Gaining Independence Through Vision Therapy, Bioptics, and an Adaptive Driving Program

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**BACKGROUND**
Recent studies have confirmed that residual pliability is present in the adult visual brain with amblyopia. 1-4 Neuroplasticity has been broadly defined as the ability of the central nervous system to reorganize its structure, function, and connections in response to external or internal stimuli. 5 However, amblyopia was believed to be unalterable past the critical period of visual development (7-8 years of age). 6

Through stimulation of the different pathways of the visual system utilizing vision therapy, perceptual learning as referred to in some studies, visual skills can be improved in an adult. Substantial pliability in adults has been found with prolonged visual perceptual learning. 7 Interestingly, the effects are long-lasting and can be transferred to new visual tasks 8. Vision therapy was used to improve the function and quality of life in an adult patient with long-standing amblyopia, strabismus, nystagmus, and binocular vision disorders. This case involved using exclusion therapy, vision therapy, and a driving program, and an adaptive driving program to improve visual function and transfer skills to driving.

Moderate low vision is classified as having best corrected vision between 20/70 to 20/100 9. Biopic telescopes were prescribed in this case to meet the patient’s goal for driving. Driving is often a goal for those with low vision. For many individuals, driving is associated with a sense of independence, personal identity, and life satisfaction. 10 A biopic telescope system, telescopes mounted on the superior portion of the spectacle lenses, has been found to be useful by those who have low vision (see Figure 1). During the majority of the driving time, patients view through the car’s mirrors and at brief moments (approximately 2 seconds, or 5% of the time) view through the telescope to view street signs, traffic lights, and other distant objects. 11 Globally, biopic telescopes provide 2x to 4x magnification and a field of view between 6 and 10 degrees. 12 Although visual acuity is the only visual factor that is required in all states for a driver’s license, it has been shown to have a weak relationship with motor vehicle collision rates 13, 14. Biopic driving safety includes being adequately trained on using the telescope, as well as other visual function tools. Good candidates for biopic driving includes congenital, stable visual impairments, with full peripheral visual fields 15.

After an appropriate biopic telescope has been determined dependent on state biopic telescope laws and patient characteristics, the patient receives training and is proven to be proficient with the device while driving. Occupational therapists, vision rehabilitation specialists, and certified low vision therapists usually provide this specialized training. The adaptive driving program determines driving ability by assessing different areas in visual, cognitive processing, physical ability, and driving awareness (see Figure 2). 16 The driving assessment process begins in a stationary environment (parking lot), then in the car, next in slower/suburban areas, and finally in highways and faster paced environments. Once an individual has proven to be proficient in driving with the telescope, they are evaluated by the state licensing agency to determine if a license will be issued.

**HISTORY**

- **55-year-old Caucasian Female**
- **Main complaints: “Improving visual acuity and to drive again.”**
- **Wore biopic telescope with 3x magnification. Left eye turned in more after surgeries**
- **Last Eye Exam: 10/5/2015 with Primary OD
- RE: Mild Hyperopia OU, Mild Astigmatism OU (Currently wears Scleral contact lenses)**

**Therapy VIPS: Discrimination: Color Red/Blue SVI Saccades 1**

**Track and Read: Words with Focus Flexibility**

**Recent Ocular History**

- **Recommended Adaptive Driving Program**

**RESULTS**

**Final Progress Evaluation Summary (3/22/2016)**

**VA:**

- **DVA:** 20/50 OD; 20/40 OS
- **NCVA:** 20/50 OD; 20/50 OS

**Cover Test:** Distance: 35pd CRET

- **Near:** 25pd CRET

**Snellen:**

- **Accurate**

**B.C.**:

- **TTN x3:** diplopa

**Worth Four Dot**

- **Distance: Constant alternating suppression**
- **Intermediate: Constant alternating suppression**

**Near:**

- Fusion at 3 cm without uncovered diplopia closer than 3 feet

**Developmental Eye Movement Test:**

- **35% Speed, 33% accuracy**

**Subjective improvements:**

- **Driving with biopic and loves it. Better at parking her car. She now reads for pleasure without fighting to see clearly. Can paint too small now (never able to do).**

**Plan:**

- Recommended an extension of program to continue developing visual skills.

**DISCUSSION**

- The prescribed vision therapy program included transferring visual skills to driving: scanning, central-peripheral integration, figure ground, reaction speed, processing speed, discrimination, and in-office training with bioptics.

- Biopic telescopes and an adaptive driving program should be considered for a patient with moderate low vision and motivation to improve driving skills.

- There is substantial evidence that residual plasticity is present in the adult brain, allowing for the treatment of visual dysfunctions past the critical period.

- Neurplasticity is often experience dependent, time-sensitive and strongly influenced by the environment. Attention and motivation are also critical factors for plasticity 14.

- Peripheral learning techniques have been proven to demonstrate enduring effects on the visual system and transfer to new visual tasks 15.

- Visual discomfort, glare, driving difficulties, and reduction in near tasks have been reported to decrease quality of life in those with nystagmus. Yoked prisms, vision therapy, and occupational therapy training were effective in reducing visual discomfort. With further training and potential vision, a person with nystagmus can improve driving skills 15.

**REFERENCES**


