

## Integration of Auditory and Visual Systems

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*Author's Note: The work of Leonard J. Press, OD, provided much support for these concepts and is referenced in many parts of this article. Both his monograph, Parallels between Auditory and Visual Processing, and his article, "Historical Perspectives on Auditory and Visual Processing", are excellent resources for those who wish to do more in-depth reading on this topic.*

### **Experiences with Berard AIT Reflect the Connection between these two systems.**

Dr. Berard shared an account from one of his patients who, shortly after having received Berard AIT, called to complain that he could not see as well since he finished the program. Dr. Berard suggested that he make an appointment with his eye doctor because Dr. Berard, an ENT, was not trained to examine eyes. After the patient visited his eye doctor, he called Dr. Berard again, this time exclaiming that he had needed a new reading prescription because his vision had improved! Dr. Berard did not have an explanation for this, but was pleased for the patient's good results.

Having done Berard AIT for over 2 decades now, I have also had many reports and evidence from my clients regarding changes in visual skills following the training. One mother was delighted to learn that her son's vision had a

significant shift in acuity, from being legally blind to reading the chart at 20/60 about 6 weeks after AIT. Another client reported to me that he "can tell where the floor is now." Parents brought examples of pre- and post-AIT handwriting and coloring samples to show me the improvements.

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One child's drawing of the "Hamburgler" demonstrated her new awareness of spatial perspectives. She drew his image facing frontwards, and then exclaimed "I can draw him from the back, too!"

These reports provide some evidence of change in the visual system. The changes occur in various aspects of vision, not just acuity, or depth perception.

There is also evidence of the auditory/visual connection in the form of test results. A child's performance on the Phelp's Kindergarten Readiness Test showed the following percentile rank changes in processing after Berard AIT:

Verbal Processing 25/75 (before/after),  
Perceptual Processing 9/50, and  
Auditory Processing <1/91,  
Total readiness score 3/77.

Vision screenings may include use of the Van Orden Star and Cheirosopic Tracings. When these measurements are done pre- and post-Berard AIT, significant improvements have been noted in many clients. Behavioral optometrists have also reported significant progress in clients' visual abilities after AIT.

Reading is another skill area in which we receive reports of positive change. A client reported to me that she could read twice as long now after 7 days of the Berard program. When asked what was different now, she replied, “I don’t get tired now. I know what the words mean when I read them, so I don’t need to keep re-reading.”

### **Theories about the integration of the auditory and visual systems.**

The evidence of the relationship between the auditory and visual is available in many forms and we feel confident that the Berard AIT program is facilitating the integration of the two systems. The puzzle is understanding how or why this occurs.

In 1994, the Cerebellar-Vestibular System (CVS) theory was published in *The Sound Connection*<sup>1</sup> to provide a possible explanation about some of the results that are observed after Berard AIT. A dysfunction of the CVS can produce an assortment of symptoms and behaviors. Some of these include problems with

- hearing and vision,
- balance and coordination,
- abnormal responses to motion,
- sense of time and direction,
- concentration and memory,
- hyperactivity,
- obsessive-compulsive behaviors,
- academic performance,
- anxiety.

Auditory integration training may be one method of providing stimulation to the CVS to help reorganize a dysfunctional system. When the sound vibrations trigger reorganization, it is not just reorganization within the auditory system, but rather within the CVS, which can impact on all brain functions that it regulates.

Optometrists have a history of interest in both auditory and visual processing and have developed materials for skill development in these domains. In the 1970s, Dr. Jerome Rosner developed the Visual Analysis Test (VAT) and the Auditory Analysis Test (AAT) to facilitate his design of a perceptual skills curriculum. These tests were followed by creation of the Spatial Awareness Skills Program and the Phonological Awareness Skills Program.<sup>2</sup> Dr. Harry Wachs and Hans Furth developed many therapy activities with a focus on processing within many domains, including visual and auditory (*Thinking Goes to School*, 1975).<sup>3</sup>

### **Dyslexia: Visual, Auditory, or Both?**

Dyslexia has been a concern for those involved in education and for parents of children who struggle with learning to read. Particularly in the U.S, dyslexia is often thought of as a visual disorder and treatment may be focused in that arena. Dr. John R. Griffin and Dr. Harold Walton suggested that there

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*Weaknesses in auditory/visual integration are factors in reading disabilities.*

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are two forms of dyslexia, dysphonetic (the auditory form) and dyseidetic (the visual form), and that both forms involve visual and auditory processing. Findings from studies done by Dr. Harold Solan and Dr. H.G. Birch led to the conclusion that weaknesses in auditory/visual integration are factors in reading disabilities.<sup>4</sup> When children with reading disorders quickly begin to read with more efficiency after Berard AIT, it may be that one, or the other form, or perhaps both forms were present. This suggests the AIT stimulated reorganization and integration of the auditory/visual connections, enhancing the skills needed to become a proficient reader.

Dr. Solan and his colleagues note the important relationship of auditory and visual processing through the vestibular system as a dominant factor in our primary learning processes. They state that “since vestibular responses are associated with eye movements and hearing, they contribute to visual and auditory processing”.<sup>5</sup> These observations provide further support for the cerebellar-vestibular system theory about Berard AIT.

### **Auditory and Visual: Parallel Processing Systems**

Dr. Leonard Press explains the parallels or similarities between auditory and visual processing in his book, *Parallels between Auditory and Visual Processing*.<sup>6</sup> Dr. Keith Holland presented this same concept, reporting that every function in the visual system has an equivalent in the auditory system. Professionals in the field of special education are quite familiar with evaluations of

- figure-ground,
- discrimination,
- memory,
- closure,
- and sequencing

in both the domain of auditory as well as that of vision. Of particular interest is Holland’s point that there is top-down and bottom-up interaction of auditory processing in the inferior colliculus for sound as there is in the superior colliculus for vision. In other words, auditory perception mirrors visual perception.<sup>7</sup>

Researchers at the Ruhr University-Bochum, in Germany, also recognize that neural pathways simultaneously process information from different senses. They discovered that patients who are blind in one side of their visual field can

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benefit from listening to sounds on the affected side. After passively listening for an hour, the patients’ ability to detect light stimuli in the blind half of their visual field improved significantly. Dr. Jorg Lewald states “there is increasing evidence that processing of incoming sensory information is not strictly separated in the brain”.<sup>8</sup>

Dr. Lewald reports that nerve cells in the superior colliculus process auditory and visual information simultaneously, and this area is not usually affected by visual field defects. So there are some dormant capabilities in the blind half of the visual field. Because these same nerve cells also receive auditory information, the researchers tried acoustic stimuli to increase sensitivity to

light stimuli, and it was successful, though the effect lasted 1.5 hours. The researchers are now focused on gaining more sustained improvement in visual abilities and use of sound stimulation for more complex visual functions.<sup>9</sup>

### **The Future: Berard AIT and Vision Therapy are Complementary, Educationally Related Services**

There is ample evidence of the connection or integration between the auditory and visual systems, and there is evidence that when the integration of these systems is faulty, there can be significant breakdowns in the learning process. There is also evidence that retraining of the auditory system, which seems to carry over to retraining of visual functions, enhances the learning process. Collaboration between behavioral optometrists and Berard AIT practitioners would likely result in better understanding and ultimately better methods for improving the integration of these two systems, ultimately leading to enhanced learning abilities. Berard AIT, a non-invasive, easy to apply technique, could be another tool for behavioral optometrists whose goal is integration of the auditory/visual systems to optimize learning skills.

#### References

1. Brockett S. The cerebellar-vestibular system theory. *Soc Aud Intervention Tech, Sound Connect.* 1994;2(2):6.
2. Press, LJ. Historical perspectives on auditory and visual processing. *J Beh Opt* 2012;23(4):99-105.
3. Furth HG, Wachs H. *Thinking Goes to School: Piaget's Theory in Practice.* New York: Oxford University Press, 1975.
4. Press, LJ. Historical perspectives on auditory and visual processing. *J Beh Opt* 2012;23(4):99-105.
5. Press, LJ. Historical perspectives on auditory and visual processing. *J Beh Opt* 2012;23(4):99-105.
6. Press, LJ. *Parallels between auditory and visual processing.* Santa Ana, CA: Optometric Extension Program Foundation, 2012.
7. Press, LJ. Historical perspectives on auditory and visual processing. *J Beh Opt* 2012;23(4):99-105.
8. Ruhr-Universitaet-Bochum. "Hear to see: New method for the treatment of visual field defects." ScienceDaily. ScienceDaily, 30 May 2012. <http://www.sciencedaily.com/releases/2012/05/120530100242.htm>
9. Ruhr-Universitaet-Bochum. "Hear to see: New method for the treatment of visual field defects." ScienceDaily. ScienceDaily, 30 May 2012. <http://www.sciencedaily.com/releases/2012/05/120530100242.htm>