PATIENT EE: Goal and Strategies for Attention Training

Long Term Strategic Goal

Mrs. EE will demonstrate 90% accuracy on functional reading and writing tasks in a structured clinical setting with auditory distraction, to improve attention during completion of home activities.

Monthly Strategic Treatment Goal

Initiate/Continue _____ stage (e.g., acquisition, application, adaptation) of goals and strategies for attention training.

Short-Term Tactical Treatment Goals

STGa: Mrs. EE will respond with 90% accuracy to multiple choice comprehension questions to 1-2 paragraph narratives with TV news background.

STGb: Mrs. EE will respond with 90% accuracy to written two-step math story problems with TV news background.

STGc: Mrs. EE will assemble a 4-6 step recipe with 90% accuracy with natural environmental noise distraction.

STGd: Mrs. EE will independently complete a sample bill paying activity with 90% accuracy with natural environment noise distraction.

5. Rehabilitation of Hemispatial Neglect

5.1 Introduction

Hemispatial neglect represents a significant challenge for the patient and rehabilitation professionals. Patients with neglect are typically unaware of this impairment, especially in the acute phase of recovery. The rehabilitation of hemispatial neglect must therefore sometimes incorporate elements from the chapter on the rehabilitation of executive functions (see section 2.7.b). Research on the rehabilitation of hemispatial neglect has demonstrated that systematic training in visual scanning, sometimes accompanied by either real or imagined motor activity of the left arm or hand, is effective in improving neglect.

5.2 Hemispatial Neglect in Brain Dysfunction

Patients with lesions in the right cerebral hemisphere often show a reduced tendency to respond to and actively search for objects in the contralateral side of space, even though they may have intact visual fields on ophthamological testing. This is most commonly referred to as hemispatial neglect, unilateral neglect, or hemi-inattention. A significant number of patients with right hemisphere injury present with neglect in the acute stage, and while many improve, chronic visual neglect can have a dramatic effect on daily activities, even those that are basic such as eating, grooming, dressing, or reading. Hemispatial neglect for visual information is sometimes accompanied by impairments of attention to tactile and proprioceptive, as well as auditory, stimuli on the contralateral side of the injury.

5.3 BI-ISIG Recommendations for Hemispatial Neglect

The BI-ISIG Cognitive Rehabilitation Task Force of ACRM has recommended, as a Practice Standard (Cicerone et al., 2011), visuospatial rehabilitation that includes visual scanning training for left visual neglect after right hemisphere stroke. Limb activation or electronic technologies for visual scanning training may be included in the treatment of neglect after right hemisphere stroke as a Practice Option. Also, systematic training of visuospatial deficits and visual organization skills, without visual neglect, may be considered a Practice Option for persons with visual perceptual deficits after right hemisphere stroke as part of acute rehabilitation.

5.4 General Framework for the Rehabilitation of Hemispatial Neglect

Since the 1960's, researchers have made efforts to establish effective treatment for left neglect. Initial studies in this area focused primarily on the use of visual scanning strategies, including "anchoring" and training patients to look to the left. In the earliest published work in this area, researchers at NYU Langone Medical Center, Rusk Institute of Rehabilitation Medicine, conducted a series of studies to improve scanning capability in individuals with right brain damage (RBD), hoping to ameliorate the left neglect and visual inattention caused by the stroke. In an initial study (Weinberg et al., 1977), 57 patients with visual perceptual problems following RBD were randomly assigned to either a treatment group (n = 25) receiving 20 hours of scanning training across four weeks, or a control group (n = 32) that did not receive the training. Both groups participated in conventional occupational therapy over the four-week period. Following training, the experimental group improved on four visual academic tasks e.g., reading and arithmetic, while the control group did not. More severely-impaired patients showed greater improvement when compared with their controls, than did the

more mildly-impaired group when compared with their controls.

In another representative study, Pizzamiglio et al. (1992) provided visual scanning training to a group of 13 RBD patients with left visual neglect. Patients ranged from 3-34 months post-stroke, and received training five times a week for eight weeks. Following training, all but one patient demonstrated improvement on a variety of impairment-based and functional tasks and this improvement appeared to be independent of spontaneous recovery. Most importantly, treatment gains generalized to functional tasks at home and were especially evident on tasks requiring exploratory scanning and sequential analysis of multiple target stimuli. However, training did not generalize to all visuo-spatial tasks and improvement did not occur in the one patient whose unawareness of his impairment did not resolve. Moreover, all patients continued to show variability in their neglect as a function of the density of the visual display and salience of the objects in their right visual field.

Diller and associates at Rusk hypothesized that the visual perceptual deficits in RBD suggested a typology: (a) patients with RBD may display gross disturbance in left to right scanning and neglect of most stimuli in the left side of space; (b) patients may present with additional disturbances of sensory awareness and spatial organization; or (c) patients may demonstrate a lateral visual field inattention only under more cognitively challenging task demands (Gordon et al., 1984; Weinberg et al., 1977). In a follow-up study to the one mentioned above (Weinberg et al., 1979), the research group added training in sensory awareness and spatial organization to the scanning protocol, and trained 30 patients with RBD using a two-phase treatment program. Fifteen hours were spent on scanning training using a visual tracking device to follow a moving target and search for lights on a board, as well as practice in visual cancellation tasks and reading. Five hours were then spent in training: (a) sensory awareness, using a mannequin, whereby the patient was touched on the back (using grid-marked locations) and was asked to identify the same locations on the back of a mannequin; and (b) spatial organization by using plexiglass cylinders of different lengths to estimate size differences on and off the body. The experimental group improved more than the (20) controls, again with more severely-impaired patients showing greater improvement than mildly-impaired patients.

A variety of other interventions have been studied for the treatment of neglect, but the essential ingredient of these strategies includes training in visual scanning, sometimes facilitated by strategies to promote scanning to the left hemispatial field either through incorporating movement of the left arm and hand, or through visual imagery of movement of the left arm or hand when the left arm is hemiparetic.

Visual imagery has been incorporated into scanning techniques through the use of the "Lighthouse Strategy" (LHS), in which patients were trained to use the imagery of being a lighthouse, turning from side to side in order to illuminate their surroundings (Neimeier, 1998). Neimeier (1998) used this strategy to treat 16 stroke patients with left neglect. The treatment group was, on average, two months post-stroke and treatment occurred in the context of a comprehensive day treatment program (average length of stay was 25 days). Training consisted of teaching patients to use the imagery of being a lighthouse, turning from side to side in order to illuminate their surroundings. As compared to a matched control group, the treatment group demonstrated significant improvement in overall attention on a functional task as measured by a facility rating scale and the reports of family and caregivers. These findings were supported by a follow-up study of 19 patients with visual neglect. Following treatment, patients demonstrated significant functional improvements in route finding, walking or wheelchair negotiation, and problem-solving skills (Neimeier, 2001).

In addition to visual scanning strategies, recent authors have studied various limb activation strategies in the treatment of hemispatial neglect. In these, patients are taught to move or simply attend to the affected limb prior to or during a spatial activity. These

strategies are based on the finding that neglect is a lateralized attention deficit, and that motor responses on the side contralateral to the lesion increase activation of the damaged hemisphere, thereby causing change in lateralized attention (Brunila et al., 2002). Additionally, these strategies may arouse premotor circuits of the damaged hemisphere which, in turn, arouse the sensory cells associated with them, ultimately leading to perceptual enhancement of the stimuli in the neglected field (Robertson & North, 1993). In addition, it is believed that even the preparation of a motor plan, either real or imagined, serves to facilitate the perception of objects in the neglected area of space.

There are three different evidence-based limb activation strategies, including spatio-motor strategies, imagined limb activation, and visuo-spatio-motor strategies. Building on Diller and associates' earlier work on spatial reconditioning, Wiart et al. (1997) used a visuo-spatio-motor strategy called "Bon Saint Come" method to treat patients with visual neglect. Twenty-two participants, all less than three months following a stroke, were randomly assigned to either an experimental group (n = 11) or a control group (n = 11). Both groups received traditional rehabilitation, while the treatment group received an additional one hour of training combining the use of visual scanning, trunk rotation, and proprioceptive (dummy) feedback for 20 days. The treatment group demonstrated significantly greater improvements in scores on the Functional Independence Measure (FIM) and on a battery of tests for neglect as compared to the control group. However, the extent to which limb activation techniques can lead to permanent changes in neglect, as compared to only a temporary reduction in its effects during the activation itself, remains to be determined.

5.5 Visual Scanning Training

The philosophy of the use of training tasks (primarily visual cancellation tasks) for treating hemi-inattention is described in Diller and Weinberg (1977). In using a visual cancellation task that is sensitive to disturbances in visual attention, several features influence the individual's task response. Before commenting on these features, important aspects of hemi-inattention should be noted: neglect in individuals with right cerebral brain damage may be thought of as a response style in which the individual ignores or minimizes space on the left. A visual cancellation task has spatial features sensitive to this response style and thus can serve as a diagnostic tool. In turn, modifications of visual cancellation task conditions can have profound effects on improving the individual's performance and allow for its use as a training task. The following principles (see section 5.5.a below) are offered in the conceptualization of visual tasks; by using these principles to alter task demands, the training task will provide inherently greater or less structure, making task completion less or more challenging, respectively. As with all training, tasks are designed to provide greater structure earlier in training and for individuals with greater impairment. Task structure is reduced (and hopefully structure is internalized) as learning proceeds.

5.5.a Principles of Visual Scanning Training

1) **Locus of the Stimulus:** Stimuli on the left side of space are more likely to be omitted than stimuli on the right side of space.
2) **Anchoring:** When individuals are given either verbal or visual cues to begin each line at the extreme left side of the page to indicate the starting position, improvement is noted. Individuals with RBD are more influenced by anchoring on the left side of space than on the right side of space. Both types of anchoring are superior to free-style performance.
3) **Pacing:** Once the individual's orientation is anchored, there is still a tendency for rapid drifting towards targets on the right side of the page. The patient can

slow down performance to an even pace simply by reciting the targets aloud. This activity automatically harnesses the performance speed.

4) **Density:** Errors tend to occur when targets are closer to each other. It is possible to reduce errors by increasing distance between targets. An increase in font size of the visual array is another way of addressing this principle.

5) **Information Load:** Stimulus complexity increases task demands. Visual search for two targets is more difficult than visual search for a single target. Conditional target cancellation is also more difficult (e.g., cross out all the "8s," but underline the "5s."

6) **Performance Prediction and Feedback:** Asking the individual to predict performance results, as well as providing feedback on performance, are both methods of incorporating awareness into the task performance process.

5.5.b Assessment of Visual Scanning

Assessment of visual scanning for the Diller et al. (1980) protocol utilizes forms 5-1 and 5-2 provided below. The first scanning task (5-1) requires the patient to scan for a single letter "H," and the second (5-2) requires the patient to scan for two target letters, "C" and "E," simultaneously. The following instructions are provided for the one- and two-target components of the Diller-Weinberg Visual Cancellation Test.

Form 5-1 Cancel "H"

Description: An 8" X 11½" sheet of paper containing six lines of 52 letters per line. The stimulus letter "H" is scattered randomly throughout the task (105 occurrences).

Introduction: Examiner points to the middle of the top line and asks the patient to identify five or six letters. If correct, then proceed: "I want you to put a line through (cross out) every "H" that you see, without skipping any. When you are done, put your pencil down."

Scoring: Find the total number of omissions, number of commissions, and time of testing. Divide the page into thirds and determine the number of errors on each third of the page.

Form 5-2 Cancel "C" and "E"

Description: An 8" X 11½" sheet of paper containing six lines of 52 letters per line. The stimulus letters "C" and "E" are scattered randomly throughout the task (105 occurrences).

Instruction: Examiner points to the middle of the top line and asks the patient to identify five or six letters. If correct, then proceed: "I want you to put a line through (cross out) every "C" and "E" that you see, without skipping any. When you are done, put your pencil down."

Scoring: Find the total number of omissions, number of commissions, and time of testing. Divide the page into thirds and determine the number of errors on each third of the page.

5.5.c Step in Systematic and Orderly Scanning Training

These investigators (Diller et al., 1980) established very clear procedures for visual scanning training using Forms 5-3 and 5-4, which are provided on pages 99 and 100.

1) **Establish patient understanding of problem:** This training improves basic abilities and prepares the patient for training in reading. Difficulties with impulsivity are also addressed. The trainer should try to relate this training to any reading difficulties the patient may have reported.

2) **Gather and prepare materials:** Materials include two forms of cancellation tasks: single and double stimuli. Each form is an 8 ½" by 11" sheet of paper containing 312 numbers (ranging from one to nine) divided into six lines, each line having 52 stimuli. The target stimuli are randomly distributed along each line. The forms correspond to cancellation of "8," "3," & "5" on the scanning training Forms 5-3 and 5-4 (Weinberg et al., 1977). All cancellation sheets are taped on a flat surface in front of the patient. If the patient wears glasses, make sure they are clean and patient is wearing them.

3) **Training in Single Stimulus Visual Cancellation:**
   a) A vertical line is drawn on the left margin of the cancellation form by the trainer to *anchor* the left field for the patient. If needed, numbers are placed to the left and right of each line of the form to provide additional anchoring.
   b) The patient is asked to look at the anchor line at the top left margin of the page and then find the number "1" beside the anchor line.
   c) Ask the patient to scan from left to right along the first line (line #1), reading all the numbers *aloud* and crossing out every "8" along the way.
   d) The trainer should observe the patient's behavior carefully. The patient is corrected is he/she skips any "8s" in cancellation, or misreads/omits numbers while reading.
   e) When the patient has finished the cancellations on the first line, the trainer instructs the patient to scan to the left, to find the anchor line, and to use the sequential numbering of the lines in order to find the beginning of the next line. The patient may use the previously cancelled line as a *visual* guide in getting back to the beginning of the line, but actual tracing (i.e., with a pencil) of the line back to the left is discouraged.
   f) As the patient's performance improves, the number of cues can be systematically decreased:
      - Remove sequential numbers from right margin, keep anchor line and sequential numbers on the left margin, and continue to have patient read numbers aloud.
      - Remove sequential numbers from the left, but keep anchor line. Have the patient read numbers aloud.
      - Have patient perform cancellation task silently, but instruct patient to verbalize numbers to self.
      - Remove anchor line on left.
      - Gradually increase patient's speed without loss of accuracy.
   g) As cueing decreases, the patient should be given direct feedback on his/her performance. This can be done initially by circling the patient's errors, and then gradually letting the patient find his/her own errors on work completed.
   h) As training continues, or if patient shows significant unawareness, the patient should be encouraged to predict his/her performance on the Single Stimulus Visual Cancellation Task. Have the patient compare predicted with actual performance, as well as discuss the reasons for any discrepancy, in order to increase awareness of the visual difficulty.

4) **Criteria for Performance — Single Stimulus Visual Cancellation:**
   a) For the mildly impaired patient: The patient must be able to complete six lines of Single Stimulus Visual Cancellation with less than four errors scattered throughout the form.

b) For the markedly impaired patient: The patient must make one-third or less as many errors as on Diller-Weinberg Visual Cancellation Test "H" pre-test, and errors should not be concentrated on the left side of the page.

5) Training in Double Stimuli Visual Cancellation:

a) Training in double-stimuli visual cancellation follows the same procedures as in the single form (see above). This training is introduced when the patient has comfortably mastered the single stimuli cancellation task with a minimum of cueing.

b) Instruct the patient to scan from left to right along each line, crossing out every "3" and "5" seen.

c) The hierarchy of cueing (i.e., numbering lines, anchoring, verbalization, etc.), and the removal of cues, are the same as in the single stimulus visual cancellation task condition.

6) Criteria for Performance – Double Stimuli Visual Cancellation:

a) For the mildly impaired patient: The patient must be able to complete six lines of Double Stimuli Visual Cancellation with less than four errors scattered throughout the form.

b) For the markedly impaired patient: The patient must make one-third or less as many errors as on the Diller-Weinberg Visual Cancellation "C & E" pre-test, and errors should not be concentrated on the left side of the page.

5.5.d Computerized Visual Scanning Training

Pizzamiglio et al. (1992) established the following procedures as part of a broader protocol for the treatment of visual neglect. Although not recommended as a stand alone treatment, computer-based scanning tasks may be used in conjunction with paper and pencil cancellation tasks.

1) Stimuli should be projected over a large visual field (e.g., 96" horizontally by 18" vertically). The field should consist of four rows, each row allowing for stimuli to be presented in 12 different positions. Each position should be separated by 6.9" horizontally and 2.9" vertically.

2) The patient is seated approximately three feet from the screen. Single digits (size 2.3" x 1.7") are randomly presented one at a time in one of 48 positions. In each trial, each digit has an equal chance of being presented. The patient is asked to name the digit presented and press a button as quickly as possible after seeing it.

3) In each 30-minute training session, the patient is shown 20 sequences each consisting of approximately 20 digits.

4) Initially, digit sequences are presented from right to left. Early in training stimulus presentation is also preceded by a warning signal, such as a flashing bar under the target accompanied by both verbal and tactile cues from the therapist.

5) As training continues, digits are also gradually presented more towards the left visual field, so that by the end of training sequences are presented in random alternating fashion between left and right positions.

6) As the patient's performance improves, the number of cues can be decreased by removing the tactile cues, the verbal cues, and/or the warning signal.

5.5.e Visual Scanning Training for Reading and Copying Prose

Hemispatial neglect can, of course, affect reading, often referred to as neglect dyslexia. Both Diller et al. (1980) and Pizzamiglio et al. (1992) have developed training programs for the treatment of reading and copying disorders. The following procedures are based on these protocols.

1) Reading

a) **Establish patient understanding of problem:** Visual scanning difficulties can affect a patient's ability to read. This training is aimed at helping the patient compensate for neglecting the left side of pages and the beginning of words, as well as skipping lines while reading. Application to daily activities should be discussed.

b) **Materials:** Printed materials taken from the large-print and regular-print newspaper may be used for training. The large-print and regular-print *Reader's Digest* are also good sources.

c) **Training preliminaries:** Selected paragraphs of various length and content are used for training. Selected readings are placed directly in front of the patient to read.

d) **Training reading skills:**

1) Start with large-type single sentences and newspaper or magazine titles with simple, realistic content. Progress to a four-line paragraph and gradually increase the length to 10- and 15-line reading passages. Table 5-1 provides sample four-line reading stimulus material. The trainer places a red anchor line on the left, and sequential numbers on the left and right margins of each passage. The patient is asked to read the paragraph aloud, starting with line #1, and to look first for the anchor line and the sequential numbers before reading each line.

2) Begin with the minimum additional cues the patient needs to accurately read the material. Cues can be tactile (e.g., tapping the neglected shoulder), or verbal (e.g., "Remember to look carefully on your left.")

3) The trainer should observe the patient's behavior carefully and should not permit the patient to misread words, skip lines, or move the paragraph into the right visual field. Head movements are encouraged.

4) Patients may experience difficulty in locating the next line to read. If this occurs, maximum cueing should be instituted. Table 5-1 provides the sequence of cues that should be utilized. The patient is then instructed to scan to the left until he/she finds the anchor line and the sequential numbering of the lines.

5) As the patient's performance improves, the length and complexity of the reading passages can be gradually increased, while cues are systematically decreased in the following way:

- Remove sequential numbers from right margin, but keep anchor line and sequential numbers on the left margin. Have the patient read aloud.
- Remove sequential numbers from left margin, but keep anchor line. Have the patient read aloud.
- Remove anchor line on left. Have the patient read aloud.
- Transfer from large-print text to regular-size text and follow same hierarchy of cueing as needed for accurate patient performance.
- Have the patient read in silence and ask questions about the content.
- Increase the length of the passage to be read in silence.

Table 5-1 Stimulus Material and Sequence of Cueing for Four Levels of Reading Training in Neglect Dyslexia

Levels	Sequence of Cuing	Stimulus Material	Task Demand
Level 1	a) A vertical anchoring line on left side. b) Sequential numbering on left and right margins.	1- The Treasury Secretary is not now a -1 2- member of the National Security Council -2 3- but is occasionally invited to participate -3 4- in its deliberations. -4	Patient is asked to look at the anchoring line, and the number at beginning and end of lines. S/He uses vertical line to find beginning of paragraph, and uses numbers not to skip lines.
Level 2	a) A vertical anchoring line on left side. b) Sequential numbering on left margin only.	1- A growth of 6 percent in the nation's 2- output of goods and services next year 3- would be higher than what is now being 4- forecast by most economists. In the third	Patient uses only anchoring line and number at the beginning of paragraph.
Level 3	A vertical anchoring line on the left side.	Among the subjects discussed in the series of meetings, most of them an hour long, were foreign policy, international economics, government reorganization,	Patient uses only the anchoring line.
Level 4	No cues provided.	At meetings with the Senate Foreign Relations and House International Relations Committees, Mr. Obama said that he would cooperate and consult closely	Patient reads and/or copies without any cuing provided.

Form 5-1 Diller-Weinburg Visual Cancellation Test — Single Stimuli

H

B H D F C H C F H G I H C H I H B D A H C F B H D E H D A F H I C H F H B A F H E H F H C B D H F G H E

H E G H F E H D H F H C B F H A D H C E H I H G D H C E B H E G H I H C H E H F C I H E B H G F D H B E

H B H A E H B H C F A H F H G H C G D H C B A H G D E H C H B E H D G H D A F H B I F H E B H D H E H G

H D G A H C H F B H A F H E B F H C D H F H G E H B H D H F A C H C H F D I H C B I H B H A C H D H F B

E H B H G B I H C E H A F H I H E B H G F B H F A H E B G H G F E H D B H B H C F H A D C H E I H F H G

H D C B H E D G H A D F H B H I G E H G H D E H C G H D H E B A H F B H C D A H G B H C H D F H C A I H

Form 5-2 Diller-Weinburg Visual Cancellation Test — Double Stimuli

C E

B E I F H E H F E G I C H E I C B D A C H F B E D A C D A F C I H C F E B A F E A C F C H B D C F G H E

C A H E F A C D C F E H B F C A D E H A E I E G D E G H B C A G C I E H C I E F H I C D B C G F D E B A

E B C A F C B E H F A E F E G C H G D E H B A E G D A C H E B A E D G C D A F C B I F E A D C B E A C G

C D G A C H E F B C A F E A B F C H D E F C G A C B E D C F A H E H E F D I C H B I E B C A H C D E F B

A C B C G B I E H A C A F C I C A B E G F B E F A E A B G C G F A C D B E B C H F E A D H C A D E F E G

E D H B C A D G E A D F E B E I G A C G E D A C H G E D C A B A E F B C H D A C G B E H C D H E H A I E

Form 5-3 Diller-Weinburg Visual Cancellation Training Sheet — Single Stimuli

8

2 8 4 6 3 8 3 6 8 7 9 8 3 8 9 8 2 4 1 8 3 6 2 8 4 5 8 4 1 6 8 9 3 8 6 8 2 1 6 8 5 8 6 8 3 2 4 8 6 7 8 5

8 5 7 8 6 5 8 4 8 6 8 3 2 6 8 1 4 8 3 5 8 9 8 7 4 8 7 5 2 8 5 7 8 9 8 3 8 5 8 6 3 9 8 5 2 8 7 6 4 8 2 5

8 2 8 1 5 8 2 8 3 6 1 8 6 8 7 8 3 7 4 8 3 2 1 8 7 4 5 8 3 8 2 5 8 4 7 8 4 1 6 8 2 9 6 8 5 2 8 4 8 5 8 7

8 4 7 1 8 3 8 6 2 8 1 6 8 5 2 6 8 3 4 8 6 8 7 5 8 2 8 4 8 6 1 3 8 3 8 6 4 9 8 3 2 9 8 2 8 1 3 8 4 8 6 2

5 8 2 8 7 2 9 8 3 5 8 1 6 8 9 8 5 2 8 7 6 2 8 6 1 8 5 2 7 8 7 6 5 8 4 2 8 2 8 3 6 8 1 4 3 8 5 9 8 6 8 7

8 4 3 2 8 5 4 7 8 1 4 6 8 2 8 9 7 5 8 7 8 4 5 8 3 7 8 4 8 5 2 1 8 6 2 8 3 4 1 8 7 2 8 3 8 4 6 8 3 1 9 8

Form 5-4 Diller-Weinburg Visual Cancellation Training Sheet — Double Stimuli

3 5

2 5 9 6 8 5 8 6 5 7 9 3 8 5 9 3 2 4 1 3 8 6 2 5 4 1 3 4 1
4 1 6 3 9 8 3 6 5 2 1 6 5 1 3 6 3 8 2 4 3 6 7 8 5
3 1 8 5 6 1 3 4 3 6 5 8 2 6 3 1 4 5 8 1 5 9 5 7 4 5 7 8 2
8 2 3 1 7 3 9 5 8 3 9 5 6 8 9 3 4 2 3 7 6 4 5 2 1
5 2 3 1 6 3 2 5 8 6 1 5 6 5 7 3 8 7 4 5 8 2 1 5 7 4 1 3 8
3 8 5 2 1 5 4 7 3 4 1 6 3 2 9 6 5 1 4 3 2 5 1 3 7
3 4 7 1 3 8 5 6 2 3 1 6 5 1 2 6 3 8 4 5 6 3 7 1 3 2 5 4 3
4 3 6 1 8 5 8 5 6 4 9 3 8 2 9 5 2 3 1 8 3 4 5 6 2
1 3 2 3 7 2 9 5 8 1 3 1 6 3 9 3 1 2 5 7 6 2 5 6 1 5 1 2 7
2 7 3 7 6 1 3 4 2 5 2 3 8 6 5 1 4 8 3 1 9 5 6 5 7
5 4 8 2 3 1 4 7 5 1 4 6 5 2 5 9 7 1 3 7 5 4 1 3 8 7 5 4 3
6 4 3 1 2 1 5 6 2 3 8 4 1 3 7 2 5 8 3 4 6 5 8 1 9 5

2) **Copying**

a) **Establish patient understanding of problem:** This training aims at helping the patient with the mechanics of copying. Since this is a rather complex task (i.e., involving horizontal and vertical scanning, reading, and writing), it is introduced after the patient has become fairly proficient with cancellations tasks and reading.

b) **Materials:** For copying prose, the materials are the same as for reading, plus a lined blank sheet of paper. For the line drawings, the materials include pairs of side-by-side dot matrices ranging from 4-20 dots each. In the left matrices, some dots are connected by solid lines.

c) **Training preliminaries:** Same as for reading.

d) **Training copying skills:**

1) Copying Prose (Diller et al., 1980; Pizzamiglio et. al, 1992)

- Start with large-type single sentences and newspaper or magazine titles to copy. Progress to a five-line paragraph, and gradually increase to 10- and 15-line passages. Form 5-5 provides a sample stimulus of prose for copying. The trainer begins with the minimum cues the patient needs for accuracy in copying. An anchor on the left margin, and sequential numbering of right and left margins of the passage, plus an anchor and similar numbering on the lined blank sheet of paper to be used for copying, may be required, depending upon the impairment level of the patient.
- Instruct the patient to copy the text exactly as he/she sees it (including punctuation, capitals, etc.). Have the patient start by copying the words one-at-a-time and line-by-line rather than grouping the words into phrases. Then instruct the patient to scan the passage from left to right, to find the word to be copied, and to begin copying next to appropriate anchors on the lined blank sheet of paper. In addition to a red visual anchor line, tactile and/or verbal cues may be necessary to facilitate performance.
- Initially, verbalization of words and location of the word in the passage should be encouraged. Words eventually can be grouped into dyads for scanning and then copying. Verbalization should then be phased out gradually, and the patient encouraged to perform the task in silence.
- As the patient's ability to copy gradually improves, cues can be systematically decreased as follows:
  - › Progressively remove tactile and verbal cues.
  - › Remove sequential numbers from right margin of passage and paper on which passage is to be copied. Have the patient read words to be copied aloud.
  - › Remove sequential numbers from left margin of passage and paper, but keep anchor lines on left. Continue to have the patient read the words to be copied aloud. At this point, patient can be instructed to copy passage in a continuous flow, rather than line-by-line.
  - › Remove left anchor line from passage and blank paper; continue to have the patient read the words to be copied aloud.

› Encourage patient to begin grouping words to be copied together, and continue to have patient read words to be copied aloud. Offer cueing as needed for accurate performance.

› Have the patient perform copying task in silence and gradually increase the length of the passage.

› Transfer from large-print text to regular-size print, and follow the above hierarchy of cues as needed for maintaining accuracy.

2) Copying Line Drawings (Pizzamiglio, 1992)

- The patient is presented a pair of four dot matrices; in the left matrix two dots are connected with a solid line. The patient is asked to copy this line drawing on the right matrix. A small circle indicates the point from which the patient must start their copy.
- The cueing procedure is similar to that used for copying prose.
- Once the patient is able to copy the four dot matrices accurately, gradually increase the number of dots per matrix up to 20.

5.5.f Visual Scanning for Describing Pictures

The following instructions are based upon visual scanning training procedures from Pizzamiglio et al. (1992). This picture description activity is included as part of a broader protocol including visual scanning for numbers in a large visual field, reading and copying training, and copying of line drawings.

a) Materials: Black and white pictures of simple figures and realistic scenes with a dimension of 30-42cm.

b) Training in Figure Description:

1) Start with simple figures and drawings. The patient is asked to describe all of the essential features depicted in the presented drawing or scene.

2) When stimuli are omitted, verbal cues are provided to aid performance. Cues may be generic (e.g., "Do you see anything else in this picture?"), or they may be specific with the aim or directing the patient's attention to missing elements.

Form 5-5 Sample Stimulus Material for Copying

1-	Up in Kentville, Nova Scotia, Walter	-1
2-	Wood, said to be the world's oldest Boy	-2
3-	Scout, recently celebrated his 103rd	-3
4-	birthday. Mr. Wood, who emigrated to	-4
5-	Nova Scotia from Britain when he was	-5
6-	20 years old, received Scouting's high-	-6
7-	est honor, the Silver Wolf Medal, in	-7
8-	1975. Did he expect to celebrate his	-8
9-	104th birthday? Mr. Wood's reply was	-9
10-	to note the Boy Scout motto, "Be pre-	-10
11-	pared."	-11

1-	-1
2-	-2
3-	-3
4-	-4
5-	-5
6-	-6
7-	-7
8-	-8
9-	-9
10-	-10
11-	-11

Figure: Copying Task Showing Maximum Cuing Provided on Paragraph to be Copied and "Blank Page" Upon Which to Copy

5.6 Visual Imagery Training: Lighthouse Strategy

Niemeier (1998) and Niemeier et al., (2001) described the "Lighthouse Strategy" used in the treatment of hemispatial neglect. The following steps are to be utilized for training.

1) When engaging in a task that requires visual attention, the patient is asked to imagine that they are a lighthouse and is shown a picture of one, if available. The therapist places a picture of a lighthouse in the farthest aspect of the left hemispatial field to which the patient can direct their visual attention. The patient is then asked to imagine that his/her eyes are like the lights inside the top of the lighthouse, sweeping all the way to the left and right of the horizon to guide the ships at sea to safety.
2) The therapist might ask, "What would happen if the lighthouse lit only on the right side of the ocean and horizon?" After the patient responds, the therapist says, "Let's try this," and introduces a simple computer-assisted, paper and pencil task, or table-top activity requiring full scanning of left and right hemispatial fields to be performed correctly.
3) The width of the visual stimuli to be scanned should be noted and controlled so as to challenge the patient, but at the same time ensure that the patient can succeed on some trials. If the therapist is using a computer, it may be important to use a large monitor that requires scanning to the outer edges of the visual field (Webster et al., 2001).
4) When the patient misses some of the stimuli, he or she is told, "Look, you missed these on the left (or right). Let's try that again, but this time pretend you are that lighthouse and turn your head from side to side to allow your eyes to sweep left and right like the light in the top of a lighthouse." The therapist provides a demonstration of the proper degree and rate of head turning, and the patient is also shown how to line up their chin first with the top of their right, and then the top of their left shoulder.
5) After completing the table-top activity, the patient is asked to count or locate items in the room on their right and left sides. Verbal and tactile cues are provided as needed to facilitate performance.
6) Initial training sessions focus on visually scanning paper-and-pencil, computer-assisted visual or simple functional tasks. With progress, subsequent training sessions incorporate ambulation or wheelchair negotiation tasks, and the patient is asked to identify target visual stimuli posted throughout the environment, or with periodic requests for the patient to locate people or objects on both sides. Physical cues such as lightly tapping the neglected shoulder can be used as well as verbal cues, both of which can be faded as the patient improves his or her ability to apply the strategy independently to training tasks.

5.6.a Activities for Training in Visual Scanning and the Use of the Lighthouse Strategy

Acquisition and Application Stages:

- Attention Process Training — large and small shape, number and letter cancellation tasks
- Computer-based scanning and tracking programs
- Computer-based reading programs
- Other simple reading materials
- Paper and pencil tasks (drawing, copying, coloring, writing etc.)

- Counting or locating pictures or objects spread out on a table
- Locating or counting objects or people within the treatment room
- Drawing and picture descriptions

Application and Adaptation Stages:

- Magazines, newspapers, novels, and textbooks
- Internet navigation tasks
- Locating keys on computer keyboard, icons on computer desktop, or tabs on the left side of program menus, web pages, etc.
- Computer-based reading fluency programs
- Following recipe instructions
- Cooking and shopping
- Locating items in a cluttered drawer or kitchen
- Locating, counting and/or navigating around people or objects during ambulation or wheelchair navigation
- Map reading and/or locating items on a map
- Locating treatment rooms or other target locations on the left side of the hallway while navigating facility
- Responding to targets on left side of screen during driving simulation task, or while playing video games
- Looking both ways before safely crossing the street

5.7 Limb Activation Strategies

5.7.a Spatio-Motor Strategies

Spatio-motor strategies encourage the patient to move their left hand, arm, or shoulder as much as possible immediately before or during visual training tasks. Some techniques have involved asking the patient to tap the table as many times as possible with the left hand (Wilson et al., 2000), or asking the patient to clench and open their left hand repeatedly, or if unable to do that, to simply lift their shoulder on the left, during the performance of the task (Brunila et al., 2002; Worthington, 1996).

5.7.b Visuo-Spatio-Motor Strategies

Visuo-spatio-motor strategies utilize both scanning and limb activation simultaneously. Research has demonstrated the success of this strategy in treating some cases of hemispatial neglect (Samuel et al., 2000; Worthington, 1996). It should be noted that this approach reflects a combination of the visual scanning strategy of "anchoring" and visuo-motor cueing.

1) During a reading task (or any visual scanning task) the patient is asked to: (a) place their left hand at the margin of the visual stimulus they are to visually scan; (b) look at their left hand; and (c) scan across the page until they complete the scanning task. The training involves teaching the patient to "scan to your hand."
2) In subsequent sessions, the patient can be taught to use this phrase as a means of cueing themselves to attend to the left side while performing reading or scanning tasks. Additionally, it is also recommended that the patient move his/her left arm before and during the scanning activity, if possible.
3) Movements that are most helpful are those that visually cue the patient to the left side of space (visuo-spatio-motor cueing) while activating the left limb at the

same time. Patients can be trained to move their left arm and to look at it when they unable to find the target of an exercise. If a patient fails to explore the left hemispatial field spontaneously, they should be cued to move their left arm and try again.

A similar technique, called the "Bon Saint Come" method (Wiart et al., 1997), involves the combined use of a biofeedback device and voluntary trunk rotation to improve performance on tasks requiring visual scanning. The following steps are involved in training.

1) The patient is taught how to use a device to search for lights on a lightboard. Initially, the patient is seated, and is wearing a vest that has a vertical metal bar attached to it. The pointer of the bar projects forward horizontally just above the apex of their head. In order to touch a target, the patient needs to rotate their trunk to move the device.
2) During the first sessions, a spotlight is used to cue visual fixation to the left side of the board. The patient is then required to detect visual and/or auditory signals and slowly move from the left to right side to locate and touch the target with the pointer. If the patient succeeds, the same visual and auditory signals are emitted, providing positive feedback. Incorrect responses provoke no response, and the patient has to try again.
3) As the patient's trunk control improves, they do the same exercises from a standing position. As treatment progresses, sessions can increase in duration from 15 minutes building up to an hour, according to the patient's capabilities.
4) Once the patient is able to successfully use the strategy, the technique can be adapted to other activities, without the need for the machine.

As is always the case, systematic data collection in the rehabilitation of neglect is very important. The therapist is encouraged to use the forms in Appendix B for data collection and graph these data, not only to determine if the rehabilitation strategies being utilized are resulting in progress, but for the patient and interested others to have feedback about progress. Actively engaging the patient in data collection also promotes the meaningfulness and relevance of rehabilitation.

5.7.c Activities for Training in the use of Spatio-Motor and Visuo-Spatio-Motor Strategies:

- Large and small shape, number and letter cancellation tasks using a boundary line as well as the hand as visual anchors
- Reading materials (magazines, novels, newspapers, maps, textbooks), again using the hand and a boundary line as visual anchors
- Locating keys on computer keyboard
- Paper and pencil tasks (drawing, copying, coloring, writing)
- Any activity of daily living (grooming, eating, dressing)
- Cooking
- Functional physical activities (transfers, wheelchair negotiation, ambulation)
- Scanning for particular road signs when a passenger in a car

5.7.d Imagined Limb Activation

When hemiparesis is so dense that no active movement is possible, imagined limb activation can be used. McCarthy et al., (2002) describe a procedure in which patients are asked only to visualize moving the left arm. In this procedure, the therapist directs the patient to perform a number of upper extremity movements with the unaffected right arm.

These include: (1) bending the arm at the elbow; (2) clenching the fist; (3) unclenching the fist; (4) stretching out the arm; (5) stretching out the fingers; (6) wiggling the fingers; and (7) pinching the fingers and thumb together. This sequence is then repeated with the same arm. Following this, the patient is asked to imagine performing these tasks, first with the right arm, and then with the affected left arm. Then, at various points during the completion of a task, the patient is again asked to imagine moving the left arm in the same set of movements.

One potential problem with this technique can be its level of difficulty. Imagining oneself engaging in even a simple motor activity can be difficult, particularly for those with additional impairments in body schema, sustained attention, working memory, or executive functioning. Also, the determination of whether the utilization of this technique is helpful must be based on the patient's performance on visual scanning, as it is obviously not possible for the therapist to know if the patient is able to imagine movement, other than based on their self-report. For these reasons, it is important for therapists to carefully question their patients during and after using this technique: "Were you able to imagine moving your arm? On a scale of 1-10, where 10 is perfect success, how did you do? Was there anything about the task that caused problems for you?"

5.8 Strategic and Tactical Goal Writing for the Rehabilitation of Hemispatial Neglect

PATIENT SR: Goals for Training in the use of the Lighthouse Strategy

Long-Term Strategic Goal:

Ms. SR will remember and use the Lighthouse Strategy to compensate for her left hemispatial neglect during training tasks.

Monthly Strategic Treatment Goal:

Initiate/Continue _____ stage (e.g., acquisition, application) of Lighthouse Strategy training.

Short-Term Tactical Treatment Goals:

STGa: Ms. SR will demonstrate effective use of the Lighthouse Strategy during training tasks with maximum verbal, visual, and tactile cues.

STGb: Ms. SR will perform large shape cancellation tasks (using a left side boundary marker) with 75% accuracy and maximum verbal cues to use the Lighthouse Strategy.

STGc: Ms. SR will perform small shape cancellation tasks (using a boundary marker) with fewer than two left side errors and moderate verbal cues to use the lighthouse strategy.

STGd: Ms. SR will scan for and locate keys on a computer keyboard with 90% accuracy and minimum verbal cues to use the Lighthouse Strategy.

STGe: Ms. SR will scan for and locate icons on the left side of computer screen with 100% accuracy and intermittent cues to use the Lighthouse Strategy.

STGf: Ms. SR will independently track and respond to visual stimulus moving left to right at slow speed on computer screen with 90% accuracy.

STGg: Ms. SR will independently scan for, and locate visual stimulus, presented to left visual field in time decreased by 5% of baseline.

Long-Term Strategic Goal:

Ms. SR will effectively use the Lighthouse Strategy to compensate for her left hemispatial neglect during daily functional activities.

Monthly Strategic Treatment Goal:

Initiate/Continue adaptation stage of Lighthouse Strategy training.

Short-Term Tactical Treatment Goals:

STGa: Ms. SR will scan for and locate items on left side of treatment room on 7/10 trials with moderate verbal cues to use the Lighthouse Strategy.

STGb: Ms. SR will attend to speaker on left side of treatment room on 9/10 trials with minimum verbal and tactile cues.

STGc: Ms. SR will scan for and locate target objects on the left side of table during cooking activity with 90% accuracy and intermittent verbal cues to use the Lighthouse Strategy.

STGd: Ms. SR will independently use the Lighthouse Strategy to scan for and locate 9/10 target items on left side of supermarket shelf.

STGe: Ms. SR will navigate around 100% of obstacles on her neglected side during ambulation activities with intermittent cues to use the Lighthouse Strategy.

STGf: Ms. SR will independently use the Lighthouse Strategy to scan for oncoming traffic in both directions during outdoor ambulation task on 5/5 trials.

STGg: Ms. SR will independently scan for and locate tabs on left side of web page during internet training activity with 100% accuracy.

STGh: Ms. SR will independently use the Lighthouse Strategy to locate target objects on her neglected side during cooking task in time decreased by 5% of baseline.

STGi: Ms. SR will perform reading fluency task on computer in time decreased by 10% of baseline.

PATIENT TM: Goals for Training in the use of Spatio-Motor or Imagined Limb Activation Strategies

Long-Term Strategic Goal:

Mr. TM will independently remember and use spatio-motor (or imagined limb activation) strategies to improve his awareness of, and attention to, his neglected side during daily functional activities.

Monthly Strategic Treatment Goal:

Initiate/Continue _____ stage (e.g., acquisition, application, adaptation) of Spatio-motor and/or Imagined Limb Activation Strategies

Short-Term Tactical Treatment Goals:

STGa: Mr. TM will perform left upper extremity exercises prior to initiating visual scanning tasks with maximum verbal, visual, and tactile cues.

STGb: Mr. TM will perform imagined limb activation exercises prior to engaging in bed to wheelchair transfer task with maximum verbal, visual, and tactile cues.

STGc: Mr. TM will continually engage in hand tapping exercise with his left hand while performing reading task with moderate verbal cues.

STGd: Mr. TM will independently initiate use of visualization strategy prior to performing reading task during 1/5 treatment sessions.

STGe: Mr. TM will independently initiate and perform ten left shoulder shrug exercises prior to engaging in dressing task during 5/5 treatment sessions.

PATIENT BG: Goals for Training in the use of Visuo-Spatial-Motor Strategies

Long-Term Strategic Goal:

Ms. BG will effectively use visuo-spatio-motor strategies to improve her awareness of and attention to her neglected side during her daily functional activities.

Monthly Strategic Treatment Goal:

Initiate/Continue _____ stage (e.g., acquisition, application, adaptation) of visuo-spatial-motor strategy training.

Short-Term Tactical Treatment Goals:

STGa: Ms. BG will perform large shape cancellation tasks with 75% accuracy with maximum verbal, visual, and tactile cues (including using a boundary line and left hand placement as anchors).

STGb: Ms. BG will complete figure copying task with fewer than two left side omissions with moderate verbal cues, and use of a boundary marker and left hand placement as visual anchors.

STGc: Ms. BG will attend to her neglected side during ambulation task with moderate verbal and tactile cues.

STGd: Ms. BG will scan for and locate visual stimulus on the left side of cancellation tasks with 90% accuracy (using both a boundary line and left hand placement as visual anchors) and minimum verbal cues.

STGe: Ms. BG will locate food on left side of dinner plate with boundary marker, left hand placed on edge of plate and intermittent verbal cues.

STGf: Ms. BG will independently attend to her neglected left side and initiate left upper limb movement prior to performing transfer task.

STGg: Ms. BG will independently use compensatory strategies to cue herself to attend to her neglected side while performing reading task.