NEW PRODUCT REVIEW

THE NEURO-VISION REHABILITATOR (NVR)

Developed by Allen H. Cohen, O.D. and Rodney K. Bortel

Reviewed by Irwin B. Suchoff, OD, DOS

INTRODUCTION

The history of how instrumentation used in vision therapy/vision training (VT) has evolved has yet to be written. Nevertheless, while Dr. Leonard Press doesn't focus on the topic in his chapter on the evolution of VT, he does note the movement from in-instrument to out-of-instrument techniques.[1] Thus, there was an initial primary dependence on instruments such as stereoscopes and synoptophores. The expansion to the utilization of, e.g., the Hart Chart and Marsden Ball techniques and the Brock Posture Board comprise a second generation. The third generation encompasses projected images with the use of anaglyphs and vectograms and, more recently, the use of computers.

Another aspect involves the sequencing of the VT regimen. Initially, the thrust in strabismic orthoptics was for the development of fusion, first at the angle of deviation, and then extending the fusional ranges.[2] Over time this changed to a hierarchical sequencing of first maximizing ocular motility and accommodative performances for each eye, then to developing the various levels of motor and sensory fusion with anti-suppression techniques.[3]

Two other additions gradually found their way into the VT regimen. The first was based on a component of Skeffington's Venn diagram of four circles that comprised the vision process; namely the anti-gravity portion. This recognized the importance of what Birnbaum described as being concerned with balance and position in space, and providing a frame of reference for orientation and spatial localization.[4] Ayres elaborated on the concept by describing the interactions between the visual and vestibular system: The vestibular system acts as an anchor for the visual system by virtue of the gravity sensitive calcium carbonate crystals in the vestibular system's labyrinth, and the directional sensitive semi-circular canals. Ayres further stated that visual information is useless unless the individual can relate what is seen to a physical reference, and this reference is provided by the vestibular system. She also stressed the crucial role of inter sensory integration in human development and in all activities of daily living.[5]

Suchoff IB. New Product Review: The Neuro-Vision Rehabilitator (NVR) J Behav Optom 22;13-15.

THE NEURO-VISION REHABILITATOR (NVR)

The developers of the NVR have sought to include all the above aspects of VT into a single system. Dr. Allen H. Cohen provided the conceptual framework based on his many years of practice at the Veterans Affairs Medical Center in Northport, N.Y., and in his private practice on Long Island, New York; Rod Bortel, owner of HTS, and his staff provided the expertise to package it into an elegant computer based system utilizing Wii hardware. Included are: a Blue Tooth integrated balance board; an infra-red head sensor; a controller sensor receiver, a wireless remote controller or "hand shooter"; the NVR software system; and an Operations Manual. A projector, computer, and screen are necessary, but not included.

The software contains five treatment modules. Each has at least four levels of increasing task complexity in terms of cognitive loading, changes of target characteristics, and the speed of computer based presentation. Other options include the use of the head sensor and balance board to monitor proprioception, and the inclusion of verbal instructions, or auditory signals that indicate correct or incorrect performance of the particular task. This is accomplished by the computer sensing the position of the manually placed cursor of the hand shooter on a designated target; essentially this is a monitoring of the eye-hand coordination aspect of kinesthesia. The sense of touch can also be incorporated. This is by vibrations of the hand shooter that signals an incorrect response. Three of the modules incorporate anaglyphic presentations for anti-suppression, monocular fixation in a binocular field, or stereoscopic enhancement techniques. Figure 1 shows the starting screen and available options for one of the modules. The system also provides archiving of patient demographics and reports for each therapy session.

THE MODULES

In each of the modules (Figures 2-6) there is a central "bull's eye." This is the "home base" to monitor head position that is signaled by the head sensor and signals sent by the balance board. The patient's task is to place a green circle that represents the head position, and a purple cross that represents placement on the balance board into the center of the bull's eye.

The following discussion does not necessarily represent the sequential order in which the modules are used; that determination is made by the doctor according to the patient's clinical signs, symptoms and capabilities.

1. **Visual Motor Enhancer (VME).** This is a rotator with a selection of targets that can be randomized in terms shape, speed and direction of rotation for saccadic eye movements. See Figure 2.
2. **Ocular Vestibular Integrator (OVI).** This module is basically a grid con gu-ration with bull's eyes that are smaller

than the central home base, randomly appearing in the grid's system. The patient's task is to keep xation within the central bull's eye and note when a peripherally situated bull's eye lights up, and "shoots it" with the wireless remote controller. Figure 3 shows an advanced level of the OVI where, after the target has been shot, a square with letters is exposed. The patient then shoots each letter as directed.

3. **Dynamic Ocular Motor Processing (DOMP).** A grid con guration with letters or geometric forms uniformly placed constitutes the basic screen for the module. The patient makes a saccade movement and then shoots out the targets based on self or computer generated directions. Figure 4 depicts a moderate level of the DMOP where the computerized generated underlined letters are the targets. The patient would be instructed to "Start at the top line, and go left to right and shoot out each underlined letter, and continue to the last line".
4. **Visuomotor Integrator (VMI).** The golf course as shown in Figure 5 is the screen for this module. At a basic level the patient locates the golf cart, shoots it and then "pushes" it with the wireless remote controller to the ags in numerical order. At a more advanced level the remote's cursor is placed on the cart and must stay on it as the cart moves at random directions and speeds.
5. **Fixation Anomalies (FA).** The serpentine line as shown in Figure 6 is the screen for an advanced level of the FA module. It aims to lessen intrusion xations, eccentric xations and nystagmoid eye movements. The patient shoots a designated target placed on the serpentine line and then moves down the line, keeping the cursor of the remote controller on the line until another designed target is found and shot. This continues to the end of the line. At the highest level the technique is presented in an anaglyph setting.

The above description of the instrument and its modules is meant to orient the reader to the NVR. The regimen of how it is used is reflective of a model espoused by Dr. Cohen. Its basis is the plasticity of the nervous system.[6] The method of therapy follows a system of motor learning that has three parts: First, that the new skill is learned by trial and error with constant feedback; second the skill is repeated and

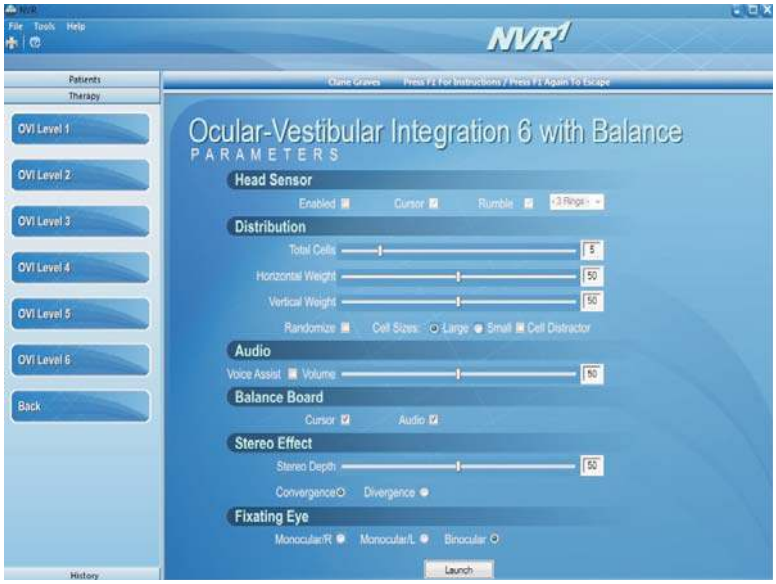

Figure 1.

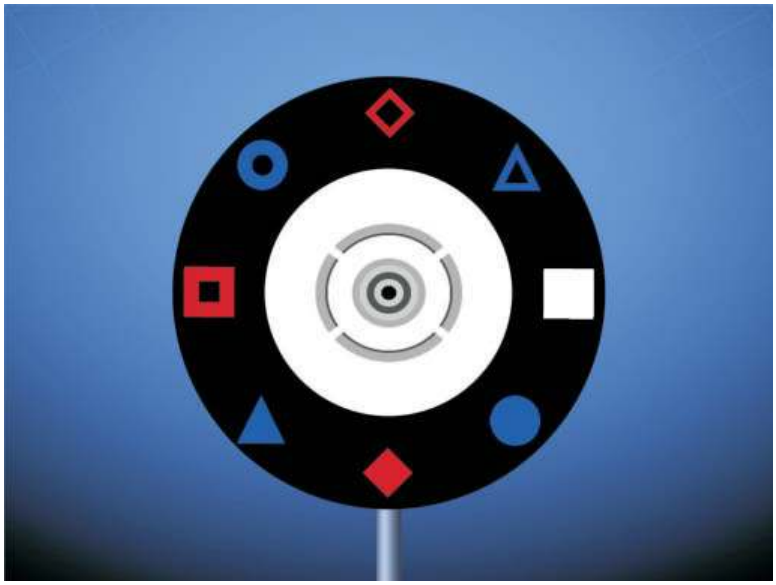

Figure 2.

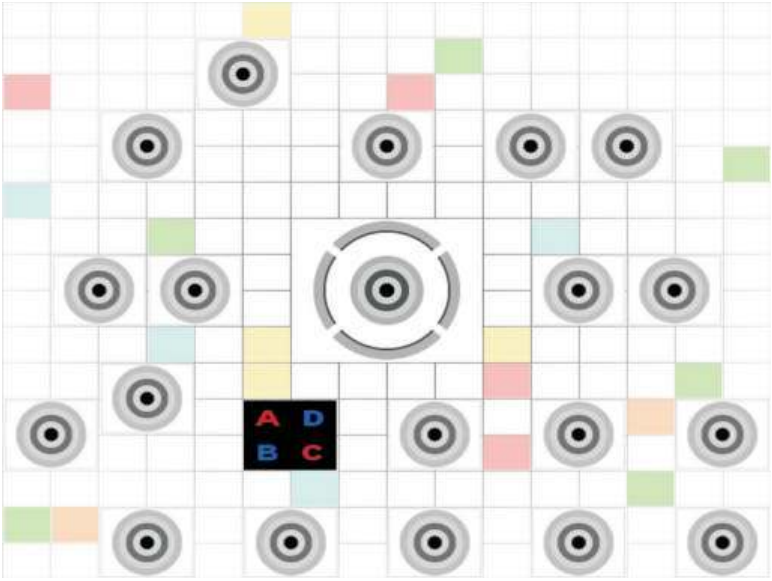

Figure 3.

Figure 4.

Figure 5.

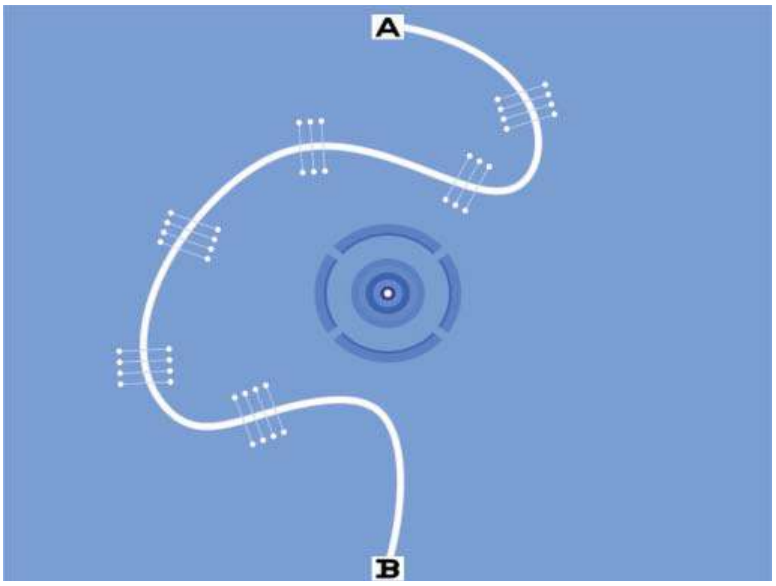

Figure 6.

refined so that task difficulty can be increased, again with feedback; lastly, that the motor skill becomes very accurate and automatic without the need for feedback.[7] Dr. Cohen has translated this into three therapeutic phases for the NVR. The first is to enhance the stability of the visual input system, phase two develops fusional sustenance, and the third phase is to develop speed of visual information processing and stability of visuomotor performance. The Operations Manual provides detailed information of how each phase is attained by using appropriate levels of the various modules. There is also an online video demonstration of the NVR at http://nvrvision.com.

Dr. Suchoff has no financial interest in the NVR.

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For product information:
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See HTS ad on page 19 of this *Journal* for detailed information on the The Neuro-Vision Rehabilitator (NVR).