

Computer-Based Primary Visual Cortex Training Combined With LASIK for Treatment of Low Myopia

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DURRIE VISION

— Putting research into practice —

Disclosure

Dr. Stahl's spouse, Dr. Jason Stahl, is a consultant for Alcon, Bausch and Lomb, and AcuFocus

Dr. Durrie is a clinical investigator for:

- *Alcon*
- Allergan
- Wavefront Science
- *NeuroVision*
- High Performance Optics
- OcuSense
- QuestVision
- Visiometrics
- Tracey Technologies
- Bausch and Lomb
- IntraLase
- Refractec
- AcuFocus
- WaveTec

What is NeuroVision?

- Computer based training program used to improve visual performance
- Based on principles of:
 - Neural plasticity
 - Lateral interactions
 - Perceptual learning
 - Gabor Patches

How Does NeuroVision Work?

Neural plasticity relates to the ability of the nervous system to adapt to changed conditions

Visual acuity improvement in adults with **amblyopia** has been reported¹³

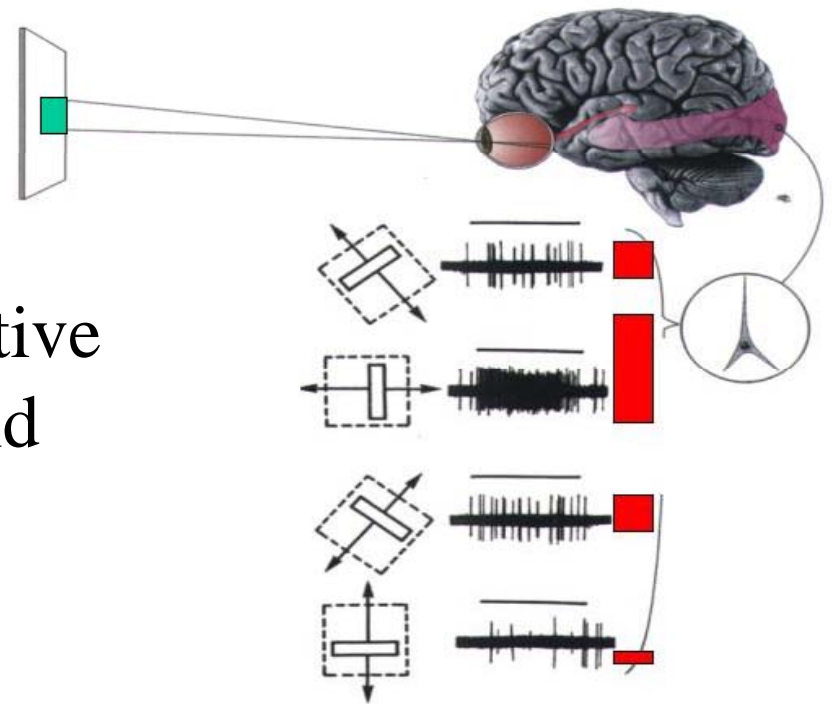
- After prolonged patching
- After the better eye's vision has been degraded by age related macular degeneration, cataract or trauma

Playing video games can improve a person's ability to perceive objects in a crowded space, reported in the January issue of *Psychological Science*

How Does NeuroVision Work?

Perceptual learning has been evidenced in a variety of visual tasks and was found to persist for years **without further practice**⁶⁻¹⁰

NeuroVision software enables perceptual learning by repetitive performance of controlled and specific visual tasks



How Does NeuroVision Work?

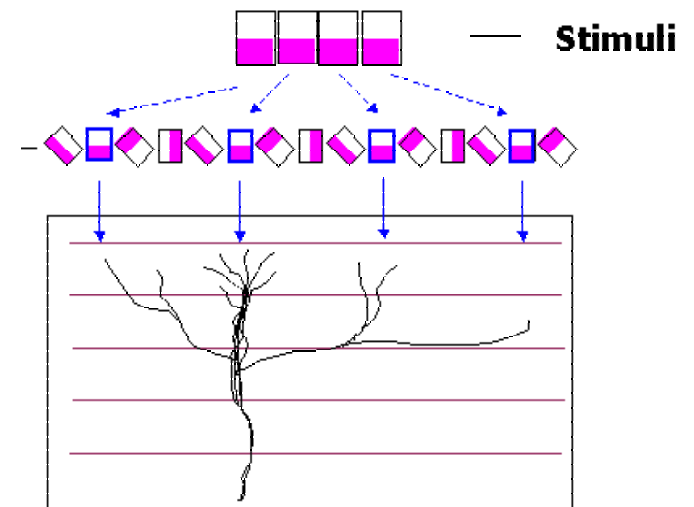
Neuronal Lateral Interactions

Individual neurons respond to:

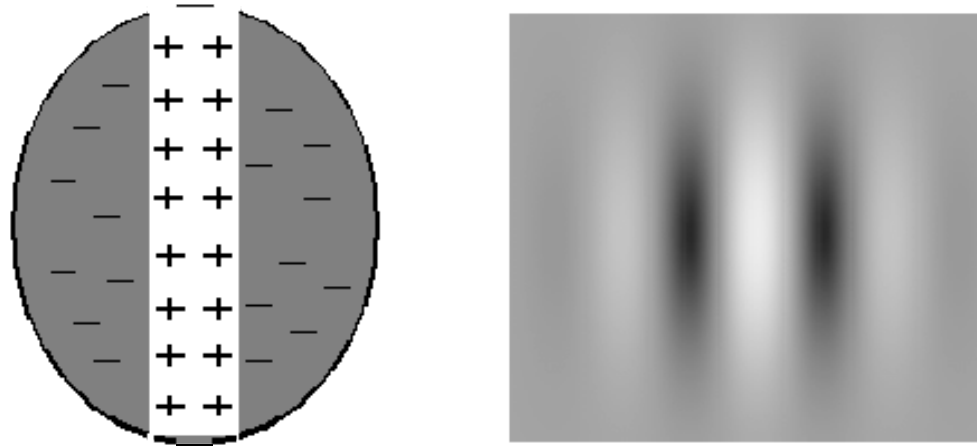
- Precise location
- Orientation
- Spatial frequency

Neuronal Interactions:

- Result in excitation or suppression



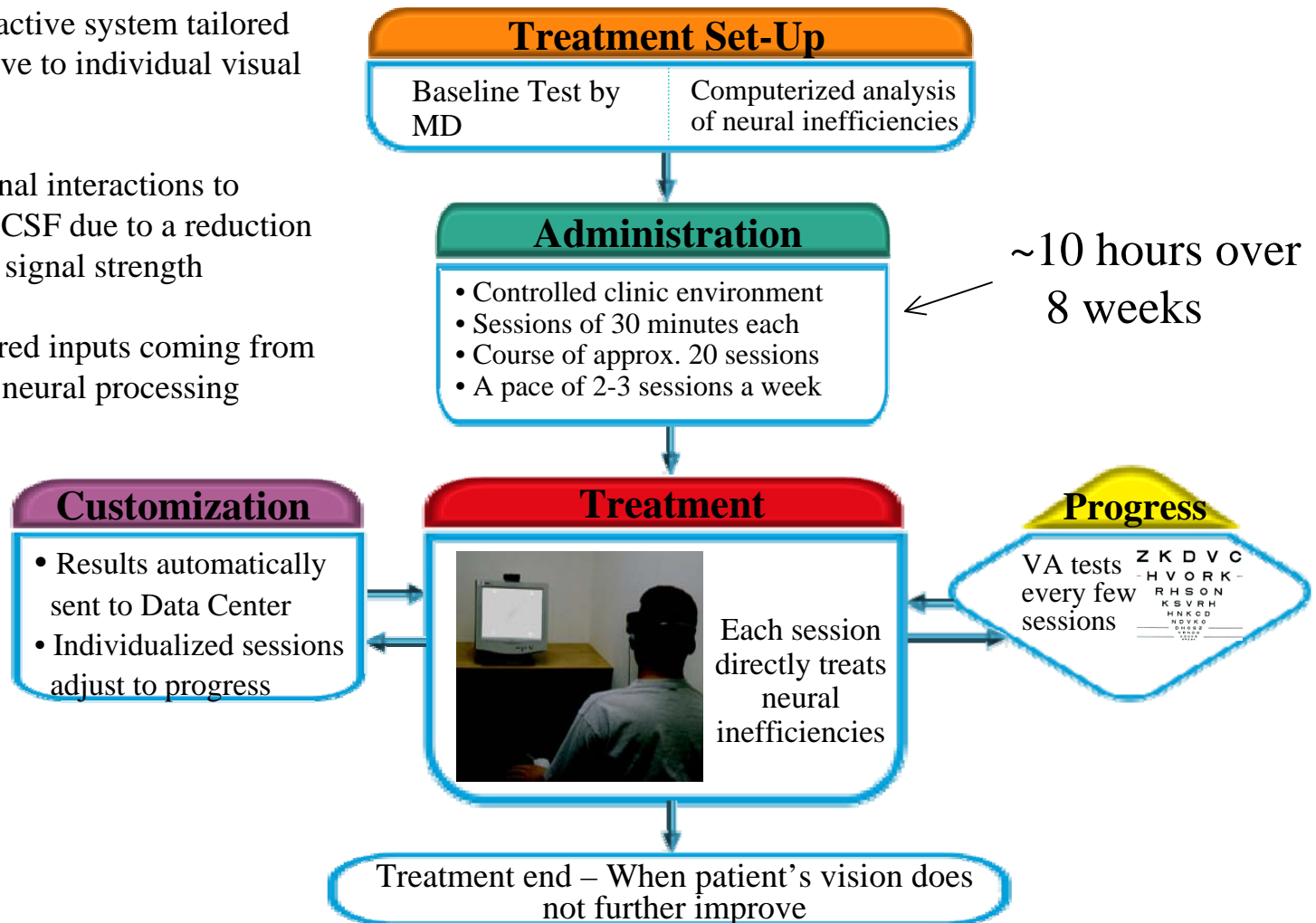
Gabor Patch



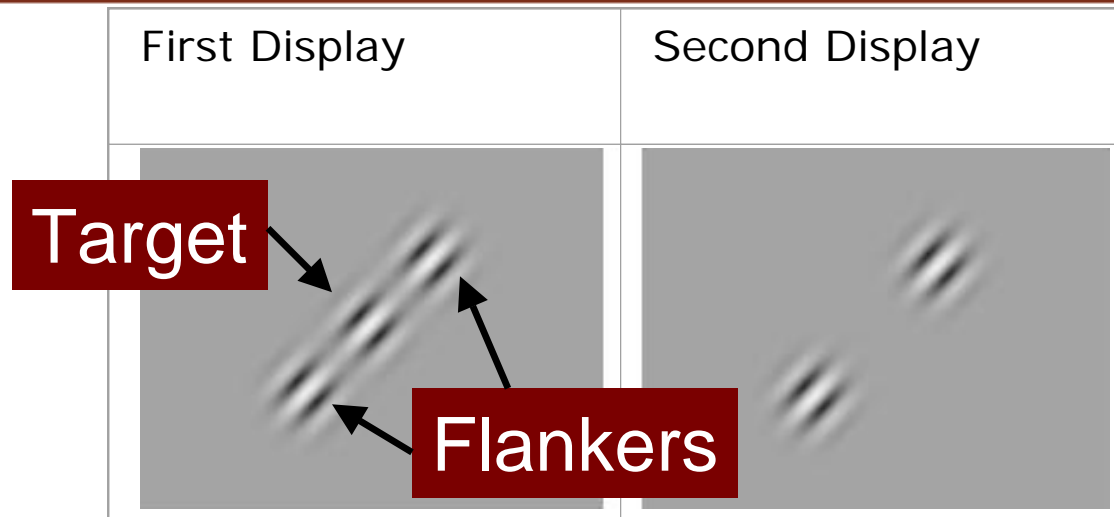
- **Gabor Patches**¹⁴ are widely used in the field of visual neuroscience to describe the shape of receptive fields of neurons in the primary visual cortex
- They represent the most effective stimulation¹⁵

Neurovision Treatment

- Software-based, interactive system tailored and continuously adaptive to individual visual abilities
- Probes specific neuronal interactions to induce improvement of CSF due to a reduction of noise and increase in signal strength
- Compensates for blurred inputs coming from the retina by enhancing neural processing



Visual Perception Task



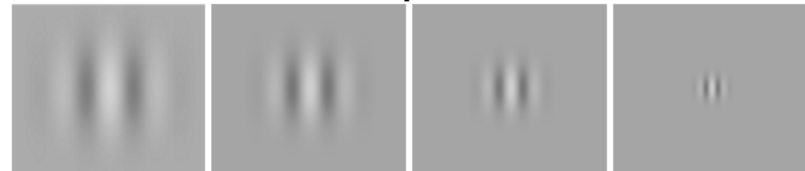
- The software measures the contrast threshold of a Gabor target with the presence of flankers
- The patient is exposed to two short displays in succession and the patient identifies which display contains three Gabors

Visual Perception Task – Example



NeuroVision Treatment

Spatial Frequency



Local Orientation



Contrast



Global Orientation



Target-Flankers Separation



Target Displacement



NeuroLASIK for Low Myopia

US Study Design

- Purpose: To compare the combination of visual cortex training and LASIK (NeuroLASIK) with a “sham treatment” and LASIK on postoperative outcomes

NeuroLASIK for Low Myopia

- Methods
 - 98 eyes
 - Prospective multicenter study
 - All patients underwent LASIK with the Alcon LADARVision 4000 or the Wavelight Allegretto laser
 - 1 month post-operatively all patients underwent computer based activities of either:
 - Treatment Group – NeuroVision treatment
 - Control Group – “Sham” treatment of non-visually stimulating video game activity

NeuroLASIK for Low Myopia

- Clinical Endpoints
 - Uncorrected distance acuity
 - 1 hour, 1 day, 1 month, 3 months
 - Contrast sensitivity testing
 - 3 month visit

NeuroLASIK for Low Myopia

- Acuity data after surgical treatment (prior to visual training exercises)

	Treatment	Control
20/20 or Better	31	30
Worse than 20/20	17	20

Results – Visual Acuity

- 3 month visit – after visual training, n=98

	Treatment	Control
UCVA Improvement (Snellen lines)	0.82	0.28

- 20/20 or better group, n=61

	Treatment	Control
UCVA Improvement (Snellen lines)	0.41	0.27

- Worse than 20/20 group n=37

	Treatment	Control
UCVA Improvement (Snellen lines)	1.56	0.34

Results – Contrast Sensitivity

- 3 month visit – after visual training, n=98

	Treatment	Control
CSF Improvement	79%	52%

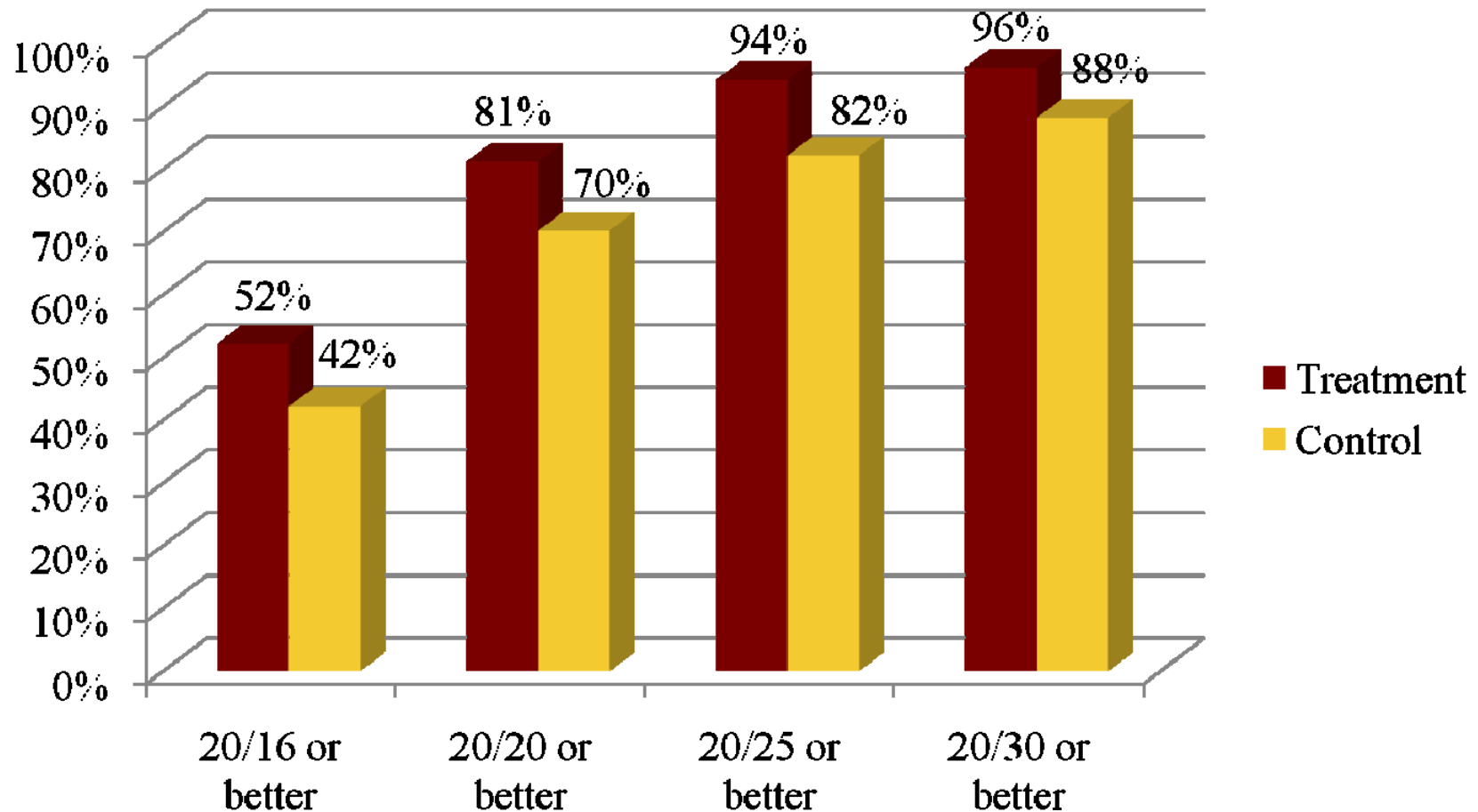
- 20/20 or better group, n=61

	Treatment	Control
CSF Improvement	76%	56%

- Worse than 20/20 group n=37

	Treatment	Control
CSF Improvement	90%	47%

Visual Acuity Results – 3 months



Summary of Results

- Most significant improvement with NeuroVision treatment in eyes with worse than 20/20 vision after refractive surgery
- Patients tolerated the NeuroVision treatment activities and reported them easy to do

Conclusions

- NeuroVision treatments are a safe, effective and easy way to improve visual acuity and contrast sensitivity in post-refractive surgery eyes
- The treatment can enhance refractive surgery results, especially in patients with less than 20/20 results post-operatively
- We look forward to completing our data collection and presenting finalized results

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