

Susan R. Barry, Ph.D.

## Thwarted at every turn

In 2006, Dr. Oliver Sacks published a story about me in the *New Yorker* magazine titled "Stereo Sue."<sup>1</sup> The article described my experience with gaining stereovision at age 48 despite a history of infantile esotropia. Since that time I have written my own book, *Fixing My Gaze*, which provides details about my clinical treatment and perceptual changes. One response to my account, usually voiced by clinicians unaccustomed to working with adult vision therapy patients, is that my experience is "one in a million" or "a miracle cure." My story is indeed unusual but not for the reasons that most believe. Because of the clinical climate and conventional wisdom surrounding strabismus, most strabismic patients seeking improved vision are thwarted at every turn.

Ever since Claud Worth published his classic textbook in 1903, *Squint: Its Causes, Pathology, and Treatment*, there has been debate as to whether a child, esotropic since infancy, can develop the ability to fuse and see with stereopsis. Because Worth believed that infantile esotropes had a congenital weakness of the fusion facility, he maintained that surgery could align the eyes cosmetically but would never result in the acquisition of stereopsis. Francis Bernard Chavasse, a student of Worth's, relaxed this pessimistic prognosis somewhat by postulating that the ability to fuse developed as a series of reflexes in early childhood. Surgery may straighten the eyes sufficiently to allow stereopsis to develop, but only if the surgery was performed on the patient before the age of 2.

In the 1950s, David Hubel and Torsten Wiesel embarked upon their Nobel Prize-winning studies on the

development of the visual cortex. They sutured one eyelid shut in kittens and monkeys and demonstrated that this manipulation drastically reduced the number of binocular neurons in the visual cortex.<sup>2,3</sup> Further studies indicated that there was a "critical period" in early infancy for the effects of eyelid suture.<sup>4,5</sup> In addition, infant cats and monkeys made artificially strabismic did not develop a normal complement of binocular, disparity-sensing neurons.<sup>6</sup> However, Hubel and Wiesel did not test whether a critical period existed for this manipulation.<sup>7</sup> Although the laboratory experiments were carefully controlled and beautifully executed, the medical community overextrapolated these results to the clinic with little consideration for the differences between the experimental conditions and human disorders. What had been opinion became dogma. Although the concept of the critical period is softening in the current scientific literature, it will take time before these ideas permeate the medical community. With few exceptions, most ophthalmologists and optometrists still tell their adult patients with strabismus or amblyopia that they have missed a critical period in early childhood for the development of stereovision, that their brains have been permanently rewired, and that their vision is not likely to improve.

Armed with the concept of the critical period, ophthalmologists began to operate on strabismic infants in the first year of life with some success. With the push for early surgery and an emphasis on treating very young children, they abandoned, for the most part, the orthoptic techniques pioneered in the late 1800s by Louis Emile Javal. These procedures had



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been effective in straightening the eyes and promoting stereopsis in adult patients, but the time and effort involved in this training was considered prohibitive. It was left to a small group of optometrists to develop better rehabilitation techniques.

Frederick Brock and William Ludlam as well as other optometrists spent their careers examining not only how their strabismic patients moved their eyes but what it was that their patients actually saw. They realized that strabismus is as much an adaptation to underlying binocular imbalances as it is a cause of a poor ability to fuse. With these observations, they modified and expanded orthoptics into a series of vision training or vision therapy procedures that were enormously effective. In one study of 149 adult strabismics, Ludlam reported that straight eyes and binocular vision developed in 75% of patients, none of whom had had surgery.<sup>8,9</sup> From the 1930s through

the 1950s, Brock published extensively in optometric journals.<sup>10-13</sup> However, with the growing momentum for the concept of the critical period and the push for early strabismic surgery, these studies were largely ignored.

One of the greatest contributions of Frederick Brock was his understanding of the importance of stereopsis in everyday vision. Brock recognized that a person who has always been strabismic and stereoblind cannot imagine stereoscopic depth using monocular cues such as perspective or shading. Moreover, a person with normal binocular vision cannot experience the compressed and flattened worldview of someone who has always been stereoblind. Even if someone with normal binocularity closes one eye, that person will still use a lifetime of stereo experiences to fill in the missing information. Most importantly, a lack of stereopsis implies much more than a flattened worldview. Poor or absent stereovision indicates a weak ability to integrate the input from the 2 eyes, an increase in visual conflict, and less efficient vision. Sadly, these considerations still receive little attention so that many strabismics are told that their vision is good enough.

Today, a relatively small group of optometrists still practice and continue to perfect optometric vision therapy techniques. (Some are board certified by the College of Optometrists in Vision Development and others have completed the American Academy of Optometry diplomate program of the Section of Binocular Vision and Perception.) Yet, it is difficult for a strabismic patient to learn about, much

less access, this type of clinician. Many ophthalmologists are hostile to and ignorant of optometric vision therapy and do not recommend, or may actively discourage, their patients from pursuing these treatments. I was indeed lucky to consult an optometrist who saw my need for vision therapy and who referred me to an optometric colleague who was skilled in these techniques. Finally, optometric vision therapy may not be covered by medical insurance, creating the impression that the therapy is either dubious or unaffordable. When adult strabismics are told that they are too old to change, that those who provide optometric vision therapy are practicing unproven regimens, that the therapy is not covered by insurance, and that their subnormal vision is good enough, it's no wonder a story like mine is "one in a million." The barriers to better vision for a strabismic patient originate more from old dogma and professional prejudice than from the underlying biological cause.

### Acknowledgment

Susan R. Barry, Ph.D., photo by Rosalie Winard.

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