

Does Vision Therapy Work? The Wrong Question: A Perspective *'the power of a lollipop'*

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When the first author was a third-year student at the Massachusetts College of Optometry in 1972, he had a short and simple, but life-changing, conversation. While sitting outdoors on the steps after our ocular disease class, the instructor, a very bright ophthalmologist, joined me for a chat. The topic of "vision therapy" came up. I knew very little, and he even less. He asked, "Does vision therapy work?". I replied a confidant, "Yes." He was somewhat sympathetic but responded, "Maybe give the child a lollipop instead." The

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Ciuffreda K, Ludlam D, Yadav N. Does vision therapy work? The wrong question: A perspective. *Vision Dev & Rehab* 2016;2(2):101-4.

Keywords: accommodation, mild traumatic brain injury, motor learning, near work, perceptual learning, vision therapy, visual-evoked potentials

implication was that the added attention and positive reinforcement given to the student by the optometrist/vision therapist, the classroom teacher, the parents, and others, provided the basis for the 'improvement', in reality a placebo effect. That conversation remained in the back of my mind. It had a big impact a few years later---our graduate research laboratory at Berkeley published the first study demonstrating objectively that 'vision therapy works' in a small cohort of optometry students with accommodative insufficiency and slowed accommodative dynamics.¹ This was confirmed in two subsequent laboratory studies.^{2,3} That was the beginning for me — I was hooked!. Over the years, we, and others, have used a variety of approaches, including objective techniques,⁴⁻¹² clinical trials,^{13,14} retrospective analysis,^{15,16} meta-analysis,^{17,18} and well-documented case reports and case series¹⁹⁻²² to demonstrate the efficacy of vision therapy over a range of diagnostic groups, such as traumatic brain injury, convergence insufficiency, amblyopia, and others. Thus, over the past nearly 100 years, our profession, and particularly the area of vision therapy, has evolved from the early days of clinical anecdotes and philosophizing at regional meetings to objective, physiological evidence for direct vision therapy-related brain changes.

Related to the above anecdote, there are THREE critical questions that one may ask:

First, "Does vision therapy work?" Unfortunately, that is now the wrong question. It is passé. This is asked by an 'uninformed' individual. The response, then and now over 40 years later, remains a resounding, "Yes!" This reply is now based on the positive results of a wealth of studies, some of which are cited in this perspective.

Second, "How does vision therapy work?" That is, what are the underlying mechanisms? This is an appropriate

question. Most/all of what we do in vision therapy broadly encompasses the area of psychology referred to as 'perceptual and motor learning'. Perceptual learning was likely first enunciated by Gibson and Gibson (1955).²³ That is, if one practices some perceptual (sensory) task repeatedly, one will improve substantially (30% or more) in the task. The optometric analog would be a blur discrimination task during lens sorting in amblyopia. More recently, perceptual learning has come into the forefront in the area of amblyopia therapy as an 'explanation' to describe what occurs in parts of the overall therapeutic program.²⁴ Motor learning was most likely first enunciated by Bryan and Harter (1897)²⁵ in the context of learning Morse code manually. The optometric analog would be eye movement training, eye-hand visuomotor training, etc. Thus, the perceptual/sensory and motor areas in the general psychology area of 'learning' provide the scientific basis for what we do in much of vision therapy.^{24,26}

Third, *"What are the underlying neural substrates that are positively impacted by our perceptual and motor-learning-based vision therapy?"* This too is an appropriate, and critical, question in the trilogy. Again, there is considerable and growing indirect and direct evidence of support. This comes from two lines of investigation: (1) objective techniques assessing positive changes in the specific system response per se, such as found over the past decade for both eye movements²⁷⁻²⁹ and accommodation³⁰ in mild traumatic brain injury. Based on the changes found, one can infer the positively impacted neural control centers/substrates. (2) objective techniques directly assessing positive changes in brain responsivity, such as by the visually-evoked potentials (VEP)¹² and brain imaging.⁷ These two approaches will likely continue in the near future, for

example in the areas of brain injury and also convergence insufficiency.

So, the next time someone asks the question, "Does vision therapy work?" give them a lollipop whose "flavor" is information, and let them relax and savor the evidence provided in this short missive.

Acknowledgement:

We thank Dr. I.B. Suchoff for his insightful comments.

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