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## **A New Vision of Rehabilitation Recovering cognitive abilities with Dynavision**



Occupational therapists are constantly striving to find the evidence-based interventions that will help clients improve their occupational performance and reach their desired functional outcomes. We draw upon our academic preparation and clinical experiences and seek out continuing education, research evidence, and input from our colleagues. We look for the most efficient and effective treatments that wisely make use of insurance benefits. We choose therapeutic activities and exercises that are engaging and challenging to the client to gain their full participation.

Figuratively speaking, OTs carry a large toolbox of strategies they can customize for interventions using a client-centered and evidence-based approach. Dynavision is one I have tool I have found effective in preparing clients to perform their occupations in the rehabilitation setting.

### **A Valuable Tool in the Physical Rehabilitation**

In the physical rehabilitation setting, a significant percentage of the population has had a stroke and traumatic brain injury (TBI) make up a significant percentage of the population. Stroke is a leading cause of long-term, severe disability in Americans, and currently 5.5 million US adults

live with the effects of a stroke. Approximately 1.4 million Americans experience a TBI each year (1).

Patients who have sustained a stroke or brain injury often face impairments in visual, perceptual, cognitive, and physical skills. Other neurological conditions such as spinal cord injury and debilitation contribute to the wide variety of clinical diagnoses treated in rehabilitation settings. Clients with these conditions often experience functional limitations resulting from impairments in balance, coordination, range of motion, strength, and endurance.

The Dynavision can be used to address the performance skills impaired by these conditions, including motor and praxis skills and sensory perceptual skills, and in doing so improves the client's ability to engage in daily occupations (2). Dynavision exercises specifically address compensation and remediation for:

- visual field loss (i.e., hemianopsia or quadrantopsia)
- visual hemi-inattention
- impaired ability to alternate, divide, and sustain visual attention
- delayed visual-processing and visuomotor reaction time
- impaired eye-hand coordination
- impaired dynamic standing/sitting balance with reaching
- limited range of motion
- generalized weakness and limited endurance

### **What is the Dynavision?**

The Dynavision is a large, computerized light board containing 64 small red square target buttons that light up randomly one at a time. The client searches the board to locate the lighted button. Once located, the client touches the button to extinguish the light. The target button beeps when it is touched and another button is randomly illuminated in a new location on the board. The client attempts to extinguish as many targets as possible during an exercise "run" on the board which lasts either 30 or 60 seconds, or 4 minutes.

An LED (light emitting diode) rectangular display is positioned in the center of the board and can be programmed to periodically display numerals 1-7 during an exercise run. The therapist can use this option to test and challenge the client's ability to divide and shift attention between the center of the board to locate and read out the number and the periphery of the board to hit the lights. It can also be programmed to display lights in only one quadrant, or multiple quadrants in combination, and use the entire board or only the inner the rings.

The therapist programs the board by selecting options that control the modes, light speeds, working areas, and speed and number of digits displayed in the center panel. The board is mounted on a wall and can be adjusted up or down to accommodate individual differences in height and for clients in wheelchairs.

Because of the numerous programming options, the therapist can program the board to provide the client with the desired assessment and training challenge. It operates on two basic modes:

Self pace or apparatus pace. In the self-pace mode, a lighted button randomly appears and remains lit until the user touches the button. On the apparatus-paced modes, the therapist predetermines the speed that the buttons light up. The random targets are timed and automatically extinguish if not hit within the set time period. The length of time the digits appear in the center display can be set by the therapist.



**Originally developed to improve visuomotor skills of athletes competing in sports such as hockey, basketball and football, Dynavision™ 2000 may help patients improve hand-eye coordination, reaction times and reaction speeds. (All photos courtesy of Bioness Inc.)**

A computerized analysis of the individual's performance is useful for showing progress and educating the client on the need to learn strategies for how to compensate for their impairments. Longer durations address sustained attention, cognitive impairments, and physical endurance, in addition to teaching compensatory strategies, peripheral awareness, and visual-motor skills.

The new version, Dynavision D2, was introduced in 2010 and is made of steel, Lexan plastic, and aluminum. The Dynavision D2 weighs 125 pounds compared to the Dynavision 2000, which weighed 270 pounds, and the D2 has more features allowing for further versatility. The 2000 light board's height adjustment was manual and had a range of 11 inches whereas the D2 has a motorized height adjustment with a range of 28 inches to use with very tall clients, children, or for sitting activities.

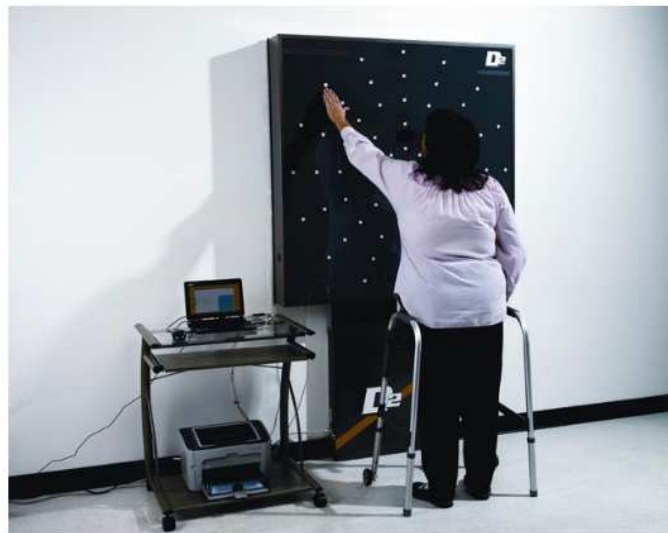
Instead of a wall-mounted control panel, the D2 uses a laptop computer so that information can be saved and viewed in graph format to show individual progress. The therapist can manipulate the way the printout presents the analyzed information, making it reader-friendly for educating clients, sharing results in team meetings and with physicians, and adding into reports. The data is password protected to protect client information.

While the 2000 had red lights only, the D2 has red and green LED lights and can be programmed to have a specified percentage of green lights appear. In one application, therapists can ask the client not to strike the green light when it appears as a way of challenging the client's cognition. The manufacturer is currently working on upgrades such as adding words, letters, and symbols to

the center display screen allowing for more in-depth cognitive training. The Dynavision D2 is manufactured by Performance Enterprises, a Canadian owned company, and as of February 15, 2010 is distributed by Bioness, Inc. who provides training and support.

### **Evidence-base for the Dynavision**

Currently, there are over 400 Dynavisions being used in rehabilitation facilities across the United States. The Dynavision was originally developed for use in athletic training to improve performance skills in visual scanning, peripheral awareness, and visual-motor reaction time. According to Mary Warren, MS, OTR/L, SCLV, FAOTA, occupational therapists have used the Dynavision in rehabilitation since 1986 “ to address visual, cognitive and motor impairment in persons with acquired brain injuries”.



**Patients experiencing loss of visual function due to stroke, traumatic brain injury and other neurological disorders and diseases may improve the processing of visual information in static and dynamic environments to help compensate for visual impairment.**

In a recent study, Warren found evidence for Dynavision’s effectiveness in rehabilitation in the training of compensatory scanning strategies for visual-field deficit and visual inattention (5).

A recent study by Vesia, Exposito, Prime, and Klavora investigated the correlation between Dynavision scores and common psychomotor tests, suggesting a potential for the Dynavision to be added as part of psychomotor assessment (5). In addition, there have been studies published correlating Dynavision training to driving performance with persons with stroke and brain injury (6-8). Although the body of research is building, there is opportunity and need for continued research on the Dynavision. There is a need for establishing norms, further investigating relationships between Dynavision and occupational performance, and further investigation of its use as an assessment tool.

### **From Clinic to Community**

As an outpatient OT at Sharp Rehabilitation Services in San Diego, I use the Dynavision on a daily basis for both assessment and intervention. The concept of touching the lit button is cognitively simple so that even lower functioning clients usually understand and are able to interact with the board. Its versatility allows for customizing the parameters to obtain a client's baseline performance and direct the subsequent training.

When used to increase range of motion, eye-hand coordination, and balance while reaching, the scores are even simpler. The client strives for more hits, faster hits, and farther-reaching hits. My clients enjoy the challenging but fun method of trying to beat their baseline scores. They enjoy competing with themselves and seeing their progress on the printed analysis. The challenge and competition engages participation with good motivation.

In my experience, Dynavision training can improve a client's safety in the community by providing them with the opportunity to practice dynamic strategies that increase their scope and speed in visual search and teaches them how to employ organized search methods to an impaired visual field or neglected side. The board also challenges the client to improve their ability to rapidly shift attention between the central to peripheral field; increase visual processing speed and attend during multi-processing tasks. These skills are important for navigating through dynamic environments either on foot, in a wheelchair, or an automobile.

### **Taking Action**

Jose was a 50-year-old man who experienced a stroke with subsequent left homonymous hemianopsia and mild left inattention. He complained was that he was not able to see to the left. He was fearful of walking in unfamiliar places and avoided crowds leaving him dependent on his family when venturing outside his home. He came to occupational therapy with the goals of returning to work and driving. His Dynavision assessment involved four baseline runs.

The first run was a self-paced, 60-second trial where the light stayed on until he pushed it. The second run was an apparatus-paced 60-second trial with each light stayed on for 1 second only. If he did not hit the light by the end of the second, the light went out and was considered a miss. The third run was set up the same as the second but with the added challenge of three digits appearing for 1 second in the center screen. Jose was instructed to call out the numbers while continuing to monitor and push out the red lights on the board. The fourth run was set up the same as the third but lasted for 4 minutes to assess his sustained attention and endurance.

During the training phase, Jose was instructed in strategies such as compensatory scanning, organized search patterns, peripheral awareness, and multi-processing for attention, speed, and efficiency. During each therapy session, he received approximately 10 minutes of Dynavision training where he practiced his compensatory strategies and worked to beat his baseline scores.

The printouts of his performance were useful in educating him on how well he was using compensatory strategies, organizing his visual search, and multi-tasking. Reviewing the printouts after each run helped him learn to make the proper adaptations. After 12 sessions, he was able to demonstrate efficient compensatory scanning, improved visual processing speed, visuomotor reaction time, and the ability to multi-task. Upon discharge from occupational therapy, he was

referred to the adaptive driving program for evaluation and training behind the wheel. He was able to meet his goal of returning to driving and going back to work.

Another client who volunteered as a story reader in her grandson's classroom prior to her stroke wanted to be able to resume reading to the children, but her hemianopsia caused her to be fearful of navigating among the crowds of children.

With Dynavision training included in her treatment, she was able to learn to consistently use compensatory scanning to maintain her orientation and navigate busy environments. It is important for clinicians to have options that are evidence-based, easy to use, provide solid documentation of progress, and facilitate functional outcomes. I have included the Dynavision in my toolbox of treatments. More information about the Dynavision can be obtained from the Bioness website.

— *Laura Nelson, MS, OTR/L, is an occupational therapist at Sharp Rehabilitation Services in San Diego, Calif. Questions and comments can be directed to [editorial@therapytimes.com](mailto:editorial@therapytimes.com).*

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