A Randomized Controlled Trial Evaluating the Efficacy of Neural Vision Correction (NVC™) in Enhancing Unaided Visual Acuity in Low Myopes

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Introduction

NeuroVision™ NVC vision correction technology is a non-invasive, patient-specific treatment based on visual stimulation and facilitation of neural connections responsible for vision. The technology involves the use of an internet-based computer generated visual training exercise regime using sets of patient specific stimuli based on Gabor patches, to sharpen contrast sensitivity and visual acuity.

Following the conclusion of a non-comparative interventional study which demonstrated the efficacy and safety of NVC technology in improving unaided visual acuity and contrast sensitivity in 20 patients with myopia, we embarked on a randomized controlled trial to evaluate the efficacy of NVC technology in enhancing the unaided visual acuity (UAVA) in low myopic patients (LMP).

We present here the results of a planned interim analysis that was done at treatment completion of 75% of the study subjects. This study was conducted in active Military Services in the Singapore Armed Forces.

Scientific Background

Cortical neurons in the visual cortex function as highly specialized image analyzers or filters, responding only to specific parameters of a visual image, such as orientation and spatial frequency, and visual processing involves the integrated activity of many neurons with inter-neuronal interactions effecting both excitation and inhibition. Visual contrast activates neurons involved in visual processing, and neuronal interactions determine the sensitivity for visual contrast at each spatial frequency, and the combinations of neuronal activities contrast sensitivity function (CSF). The relationship between neuronal responses and perception are mainly determined by the signal-to-noise ratio (S/N ratio) of neuronal activity, and the brain pools responses across many neurons to average out noisy activity of single cells, thus improving S/N ratio, leading to improved visual performance and acuity.

Studies have shown that the noise of individual neurons can be brought under experimental control by appropriate choice of stimulus conditions, and CSF can be increased dramatically through control of stimulus parameters. Studies have shown that the noise of individual neurons can be brought under experimental control by appropriate choice of stimulus conditions, and CSF can be increased dramatically through control of stimulus parameters. The building block of these visual stimulations is the Gabor patch (Figure 1), which efficiently activates and matches the shape of receptive field in the Visual Cortex.

Technology Implementation

The fundamental stimulation-control technique is called “Lateral Masking”, where collinearly oriented flanking Gabors are displayed in addition to the target Gabor image. The patient is exposed to two short displays in succession, in a random order; the patient identifies which display contains the target. Audio feedback is provided with an incorrect response. The task is repeated and a staircase is applied until the patient reaches their visual threshold level (Figure 2).

Methods

• 67 adults aged 17-55, with Low Myopia, having cycloplastic spherical equivalent (SE) in the range of -0.5DS to -1.5DS and astigmatism in the range of 0.0DCD to -0.75DCD were recruited.
• Baseline Unaided Visual Acuity (UAVA) in both eyes was 0.2 logMar (20/30) or worse.

The subjects were randomly divided into 2 groups: 54 LMP were allocated in the treatment group - completed real NVC treatment. 13 LMP were allocated to the control group - completed sham treatment (placebo).

The study was double masked
• UAVA was tested at Baseline and at the End of Treatment using ETDRS charts
• A significant improvement in UAVA was defined as improvement in UAVA of 0.2 logMar (2 lines) or more

All analyzed subjects completed NeuroVision or sham treatment without any major incompliance with the treatment schedule and protocol.

Results

• Mean improvement in UAVA was 1.78 logMar lines in the treatment group and 0.23 logMar lines in the control group.

• 35 subjects (64.8%) in the treatment group achieved an improvement of 2 logMar lines or more (Significant Improvement) in at least one of their eyes. All subjects (77%) in the control group achieved a Significant Improvement in at least one of their eyes (p = 0.0005, Fisher’s Exact Test, OR = 22.105, 95% CI 6.665 to 183.256)

• 16 subjects (29.6%) in the treatment group achieved a Significant Improvement in both of their eyes.

No subjects (0.0%) in the control group achieved a Significant Improvement in both of their eyes (p = 0.028).

Mean Baseline Cycloplegic refraction was -1.29D.
Mean refractive error remained unchanged.
No adverse events were reported.

Conclusions

NeuroVision treatment for patients with low myopia demonstrates an improvement in Unaided Visual Acuity that is statistically significant from subjects receiving a sham treatment.

References