The Use of Behavioral Techniques in Functional Skills Training After Severe Brain Injury

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

This paper discusses the application of behavioral methods to functional skills training in the adult with severe brain damage. Four cases are described demonstrating the effectiveness of this type of intervention in teaching washing and dressing skills. Three patients had deficits arising from traumatic brain injury and one had continuing problems following herpes simplex encephalitis. Theoretical issues in adapting behavioral methods to the needs of such patients who have severe disorders of memory, attention, and motivation are discussed.

Miller (1980) has argued that an important aspect of rehabilitation after severe brain injury is retraining in independent living skills. After brain injury, formerly automatic behaviors may require active attention. Strategies previously used to perform simple functional tasks may no longer be effective (Schneider, Dumais, & Shriflin, 1984). The difficulties that brain-injured patients have in relearning functional skills depend on (a) the extent of physical, perceptual, and cognitive impairment (for example, abnormalities of tone and disorders of attention, memory, and drive) and (b) the degree to which self-defeating, inappropriate compensatory behaviors have been developed, such as manipulating others to help perform the task or not doing it at all (Giles & Morgan, in press). When physical and cognitive dysfunction and inappropriate compensatory behaviors coexist, they create significant problems in reacquiring self-care skills.

The Place of Functional Skills Training

After the stage of rapid spontaneous recovery, often thought to last between 6 to 12 months (Jennett, 1984), little can be done by conventional medical interventions to restore lost function (Giles & Shore, 1988; Jennett, 1984; Miller, 1980) except where there are specific neuropsychiatric disturbances such as mood disorders (Fussey & Giles, 1988). The basis of rehabilitation is therefore to train or retrain in the skills necessary for the maximum level of independence attainable by the patient. Performance in basic self-care activities, such as washing and dressing, can be an important determinant of placement for those in need of long-term care. Failure to develop these skills may lead to the patient's remaining in an inappropriate setting such as a psychiatric hospital (Acton, 1982). Unfortunately, there is little guidance available in the occupational therapy literature to help occupational therapists overcome deficient self-care skills in the severely impaired brain-injured population. Discussion is usually limited to assessment, or to aids and adaptations (Nichols, 1976). Some occupational therapy authors have advocated the use of behavioral techniques in the training of activities of daily living (ADL) for patients with brain injury (Pedretti, 1981; Trombly, 1983), but this does not appear to be based on research findings.

Miller (1980), when examining the learning characteristics of adults with severe brain damage on a psychomotor task, found that they demonstrated rapid improvement with practice, considering the fact that their starting levels were poor compared with those of normal control subjects. He concluded that their pattern of learning was comparable to that of people with severe mental impairments and suggested that this
pattern should be considered in the design of rehabilitation programs for the adult brain-injured population. Behavioral approaches in treating deficits in functional skills have been found to be effective with patients with severe mental impairments (Azrin, Schaeffer, & Wesolowski, 1976) as well as with long-term institutionalized psychiatric patients (Dolan, 1979; Hunt, Fitzhugh, & Fitzhugh, 1968). Behavioral methods have been used by occupational therapists with some of these populations (Stephan, 1987). Recent studies demonstrated that patients with severe brain trauma can learn, and that behavioral methods can improve basic functional skills (Glisky, Schacter, & Tulving, 1986; Goldstein et al., 1985).

A Behavioral Approach to Rehabilitation

At The Kemsley Unit of St. Andrew's Hospital in Northampton, England, a token economy system is used in the rehabilitation of persons with severe sequelae of brain injury (Eames & Wood, 1985). The token system, which is similar to that used with other populations (Craighead, Kazdin, & Mahoney, 1976; Kazdin and Bootzin, 1972), incorporates a wide range of behavioral techniques to help patients overcome the physical, behavioral, and cognitive deficits that prevent them from returning to the community. Behavioral techniques include, but are not limited to, contingent reinforcement, prompting, shaping, in vivo desensitization, extinction procedures, and discriminatory learning procedures. A token economy system allows a structure in which therapists of various disciplines can train patients in specific skills. Positive reinforcement, usually social reinforcement (e.g., attention, interest, and praise) plus tangible reinforcement (e.g., chocolate, soft drinks, or other privileges) are applied as a consequence of appropriate behaviors. Socially unacceptable or inappropriate behavior results in the patient forfeiting the chance of obtaining such rewards. The use of the system has resulted in reduced inappropriate behavior and, subsequently, improved placements (Eames & Wood, 1985). This paper describes the results of an attempt to improve the washing and dressing behaviors of four consecutively admitted adults with brain injury of traumatic or infective origin who had deficits in this area. Techniques used included operant procedures, verbal prompts, and reinforcements. All patients were heavily dependent in personal hygiene behavior.

Subjects

Patient 1

C.P., a 37-year-old woman was admitted to The Kemsley Unit 4 years after sustaining a severe brain injury. She remained in a coma for more than 14 days. Her continuing problems included right hemiparesis of the upper and lower extremities, poor visual acuity, poor attention, limited speech, and left–right disorientation. Her immediate memory for digits (4 forward and 2 backwards) was below the normal range. Her verbal memory for a short story on immediate recall was negligible, and she had no recall 20 minutes after a story had been told. C.P. had an amnesic syndrome. On a behavioral memory assessment (Giles & Clark-Wilson, 1988), it was found that this deficit transferred into tasks of everyday life such as her ability to remember routes or where she put things. During C.P.'s initial dressing evaluation, she frequently repeated the word “bed” and asked the staff for help. When this was refused she would swear, gnash her teeth, and repeatedly hit the sink at which she was sitting. Besides her cognitive and behavioral deficits, C.P. had physical deficits that made it necessary for her to be taught new methods of performing activities of washing and dressing. In general, C.P. needed physical assistance in all aspects of washing and dressing because of her lack of cooperation, difficulty in initiating behavior, and extreme difficulty in planning actions.

Patient 2

D.S., a 23-year-old man, was admitted to the unit exhibiting the residual effects of brain damage acquired 17 years earlier. Information on coma duration was not available. A right hemiplegia had restricted the growth of his right extremities. Active movement in the upper right extremity was limited to the shoulder, and he held the arm in a typical flexor pattern. Ataxia on the left side was more pronounced in the upper than in the lower extremity. D.S. had severe deficits in attention and memory, and had impaired visual acuity and visuospatial problems. He refused to do anything for himself and became physically and verbally aggressive if requests were repeated.

Patient 3

T.M., a 20-year-old man, was admitted 4 years after developing herpes simplex encephalitis (see Greenwood, Bhalla, Gordon, & Roberts, 1983, for his early history). T.M.'s problems included wandering, intermittent incontinence, memory impairment, and behavioral problems resembling frontal disinhibition (right frontotemporal damage confirmed by a CT scan). His problems with attention and arousal were such that he would frequently fall asleep during or run out of therapy sessions. No neglect or agnosia was present, but a mild constructional apraxia was noted. T.M. could not attend to washing and dressing tasks long enough to complete them and if allowed to would wander the unit half dressed.
C.H., a 23-year-old man was admitted 4 years after being struck by an automobile while riding his bicycle. He had been in a coma for 6 to 8 weeks. C.H.'s problems included epilepsy (partially controlled by medication), severe receptive and expressive dysphasia, and impaired memory to the degree that he could be classed as amnesic. Perseveration and obsessions hampered his everyday activities. It was taking him over 3 hours to wash and dress each morning.

Summary of Patients' Characteristics and Purpose of Intervention

On admission all 4 patients were maximally physically dependent in washing and dressing. Since their injuries, the minimum time elapsed was 3 years and the maximum time was 17 years (M = 7 years, SD = 5.8 years). Given this length of time since injury, further spontaneous recovery would not have been expected. Three of the four patients could not read, but all could understand simple verbal instructions. Improved personal hygiene performance was important because it was thought that Patients 3 and 4 could be managed at home if they had improved self-care skills (including washing and dressing) and that Patients 1 and 2 could improve enough to be placed in settings allowing greater independence.

Intervention Program

The procedure used was clinically oriented and was not a pure experimental design. The treatment package included verbal prompts and contingent reinforcement. No attempt was made to specify the contribution of either element; determining this would require further research. Because of the illiteracy and severe memory and motivation disturbance of these four patients, verbal prompts rather than written or pictorial prompts were used in the behavioral training programs. Verbal prompts also have the advantage of being simple to fade. Individualized programs consisting of a series of prompts matching specific washing and dressing tasks were designed and graded to each patient's needs. The number of prompts was dictated by the patient's ability. Some patients needed only a few prompts, such as “Wash your face,” to produce complex behavioral chains. Other patients required several prompts, for example, “Pick up the washcloth,” “Put soap on the washcloth,” “Wash your face,” “Rinse the washcloth,” and so on. This method is similar to prompt sequences used with other populations (for an example, see Stephan, 1987).

Baseline observations of each patient were made for 5 days before the program was introduced. The observations showed slow performance (Patient 4) or no performance (Patients 1, 2, and 3) to the prompt, “Wash and dress yourself.”

Patients were given every opportunity to succeed in their programs. If they failed to perform the behavior indicated by the prompt, they were assisted to perform without any social interaction or other attention and the next prompt was given. Successful performance after a prompt was reinforced immediately, both by social praise and by a tangible reinforcer, usually chocolate, but sometimes tokens to be traded for a larger reinforcer, for example, a trip out. As the patient progressed, various simple prompts corresponding to behaviors were grouped so that the total number of prompts gradually decreased and the patient had to produce more behavior in response to each prompt. Inappropriate or attention-seeking behavior, such as gnashing teeth, blowing kisses (Patient 1), swearing (Patients 1 and 2), collapsing and rolling on the floor (Patients 2 and 4), led to a “time-out-on-the-spot” (TOOTS) procedure. TOOTS is an extinction behavioral technique adapted from the behavioral procedure of time-out (Ullmann & Krasner, 1969). It removes the opportunity of gaining positive reinforcement, and its use is contingent on the patient's producing an unwanted behavior. Approximately 20 seconds after the patient ceased to display the inappropriate behavior he or she would be re-prompted. Episodes of physical aggression led to a time-out in a designated quiet area for 5 minutes. These methods are more fully described elsewhere (Fussey & Giles, 1988; Wood & Eames, 1981).

All programs were conducted 5 days a week and took between 30 to 60 minutes. When a program could not be performed, a bath or shower was substituted to avoid the learning of conflicting methods.

Each patient's performance was recorded each time the program was conducted. Each numbered item was recorded as having been performed “I” (independently, i.e., without prompting), “P” (prompted), “A” (assisted, i.e., physical assistance required), or “R” (refusal to cooperate). In all patients, refusal to cooperate was limited to the first 1 to 4 weeks of the program and is not further reported. Where prompts had to be repeated, they were recorded as separate prompts each time. The increase in acts performed independently was not recorded, preference having been given to recording the number of prompts. The ranking of patient dependency level by two raters was identical, demonstrating a satisfactory interrater reliability.

Results

Figure 1 shows the number of prompts C.P. (Patient 1) required to complete her morning program over a
22-week period. Slight increases in Weeks 12 and 17 mark the grouping of prompts into larger units requiring more complex behaviors (see Appendixes A, B, and C). It is evident that there was a trend toward reduced physical assistance and verbal prompts at 12 weeks, but C.P. remained dependent on repeating prompting. C.P. had also learned specific dressing techniques, such as putting her affected arm into clothing first. The number of prompts she required decreased over time, as did the assistance she needed. At 6 months C.P. was able to wash and dress herself without physical assistance. With new staff, C.P. would say that she could not dress, but if left alone, she would wash and dress (without prompting). External motivators, such as chocolate, given contingent upon her completing the programs, were important in maintaining C.P.’s cooperation and therefore were retained. Because funding was withdrawn, treatment was curtailed prematurely, that is, before the external motivators could be eliminated. However, telephone inquiries to her new placement 6 months after her discharge revealed that she had maintained her gains in dressing and washing and that her increased level of cooperation made her popular with the staff.

Figure 2 shows that D.S. (Patient 2) learned to wash and dress himself in 10 weeks. However, it was necessary to continue with the program for another 4 months before D.S. could reliably wash and dress himself without supervision. Both the number of prompts and the amount of physical assistance required decreased over time. Ten months after the cessation of the program, D.S. remained fully independent in washing and dressing.

Figure 3 demonstrates the level of improvement of T.M. (Patient 3) in washing and dressing behavior. Although T.M. became more independent, he continued to require the presence of a staff member to perform these skills adequately. The number of prompts he required decreased over time, as did the physical assistance he required.

The treatment result for C.H. (Patient 4, see Figure 4) demonstrates some of the limitations of the straightforward approach described above and highlights the need to tailor intervention to the patient’s needs. His response to treatment may also have been complicated by a continued seizure disorder which was not fully controlled by medication. Because C.H.’s major problem was slowness, he was given a specified period of time for each task in Program 1. After 4 weeks, despite a decrease in the time C.H. needed to complete Program 1, it was replaced by Program 2 because the time it took him to wash and dress remained excessive. Program 2 consisted of a series of prompts written on a board by the sink which C.H. could check off after completing them. C.H. required intensive training (2 hours per day) over 5 days to learn the written instructions and how to use them. When C.H. finished the entire sequence in less
than a specified time, he earned stars which could be traded for something he wanted, such as a book or a trip out. Program 2 produced a further reduction in the time it took him to complete washing and dressing. The experimental withdrawal of Program 2 after 3 months led to a gradual reduction in speed of performance. Program 2 was therefore continued as a maintenance regimen; it allowed C.H. to wash and dress in a short period and with less staff supervision than prior to treatment.

To summarize the results, after treatment Patient 4 took 2 to 2½ hours less to wash and dress. All patients required fewer prompts and less assistance after treatment. Although improvement cannot be confidently ascribed solely to the treatment, we regard nonspecific factors (such as attention from the staff) or spontaneous recovery as extremely unlikely causes of improvement. All patients had been unable to wash and dress for over 3 years (and in one case 17 years) despite spending many years in rehabilitation settings. Since all the patients had to be dressed by others prior to commencing training and since improvement in independence occurred only after initiation of the programs, it is unlikely that the nonspecific factors connected with being on the unit accounted for the improvement.

Discussion

Prior to brain injury, individuals often rely on strategies to perform functional tasks that are not available to them after injury. Where patients have an impaired episodic memory (Tulving, 1983), anything less than a strict routine may result in their omitting or repeating elements. Dressing is usually mastered before washing. Not only is the activity probably more motivating, there are situational cues present for dressing that are not present for washing (i.e., the patients with memory disorders can see how far they have progressed in dressing by what clothes they have on). Patients can often learn simple verbal sequences and respond correctly when asked questions about how they wash and dress in the morning long before they can perform the required behavior spontaneously. It is necessary to continue with teaching until performance becomes a habit. Where drive is lowered, overlearning may reduce the amount of effort required from the subject to initiate the activity.

Learning may take place without the patient's being aware of it. When the patient has low motivation for self-care tasks, the use of a behavioral approach makes it possible to alter the contingencies of reinforcement to make performance more motivating. There is some evidence that reinforcement aids learning (Dolan & Norton, 1977; Lashley & Drabman, 1974). The importance of tangible reinforcement in addition to social praise is less clear, and results have been inconsistent (Dolan, 1979; Dolan & Norton, 1977; Lashley & Drabman, 1974). Dolan (1979) has suggested that the inconsistency may result from the level of motivation toward what is to be taught: Where there is high motivation, tangible reinforcement is likely to be irrelevant. This accords with our own clinical impressions. Even when artificial reinforcers are required initially, it is often possible to withdraw them as the social rewards attendant upon the behavior begin to support it. However, even after the end of the intervention program, it is essential that independence remain more rewarding than dependence. Many of the social pressures that ensure good habits in the general population do not apply in institutional settings for the person with severe brain damage. Moreover, such persons are often insensitive to social cues and social reinforcement.

The training characteristics of the adult with acquired brain injury may be influenced by the site of the lesion (Fussey & Giles, 1988). However, at present little can be specifically predicted about a patient's degree of responsiveness to behavioral training. A method of predicting this would be helpful. The work of Oakley (Goldstein & Oakley, 1985; Oakley, 1983) suggests that learning is possible in patients with severe brain damage, and our own experience would support this view. Even those with severe memory impairments (amnesic syndrome) can respond to this type of training. However, therapists using behavioral techniques must remain flexible and adapt their intervention strategies to the individual patient's needs.

Conclusion

Reports of four cases confirm that some patients may be helped to improve their washing and dressing beh-

![Figure 4](http://ajot.aota.org/figure4.jpg)
haviors by the use of behavioral methods. Follow-up data demonstrate that the effect of the programs described were durable for Patients 1 and 2 and considerably reduced demands on staff time in Patients 3 and 4. Positive results were achieved despite the patients' differing abilities. Our impression, based on work with these four patients and with others, is that the use of specific behavioral techniques may yield results even when several treatments with other approaches have failed.

Acknowledgments

We thank M. J. Rose, Consultant in Charge, and R. L. Wood, Consultant Neuropsychologist, for permission to carry out the work reported here. We also thank M. Shore and P. W. Burgess for their helpful comments on an earlier draft of this paper.

Appendix A

Dressing Program for C. P.—Seventy Steps.

Reinforce socially and tangibly for each task achieved. TOOTS* references to “bed” (see text, p. 659). Reprompt (if necessary) to achieve task.

1. Get clean clothes out (staff to help).
2. Walk to the sink.
3. Hold onto faucets (staff to help with right hand and to remove standing frame).
4. Lift your bathrobe and nightgown past your seat.
5. Sit down slowly.
6. Take off glasses.
7. Sit well.
8. Undo the bottom of the dressing gown.
9. Take off dressing gown.
10. Take collar of nightgown. Lean forward and pull over head.
11. Put washcloth on the side of the sink and fill the sink.
13. Put washcloth on flat hand and wash face.
15. Put washcloth on flat hand and rinse face.
16. Dry face.
17. Put washcloth on side of sink.
18. Put soap on washcloth.
19. This is your right arm—wash under your right arm (staff member touches C. P.'s arm to show her—she has difficulty with right-left discrimination).
20. Rinse washcloth.
21. This is your right arm—rinse under your right arm.
22. Dry your right arm.
23. Put washcloth on the side of the sink.
24. Put soap on the washcloth.
25. This is your left arm—wash under your left arm.
26. Rinse washcloth.
27. This is your left arm—rinse under your left arm.
28. Dry left arm.
29. Put washcloth on the side of the sink.
30. Put soap on washcloth.
31. Put washcloth on flat hand and wash under breasts and between legs.
32. Rinse washcloth.
33. Rinse under breasts and between legs.
34. Dry under breasts and between legs.
35. Squeeze out washcloth.
36. Unplug the sink.
37. Apply deodorant.
38. Apply talcum powder.
40. Put cap on toothpaste.
41. Clean teeth.
42. Rinse mouth out with water from glass.
43. Dry mouth.
44. This is your right arm—put your right arm through the brassiere and up past the elbow (staff member makes sure brassiere is fastened—C. P. may need help in arranging brassiere).
45. This is your left arm—put your left arm through the brassiere and up past the elbow.
46. Lean forward and pull brassiere over head.
47. Push brassiere over right shoulder.
48. Pull down brassiere.
49. This is your right leg—cross right leg over left leg.
50. Put your underpants over right foot and pull up to knees.
51. This is your left leg—cross your left leg over right leg.
52. Put your underpants over your left foot and pull up to knees.
53. Pull up past knees as far as possible.
54. This is your right arm—put your right arm through dress/sweater.
55. This is your left arm—put your left arm through dress/sweater.
56. Lean forward and pull dress/sweater over head.
57. Push dress/sweater over right shoulder.
58. Pull dress/sweater down.
59. Fasten buttons (C. P. needs help with neck buttons of shirt).
60. This is your right leg—cross your right leg over your left leg.
61. Put on your right sock/trousers (C. P. may need a small amount of help).
62. Put on your right shoe.
63. This is your left leg—cross your left leg over your right leg.
64. Put on your left sock/trousers.
65. Put on your left shoe.
66. Hold on to the faucets (staff help with right arm).
67. Lean forward and stand up.
68. Pull up your underpants.
69. Brush hair.
70. Look in mirror and check OK.

*TOOTS = “time out on the spot” procedure (see text, p. 660).

Appendix B

Dressing Program for C. P.—Thirty-Four Steps.

Give prompt once, repeat after 10-second pause if necessary. Ignore comments such as “I can’t,” “Hungry,” etc. Leave room for 2 minutes if C. P. shouts, gnashes teeth, etc.

1. Choose a dress—put on chair by sink.
2. Get underpants, brassière, and socks—put on chair.
3. Go to the sink and take off bathrobe.
4. Lift nightgown up—hold onto faucets (C. P. may need help with right hand).
5. Sit down—take nightgown off—hold collar, pull over head.
Appendix C

Dressing Program for C.P.—Thirteen Steps.

1. Get out your clean clothes.
2. Get undressed (nightclothes).
3. Put soap on washcloth, wash face.
4. Rinse and dry face.
5. Put soap on washcloth and wash underarms.
6. Rinse and dry underarms.
7. Put soap on washcloth and wash breasts.
8. Rinse and dry breasts.
9. Put soap on washcloth and wash between legs.
10. Clean teeth.
11. Talc and deodorant.
13. Comb hair.

References


