A Consecutive Series of Adults With Brain Injury Treated With a Washing and Dressing Retraining Program

Gordon Muir Giles, Jonathan Edward Ridley, Ann Dill, Susan Frye

Key Words: activities of daily living • brain injuries • rehabilitation

Objectives. Single-case reports indicate that behavioral methods can assist persons with brain injury to redevelop self-care skills. However, the proportion of patients who could benefit from these interventions is unknown. The present study used a specific retraining protocol to treat all patients admitted to a single facility over a 3-year period who were unable to wash and dress independently.

Method. Four patients out of 48 met the study criteria and were treated with the washing and dressing protocol. Three had traumatic brain injury, and one had brain injury after cerebral bleed. The training program involved behavioral observation, task analysis, consistent practice, and cue fading. The Adaptive Behavior Scale was used to measure behavior change.

Results. Three subjects achieved rapid independence in washing and dressing (20 days, 37 days, and 11 days of treatment), and one did not show significant clinical improvement.

Conclusion. All patients admitted to the facility during a 3-year period who required washing and dressing retraining were treated with the same protocol. The consecutive series design prevented researchers from selecting patients whom they believed were good treatment candidates; therefore, the findings support the general applicability of the training program.

Independence in activities of daily living (ADL) is a central factor in determining the future placement and quality of life of persons with brain injury. Basic ADL deficits occur in 5% to 15% of persons with severe brain injury (Jacobs, 1988; Jennett & Teasdale, 1981). Typically, in acute rehabilitation settings, persons with brain injury are either dressed by nursing staff members or provided with adaptive equipment and intermittent dressing instruction. For many, this type of intervention, in combination with spontaneous recovery, results in functional independence. For a subgroup of persons with severe brain injury, particularly those with both physical and cognitive disorders, such intervention does not produce self-care independence.

One method used to address functional deficits is specific task training (Giles & Clark-Wilson, 1993). A number of single-case studies have described attempts to increase independence in real-world settings (Burke, Wesolowski, & Lane, 1988; Cohen, 1986; Giles & Clark-Wilson, 1988; Giles & Morgan, 1989; Lewis, Nelson, Nelson, & Reusink, 1988). The interventions reported are often designed to meet the idiosyncratic needs of specific patients, and little is known about their general applicability. This article describes a retraining procedure used...
with four patients who were at least 7 months post severe brain injury and had both severe physical and cognitive impairments. The patients had not developed independent washing and dressing behaviors during the acute rehabilitation period and required daily self-care assistance.

Literature Review
Behavioral methods are recognized as effective in the treatment of behavior disorders in patients with brain impairments (Davis & Goldstein, 1994; Eames & Wood, 1985a, 1985b; Fussey & Giles, 1988). However, reports of the use of these methods in ADL skills retraining in this population are few. Further, there is little to indicate which behavioral techniques may be most effective in ADL retraining. This review examines the efficacy of specific behavioral training techniques and examines efforts to redevelop ADL skills in persons with neurological impairments.

Behavioral Training Techniques
Behavioral retraining methods have been applied to the cognitive (Fox, Martella, & Marchand-Martella, 1989), social (Elsass & Kinsella, 1987), and behavioral (Eames & Wood, 1985a, 1985b) deficits of persons with brain injury. A more limited group of techniques have been used to redevelop basic personal care skills (Cohen, 1986; Giles & Clark-Wilson, 1988, 1993; McMillan, Papadopoulos, Cornell, & Greenwood, 1990). The most frequently used techniques are task analysis, chaining, cuing or prompting, shaping, response practice, and overlearning (Giles & Clark-Wilson, 1993).

Task analysis is a process that divides tasks into parts that can be taught as units and chained together into a functional whole. Task analysis is a component of most functional retraining programs (Giles & Clark-Wilson, 1993). Chaining, prompting, and response practice are techniques that may strengthen the relationship between the desired response and the preexisting stimuli. Because evaluative studies of the use of these methods with persons with brain injury are lacking, the current review examines the use of these methods with persons with mental retardation.

Functional tasks can be thought of as complex stimulus–response chains in which the completion of each activity acts as the stimulus for the next step in the chain (Kazdin, 1994). Three chaining options are available for functional task training:

1. Backward chaining in which the task is trained first, followed by the second to last step and the last step, and so on, progressing backward through the chain.

2. Forward chaining in which the first step of the chain is trained first, followed by the first and second step, and so on, progressing forward through the chain.

3. Whole task method (WTM) in which each step of the chain is trained on each presentation.

Basic operant researchers have preferred backward chaining on theoretical grounds (Martin, Koop, Turner, & Hanel, 1981; Skinner, 1938), whereas clinicians have focused on the practical advantages of WTM.

Blake and Williams (1969) evaluated the learning of trigram numeral pairs among subjects with mental retardation, average IQ, and above-average IQ and found a clear superiority of WTM. However, Walls, Zane, and Ellis (1981) compared forward chaining, backward chaining, and WTM in training subjects with mild to moderate mental retardation in small assembly tasks and found backward chaining to be more effective than WTM. Other contemporary studies have found WTM to be superior (Martin et al., 1981; Spooner, 1981, 1984), though McDonnell and Laughlin (1989) found no significant difference between backward chaining and WTM when teaching persons with mental retardation to purchase items in a supermarket and a fast food restaurant. On the basis of these research findings and because WTM maximizes early independence by incorporating already-mastered steps, WTM was used in the current study.

Events that facilitate the production of a behavior are called prompts or cues. Two types of prompting systems have been evaluated in teaching chained tasks: the system of least prompts (SLP) and time-delay procedures. The SLP (sometimes referred to as the increasing assistance procedure) involves the presentation of a prompt hierarchy that is arranged from most general to most specific. The person is cued progressively through the hierarchy of prompts available for each step in the chain until a correct response is produced.

The time-delay cuing system typically involves two training stages:

1. A cue designed to elicit the next step in the chain is delivered so as to coincide with the stimulus (i.e., the completion of the previous step in the chain).

2. A defined interval is inserted between the occurrence of the stimulus and the response-eliciting cue.

Two types of time-delay procedures are described in the literature: (a) progressive time delay (PTD), where longer and longer intervals are inserted between the occurrence of the stimulus and the cue, and (b) constant time delay (CTD), where a fixed response interval is inserted between stimulus and cue (Wolery, Griffen, Ault, Gast, & Doyle, 1990).
Although the SLP has been used to teach self-treatment of cold symptoms to a person with anoxic brain damage (O’Reilly & Cuvo, 1989), the majority of studies of functional interventions involving chained tasks have used CTD (Giles & Clark-Wilson, 1988, 1993; Katzmann & Mix, 1994). Unfortunately, the method used is often not described in enough detail to be certain of the actual intervention. No studies comparing time-delay methods with SLP methods have been conducted with persons with brain injury. However, in studies comparing these methods in persons with mental retardation, both CTD and PTD have been shown to be superior to SLP (McDonnell, 1987; Wolery et al., 1990). We used CTD procedures in the present study because the time-delay procedure is more effective than the SLP and because CTD requires less attention from the therapist to the cuing itself (Wolery et al., 1990).

Repetition of a behavior increases the probability of the behavior being further repeated (Giles & Clark-Wilson, 1993). This is known as response practice and is the most important aspect of successful behavioral training. As practice is continued, the behaviors can become automatic. Overlearning refers to the practice of a skill well beyond the point where mastery has been achieved. Overlearning increases the chances that a skill is consolidated in the person’s repertoire of skills and reduces the effort required for performance of the skill (Giles & Clark-Wilson, 1993).

Washing and Dressing Training

Using a verbal mediation strategy, Cermak (1976) attempted to teach a patient who was post herpetic simplex encephalitis to perform a self-care task. The patient had great difficulty learning a six-item list of word pairs; however, when a verbal mediating link was introduced between the first and the second word, the patient’s performance improved. After this success, Cermak used the same strategy to teach the patient more complex and personally relevant information designed to govern ADL behavior. After three exposures to the pairing, the patient could state the to-be-remembered information but did not produce the behavior. For example, to the question, “What should you do first thing in the morning?” the patient would answer correctly, “Take a shower” (p. 320), but would do nothing unless given further cuing (i.e., the patient’s verbalizations did not control his behavior). Cermak suggested that the verbal material remained unassimilated into the patient’s cognitive framework. It is interesting to note that Cermak did not apply a physical mediating link analogous to the verbal mediating link used to improve the patient’s performance on the verbal paired associate task (i.e., he did not physically assist the patient to perform the behavior).

Giles and Morgan (1989) attempted to improve personal hygiene behavior in a 29-year-old man who was 6 years post herpetic simplex encephalitis. The patient had behavior disorder and an amnestic syndrome that involved an inability to remember events for more than 30 sec. The patient was observed to use environmental cues to regulate his behavior; unfortunately, his attempts were mostly inappropriate. For example, he would not wash under his arms because, “It is cold outside, so I could not have been sweating” (p. 313). The patient could manage functions such as washing his face or brushing his teeth but was not able to put these units together in a logical sequence. Task analysis divided the patient’s morning hygiene behaviors into nine discrete activities. The patient was told a phrase that linked the act performed to that which immediately followed it. He was then prompted to repeat the phrase and perform the activity. Both verbal regulation and actual performance were reinforced with chocolate and verbal praise. The patient achieved full ADL independence after 14 weeks of treatment and was maintaining independence at 3-month follow-up. Giles and Morgan concluded that a reliable association between the patient saying the prompt and performing the action was established as the program continued with reinforcement of both verbal mediation and action.

Giles and Clark-Wilson (1988) described the use of a behavioral training program with four adults with severe brain damage. The patients were unable to complete self-care activities because of memory impairment, difficulties in initiation and planning, impaired attention, disinhibition, perseveration, obsessiosity, and behavior disorder. The intervention program consisted of verbal prompts and tangible reinforcements, such as chocolate or tokens redeemable for larger reinforcers. Individualized programs of prompts were developed, taking into account the severity of each patient’s performance deficit. Successful completion of a prompt was reinforced. Three of the four patients became physically independent by week 16, and the need for verbal cuing decreased as the program continued. One patient who had required 3 hours to dress before treatment, required only 30 min to wash and dress by week 5 of treatment.

McMillan et al. (1990) described the treatment of poor self-care behaviors in a 38-year-old woman who was post herpetic simplex encephalitis. The patient was able to carry out individual washing and dressing behaviors but could not link these together in an effective sequence. The intervention involved dividing her morning ADL into an 11-step routine, which was later altered to 15 steps. After completing an activity, the patient was asked what she should do next, and if this did not elicit the next step in the program, she was prompted with the next activity. The frequency with which prompts were required...
fall from an average of 75% (8.3 out of 15 prompts) in the first month of treatment to 36% (5.4 out of 15 prompts) in weeks 6 through 20 and to 4% (.5 out of 15 prompts) in weeks 29 through 32. In the last 4 weeks in which recordings were made, no prompting was required on 54% of the days. The researchers suggested that the slow rate of improvement of their patient (6 months) relative to the patient of Giles and Morgan (1989) (14 weeks) may have been because of her more acute status. However, their training methods appear to be different from those of Giles and Morgan in that they used specific prompting only when a more general cue was unsuccessful (i.e., they used an SLP). The SLP method risks having the patient propagate erroneous responses, slowing the learning of the desired response (see McDonnell [1987] for other problems with the SLP method).

Katzmann and Mix (1994) described the response of a 34-year-old women who was 4 months post viral encephalitis to an ADL retraining program. Before treatment, the patient was unable to complete self-care activities because of memory deficits, poor attention, and obsessionality. The training program was developed on the basis of observation of the patient’s spontaneous washing and dressing behavior. The patient was given the opportunity to independently initiate each task. If she did not initiate the task within 1 min from the completion of the previous step, she was given a verbal cue (i.e., a CTD procedure). If she still did not initiate the task within an additional 1 min, she was provided with physical assistance. During the pretreatment baseline, the patient required physical assistance 28% of the time, required verbal cuing 25% of the time, and was independent 47% of the time. By week 9, she required verbal cues 5% of the time and physical cues 1% of the time. After discharge, the program was carried out by the patient’s cousin. One month after discharge, the cousin reported that the patient was 85% to 90% independent and required only 60 to 65 min to complete the program.

Pulaski and Emmett (1994) described a combination of task training and pharmacotherapy to improve functional performance of a 48-year-old women after removal of a cerebella pontine angle tumor. On admission, the patient was dependent in dressing and was non-weight bearing. Within the first 7 weeks, the patient made significant gains in response to what the authors described as traditional therapy approaches. However, after this period of improvement, the patient ceased to progress, remaining dependent in self-care. At the end of week 11, bromocriptine mesylate was added to the patient’s treatment regimen. After 1 week of treatment with bromocriptine mesylate and continued delivery of structured and repetitive therapy, the patient’s performance in dressing, transferring, and ambulation improved. Four weeks after the addition of bromocriptine mesylate to the treatment regimen, patient transfers required supervision 50% of the time and contact guard 50% of the time. In dressing skills, the patient’s need for verbal cues and physical assistance to complete the steps of the task decreased. She progressed from needing 45 min to complete dressing to only needing 15 min. At discharge, 7 weeks after the addition of bromocriptine mesylate, the patient was independently dressing and transferring. She was also ambulating 150 ft (with a large-based quad cane) with contact guard and minimal verbal cues. Independence in dressing and transferring continued at 3-month follow-up. Pulaski and Emmett concluded that the combination of a pharmacological agent with rehabilitative efforts resulted in major improvement.

**Method**

**Subjects**

A behavioral retraining program for developing independent washing and dressing behaviors was provided to all patients who were admitted to a Transitional Living Center (TLC) for adults with brain injury during a 3-year period and who met the following treatment criteria: (a) dressing and washing deficits due to physical and cognitive impairments and (b) a disorder considerable enough to require daily assistance. Two patients without physical impairment and whose ADL performance deficits were part of an acute confusional state were excluded from the study. Both patients were able to perform ADL independently but refused to do so; therefore, an alternative intervention method described in Giles and Clark-Wilson (1993) was used for them. Four patients admitted during this time met the treatment criteria.

Three subjects were men, and the age range for all subjects was 20 to 34 years. Average coma duration for Subjects 1, 2, and 3 was 48 days (range = 3 days–112 days) and was unavailable for Subject 4 because of the nontraumatic nature of his injury. Average time from injury to treatment was 14 months (range = 7 months–25 months). The treatment group represented 8.3% of the potential treatment population (N = 48), which was within the expected range of 5% to 15% for severe ADL deficits for all persons with brain injury (Jacobs, 1988; Jennett & Teasdale, 1981).

**Subject 1** was a 20-year-old, right-handed man who had sustained a closed brain injury with right frontal contusion from an automobile accident. Duration of coma was approximately 4 weeks followed by a stuporous state for 5 weeks. Acute hospital care was followed by 5 months of rehabilitation services. On admission to the TLC, the subject had wheelchair mobility indoors and had a severe left-sided hemiparesis, which was more pronounced in the lower extremity. Right-
elbow extension was limited by 10% because of heterotopic ossification. The subject’s memory was severely impaired; immediate recall of the Logical Memory subtest of the Wechsler Memory Scale (WMS) (Wechsler, 1945) was very poor, with delayed recall nonexistent.

Subject 2 was a 30-year-old, right-handed woman who had sustained a brain injury in a motor vehicle accident in a remote region of the western United States. When admitted to the hospital 6 hours after the accident, her Glasgow coma scale (Teasdale & Jennett, 1974) score was 6. Coma duration was approximately 3 days. After stabilization of her medical status, the subject was transferred to a skilled nursing facility for 2 months and then to a rehabilitation unit for 4 months. Neuropsychological testing on admission to the TLC revealed considerable memory impairment. Her WMS Logical Memory immediate recall score was in the severely impaired range (13th percentile), and her delayed recall score was in the profoundly impaired range (5th percentile). When admitted to the TLC 7 months after injury, the subject was alert and oriented to time, place, and person; wheelchair dependent with bilateral moderate spasticity and hemiparesis; and dependent in ADL.

Subject 3 was a 23-year-old, left-handed man who had sustained a right frontotemporal parietal injury in a motorcycle accident. The trauma resulted in a bilateral subdural hematoma. Coma duration was approximately 16 weeks. The subject received intensive rehabilitation for approximately 1 year. Neuropsychological testing revealed visual memory to be within normal limits, but verbal memory was considerably impaired. His WMS Logical Memory immediate recall score was in the moderately impaired range (33rd percentile), and his delayed recall score was in the profoundly impaired range (9th percentile). Behaviorally, the subject exhibited egocentricity with poor ability to manage frustration, which resulted in explosive verbal outbursts. He was nonambulatory as a result of bilateral lower-extremity hypertonicity, contractures, and ankle decalcification. When admitted to the TLC 25 months after injury, the subject was dependent in ADL.

Subject 4 was a 34-year-old, right-handed man who had developed alteration of consciousness and left hemiplegia as a result of a large intracranial bleed caused by a ruptured aneurysm of two communicating arteries. The subject underwent a craniotomy with evacuation of hematoma. He developed an obstructive hydrocephalus and underwent left ventriculostomy. There was complete occlusion of the right carotid artery. Because of the nontraumatic nature of the subject’s brain injury, coma duration cannot be used to infer injury severity. Two months after the incident, he was transferred to an acute rehabilitation unit where he developed progressive impairment in his level of alertness. A left subdural hematoma was discovered, requiring rehospitalization to place a ventricular peritoneal shunt. Results of neuropsychological testing were not available; however, the subject had severe cognitive deficits that profoundly impaired attention, initiation, and reasoning skills. Right-elbow extension was severely decreased because of severe hypertonicity. When admitted to the TLC 16 months after injury, the subject was dependent in ADL.

Treatment Program

Therapists observed each subject for three consecutive mornings and recorded the subject’s behavior after the cue, “Do what you would normally do in the morning to wash and dress.” Failure to engage in washing-related and dressing-related behaviors for 2 min resulted in a recue or, if this was ineffective, in physical assistance directed toward washing and dressing. Particular emphasis was placed on identifying tasks or task subroutines in which the subject was independent. Behavioral sequences that the subject used systematically and that were effective were written into his or her retraining program. The behavior of Subjects 1, 2, and 4 was found to be erratic in order and content. Subjects 2 and 3 attempted to wash and dress in ways that necessitated physical assistance from others (e.g., asking others to bring them water and toiletries so that they could wash in bed).

After the initial observation period, therapists developed an ADL program for each subject. Each program consisted of a series of instructions that the therapist used to cue specific behaviors. The written program was followed as closely as possible in order to maximize the subject’s chances for learning. Each subject’s program was carried out by an average of two to three therapists. At the beginning of the program, none of the subjects were physically capable of performing all the program subroutines. To maximize learning, the physical subroutines were practiced in separate sessions (15–30 min, 3–5 times per week) as well as during the program itself. The program was carried out in the subjects’ rooms and replaced routine personal hygiene assistance. The program lasted 30 to 45 min for Subjects 1, 2, and 3 and 60 to 90 min for Subject 4. Treatment periods were open ended and were continued until the subject was independent for 5 days or when treatment efforts were determined by the treatment team to be ineffective. Physical aids, such as grab bars, were provided in conformity with the program specifications.

Early in treatment, verbal cuing was provided irrespective of the subject’s behavior to ensure that the appropriate sequence was followed. As the patient began to show improvement (e.g., by beginning the next activity before the cue could be given or verbalizing the next
activity), cuing was provided only if (a) performance of the next step of the program was not evident within approximately 5 sec of completion of the previous step, or (b) behavior incompatible with production in the next step of the chain was demonstrated. When the subject proceeded directly to the next appropriate behavior after the completion of the previous behavior, he or she was congratulated, and no cue was given.

**Measures**

The primary outcome measure used was a structured observation method (Giles & Clark-Wilson, 1988). Ratings of independence, number of cues provided, and physical assistance were recorded for each day the training program was provided. At admission and 3 months later, the subjects were administered the Adaptive Behavior Scale (ABS) (Nihara, Foster, Shellhaas, & Leland, 1975). The ABS is an observational instrument consisting of 100 subscales, with 66 related to independent functioning and 44 related to behavioral regulation. The 8 subscales related to self-care are reported in this study.

**Results**

Table 1 shows the ADL-related subscales of the ABS of three of the four subjects. (ABS scores were not collected for Subject 4 because of administrative error.) Scores indicate a marked improvement in functioning. Subjects 2 and 3 scored maximally independent on all subscales by the 3-month rating. Despite marked improvement, Subject 1 did not achieve full independence in all hygiene activities by 3 months. The ABS conflates toileting and incontinence, and although Subject 1 was fully independent in toileting, he continued to have occasional incontinence. Additionally, although Subject 1 could wash at the sink and dress independently, he was not independent in taking a bath.

The number of verbal cues and amount of physical assistance required for Subject 1 to complete his morning self-care program began to decrease in the first week of treatment and continued through the second week (see Figure 1). By the third week, he required no cuing or assistance. This independence was maintained at 3-month follow-up. The number of verbal cues and amount of physical assistance required for Subject 2 decreased steadily over a period of 5 weeks, resulting in independence in washing and dressing behavior by day 37 and was maintained at 3-month follow-up (see Figure 2).

Subject 3 was unusually consistent in his pretreatment washing and dressing behavior because he had developed his own specific morning hygiene routine (see Figure 3). Unfortunately, his routine for washing and dressing was dependent and maladaptive (i.e., he insisted that others provide him with water, toiletries, physical assistance). With the introduction of the treatment program, Subject 3 required not only three times the number of verbal cues, but also experienced a decrease in need for physical assistance. By day 10, he no longer required physical assistance, and by day 11, he was independent.

No baseline data are available for Subject 4 because the procedures used with Subjects 1, 2, and 3 did not elicit ADL behaviors in him (see Figure 4). It should be noted that although Figures 1 through 3 indicate time in days, Figure 4 provides average data points for each week of Subject 4’s ADL program. Subject 4’s program also contrasts with the other three in that it was more detailed (see Appendix) and more time consuming to deliver. Independence and verbal cuing were inversely related, with independent behaviors stabilizing between weeks 16 and 20 above verbal cuing and physical assistance. Although the subject demonstrated learning (i.e., reduction in cuing, increase in behaviors performed without cues), there were no overall increases in his functional independence.

**Discussion**

This article provides evidence that the behavioral approach to ADL retraining described here and in earlier reports (Giles & Clark-Wilson, 1988, 1993; Giles & Morgan, 1989) may be effective with patients with brain injury.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Adaptive Behavior Scale Scores for Subjects 1, 2, and 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subject 1</td>
</tr>
<tr>
<td><strong>ADL Skill</strong></td>
<td>Pretreatment</td>
</tr>
<tr>
<td>TT</td>
<td>4</td>
</tr>
<tr>
<td>SC</td>
<td>0</td>
</tr>
<tr>
<td>WHF</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>PH</td>
<td>3</td>
</tr>
<tr>
<td>TB</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>UD</td>
<td>2</td>
</tr>
</tbody>
</table>

**Note.** ADL = activities of daily living; TT = toilet training (range = 0–4); SC = self-care at toilet (range = 0–6); WHF = washing hands and face (range = 0–4); B = brushing (range = 0–6); PH = personal hygiene (range = 0–4); TB = toothbrushing (range = 0–5); D = dressing (range = 0–5); UD = undressing (range = 0–5). *Maximum score possible.
who have not shown improvement when treated with less structured approaches. Our four subjects did not respond to more conventional ADL training methods. The data on coma duration and postinjury time suggest that spontaneous recovery is unlikely to be an important factor contributing to patient improvement. The choice of a consecutive series research design—all patients who met criteria during a defined period were entered consecutively into this study and therefore treated with the same intervention—eliminated the selection of "good candidates" for treatment. Therefore, this method suggests that the treatment used has more general applicability than can be established with a series of single-case studies. It is important to note, however, that the subjects treated were probably not representative of all adults with severe brain injury in need of ADL retraining. All the subjects were admitted to a TLC, which implies that they were medically stable, were able to follow verbal instructions, and did not have marked behavioral disregulation.

Our ADL retraining program differs from Giles and Clark-Wilson's (1988) program in that neither tokens nor tangible reinforcements were part of the intervention. The subjects in the two reports also differed in that all four subjects in the present study were compliant with ADL retraining. It may be that additional reinforcement is not required when patients are intrinsically motivated toward the task (Giles & Clark-Wilson, 1993). The clinical environment in which treatment occurred was also different from that described by Giles and Clark-Wilson (1988). The TLC may have been more effective in promoting therapeutic change than the token economy described in Giles and Clark-Wilson's (1988) study.

The actual mechanisms that resulted in patient learning in our study are unclear. Although nondeclarative memory might be sufficient to account for the learning, the intervention program design attempted to capitalize on the ability of persons with memory impairment to learn frequently presented verbal information. As the treatment program progressed, all four subjects became increasingly able to state the order in which ADL were to be performed. In contrast to Cermak's (1976) patient who could state that he should take a shower but then did not do so, the success of the current study may be accounted for by a complex interaction of both declarative and nondeclarative memory. The verbal components of the treatment program in our study may have facilitated

---

**Figure 1.** Performance of Subject 1 on a program to improve self-care behaviors. Note. From "A Rapid Method for Teaching Severely Brain-Injured Adults How to Wash and Dress" by G. M. Giles & M. Shore, 1989, Archives of Physical Medicine and Rehabilitation, 70, p. 158. Copyright 1989 by W. B. Saunders Company. Adapted with permission.
the subjects' "knowing that they know," hence accessing the appropriate behavior at the appropriate time.

The factors that prevented the intervention from producing clinically meaningful change in Subject 4 are unclear. The origin of the subject's brain damage was a cerebral aneurysm rather than traumatic brain injury. The different origin of his injury may have obscured a lack of comparability in the severity of the brain damage (i.e., he may have had more severe brain damage). As is evident from the Appendix, Subject 4 required multiple cues for behaviors that Subject 1, for example, could perform with a single cue. Behaviorally, Subject 4's most prominent characteristics were lack of spontaneity, difficulty in initiating behavior, and marked motor slowing consistent with marked frontal lobe impairment. After termination of the ADL program, pharmacological attempts to address his poor initiation skills, such as those described by Pulaski and Emmett (1994), proved unsuccessful.

Although some critics have referred to our behavioral training methods as "commonplace" (Heacock, McNeney, & Zasler, 1989, p. 720), it remains our impression that the rigorous application of learning-based approaches to ADL deficits is an infrequent part of occupational therapy practice. Similarly, there is no detailed literature that can inform the application of ADL interventions to persons with brain injury comparable to that available for persons with mental retardation.

Conclusion
This article includes a detailed review of the available literature. Prospective comparison studies of traditional, behavioral, and behavioral plus pharmacological approaches are much needed additions to the information available for occupational therapists in the design of rehabilitative programs.

Acknowledgment
We thank W. B. Saunders Company for providing permission to use descriptions and data for Subject 1 from "A Rapid Method for Teaching Severely Brain-Injured Adults How to Wash and Dress" by G. M. Giles & M. Shore, 1989, Archives of Physical Medicine and Rehabilitation, 70, pp. 156-158.

Appendix
Examples of Washing and Dressing Programs

Dressing Program for Subject 1
1. Push back the covers.
2. Sit on the side of the bed.
3. Get into the wheelchair.
4. Go to the sink (should sit directly facing the sink).
5. Take off shirt.
7. Fill sink.
8. Wash face (wash, rinse, dry).
9. Wash armpits (wash, rinse, dry).
10. Push wheelchair back from sink, grasp sides of sink with both hands, make a good hip bend, stand up, push down trousers and underwear, and sit down.
11. Wash groin.
12. Dress rap half.
13. Put on socks, put underwear and trousers over feet.
14. Push wheelchair back from sink, grasp sides of sink with both hands, make a good hip bend, stand up, pull up underwear and trousers, and sit down.
15. Put on shoes.
16. Comb hair.

Remember to give praise for good performance!

Part of the Dressing Program for Subject 4

Brush teeth program.
1. "Brush your teeth."
2. Put toothbrush on sink edge.
3. Squeeze paste on toothbrush.
4. Put paste on shelf.
5. Turn water on.
6. Wet toothbrush.
7. "Brush your teeth."
8. Brush front teeth.
13. Rinse toothbrush and put down.
14. Fill cup with water.
15. Rinse mouth.
16. Rinse again.
17. Put cup down.
18. Turn water off.

Upper body bathing.
1. Remove shirt, pull over head, remove right arm, remove left arm.
2. Turn water on.
3. Plug sink.
4. Pick up washcloth.
5. Wet washcloth.
6. Squeeze out washcloth.
7. Soap washcloth.

Figure 3. Performance of Subject 3 on a program to improve self-care behaviors.
Figure 4. Performance of Subject 4 on a program to improve self-care behaviors.

8. Wash face.
10. Wash left armpit (assist holding out arm).
11. Wash right armpit.
12. Wash chest.
13. Rinse washcloth.
14. Wring out washcloth.
15. Rinse face.
17. Rinse left armpit.
18. Rinse right armpit.
20. Put down washcloth.
21. Drain sink.
22. Pick up towel.
23. Dry face.
24. Dry neck.
25. Dry left armpit.
26. Dry right armpit.
27. Dry chest.
28. Remove top from deodorant.
29. Spray under left arm (assist for positioning).
30. Spray under right arm.
31. Put top on deodorant.
32. Put deodorant away.

References


