SURVIVORS OF BRAIN INJURIES OFTEN EXPERIENCE MULTIPLE COGNITIVE, BEHAVIORAL, AND MOTOR DEFICITS THAT THEY MUST LEARN TO REMEDIATE OR COMPENSATE FOR TO BECOME FUNCTIONAL IN DAILY SELF-CARE TASKS AS WELL AS MOBILITY TASKS. EXECUTIVE DYSFUNCTION IS A GENERALIZED TERM USED TO INDICATE THE ABILITY TO INTEGRATE HIGHER LEVEL COGNITIVE SKILLS. EXECUTIVE DYSFUNCTION IS OFTEN PRESENT IN PERSONS WITH BRAIN INJURY, ESPECIALLY THOSE WhOSE FRONTAL LOBES HAVE BEEN DIRECTLY OR INDIRECTLY INJURED. THE FRONTAL LOBES PERFORM TWO MAJOR TASKS: THEY HELP A PERSON DECIDE WHAT IS IMPORTANT TO PAY ATTENTION TO AND WHAT IS WORTH DOING, AND THEY PROVIDE CONTINUITY AND COHERENCE OF BEHAVIOR OVER TIME (HART & JACOBS, 1993). PERSONS WITH FRONTAL LOBE DEFICITS ARE DESCRIBED AS KNOWING WHAT TO DO BUT UNABLE TO DO IT (HART & JACOBS, 1993). THIS INABILITY TO USE KNOWLEDGE TO GUIDE BEHAVIOR MAY OFTEN BE INTERPRETED AS RESISTANCE OR POOR MOTIVATION. ACCORDING TO FUSTER (1991), SHORT-TERM OR WORKING MEMORY ALSO IS INVOLVED IN THE ABILITY TO ADJUST BEHAVIOR TO INCOMING INFORMATION AS WELL AS IN THE ABILITY TO CREATE A PREPARATORY MOTOR SET THAT ALLOWS FOR THE EXECUTION OF BEHAVIOR ACCORDING TO PERCEIVED NEEDS. LEZAK (1993) SUGGESTED THAT EXECUTIVE FUNCTIONS CONSIST IN PART OF A VOLITATIONAL OR MOTIVATIONAL ASPECT AS WELL AS PURPOSIVE ACTION. STUSS (1993) SEPARATED EXECUTIVE FUNCTION INTO ROUTINE OR AUTOMATIC FUNCTIONS (ALSO REFERRED TO AS THE BASAL GANGLIA) AND NONROUTINE OR CONTROL FUNCTIONS. HE STATED THAT A DISRUPTION AT THE ROUTINE OR AUTOMATIC LEVEL CAN RESULT IN A DEFICIT AT THE CONTROL OR NONROUTINE LEVEL. INITIATION DEFICITS, FOR EXAMPLE, IN THE KINETIC OR MOVEMENT SYSTEM CAN BE CONNECTED TO INITIATION DEFICITS IN THE COGNITIVE SYSTEM.

Often patients may be able to verbalize what they need to do if asked or cued in some manner, but may be unable to initiate the activity itself. For this case study, we refer to this inability as an initiation deficit. Poor initiation can severely impair or interfere with a patient's ability to regain or achieve independence in daily functional activities. After brain injury, patients must often learn new ways of completing basic activities. Giles and Shore (1989) stated that new physical routines may be the hardest tasks to learn. Patients with initiation deficits may not require physical assistance, but they generally require verbal cues. A patient who can complete a functional task, such as bathing or dressing, only with step-by-step verbal cues is not truly independent. Therapists who provide rehabilitation services for patients with brain injury resulting in poor initiation must find a way to address this deficit to ensure optimum return to independent functioning.

The occupational therapy literature provides little information on how to retrain patients specifically for functional tasks if they have cognitive deficits in general (Giles & Clark-Wilson, 1988; Giles & Shore, 1989) or cognitive deficits in conjunction with motor deficits. There is even less information on retraining patients with specific initiation deficits. Traditional approaches to retraining
patients with cognitive deficits in self-care skills include behavior modification (Giles & Clark-Wilson, 1988; Giles & Shore, 1989), frequent repetition of task (Cook, Luschen, & Sikes, 1991; Giles & Clark-Wilson, 1988; Giles & Shore, 1989) and procedural learning (Giles & Shore, 1989; Miller, 1980). Cook et al. (1991) used a tape recorder to provide verbal cues, but this novel approach did not change the level of independence for the patient; rather, it focused the patient’s dependency on the tape recorder instead of on the therapist or family member.

The physical therapy literature also does not provide much information to guide the treatment of patients with general cognitive deficits in conjunction with motor deficits. Friedman, Baskett, and Richmond (1989) found that patients with cognitive impairments showed significantly less improvement in gait and transfer activities than did patients without cognitive deficits, but they did not discuss specific therapeutic approaches.

Pharmaceutical interventions aimed at improving initiation are primarily experimental. Some medications, such as bromocriptine mesylate, have been tried on a limited basis. Bromocriptine mesylate is a dopamine agonist traditionally used for patients with Parkinson’s disease or Parkinsonian symptoms, for patients with neuroleptic malignant syndrome, and for arresting lactation (Gualtieri, 1988). Bromocriptine mesylate improves the level of dopamine available in the central nervous system (Gualtieri, 1988), thus enhancing the ability for active receptors to use the available dopamine. The use of bromocriptine mesylate to address poor initiation in patients with brain injuries has not been studied empirically. The available literature is mostly anecdotal.

One paper described a patient who demonstrated significant functional improvement when treated with a dopamine agonist (Wiener, Auerbuck, & Moore, 1987). Van Woerkom, Minderhau, Gottschal, and Nicolai (1982) described a significant benefit in functioning when L-dopa and other agonists were introduced in a controlled study group of patients with severe brain injury. The authors suggested that the agonist may accelerate spontaneous recovery. In a more recent report, Barrett (1991) described marked improvements in initiation in four patients with brain injury treated with bromocriptine mesylate. When the pharmaceutical agent was stopped, their level of functioning declined; it was regained later when bromocriptine mesylate was resumed.

This paper describes the use of bromocriptine mesylate to increase initiation in a patient with brain injury. Measures of independence were taken in three functional activities (transfers, dressing, and ambulation) to determine the efficacy of combining the use of a pharmaceutical agent and the provision of rehabilitative services. Independence was based on the amount of physical assistance and number of verbal cues required.

Case History

The information for this case study was gathered through ex post facto chart review of weekly occupational therapy and physical therapy progress notes, patient videotapes, and firsthand observations. A follow-up interview with the patient was also conducted and videotaped approximately 3 months after discharge.

Subject

The subject was a 48-year-old right-handed woman admitted to an acute care hospital on January 16, 1990 for removal of a cerebellar pontine angle tumor that was found to be meningioma. Postoperatively, the patient showed gradual neurologic decline and eventually became unresponsive with decerebrate posturing, which was believed to be due to increasing cerebral edema causing central brain herniation. On January 23, a shunt was placed in her right brain ventricle and she was treated for meningitis. On February 23, the patient was transferred to the neurobehavioral injury unit of our rehabilitation hospital. Subsequent computed axial tomography (CAT) scans showed a temporal occipital craniotomy, metallic clips in the posterior fossa, tissue loss in the right cerebellum, increased ventricular size, and a right basal ganglia infarct. In view of the patient’s clinical presentation at the time of admission to our hospital and throughout her clinical course, the neurologists theorized that the axons connecting the frontal lobes to other brain areas had been disrupted secondary to massive edema and central brain herniation.

Therapy Evaluation and Treatment

The occupational and physical therapy evaluation conducted at admission indicated that the patient was dependent in all areas of functional mobility and self-care. She was incontinent of bowel and bladder, lethargic, and disoriented to even basic biographical information. She was able to attend to simple stimuli (such as calling her name loudly) only for up to 10 or 15 sec. She demonstrated severely increased tone throughout her body, with greater tone exhibited in her right upper and lower extremities. Range of motion was decreased in both shoulders (limited in shoulder flexion and abduction), and a flexion contracture was present in her right knee. She also demonstrated poor head and trunk control. Evaluation of sensory changes and visual perceptual impairments was not possible, but as the patient evolved, she demonstrated no impairments in these areas. Her history was not medically or psychosocially significant.

The patient was treated on the neurobehavioral injury unit which was organized to provide a highly structured treatment environment and interdisciplinary staff members (consisting of physical, occupational and
speech therapists, nurses, neurologists, neuropsychologists and other professionals as indicated) experienced in treating patients with brain injuries. The patient’s therapy focused on remediation of functional mobility, basic self-care, and low level cognitive skills including bed mobility, transfers, activities of daily living, and the use of a card that contained basic orientation information and the patient’s daily therapy schedule. Therapy also focused on improving basic attention, ability to follow simple commands, and ability to make basic needs known to staff members. The approaches used in therapy included routine structure, constant repetition, breakdown of activities into simple steps, and procedural learning (the process of learning an activity through motoric repetition of that activity rather than through recall of verbal information).

The patient made significant cognitive, neuromuscular, and functional independence gains during the first 7 weeks of therapy. She then plateaued for 4 weeks, making no further neuromuscular gains or progress in independence in activities. Despite an ability to verbalize what she needed to do to complete an activity when asked, the patient was unable to initiate any step of the activity. The treatment team concluded that this lack of initiation was the greatest factor interfering with improvement in functional mobility and self-care. Given limited but somewhat successful experience in using bromocriptine mesylate to increase initiation with previous patients with brain injury, the neurologists prescribed bromocriptine mesylate for the patient. As use of this agent in this manner was experimental, there were no standard protocols for administration, dosage, or therapeutic levels. The patient started on bromocriptine mesylate on May 5, 1990, 10 weeks after admission to the rehabilitation hospital.

Meanwhile, the patient continued to participate in rehabilitative service, including occupational therapy and physical therapy. The following is a retrospective review of the patient’s progress in three functional activities (transfers, dressing, and ambulation) before and after the administration of the bromocriptine mesylate.

We chose three variables as measures of functional activities. They are operationally defined as follows:

1. Wheelchair–bed transfers—lock brakes, scoot forward in chair, display correct hand placement, count to three, and squat pivot to the bed.
2. Dressing—don brassiere, shirt, underwear, pants, socks, and shoes in correct order.
3. Ambulation—perform correct sequence of the motor components of ambulation using first a right knee–ankle–foot orthosis, then advancing to an ankle–foot orthosis while using a wide based quad cane.

Independence was rated according to the amount of physical assistance and number of verbal cues required to complete the activities. Levels of physical assistance were defined as follows:

1. Maximum assistance—patient is completing less than 25% of the task.
2. Moderate assistance—patient is completing less than 75% but more than 25% of the task.
3. Minimal assistance—patient is completing more than 75% but less than 100% of the task.
4. Contact guard—patient requires the assistant to place his or her hands on the patient to maintain standing balance, but does not require any further assistance.
5. Supervision—patient requires the presence of another person while performing the task to ensure safety.
6. Independent—patient is able to complete the task as defined without any physical assistance.

Levels of verbal cues were defined as follows:

1. Maximum cues—patient requires verbal cues for more than 75% of the task.
2. Moderate cues—patient requires verbal cues for more than 25% but less than 75% of the task.
3. Minimal cues—patient requires verbal cues for less than 25% of the task.
4. Supervision—patient requires the presence of another person to ensure safety.
5. Independent—patient is able to complete the task as defined without any verbal cues.

The patient’s progress in the three activities was reviewed before and after the introduction of bromocriptine mesylate with weekly occupational therapy and physical therapy notes. Additional information on the patient’s level of independence was gained in a follow-up interview approximately 3 months after discharge when the patient was participating in outpatient therapies.

Results

Transfers

At the time of admission on February 23, the patient required two persons to lift her for wheelchair–bed transfers. She made slow but steady progress through April 16, at which point she reached a level of contact guard/occasional minimal assistance and maximal verbal cues. The patient was able to verbally state the necessary steps to complete the transfer but required maximal cues to initiate the activity. She then plateaued at this level for approximately 3½ weeks. She started on bromocriptine mesylate on May 5. By June 7, she required only supervision 50% of the time and contact guard 50% of the time. She also required verbal cues only 50% of the time. By June 19, she needed only one prompt such as “I want you to transfer now” to complete the task. At discharge on June 19, 1990, only supervision was needed (with no verbal
cues). Three months later, the patient was completely independent in transfers and required no cues or assistance (see Figure 1).

Dressing

On admission, the patient was dependent for dressing both upper and lower extremities. She was seen daily for individual activities of daily living (ADL) retraining sessions in occupational therapy. Routine structure and consistency with verbal cuing were used to capitalize on procedural learning. She made progress for approximately 7 weeks, at which point she plateaued at the following level: minimal assistance for upper extremity dressing, moderate assistance for lower extremity dressing, and maximal assistance for putting on socks and shoes. She required maximal repetitive verbal cues to complete each step of the dressing activity. The patient was, however, able to verbalize the steps necessary to complete the dressing activity when asked. The patient plateaued at this level for approximately 4 weeks. Within one week of taking bromocriptine mesylate (May 5), the patient began to make rapid progress, decreasing the need for verbal cues and physical assistance to complete the steps of the task. For example, she progresses from needing 45 min to complete dressing on May 31 to needing only 15 min with less assistance by June 7. The patient appeared to require less time as she began to spontaneously initiate the steps rather than waiting for repetitive cuing. By discharge, the patient was independent of verbal cues and required only minimal assistance for upper extremity dressing (secondary to decreased shoulder flexion bilaterally). A 3-month follow-up interview, the patient's family stated that the patient required only a wake-up call and could then independently shower and dress (see Figures 2 and 3).

Ambulation

The patient was nonambulatory on admission. By April 27, she had begun ambulating one length of the parallel bars with maximal assistance of two (see Figure 4, appears as dependent) and exhibited significant gait deviations (i.e., decreased heel strike, severe rotation of the trunk, overuse of both upper extremities, and postural deviations). Structured routine, repetition, and breakdown into simple repetitive steps were used by her physical and occupational therapists. Traditional standing balance and pre-gait activities were also used. The patient did make some progress but by May 3 she could only ambux-
Figure 2. Upper extremity dressing. The patient plateaued for approximately 4 weeks at a minimal assistance, maximal verbal cue level. Bromocriptine mesylate was introduced on May 5, 1990. The patient remained at a minimal assistance level (secondary to bilateral shoulder contractures) but became independent of all verbal cues.

Figure 3. Lower extremity dressing. The patient plateaued for approximately 4 weeks at a moderate assistance, maximal verbal cue level. Bromocriptine mesylate was initiated on May 5, 1990. The subject made significant weekly gains, eventually requiring only supervision with no verbal cues.
late 3 to 4 lengths of the parallel bar using a right knee-ankle-foot orthosis and maximum assistance of one. Outside the parallel bars, the patient required maximum assistance of two persons (appears as dependent in Figure 4). Again, the patient was able to verbally state the steps necessary to complete the activity but required maximal cues to put the steps into action. She began taking bromocriptine mesylate on May 5, 1990. By June 7, she was using only a right ankle-foot orthosis to ambulate 100 ft outside the parallel bars with a wide based quad cane. She required only a contact guard of one and moderate verbal cues. On June 15, the patient was able to ambulate 150 ft while using a large based quad cane and no brace, with contact guard of one person and with moderate verbal cues. At discharge on June 19, the patient was ambulating 150 ft (using a large based quad cane) with contact guard of one and minimal verbal cues. At the 3-month follow-up interview, the patient was ambulating unlimited distances independently with no assistive device and requiring no verbal cues. Her gait was free of deviations.

Six months after the 3-month follow-up, the patient was independent in all aspects of self-care and transfers. She was an independent ambulator and was continent of bowel and bladder. She participated in cleaning, cooking, laundry, and other homemaking activities by using a schedule book. Family members stated that she required prompting and encouragement to complete these activities, as initiation for anything beyond basic skills remains impaired. To improve her ability to initiate, organize, and solve problems in simple daily and community activities, the patient was participating in a community re-entry program 6 hr per day that focuses on increasing independence in all advanced daily and community activities. The patient was also volunteering in a child day care program 3 hr a week, again at the prompting and encouragement of family and the community re-entry program. She remained on bromocriptine mesylate.

**Discussion**

Learning is a complex process. Numerous types of learning are discussed in the literature, such as semantic, procedural, and declarative learning. Clearly some level of learning was taking place for this patient before the introduction of the bromocriptine mesylate, as evidenced by the patient’s ability to verbalize the correct steps necessary to complete the tasks. However, the patient’s task performance was greatly impaired as evidenced by a lack of progress in three functional activities for 4 weeks. This plateau in progress occurred simultaneously with a plateau in neuromuscular gains. Within 1 week of the intro-

![Figure 4. Ambulation. Before the introduction of the medication, the subject required maximal assistance of two persons to ambulate one length of the parallel bars with a knee-foot-ankle orthosis. After the medication was introduced, she made significant gains.](http://ajot.aota.org/pdfaccess.ashx?url=/data/journals/ajot/930223/)
duction of bromocriptine mesylate, and with continued provision of extremely structured and repetitive therapy, the patient’s performance in three functional activities began to improve steadily. This improvement occurred in the absence of significant neuromuscular changes. The patient required less physical assistance and fewer verbal cues as weeks progressed. Van Woerkom et al. (1982) suggested that, although there may be no evidence to suggest that bromocriptine mesylate itself alters the ultimate prognosis for an individual patient, it may enhance the possibility of early rehabilitative efforts. Early rehabilitative efforts may prevent or diminish future problems in daily functioning. We hypothesize that bromocriptine mesylate allowed the patient to begin to initiate and actively engage in therapy and thus to reach a higher level of independence than she may have reached without medication. We believe that once the patient began to participate actively in therapy, she also began to engage actively in requisite problem solving and internalization of the task rather than simply reacting to procedural cuing. The task itself began to become meaningful to the patient. One indication of this is that the patient began to independently pick out her clothes for the day. At the time of discharge, she required only minimal assistance for dressing, supervision for transfers, and contact guard for ambulation. Three months after discharge, the patient was completely independent in all three activities.

One might argue that the patient was obviously learning through traditional therapeutic approaches and had reached a threshold or cusp point in procedural learning that simply coincided with the introduction of the medication. This argument would indicate that the patient reached a therapeutic learning level that produced improved task performance, regardless of the medication. We believe that the patient’s gain in independence in the three functional activities was a combination of overlearning (provided by experienced therapists through daily structured, proceduralized therapy sessions) and the effect of the medication that improved her initiation and thus improved her task performance. Supporting this view is the fact that there were numerous nonoverlearned behaviors that did not improve after the introduction of the medication (such as simple homemaker, using a call light, and learning upper and lower extremity exercise programs). Concurrently, there were also some important nonoverlearned skills that improved immediately after introduction of the medication that were not directly trained. These include the patient’s ability to initiate conversation, display appropriate emotional reactions, demonstrate improved decision-making skills, and demonstrate an improvement in overall attention and memory for daily events. The patient also became continent of bowel and bladder without any direct training. The gains in independence in functional activities are probably not due only to the medication. The medication might have increased the patient’s ability to initiate and engage in various tasks; however, the patient needed to learn a new way of dressing, transferring, and ambulating. The medication itself did not teach her these new physical routines. Because of other cognitive deficits, the patient required structured, routine, and repetitive therapy to learn these tasks. Although we cannot fully support our view with the information presented, we believe that with an increase in initiation and an improved ability to engage in various tasks, the patient was able to actively participate in and benefit from therapy. We believe that no single factor was responsible for the patient’s dramatic improvement; rather, it came from the use of a pharmacologic agent in conjunction with rehabilitative efforts by clinicians experienced in the treatment of patients with brain injury.

Being able to decrease the need for verbal cues is critical when considering the ramifications for the patient’s discharge to her home environment, as well as the effects on the role of the caretaker within the patient’s home. Acton (1982) stated that a person’s ability to perform basic activities of daily living may significantly affect both future placement and quality of life issues. By increasing her initiation and decreasing the need for verbal cues, the patient became more independent in these basic functional activities. Had the patient continued to require step-by-step cuing, despite a decreased need for physical assistance, she would have continued to require 24-hr supervision within the home setting as she would have been incapable of completing these activities independently.

Acknowledgments


References


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Occupational Therapy Treatment Goals for the Physically and Cognitively Disabled and new companion Study Guide

This innovative text, coauthored by Claudia Kay Allen, MA, OTR, FAOTA, Catherine A. Earhart, OTR, and Tina Blue, OTR, is designed to help therapists predict the rehabilitation potential for clients with physical and cognitive disabilities and to set treatment goals to maximize the client's ability to process information.

OT Treatment Goals expands the six cognitive levels into 52 modes of performance, offering specific and practical treatment goals for each. Case studies illustrate the application of knowledge in a variety of age groups, diagnostic categories, socio-economic conditions, and cultures. Indexed. 350 pages, 1992.

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Designed to accompany the text, the Study Guide, by Claudia Allen and Susan C. Robertson, MS, OTR/L, FAOTA, includes eight sessions, each emphasizing practical application, critical analysis of key concepts, and usefulness in every practice setting. Features case examples, section quizzes, and more. 80 pages, 1993.

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