American Congress of Rehabilitation Medicine

Information for Rehabilitation Professionals

ACRM BI - ISIG
Evidence-Based Recommendations for Cognitive Rehabilitation

Rehabilitation of Visuospatial Abilities after Brain Injury

The Brain Injury-Interdisciplinary Special Interest Group (BI-ISIG) of the American Congress of Rehabilitation Medicine has conducted evidence-based reviews of the literature regarding cognitive rehabilitation for persons with traumatic brain injury (TBI) or stroke. Based upon these reviews, the BI-ISIG has made recommendations for clinical practice. Following is a summary of these recommendations and examples of how they can be used in clinical practice. The full recommendations are available at www.acrm.org and in the following publications:

Cicerone, K.D., Dahlberg, C., Kalmar, K., Langenbahn, D.M., Malec, J.F., Bergquist, T.F., Felicetti, T., Giacino, J.T., Harley, J.P., Harrington, D.E., Herzog, J., Kneipp, S., Laatsch, L., & Morse, P.A. (2000). Evidence-based cognitive rehabilitation: Recommendations for clinical practice. *Archives of Physical Medicine and Rehabilitation, 81,* pp. 1596-1615.

Cicerone, K.D., Dahlberg, C., Malec, J.F., Langenbahn, D.M., Felicetti, T., Kneipp, S., Ellmo, W., Kalmar, K., Giacino, J.T., Harley, J.P., Laatsch, L., Morse, P.A., & Catanese, J.(2005). Evidence-based cognitive rehabilitation: Updated review of the literature from 1998 through 2002. *Archives of Physical Medicine and Rehabilitation, 86,* pp. 1681-1692.

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Practice Recommendations:

- Training in visuospatial scanning has been shown to be effective for persons with visuoperceptual deficits due to visual neglect after right hemisphere stroke.
- The types of strategies that have shown effectiveness include using graded visual material to increase left-sided scanning, voluntary trunk rotation training, and cuing during limb activation in the neglected hemispace.
- For maximal effectiveness, scanning training should occur daily; effective treatment typically involves approximately 20 1-hour sessions conducted over the course of 4 weeks. Scanning training may be most effective when a large intervention apparatus that challenges peripheral vision is used.

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Practice Recommendations (continued):

- Sensory awareness and spatial organization training, in combination with visual scanning training, have been shown to be effective, particularly for persons with more severe visuoperceptual problems.

- Training on more complex visuospatial tasks appears to increase the benefits of treatment and promote generalization to other tasks that involve visual scanning, such as reading, solving written arithmetic problems, and driving. Such training is also associated with greater improvement and shorter lengths of stay in acute rehabilitation facilities.

How To Carry Out Visuospatial Interventions in Clinical Practice:

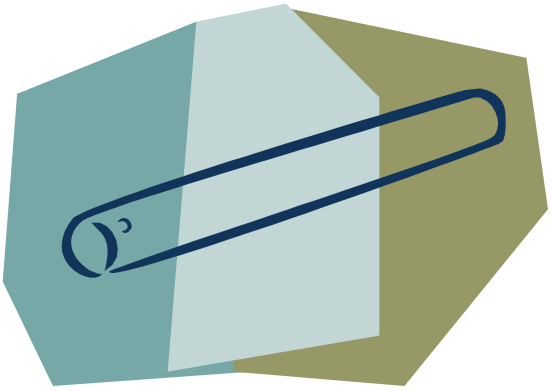
- **General Scanning Training:**[1] Evidence suggests that the use of anchoring is helpful, which provides a spatial (or sometimes verbal) cue indicating where to begin scanning. For example, individuals are instructed to cross out targets on a page (cancellation task) with the aid of visual end anchoring cues (vertical line along neglected side of page); anchoring cues can also be provided verbally (e.g., "Begin scanning at the extreme left side of the page"). Another scanning task is line bisection, requiring the person to identify the center points of horizontally positioned lines located in various spatial locations on a page.
  - Persons with visuospatial deficits should be taught to engage in active search techniques, which help them learn to seek out information that is missed.
  - Additionally, the density (target size and distance) of the visual targets should be manipulated, especially for persons with severe deficits. Targets that are located close to one another may be too difficult to be identified/differentiated.
  - Pacing is also important; individuals should be taught to recite targets out loud to reduce impulsive responding and to slow their scanning deliberately to avoid the tendency for their attention to drift to the unimpaired right side of space.
  - Practice is critical in order to make initially effortful behavior automatic.
  - Finally, feedback should be given regularly to verify accuracy and help develop confidence.

How To Carry Out Visuospatial Interventions in Clinical Practice (continued):

- **Using a scanning machine:**[2] Scanning machines have been shown to be useful in teaching systematic scanning of the environment. First, individuals are asked to track a moving target. Next, they are instructed to search for colored lights near the center of the board. After they master this step, they then search for colored lights on the neglected side of space. Finally, they are to search simultaneously for colored lights in both sides of space. Scanning-machine training is often accompanied by other general scanning training tasks to maximize improvement, such as cancellation tasks with end anchoring cues and reading tasks, in which individuals read paragraphs from newspapers projected on walls. The purpose of this type of reading task is to help individuals learn to scan across widely-spaced material.

- **Sensory Awareness Training:**[3] Persons with injury view a manikin designed to simulate the upper back of a human torso that displays numbers in a square grid format. They then wear a jacket with the corresponding grid on the back. The therapist then touches the person's back on individual squares, following which the person attempts to touch the same location on the manikin, which is situated directly in front of the person.

- **Spatial Organizational Training:**[4] Five plexiglass rods of varying lengths are used for size-estimation training. A rod is placed directly in front of, on the unimpaired side, or on the impaired side of the person with injury. The person is then asked to estimate the size of the rod. He/she receives feedback regarding estimation accuracy and cues for compensation purposes.



How To Carry Out Visuospatial Interventions (continued) :

- **Voluntary Trunk-Rotation Training:**[4] This visuospatial remediation technique can be used in conjunction with scanning training. This method involves placing the individual in a specially designed vest, which is attached to a vertical bar that extends forward, above and in front of the person's head. The end of the bar (pointer) is placed 1.5 meters in front of the person, who is forced to rotate his/her trunk under visual control in order to move the pointer laterally and therefore explore the impaired spatial field. Over multiple sessions of increasing duration, the person learns to visualize the pointer and move it through trunk rotation. Then, he/she must identify visually and orally presented signals and touch the correct target with the pointer.

- **Cuing during Limb Activation:**[5-6] The goal of this type of training is to teach the person always to place and keep his/her left arm at the left margin of any activity. Then, he/she is required to locate the left arm visually prior to beginning any task. For example, a person would place his/her left arm on the left side of a letter cancellation page. The person is then instructed to locate his/her left arm similarly at the beginning of every single administration of the letter cancellation test.

References:

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3. Weinberg, J., Diller, L., Gordon, W.A., Gerstman, L.J., Lieberman, A., Lakin, P., et al. (1979). Training sensory awareness and spatial organization in people with right brain damage. *Archives of Physical Medicine and Rehabilitation, 60,* 491-496.
4. Wiart, L., Bon Saint Come, A., Debelleix, X., Petit, H., Joseph, P.A., Mazaux, J.M., et al. (1997). Unilateral neglect syndrome rehabilitation by trunk rotation and scanning training. *Archives of Physical Medicine and Rehabilitation, 78,* 424-429.
5. Robertson, I.H., North, N.T., & Geggie, C. (1992). Spatiomotor cueing in unilateral left neglect: Three single case studies of its therapeutic effectiveness. *Journal of Neurology, Neurosurgery, & Psychiatry, 55,* 799-805.
6. Robertson, I.H., & North, N. (1992). Spatio-motor cueing in unilateral left neglect: The role of hemispace, hand and motor activation. *Neuropsychologia, 30,* 553-563.