

The Dynavision 2000 Training Board in Rehabilitation  
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Originally designed as a device to improve the visuomotor skills of athletes, the Dynavision 2000 Light Training Board has been adapted to provide the same training benefits to persons whose visual and motor function has been compromised by injury or disease. For persons with visual and visuomotor impairment the apparatus is used to train compensatory search strategies, improve oculomotor skills such as localization, fixation, gaze shift, and tracking, increase peripheral visual awareness, visual attention and anticipation, and improve eye-hand coordination and visuomotor reaction time. For persons with motor impairment it can be used to increase active upper extremity range of motion and coordination, muscular and physical endurance and improve motor planning. It has been successfully used to improve function in children and adults with limitations from stroke, head injury, amputation, spinal cord injury and orthopedic injury. Currently there are over 100 units in rehabilitation hospitals across the United States.

#### Physical Description of the Dynavision Apparatus

The Dynavision is approximately 5 foot by 4 foot board containing 64 small red square target buttons arranged in five nested rings. Each button covers a single small light bulb which illuminates randomly when the device is in use. An L.E.D. (light emitting diode) display is situated just above the center of the training surface. The board is wall mounted and adjustable to accommodate users of different heights. A computerized display panel, printer, and membrane control panel are situated on the left hand side of board. The control panel has 37 operating keys, which control four modes, six light speeds, three working areas, four quadrants, 1-7 digits with displays of 1 to .1 second and run times of 30, 60 or 240 seconds.

With these numerous options, a variety of training and testing tasks can be generated using either self paced or apparatus paced modes. In the self paced training mode, (mode A) a target button illuminates in a random location on the board. The user must locate the light and strike it with the hand as quickly as possible. When struck, the light beeps and extinguishes and another target light appears in a random location on the board. The user proceeds to strike the target lights for the duration of the exercise. The numbers of light "hits" are recorded and displayed at the end of the run. In the apparatus paced mode, the light is illuminated for a preselected period of time of 5, 3, 2, 1, .75 or .5 seconds. The user must strike the target within the preselected time to score a "hit". Apparatus paced exercises are more challenging than self-paced exercises.

Different options can be selected to accompany the two modes depending on the needs of the user. Exercises can be preselected to run 30, 60, or 240 seconds. Longer durations are useful for working on maintaining sustained attention; shorter durations for exercises requiring high intensity performance. The board can be programmed so that lights appear within only one quadrant to challenge the user who may have difficulty scanning or reaching in a certain direction. The training surface can also be adjusted between use of the full board (lights in all five rings illuminate) the middle board (the inner 4 rings of the board illuminate), or the inner board (the central three rings illuminate). The middle and inner board surfaces are suitable for children or adults with limited active range of motion or strength. When the flash option mode is used, the L.E.D. display in the center of the board can be programmed to display from one to seven digits periodically during the exercise run. The user must call out the numbers while striking the target buttons, a task which requires the ability to monitor and shift attention

smoothly between the central and peripheral visual field. . This program option significantly increases the cognitive demands on the user. Other instructional variations can be used to increase the cognitive requirements of the training tasks. For example, the user may be asked to multiply or add the digits in the L.E.D. display while striking the lights on the board. Or, on B mode, the user may be required to refrain from hitting lights when they appear in certain areas of the board or to strike lights with a certain hand only.

On completion of an exercise run, the Dynavision prints out an analysis of the user's performance, including a comparison of reaction time and accuracy in the four quadrants of board. This provides the clinician with objective data on the user's strengths and weaknesses in performance and assists in evaluation, treatment planning and documentation.

### Uses in Rehabilitation

The design of the Dynavision board in terms of size, button configuration, and number of program options enables the device to be used in treatment with a variety of age groups and rehabilitation conditions. The simplicity and straightforwardness of the response required (striking the button) enables persons with limited comprehension to understand the demands of the task. The ability to limit presentation to the inner ring of lights, coupled with the ability to lower the position of the board allows it to be used by persons with restricted upper extremity range of motion, wheelchair users, and children. Although precision in the striking the button is required, the button can be struck with any part of the hand such as the palm, fingers, or back of the hand. This allows persons with limited prehension due to conditions such as quadriplegia, hemiplegia or amputation to successfully work the board. Presentation of exercise drills as games of skill makes the Dynavision exercises fun while challenging users to give their best effort.

Ability to select different speeds of stimulus presentation from the self-pacing of mode A to the automatic presentation of mode B enables use with persons with varying speeds of information processing. The Board in mode A can be used to facilitate visual scanning and increase visual reaction time in persons who have difficulty executing adequate search patterns due to oculomotor impairment, visual inattention and neglect, and hemianopsia. Mode B and the digit flash option can be used to challenge high functioning persons who must demonstrate rapid information processing and mental flexibility in order to resume demanding tasks such as driving, engaging in sports activities and work. Varying the length of the presentation from 30 seconds to 240 seconds allows the therapist to prevent fatigue in persons with limited scanning ability and also challenge sustained attention in persons who have difficulty maintaining vigilance. Both modes A and B can be used by persons with upper extremity limitations to increase active range of motion and coordination.

The most unique and important contribution of the Dynavision to rehabilitation is its capacity to challenge the peripheral visual system. Peripheral visual attention is needed to protect an individual from potential dangers in the environment, and speed in searching the peripheral visual field is critical to safety in environments involving rapid visual changes such as is encountered in driving. The size of the Dynavision board automatically elicits a combination of head turning and eye movement which is the natural scanning strategy initiated when attending to peripheral visual stimuli. The light buttons also are identical which eliminates the need for discrete identification and instead elicits the more automatic response of visual localization which is compatible with the function of peripheral attention. This capacity enables the Dynavision to challenge the peripheral attention skills needed for driving, and orientation to and negotiation of the environment at a level few clinical activities can achieve.

### Effectiveness of Dynavision Training:

Because of the relatively recent introduction of Dynavision into rehabilitation centers, the published research literature supporting the validity of the apparatus in rehabilitation is

limited. Klavora et al, have published several articles on the use of the Dynavision (Klavora and Warren, 1998, Klavora, Gaskovski & Forsyth, 1995, Klavora, Gaskovski, Heslegrave, Quinn, & Young, 1995, Klavora, Gaskovski, 1994), including an article demonstrating the effectiveness of the device in rehabilitation of driving performance in persons post stroke (Klavora et al, 1995).

#### Room Requirements:

Because it is likely that the Dynavision will be used in inpatient and outpatient treatment by both physical and occupational therapy, and with persons with neurological and musculoskeletal impairments, it should be centrally located between departments. Although absolute quiet is not required for performance, the room should be reasonably free of extraneous noise and distraction. Training on the Dynavision is done under minimal to low lighting conditions to ensure the visibility of the lights. The selected room should have the capability for rheostat controlled lighting either through overhead lighting wired to a dimmer switch or by using a 300 watt torchiere halogen floor lamp. The apparatus requires approximately six feet of wall space and six feet of space in front of the board. The Dynavision is constructed of steel and aluminum and weighs 286 pounds. And is usually mounted on an interior wall using the wall mount system included.

#### Maintenance:

Minimal maintenance is required to keep the apparatus operational and can be performed by a therapist. The most frequent need is replacement of the printer paper and ribbon or an occasional burnt out bulb. The experience of therapists using the device in rehabilitation settings has been that even with heavy usage (several hours per day) these replacements are needed only every five to six months.

#### Purchasing:

The Dynavision is manufactured by:

Performance Enterprises  
76 Major Button's Drive  
Markham, Ontario,  
Canada L3P 3G7  
telephone (905) 472-9074  
www.dynavision2000.com

fax: (905) 294-6327  
info@dynavision2000.com

The apparatus is available only from the manufacturer. Purchase orders are accepted. Approximate cost of the unit is \$9995.00 plus shipping. The Dynavision for Rehabilitation of Visual and Motor Deficits: A User's Guide written by Mary Warren MS, OTR/L, SCLV, FAOTA and Peter Klavora, PhD is supplied with the unit.

#### References:

Klavora, P. & Warren, M. (1998) Rehabilitation of visuomotor skills in poststroke patients using the dynavision apparatus. *Perceptual and Motor Skills*, 86, 23-30.

Klavora, P. Gaskovski, P. Heslegrave, R. Quinn, R. & Young, M. (1995) Rehabilitation of visual skills using the dynavision: a single case experimental design. *Canadian J Occup Ther*, 62, 37-43.

Klavora, P. Gaskovski, P. Forsyth, R. Heslegrave, R., Young, M. Quinn, R. Martin, K. (1995) The effects of dynavision rehabilitation on behind-the-wheel driving ability and selected psychomotor abilities of persons post-stroke. *Am J Occup Ther*, 49, 534-542.

Klavora, P., Gaskovski, P. & Forsyth, R. (1995) Test-retest reliability of three dynavision tasks, *Perceptual & Motor Skills*, 80, 607-610.

Klavora, P., Gaskovski, P. & Forsyth, R. (1994) Test-retest reliability of the dynavision apparatus. *Perceptual & Motor Skills*, 79, 448-450.

## **SUGGESTIONS FOR OBTAINING FUNDS TO PURCHASE A DYNAVISON**

At a time when Rehab departments are becoming cost centers rather than revenue producing centers and everybody's cutting back, the prospect of getting an expensive apparatus such as the Dynavision may seem an impossible task. However, with a little creativity, enthusiasm and persistence it can be done. You can try to get it through on the capital improvement budget but I would encourage you also to think "outside the box" to locate a funding source.

### **POSSIBLE FUNDING SOURCES**

THE HOSPITAL AUXILIARY (You would not believe the \$ those gift shops rake in). Hospital auxiliaries have been the funding source for many of the Dynavisions found in clinics today.

THE HOSPITAL FOUNDATION Many hospitals have charitable foundations connected with them which provide grants for the purchase of special equipment.

SERVICE ORGANIZATIONS Optimists, Soroptimists, Elks, Rotarians, Lions, Kiwanis, P.E.O., the Junior League etc. etc. Many of these organizations make charitable contributions to worthy causes.

SORORITY ALUMNI CHAPTERS These women also seek out worthy causes and make donations.

If no one is willing to give you the entire sum, consider multiple funding sources and try to get part of the needed funds from several organizations. I got my first Dynavision when a patient offered to pay half of the expense if the hospital would match the other half.

### **POINTS TO EMPHASIZE WHEN YOU MAKE YOUR PRESENTATION**

- The Dynavision is unique and cutting edge (you'll be the first department to have one or it will let you compete with the other center in town with one).
- The Dynavision will allow you to provide better therapy for a wide variety of disabilities in both children and adults.
- The Dynavision can be used by both O.T. and P.T. and with inpatients and outpatients (it won't be standing idle in the clinic-they'll get their money's worth out of it).
- The Dynavision is very durable (they won't have to replace it in a couple of years), unlike computers it won't be obsolete next year.
- The Dynavision looks very nice with a brass donor plaque on it.

In pursuing your goal, remain positive and remember that the advantage of the Dynavision is that while it is expensive, the cost is not prohibitive and you get a lot of "bang" for the buck. That makes it attractive to potential donors.