Adults With Traumatic Brain Injury: Three Case Studies of Cognitive Rehabilitation in the Home Setting

Susan Miron Schwartz

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This article discusses the use of occupational therapy in the home setting and the individual application of treatment methods. Three case studies are presented that involve adults with acquired brain injury with memory deficits. The treatment methods used were (a) satutational cuing with behavioral chaining and positive reinforcement, (b) a coordinated team approach incorporating family or significant others and other therapists, and (c) environmental adaptations. A decision-making model and the dynamic assessment approach were used as a framework for treatment planning.

The treatment technique chosen depended on the skill to be learned and the patient's learning style. Each case required the selection of environmental adaptations including (a) use of family and attendants as cotherapists; (b) a tape-recorded message, played daily; and (c) an appointment book for daily things to do. Each case demonstrated prolonged therapy for skill acquisition with this patient population.

Treatment Planning Tools

Decision-Making Model

The decision-making model is a tool to organize information into a logical sequence. This model provides an overall context for evaluation, treatment planning, treatment implementation, and assessment of treatment effectiveness. It is used to determine whether a primary deficit exists, whether internal and external strategies should be developed, and whether environmental restructuring would be beneficial (Goodwin & Bolton, 1991). Ten specific questions guide the decision-making sequence.

1. Are any of the patient's basic cognitive abilities impaired? Cognitive abilities most commonly affected include attention, concentration, abstract thinking, information processing, problem solving, and memory (Kay & Silver, 1988).

2. How are other related systems functioning? These systems may be motor, visual, perceptual, sensory, or auditory.

3. Does the patient have the skills to be restimulated or retrained? The patient's residual skills are evaluated to determine whether the patient can learn through systematic training to ameliorate the cognitive deficit.

4. Is a restimulation program enough to facilitate learning activities of daily living? If not, compensatory techniques are used.

5. Are there other conditions interfering with the cognitive retraining? These would be emotional, behavioral, or physical factors. If these conditions exist, treatment goals are established to attempt to reduce them.

6. Are other methods needed in addition to cognitive approaches? If the noncognitive factors continue to interfere, other professionals or programs should be added to more directly manage these conditions.

7. Can the patient learn a compensatory strategy? A compensatory strategy provides the patient with a method to bypass the deficit in order to complete a task (i.e., use of a written checklist). The technique chosen will...
depend on the patient’s cognitive and related systems skills in addition to the patient’s level of awareness of his or her cognitive challenges.

8. Should environmental restructuring be added to the treatment? When the patient is unable to use a compensatory strategy and there is no evidence of a noncognitive factor, environmental restructuring may be needed.

9. Has the compensatory strategy been generalized from one daily living skill to another? If the strategy can be used across situations, it is effectively incorporated. If not, further environmental restructuring may need to be added.

10. Are the compensatory strategies effective and are the restimulation exercises beneficial? Reevaluation of the training program will determine whether the training methods are effective and whether a change is needed.

Dynamic Assessment
Dynamic assessment is used to determine the difference between the level of the learner’s performance before and after the application of intervention methods (Vygotsky, 1978; Campione & Brown, 1987). This Test-Intervention-Test paradigm provides information regarding the learner’s modifiability and whether an intervention technique is effective (Lidz, 1991a; Lidz, 1991b). Toglia (1989) has suggested use of dynamic assessment for evaluation of cognitive abilities in adults with brain injury. During the evaluation, the therapist asks the patient questions to elicit verbal information regarding the patient’s cognitive approach during the task performance.

Dynamic assessment is used to determine the patient’s cognitive strengths, weaknesses, and learning style. Learning style includes the patient’s preferred method of presentation and retention of information, executive function capacities (ability to plan and organize), and metacognition levels, that is, the ability to self-correct errors (Cicerone & Tupper, 1986; Wheatley & Rein, 1989). In the following case studies, the dynamic assessment was modified for two patients who were unable to recall or describe their cognitive approaches (Glisky, Schacter, & Tulving, 1986; Graf, Squire, & Mandler, 1984). Each patient’s performance of a daily living task was either directly observed by the therapist or derived from information based on observations made by other staff or family members instead of direct questioning during the task performance (Giles & Clark-Wilson, 1988; Giles & Shore, 1989a; Kay & Silver, 1988).

The dynamic assessment method was used to determine answers to questions in the decision-making model. The focus of questions 1–7 in the decision-making model is on the patient’s learning style, whereas questions 8–10 relate to treatment effectiveness.

Learning Style

Patient’s Preferred Method of Presentation
Questions 1 and 2 of the decision-making model gather information about the patient’s strengths and weaknesses regarding language, cognitive, perceptual, and motor skills. This information in combination with observations of the patient’s current use of compensatory strategies helps determine the patient’s preferred method of input (i.e., visual or auditory).

Retention Strategies
Questions 3 and 4 of the decision-making model look at the patient’s ability to benefit from remediation or retraining techniques. Persons who have brain injuries with memory deficits have the capacity to learn new information. Information is recalled by the actual performance of the activity within the context in which it was learned; this process is known as procedural memory (Germak, 1976; Cohen & Squire, 1980; Glisky et al., 1986; Squire, 1986). The process of learning is not recalled by the patient. It has been suggested that other types of memory may be involved in the learning process (Giles & Shore, 1989a; Glisky et al., 1986; Wilson, Baddeley, & Cockburn, 1989). Other types of memory include episodic memory (recall of the situational experience) and semantic memory (recall of facts). Tasks that appear procedural, such as the operation of an alarm on a watch, may include episodic and semantic memory. Semantic memory is observed when a patient reports information, but not when it was acquired (Parenté & Anderson-Parenté, 1989; Squire, 1986). With episodic memory, task performance occurs when the patient is in the same environmental context in which the learning took place. The way in which instructions or questions are phrased will influence the type of response elicited from the patient (Glisky et al., 1986; Graf et al., 1984). As noted in the research, persons with memory loss learn through procedural, episodic, and semantic memory. To elicit these types of memories, the following case studies used training methods to facilitate experiential, verbal, and sequential task performance.

Executive Functions
Executive functions include the patient’s ability to plan, organize, initiate, and inhibit actions and self-correct performance (Cicerone & Tupper, 1986; Pollens, McBratnie, & Burton, 1988). Impairment of executive functions affects the patient’s level of independent follow-through using compensatory techniques such as checklists, notebooks, or calendars.

Metacognitive Levels
Metacognition is the ability to recognize one’s own cognit-
tive abilities and to monitor one's own performance, that is, anticipation of behaviors and correction of errors. The patient's level of metacognition affects the patient's ability to accept and comply with training techniques.

Training Techniques For Adults With Memory Loss

Traditional memory training has focused on recall of information (Brooks & Baddeley, 1976; Cermak, 1976). Studies using retrieval techniques such as spaced retrieval (Schacter, Rich, & Stamm, 1985), mnemonics (Gianutsos & Gianutsos, 1979), and paired associates through visual imagery or verbal cues (Cermak, 1976; Crossan & Buening, 1984) have demonstrated a patient's ability to learn in clinical settings. However, application of these retrieval techniques in daily occupational performance is limited (Lawson & Rice, 1989). In fact, these memory techniques appear to become additional memory tasks (Ryan & Ruff, 1988); they do not address prospective memory tasks, that is, tasks that are to be accomplished in the future (Harris, 1983). It has been found that adults without brain injuries chose external compensation strategies rather than internal retrieval techniques to aid in completing prospective memory tasks (Metheam & Singer, 1977). For people with traumatic brain injury, external compensation techniques (i.e., checklists) (Kreutzer, Conder, Wehman, & Morrison, 1989), microcassette tape recorders (Parente & Anderson-Parente, 1989), and electronic aids (Giles & Shore, 1989b; Naugle, Naugle, Prevey, & Delancy, 1989) have been successfully used to improve a patient's independent performance of activities of daily living or work tasks. The training techniques used are not always explicit; however, saturational cuing seems to be the unstated method used.

Saturational cuing or prompting is the use of a series of physical or verbal cues, or both, which provides a structure in order to accomplish the task. As the patient learns to incorporate the behaviors, cues can be reduced or simplified (Ben-Yishay, Diller, Gerstman, & Gordon, 1970; Ben-Yishay, Diller, & Mandelberg, 1970; Ben-Yishay et al., 1985; Diller & Gordon, 1986; Giles & Shore, 1989a). The patient's ability to detect and correct his or her errors to learn a more complex level of behaviors is inherent in saturational cuing. This ability can be achieved in three stages: (a) acquisition: learning how to use the device, (b) application: learning when and where the device is to be used, and (c) adaptation: learning the device's use in novel situations. Each stage requires sufficient repetition to ensure that the skill has been learned and can be maintained (Sohlberg & Mateer, 1989). In the three case studies, saturational cuing was used in learning the new target behavior.

In developing the training program, the patient's motivation to use the compensatory techniques will affect the amount of structure that can be incorporated by the patient. The therapist needs to be aware of appropriate timing for introduction of treatment techniques because the patient and family may have a wide range of emotional reactions to the changes (i.e., memory deficits, role reversals) that have occurred (Miller, 1991; Moffat, 1984). The therapist provides consistent feedback and praise during all stages of training (Dolan & Norton, 1977). Feedback helps to link the problem, the compensatory technique, and the improvement in the patient's performance areas.

Case Studies

The answers to questions 1 and 2 of the decision-making model provide information regarding the patient's learning style. Once this and the problem behavior to be addressed are determined, compensatory techniques are developed by the therapist. The development of the compensatory technique is dependent on information collected via the decision-making model and dynamic assessment. Methods to develop techniques include (a) activity analysis of steps needed to complete the task, (b) development of a specific set of instructions or materials to be used to complete the activity, and (c) development of methods of training techniques (Kreutzer et al., 1989; Wilson, 1984).

In response to questions 3 and 4 of the decision-making model, in the following cases certain behaviors did not change as a result of restimulation programs; therefore, compensatory techniques were added to the training program.

The severe initiation and short-term memory deficits of Patient 2 required additional training methods that could provide continuous cues over time, facilitate immediate responses, and provide extensive rehearsal over time (Schacter et al., 1985). Other techniques to facilitate recall included first-letter mnemonics (i.e., one letter is used to represent the word) (Wilson, 1982) and vanishing cues (i.e., letters of the word are slowly eliminated for recall of the word) (Glisky & Schacter, 1988; Moffat, 1984; Wilson, 1982). A modified version of vanishing cues was used in which words were eliminated from the sentence. When possible, the training programs included family members to provide preinjury status information, to act as cotherapists, and to provide emotional support (Dargin, 1989; McKinlay & Hickox, 1988; Romano, 1989). Families of Patient 1 and Patient 2 became an integral part of the planning and implementation of treatment, thus assisting in achieving the desired goals (Carberry, 1992; McKinlay & Hickox, 1988).

In each case, the compensatory techniques were introduced after the acute stages of recovery. In the first case, therapy at home began at 2½ years after injury. In the other two cases it began 1 year after injury. These two patients also participated in a cognitive therapy program of group and individual treatment at an outpatient facility. The treatment interventions were applied after these pa-

The American Journal of Occupational Therapy
tients were in the outpatient facility 3 months. This time lapse suggests that the changes in their performance were a result of neither spontaneous recovery nor the facility's remediation program.

Patient 1

Background. Patient 1, a 50-year-old married man, was assaulted and experienced head trauma. This injury caused right frontal and parietal fractures and a left epidural and subdural hematoma; he was in a coma for approximately 10 days. He spent 2 years and 9 months at an inpatient rehabilitation facility specializing in head injury. When he entered the facility he was rated Level I (inconsistently responsive to general stimuli) on the Rancho Los Amigos Rating Scale (Hagen, Malkmus, & Durham, 1972). Almost 3 years later, when he left the facility, he was rated at Level VI (confused but responding appropriately to simple directions) (Hagen et al., 1972).

Patient 1 returned to his home to live with his wife and receive 24-hr attendant care. He could say a few words but had severe anomia. Physically, he had good muscle strength in his left arm and leg and moderate to severe spasticity and contractures throughout his right extremities with synergistic movement patterns. He used a wheelchair for mobility and was taking antiseizure medications (see Table 1 for details of his occupational performance status). Patient 1 was provided with occupational therapy, speech therapy, and physical therapy three times a week at home. His wife was dedicated to his recovery. During his inpatient rehabilitation she spent every day with him. Cognitive deficits. Patient 1 had short-term memory loss, poor initiation, inability to solve problems, and concrete thinking. In addition, he had right visual neglect and decreased visual acuity with moderate perceptual impairments. Learning style. Patient 1's preferred methods of learning were through his auditory and motor skills. He benefited most from physical cues with brief, simple verbal feedback provided during actual practice of a task. He was unable to initiate, plan, or organize an activity; he was dependent on others to direct his schedule. He had no recognition of his cognitive impairments. Treatment intervention. Occupational therapy goals were to increase the patient's independence in basic hygiene and grooming skills. Treatment directed toward these goals was initiated 3 months after his discharge. The patient's wife and home health attendants were interviewed to determine how he performed the morning hygiene and grooming routine when not receiving therapy. A specific behavioral sequence was used as follows:

- **Brushing teeth**
  1. Propel self to bathroom.

2. Gather supplies: toothbrush, cup, toothpaste.
3. Put toothpaste onto toothbrush.
4. Brush teeth.
5. Fill cup with water.
6. Rinse mouth.
7. Clean toothbrush.

- **Shaving**
  1. Stay at sink area in bathroom.
  2. Gather supplies: razor and preshave lotion.
  3. Apply preshave lotion.
  4. Shave.
  5. Clean razor.
  6. Put supplies away.

Patient 1 learned the physical components of brushing his teeth and shaving within 2 months. He still required verbal cues both to sequence the activity and to scan to find the objects he needed during the activity.

Treatment progress. After 2 months of training in hygiene and grooming, reevaluation (use of question 5 and 6 of the decision-making model) indicated that behavioral issues were interfering with his performance. The patient's wife and home health attendant had difficulty managing his behavior. A consistent morning routine had never been established; for example, the patient would be given the razor but would shave in the living room. The patient's wife stated that her husband was not cooperative in the morning; he refused to transfer out of bed to take his shower. The behavior sequence established during therapy was not followed unless the occupational therapist was present.

At this time, psychology services were added to the program at home once a week to teach the family members and the patient how to manage the behavioral issues. After 3 months of training with the psychologist, Patient 1 was still receiving moderate assistance from the home health attendant or his wife in order to brush his teeth and shave (see Table 1).

Modification of treatment. Because Patient 1 had shown the ability to learn, the occupational therapist thought that he should be able to learn the sequence of brushing teeth and shaving. To discern possible reasons for the discrepancy between Patient 1's potential and his performance, a team meeting was organized with all of the therapists, the patient, his wife, and the home health attendant to discuss the goals of all concerned.

The patient's wife's primary goal was for her husband to walk. She believed that using the wheelchair was not normal and that any encouragement to function in a wheelchair would limit Patient 1's ability and motivation to walk. The team members explained how performing daily activities from a wheelchair would improve strength, coordination, cognition, and self-worth, components that would contribute to Patient 1's ability to walk. The team
Table 1

Status of Patient 1, After Discharge to Home

<table>
<thead>
<tr>
<th>Skills Area</th>
<th>5 Months</th>
<th>8 Months</th>
<th>12 Months</th>
<th>16 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Living Skills</td>
<td>Requires moderate assistance by one person to transfer to toilet, bed, mat, and car</td>
<td>Transfers with spotting to mat requiring minimal assistance by one person to set up wheelchair</td>
<td>Requires minimal assistance into bed Is independent to mat with assistance to set up wheelchair</td>
<td>Requires much coaxing to follow through with the activity or do something new</td>
</tr>
<tr>
<td>Transferring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brushing teeth and shaving</td>
<td>Able to brush teeth after someone else performed setup and cleanup Is shaving dependent</td>
<td>Has learned physical components Requires verbal cues to sequence the task and occasionally to find supplies</td>
<td>Independently follows through with brushing teeth and shaving in the bathroom</td>
<td>Car obtains clothes from closet but does not follow through outside therapy session</td>
</tr>
<tr>
<td>Dressing</td>
<td>Requires minimal assistance to put on garments and moderate cues to sequence</td>
<td>Physically unchanged Knows sequence</td>
<td>Requires minimal assistance with socks and shoes Is independent with upper extremity garments</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Managing urinary</td>
<td>Is dependent</td>
<td>Independently manages while in wheelchair; requires assistance to stabilize wheelchair Is dependent in bed</td>
<td>Unchanged</td>
<td>Manages urinal in bed when awakens during night</td>
</tr>
<tr>
<td>Wheelchair mobility</td>
<td>Propels wheelchair within apartment Bumps into furniture</td>
<td>Unchanged</td>
<td>Pushes wheelchair through hallways of apartment house; minimal assistance needed on uneven (outdoor) terrain</td>
<td>Still needs minimal assistance outdoors (controls wheelchair with his foot when going down smooth incline)</td>
</tr>
<tr>
<td>Cognitive and Behavioral Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior</td>
<td>Resists certain activities, (i.e., taking morning shower)</td>
<td>Unchanged</td>
<td>Requires much coaxing to follow through with the activity or do something new</td>
<td>Spontaneously requests to do familiar activities (i.e., to attend programs at the YMCA)</td>
</tr>
<tr>
<td>Cognitive</td>
<td>Shows poor STM, unable to recall activities from beginning of therapy session</td>
<td>Unchanged</td>
<td>Shows concrete thinking Still has severe memory deficits</td>
<td>Shows concrete thinking Able to recall if someone visited the same day</td>
</tr>
<tr>
<td>Language</td>
<td>Has large printed cards organized into basic categories Word retrieval a problem Cannot name common objects Cannot read</td>
<td>Unchanged</td>
<td>With cues, writes words when cannot say word Still has word retrieval difficulty, but spelling the word sometimes helps him Is beginning to read a large print word by saying each letter</td>
<td>Word retrieval still a problem but spontaneously writes to spell out words Gives more appropriate social responses Reads large print words; can sometimes sound out words</td>
</tr>
</tbody>
</table>

Note: STM = Short-term memory.

meeting provided the opportunity not only for the patient's wife to recognize a unified concern, but also for the team and family members to develop more closely aligned goals.

For the next 3 months, occupational therapy sessions continued with a focus on reinforcing the behavioral sequence and educating the home health attendants and the patient's wife. Education consisted of suggestions about how to provide a consistent routine and decrease the amount of assistance provided to the patient. After 3 months, Patient 1 became independent in brushing his teeth and shaving daily.

Outcome for Patient 1. Occupational therapy provided the structure for Patient 1 to learn the physical routines of his basic grooming skills. Yet he was not able to perform the behavioral sequence on his own due to the lack of consistent environmental structuring. A team meeting provided an opportunity to understand the cognitive and noncognitive issues that prevented the patient's progress. The treatment plan was modified to include other disciplines in addition to continuing the training technique. Other issues that might have affected his learning were seizures every 2 months and poor sleeping patterns. A neurologist and a psychiatrist were consulted and medications were prescribed for both of these problems.

Three years later Patient 1's behavior is improved and his mood swings are not as severe or frequent. He
maintains his independence in shaving and brushing his teeth. He has progressed to ambulating with a long leg brace and a platform walker with minimal assistance from the physical therapist.

**Patient 2**

*Background.* Patient 2, a 30-year-old single man, was hit by a car and incurred brain injury with right occipital and bifrontal hematomas. He was in coma for 4 to 5 weeks. He was hospitalized and received rehabilitation for 6 months. After he was discharged he lived in an apartment where he received 24-hr home health care, individual occupational therapy, and physical therapy. Patient 2’s parents lived nearby and visited daily.

Four months later, home health care was reduced to 12 hr and the patient entered an outpatient cognitive remediation program 4 days a week. The outpatient program did not provide occupational therapy, thus occupational therapy continued to be provided by the home care therapist once a week.

*Cognitive deficits.* Patient 2’s attention, short-term memory, and problem-solving skills were severely impaired. Details are shown in Table 2.

*Learning style.* Patient 2 was more responsive to auditory than to visual cues. He had intellectual awareness; he could agree with the therapist that he had problems but did not know what they were. Patient 2 desired to improve and he trusted the therapist to help him. His executive functions were severely impaired (see Table 2). Thirteen months after injury, Patient 2 was still unable to initiate his morning bathing, dressing, and grooming routine.

*Treatment interventions.* Compensatory strategies that had previously been tried included a checklist posted in the bathroom and an early-morning phone call from his mother to remind him to shower, brush his teeth, and dress. After the phone call, the patient could only recall and perform one out of the three hygiene tasks (getting dressed).

The occupational therapist needed to address questions 7 and 8 in the decision-making model and to see how Patient 2 actually sequenced his morning routine. Because he was unable to verbalize the sequence, the occupational therapist prompted him to simulate the sequence by walking through the steps. He walked past the checklist on the wall, ignored the sign, walked into the living room to watch television, and, when ready to leave the apartment, dressed without showering, shaving, or brushing his teeth.

### Table 2

**Patient 2’s Performance**

<table>
<thead>
<tr>
<th>Daily Living Skills and Learning Ability</th>
<th>6 Months After Injury</th>
<th>13 Months After Injury</th>
<th>19 Months After Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grooming, bathing and dressing</td>
<td>Shaving: takes 20 min to complete, needs to refocus, needs cues to complete any self-care activity</td>
<td>Needs external cues to initiate shower, shaving, brushing teeth, needs cues to complete any self-care activity</td>
<td>Consistently shaves; occasionally showers, dresses in new clothes 80% of the time, wears dirty eyeglasses</td>
</tr>
<tr>
<td>Orientation</td>
<td>Is aware of date two out of three times</td>
<td>Is aware of date by checking calendar on watch</td>
<td>Is consistently aware of date by using his watch</td>
</tr>
<tr>
<td>Short-term memory</td>
<td>Cannot recall events within hour treatment session</td>
<td>Recalls previous day’s events with prodding</td>
<td>Recalls some of previous week’s events with prodding</td>
</tr>
<tr>
<td>Directions and error detection</td>
<td>Follows one-step written directions</td>
<td>Reads and follows one-step directions, does not respond to written cues due to decreased attention and initiation</td>
<td>Reads written two-step directions; needs cues to initiate doing the task, unable to detect own errors</td>
</tr>
<tr>
<td>Attention span</td>
<td>5 min</td>
<td>20 min with cues to persist with task</td>
<td>20 min unsupervised, 45 min structured supervised activity</td>
</tr>
<tr>
<td>Lack of spontaneity; initiation</td>
<td>Is passive; inactive unless prompted</td>
<td>Volunteers responses without waiting to be asked</td>
<td>With structure and previously learned routine, can complete the task and go to the next learned activity</td>
</tr>
<tr>
<td>Visual scanning</td>
<td>Has no visual losses, does not scan environment</td>
<td>Minimally scans environment if cued</td>
<td>Responds to cues to scan, is unable to find objects in cluttered areas</td>
</tr>
<tr>
<td>Visual-spatial</td>
<td>Has moderate impairment</td>
<td>Has moderate impairment</td>
<td>Has minimal impairment</td>
</tr>
<tr>
<td>Social skills</td>
<td>Makes redundant comments; gives concrete responses, responds to humor</td>
<td>Gives “pat” responses to questions that confuse him, initiates humor</td>
<td>Begins to show flexibility in conversation—asks more appropriate questions on the telephone</td>
</tr>
<tr>
<td>Home health attendant</td>
<td>24 hr</td>
<td>12 hr</td>
<td>8 hr</td>
</tr>
</tbody>
</table>

July/August 1995, Volume 49, Number 7
The checklist and phone call did not stimulate Patient 2's active mental engagement. He partially responded to the verbal cue provided by his mother’s phone call: he dressed but ignored the written message. The answers to questions 7 and 8 of the decision-making model were both yes, with modification needed of the existing environmental restructuring. Because Patient 2 responded more to verbal cues, the therapist decided to increase their frequency. A tape recorder was programmed with a personalized message, creating a new behavioral chain for the morning routine. A timer was attached to the tape and was programmed to play daily at high volume for 5 min. Through interview with the patient and trial and error, the tape was set to play at the approximate time of the patient’s awakening. This message prompted him to start his morning routine. The tape contained seven 5-min repetitions and was rewound weekly by the therapist. Examples of the tape-recorded message were: “It’s time to do the three S’s: Shower, shave, and shampoo”; “When you see the three S’s on the wall, what do you do?” and; “It’s time to shower, _____, and _____.” In the latter example, Patient 2 spoke the appropriate response aloud. Patient 2’s music preference was played in the background. The therapist made comments between the basic messages to personalize the information and link new visual images to the sequence of the morning routine (e.g., go directly to the bathroom and not to the living room). The tape-recorded message requested five behaviors: shower, shave, shampoo, brush teeth, and take medication.

Treatment progress. After 3 months of using the tape-recorded message (16 months after injury), the patient randomly completed two to three of the five tasks daily. He did manage to accomplish four to five of the tasks once a week. To reinforce the message of the tape, extra written cues were placed on the bedroom door directing him to the bathroom. Although he did not seem to immediately react to the written checklist, upon being questioned, he did recall seeing the posted list. After 6 months of using the tape-recorded message, the patient consistently shaved and occasionally showered.

Modification of treatment. The answers to question 7 and 8 of the decision-making model revealed that Patient 2 was using the compensatory strategy but that the method had to be modified. The message had to be changed because he had learned one behavior consistently and other behaviors sporadically. In addition, the patient stated that he no longer focused on the message, due to its familiarity. A new message was recorded with new tasks—eat breakfast and review appointment book—and with condensed old messages. His mother was asked to reduce her morning instructional phone calls to two or three times a week. A checklist of the morning tasks was placed on the bathroom mirror. The ineffective written cue on the bedroom door was eliminated.

The tape-recorded message was discontinued 6 months later for several reasons: (a) the patient spontaneously showered and performed most of the other hygiene activities two to three days a week, (b) the tape-recorded message had become too familiar, and (c) his response to cues provided by the written checklist improved. Patient 2 often spent weekends with his family where there was no tape recorder. In this different environment, he required verbal cues to initiate the hygiene and grooming sequence.

Two years after the initiation of the tape-recorded messages, Patient 2 followed his morning routine with the checklist in the bathroom. Throughout Patient 2’s treatment, the therapist and the patient’s mother communicated by telephone weekly and later bimonthly to review his procedural learning, determine how much he used the tape, and gather feedback to monitor Patient 2’s performance.

Outcome for Patient 2. Sixteen months after injury, after 3 months of intensive cognitive rehabilitation at the outpatient program, the patient still lacked the ability to perform his hygiene and grooming tasks. Occupational therapy provided family education and external compensations (tape-recorded messages) to increase this patient’s level of independence.

Several factors contributed to the effectiveness of this occupational therapy program. The intervention of a personalized message tape capitalized on the patient’s preferred auditory learning method. For this patient, the tape-recorded message provided a consistent and repetitive cue with a method to link separate behaviors into a continuous set of behaviors. This approach helped to facilitate procedural learning. The tape recorder eliminated the need for (a) recall to use a checklist, (b) recall to operate the memory aid, and (c) a facilitator to be present in the immediate environment. The tape-recorded message was programmed to elicit verbal responses, which helped to achieve mental engagement and facilitate semantic learning.

Learning for this patient seems to have occurred through procedural and semantic memory. When Patient 2 was posed a general question, such as how he accomplished his morning routine, he would state that he did not know. If he were asked a more specific question, such as “What did you do after getting out of bed?” he would state he went to the bathroom to shower. He could also verbalize part of the sequence from the tape-recorded message, for example, “shower, shampoo, shave.” If the therapist said “shower,” he would then add “shampoo and shave.” This concrete response was further apparent in his inability to transfer his learning to a new context, that is, when staying at his parents’ apartment. He required reapplication of rules in every setting.

Feedback on his performance was provided to the patient through a verbal and written outline that noted and praised his behavioral accomplishments. Patient 2’s family members were instrumental in acting as cotherapists providing cues and emotional support through their
consistent understanding and patience.

**Patient 3**

**Background.** Patient 3, a 32-year-old mother of two, was diagnosed with hypereosinophilia, a rare blood disease secondary to chronic asthma. After having a seizure she went into coma for 24 hr. She had brain damage and was hospitalized for 5 months, receiving rehabilitation only during the last month. She was discharged to her apartment where she lived with her two small children and husband. She had a homemaker visit 2 days per week to help with household activities. Occupational therapy was introduced at this time; however, it was suspended when she did not carry out any of the suggested strategies.

Six months after discharge, the patient’s husband moved out. In addition to coping with the emotional issues of separation, the patient had to learn to manage the household, children, and budgeting on her own.

The patient had no physical limitations with the exception of left foot-drop leading to mildly impaired gait. Despite this, she drove at 13 months after injury. The patient was taking medications for her asthma.

**Cognitive deficits.** Neuropsychological testing was administered at 8 and 18 months after injury and scores were largely unchanged at the second testing. Short-term memory remained significantly impaired; recall of previous events 20 min later was not possible at either testing. However, at the second testing, the patient’s recall of some of the events was aided by her use of a calendar.

**Learning style.** The patient’s primary cognitive deficits were severe memory problems, decreased organizational skills, difficulty seeing the larger picture, and decreased problem solving. Her language skills were intact and she learned through visual cues reinforced by verbal, visual (drawings), and written information. Her level of anxiety fluctuated; when her anxiety was high, she could not concentrate. She demonstrated an intellectual level of awareness in that she was able to state that she had a memory problem. She was unaware of her other cognitive deficits and their impact on her daily functioning (see Table 3).

**Treatment interventions.** When occupational therapy was reintroduced at 4 months after discharge, Patient 3 hesitated to accept the therapy—she emphasized that she was always a spontaneous person and she wanted to maintain that personality trait. Questions 7 and 8 of the decision-making model were answered yes. These two questions, in addition to question 9, were continuously reviewed in the therapy sessions by (a) questioning and observation to determine which compensation techniques helped her during the previous week, (b) development and modification of compensation techniques, (c) discussion of when and how spontaneous behaviors were disruptive to her daily life, (d) explanation of how her cognitive problems interfered with her daily living skills.

### Table 3
**Status in Activities of Daily Living for Patient 3**

<table>
<thead>
<tr>
<th>Activities</th>
<th>11 Months After Injury</th>
<th>18 Months After Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(grooming, dressing, bathing)</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td><strong>Household Activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grocery shopping</td>
<td>Makes frequent trips to small grocery store</td>
<td>Shops weekly; occasionally makes additional trip</td>
</tr>
<tr>
<td>Meal planning</td>
<td>Last minute; often needs to run out for an item around dinnertime</td>
<td>Meals are planned in morning; if item needed, is purchased before dinner time</td>
</tr>
<tr>
<td>Monitoring food in refrigerator</td>
<td>Unaware of whether food is 1 or 10 days old</td>
<td>Places dates on cooked foods; somewhat aware of how long a food item is in refrigerator</td>
</tr>
<tr>
<td>Money management</td>
<td>Is dependent, husband did all banking and record keeping</td>
<td>Keeps receipts for cash purchases and totals them for monthly budget</td>
</tr>
<tr>
<td></td>
<td>Money is given for weekly grocery supplies; has no idea of how much money was spent or for what</td>
<td>Manages own checkbook and bank statement</td>
</tr>
<tr>
<td>Child care</td>
<td>Has difficulty reading fatigue signals of children</td>
<td>Is aware of children’s fatigue signals</td>
</tr>
<tr>
<td></td>
<td>Has difficulty in getting children to bed</td>
<td>Has established routine of dinner and bedtime activities</td>
</tr>
<tr>
<td>Appointments</td>
<td>Frequently misses scheduled appointments</td>
<td>Rarely misses appointments; will double schedule because still uses two calendars (kitchen wall and daily planner)</td>
</tr>
<tr>
<td>Cognitive attention</td>
<td>Adequate</td>
<td>Adequate</td>
</tr>
<tr>
<td>Short-term memory</td>
<td>Unable to recall details from earlier in the day</td>
<td>Uses appointment book to recall information</td>
</tr>
<tr>
<td></td>
<td>Shows poor use of strategies to compensate</td>
<td>Takes notes at important meetings and with cues, refers to them to answer questions about the week</td>
</tr>
<tr>
<td></td>
<td>If event was written down, after reading about the event, can recall some of it but not details</td>
<td>Spontaneously recalls 1 or 2 events without looking in appointment book</td>
</tr>
</tbody>
</table>
### Table 4
**Use of Daily Planner for Patient 3**

<table>
<thead>
<tr>
<th>Use of Planner</th>
<th>1 Month of Training (11 Months After Injury)</th>
<th>3 Months of Training</th>
<th>4 Months of Training</th>
<th>5 Months of Training</th>
<th>6 Months of Training</th>
<th>One Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing appoint-ments in planner</td>
<td>Needs moderate amount of cues to write down the appointment</td>
<td>New daily planner purchased</td>
<td>Unchanged</td>
<td>Wrote appointments directly into daily planner 80% of time</td>
<td>Writing of appointments was unchanged, but she reviewed the daily planner daily</td>
<td>Continues to use daily planner efficiently</td>
</tr>
<tr>
<td>Carrying appointment book out of the house</td>
<td>Does not take it with her</td>
<td>Same as previous month</td>
<td>Takes it with her the 2 days she attends the outpatient program</td>
<td>80% of the time</td>
<td>Carried daily planner consistently when leaving home</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Attending appointments</td>
<td>Missed many appointments</td>
<td>Missing appointments but not as frequently</td>
<td>Double scheduling of appointments because she used two calendars Only missed a few appointments</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Rarely missed appointments</td>
</tr>
<tr>
<td>Things-to-do: Maintaining a list of things to do</td>
<td>50% of items were written onto a wipe-off board</td>
<td>Written on sticky notes or the wipe-off board</td>
<td>Unchanged, but 50% of time those items were written into her daily planner</td>
<td>60% of the time she wrote these items into the daily planner, she began to forward incomplete errands to a current list. Still used wipe-off board and sticky notes</td>
<td>Consistently wrote these items into daily planner. Some reminders were needed to forward incomplete errands to the current date although she knew to look for them as indicated in previous month</td>
<td>Unchanged Information written in disorganized manner so some tasks to do were not seen</td>
</tr>
<tr>
<td>Following through to complete task</td>
<td>Takes 4 to 6 weeks or more</td>
<td>Takes 2 or 3 weeks or more</td>
<td>Unchanged</td>
<td>Unchanged</td>
<td>Delay varied from 1 to 4 weeks or more; some tasks were avoided due to limited finance and, occasionally, to difficulty in organizing the task</td>
<td>Tasks that had to be achieved (i.e., register children for school) were accomplished within 1 to 4 weeks. Other tasks may have taken longer, as noted in the previous month</td>
</tr>
</tbody>
</table>

(e) problem solving to incorporate spontaneous actions into her life, and (f) positive feedback for successful use of strategies. Once a week the treatment session focused on management of scheduled appointments and things to do, (e.g., food shopping and meal planning). Forgotten appointments were pointed out to her. The goal of occupational therapy was for Patient 3 to achieve independence in managing prospective memory tasks.

**Treatment progress.** The daily planner was started at 1 year after injury (see Table 4). To increase competence in using the daily planner, a stepwise path was used. These steps were (a) writing appointments, (b) writing down things to do and phone calls to make, and (c) using the planner as a memory guide by reviewing the past week’s events. During the first 2 months, Patient 3 stated that using a wall calendar in her kitchen for all appointments was adequate. Because she was unable to organize the purchase of a pocket-sized appointment book, one was provided. The patient also used a wipe-off board, located underneath the wall calendar, to rewrite her daily appointments. She wrote things to do on the wipe-off board 50% of the time. By the second month, she wrote appointments either on the wall calendar or in a pocket appointment book. She required moderate cues (50% of the time) to write down appointments and a things-to-do list. She rarely carried the pocket appointment book.
when leaving the house. She needed a larger book in order to write down more information. She wrote things to do in several places: (a) wipe off book, (b) sticky notes, and (c) separate pieces of paper left in various places throughout the house. When she decided that a task needed to be accomplished, it often took her 4 to 6 weeks or more to organize to complete the task.

**Modification of treatment.** At 3 months the patient, with the therapist’s assistance, selected from a mail-order catalogue a new daily planner to meet her needs. Each page represented a day and included appointment times. The bottom quarter of the page contained a section for things to do. Patient 3 was able to complete the purchase on her own once the appropriate type of planner was selected from the catalogue. When she received the new daily planner, she required cues to organize the transferring of information from the old book to the new one.

Patient 3 continued to be more oriented to using the wall calendar as her primary datebook. She scheduled overlapping appointments due to her inconsistency in copying appointments from the wall calendar to the daily planner. She often wrote appointments out of time sequence and on diagonals, making them difficult to read from the wall calendar. After a discussion with her occupational therapist concerning concrete examples of methods to avoid missing appointments, she posted a note on the front door to remind herself to take the planner with her.

Use of the daily planner improved when the patient began to review her wall calendar and daily planner each morning for the current day’s appointments. Occasionally she corrected duplication of the following day’s appointments. She was writing things to do in the daily planner 60% of the time. At this point (6 months of training), Patient 3 discussed wanting to purchase a larger wall calendar for more writing space and to view the whole month at once. Within 4 weeks, Patient 3 purchased a larger wall calendar independently. She required minimal cues to initiate the setup of this calendar. When transferring the appointments she was encouraged to write the information sequentially.

After 1 year of training, Patient 3 continued to use her daily planner effectively for keeping track of her appointments. She reviewed it for future appointments 1 day in advance. Occasionally, she looked at the past week’s events to schedule incomplete tasks for the current week. It was still difficult for her to keep track of things to do. These items were written into the daily planner in a disorganized fashion: phone calls, tasks, and notes for appointments were mixed together. Thus, she did not always see what needed to be accomplished. At this point the patient stated that she wanted to write down suggestions made during therapies. Separate sections were created in the daily planner for this purpose. However, in follow-up treatment sessions, she did not refer to these sections unless cued to them.

After 14 months of training, the wall calendar was maintained but the daily planner became the patient’s main tool. The separate sections for notes for therapy strategies were referred to one out of seven times. By 16 months the daily planner was used maximally. In the evenings, the previous week was reviewed and things to do were forwarded as needed. Conflicting appointments were handled in advance. Notes from meetings were consistently written, either in the separate sections or in the appointment section.

While Patient 3 learned to use the daily planner, other goals and strategies were simultaneously addressed (see Table 4). Patient 3 developed anticipatory awareness and began to generalize the strategy of writing notes for prospective memory tasks. She used sticky notes, initially to excess, until she developed confidence in her ability to use her daily planner as an effective tool.

The patient had no adult family member to be a cotherapist; therefore, a neighbor friend was selected to take this role during the second month of training. A meeting to review cuing strategies was set up with Patient 3, her friend, and the treating therapists. However, the friend could not be relied upon to take this role. Patient 3 struggled with coping on her own.

**Outcome for Patient 3.** Occupational therapy introduced compensatory strategies to Patient 3 when she was ready to accept feedback and had not yet begun to solidify ineffective strategies to compensate for her difficulties.

The outpatient cognitive retraining program might have facilitated Patient 3’s level of awareness and subsequent willingness to use the compensatory strategy. The program was conducted in a group setting, which provided a support system consisting of patients with similar deficits with whom she could identify. However, the outpatient program did not specifically analyze her use of the daily planner. The home-based occupational therapist provided the consistent concrete structure and feedback that the patient required regarding her successful performance and the impact that the cognitive problems had on her daily living skills.

Three years after the introduction of a daily planner, Patient 3 maintains it for appointments and her things-to-do list. Each evening she reviews the past week and the next day’s appointments. In a follow-up visit, Patient 3 stated that she does not make plans without consulting her book, despite new friends teasing her that she cannot do anything without using “that book.” Patient 3 has achieved a level of self-awareness and acceptance of the impact of her memory deficits. She recognizes the importance of her ability to apply the compensation strategy independent of the therapist’s cue.

**Discussion**

Occupational therapy provided external compensations that facilitated the learning of specific behavior routines.
for three patients with severe memory impairment and other cognitive deficits. The treatment techniques were individualized to the patient's learning and cognitive abilities, levels of awareness and social situations. Observations of performance, weekly modification of cues, and contact with family members enabled the therapists to understand the patients' learning style as well as possible without actually living with the patient (Prigatano, 1986). The home-based therapists became involved in the education of family members and home health attendants and at times served as team coordinators. Patient and family members involvement in the treatment process provided the family members with open communication and empowerment (Carberry, 1992; Harrell & O'Hara, 1991).

Patients 2 and 3 maintained the learned routines when the external compensation of the tape recorded message and therapist were removed. In addition, they were able to verbalize some of the routines and strategies. This result suggests that information might have been transferred to long-term memory (Crossan & Buenning, 1984). Patient 3 maximized use of her existing capacities (Ben-Yishay, Silver, Piasetsky, & Rattock, 1987) despite what might have been predicted through psychoneurological testing. This result may have been due to premorbid personality factors (Prigatano, Pepping, & Klonoff, 1986).

Use of the decision-making model with dynamic assessment permits the therapist to monitor and revise a treatment plan that may initially be theoretically sound, but does not always produce intended results. Due to the slow learning processes of the adult with brain injury, the home-based therapist must be observant of subtle changes. These adults are not often provided with services lasting 9 to 12 months after injury. Only a small group of such patients, due to the nature of their circumstances, have the financial resources available to receive services for a protracted length of time. These three case reports demonstrate that progress was possible over a long period of time with the appropriate therapy. In addition, the case reports suggest that patients with brain injuries treated in traditional clinic settings may greatly benefit from the addition of home-based treatment in order to maximize the patient's and family members' learning and the patient's functional independence (Starch & Falltrick, 1990).

Detailed research of treatment in naturalistic settings, especially in the home, is limited (Giles & Clark-Wilson, 1988; McKinley & Hickox, 1988). Therefore, case studies are needed to demonstrate the effectiveness of individualized cognitive rehabilitation programs for the adult with brain injury within the home environment. Investigation is especially needed in the area of attention and prospective memory tasks, which seems to be a primary cognitive deficit for persons with brain injury (Matter, Sohlberg, & Crinean, 1987).

Conclusion

These case studies demonstrate the effect of occupational therapy on performance areas for the patient with traumatic brain injury in the home setting. The decision-making and dynamic assessment models assist the therapist to continuously review the patient's strengths and weaknesses and the psycho-social-environmental factors that affect the treatment plan. These case studies reflect the therapist's persistence in selecting and modifying appropriate external compensations for the person with memory deficits. Regular observance of the patient's performance, in conjunction with patient and family member feedback, enables the therapist to better understand the patient's learning style and family's goals. Where possible, home-based occupational therapy that supplements traditional clinic approaches can result in meaningful and long-term improvement in patient performance areas.

The contribution that the home-based occupational therapist makes in overall cost effectiveness needs to be documented. The occupational therapist facilitates independent functioning of the patient, which in the long run could help reduce nursing or attendant care hours and thus health care costs. Independent nurse case managers hired by insurance companies have often assisted in achieving this goal of cost containment. Insurance companies need to become aware of the net cost benefits of long-term rehabilitation with occupational therapy.

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Related Readings


