the surface of the tongue. Much like reading Braille with the fingertip, users interpret and appreciate the visual scene, perceiving shape, size, location, and motion of objects in their environment. It is a functional, non-surgical device developed as an aid to the visually impaired. The BrainPort vision device is the only new technology likely available in the near term to address safety and mobility issues resulting from blinding injuries sustained in recent and past military conflicts.

We understand from working with individuals who are blind, that the ideal visual prosthetic would support activities of daily living while being lightweight, unobtrusive, aesthetically pleasing. The device would be compatible with a user's existing assistive devices. Such a system would be easy to use and not require invasive surgery. Finally, it would be easily customizable and upgradeable as technology improves. The BrainPort vision device DMRDP proposal and development plan is designed to fit these requirements.

The goal of this proposal is to (1) improve the look and feel of the device through including creating a wireless tongue display; (2) evaluate the usefulness of the BrainPort Vision Device in totally blind individuals including veterans; and (3) further develop the device into a commercially ready, easy-to-use, and effective assistive tool to blind individuals.