The American Journal of Occupational Therapy

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This article was accepted for publication December 19, 1988.

Demonstrating the Effectiveness of Occupational Therapy After Severe Brain Trauma

Over the last 10 years, patients with traumatic brain injury have been recognized as a group with unique needs. According to the National Head Injury Foundation, 900,000 traumatic brain injuries occur each year in the United States, 50,000 to 80,000 of which result in permanent impairment (Clark-Wilson & Giles, in press). Improved medical management has increased the number of persons who survive severe brain injury. Many of these persons need continued therapeutic and supportive services. Reports in the occupational therapy literature describe treatments for these patients (Lundgren & Ferschino, 1986; Soderback & Normell, 1986a, 1986b), but, unfortunately, these studies are often conceptually weak and inadequately describe patients' characteristics. This paper examines the most frequently occurring problems in recent occupational therapy research and advocates the use of single subject research designs.

Occupational therapists are responsible for examining the effectiveness of their inventions with all client populations. Functional skills training, social skills training, motor skills training, and vocational rehabilitation are areas in which occupational therapists can play a significant role (Fussey & Giles, 1988; Giles, Fussey, & Burgess, 1988). Research designs to study the effectiveness of intervention after brain injury are complicated by spontaneous changes and the complex nature of neurological recovery. After an injury and an initial period of coma, the patient's condition usually resolves to some higher level of function. Hence, the therapist's providing therapy early in the recovery process and then noting the patient's improvement does not demonstrate treatment efficacy. Given the great variability in the rate and extent of recovery in brain-injured patients, it is impossible to measure improvement due to spontaneous recovery versus improvement due to therapy. Similarly, the analysis of recovery curves presents the researcher with complex problems (Giles & Clark-Wilson, 1988; Mackworth, Mackworth, & Cope, 1982).

Describing the Clinical Population

In preparing treatment reports for publication, therapists should include severity-of-injury ratings. The Glasgow Coma Scale has been used to rate injury severity in the acute stage of recovery after brain trauma (Teasdale & Jennett, 1974). A Glasgow Coma Scale score of 8 or below indicates a severe brain injury, a score of 9 to 12 indicates a moderate injury, a score of 13 to 15 indicates a mild injury. In patients with closed brain injury (i.e., injuries without skull penetration), coma duration is initially the most powerful predictor of the degree of diffuse axonal injury. In later stages of recovery, the duration of posttraumatic amnesia becomes one of the most powerful predictors of injury severity and outcome (Jennett & Bond, 1975). By including this information in reports, the therapist provides evidence of the severity of injury. When Glasgow Coma Scale or posttraumatic amnesia data are presented, different groups of patients can be compared. For example, patients whose coma duration varied between 20 minutes and 14 days and who were provided with vocational rehabilitation in an acute care hospital are likely to show a higher degree of vocational return than patients from a rehabilitation unit whose coma duration varied between 24 hours and 28 days. The knowledge that these two groups of patients did not have similar scores on measures correlated with severity of injury helps prevent the erroneous conclusion that rehabilitation services at the acute care hospital were superior to those services at the rehabilitation unit. Similarly, it is important to know the length of time between injury and treatment. The natural recovery process is identifiable for 3 years in some severely injured adults (Cope, 1985). Recovery is most rapid in the 6 to 12 months after resolution of coma (Jennett & Bond, 1975). When therapists report improvement in the early period following an injury, they should provide a way to control for spontaneous recovery, otherwise, it is impossible to attribute an effect to therapy.

Allocating Causation

A number of papers have recently appeared in the occupational therapy literature in which an improvement in a patient's functioning that is attributed to therapy is explicable by other factors. As an example of this type of error, let us examine a hypothetical report of a serial casting technique for spasticity. The hypothetical patient is an 18-year-old man who sustained a...
severe brain injury in a snowmobile accident. At admission, the patient had a Glasgow Coma Scale score of 4. Three days after the accident, he had severe flexor spasticity of the right upper extremity. Splinting did not control the posturing, and serial casting was initiated 5 days after the accident. Coma began to resolve 11 days after the accident. Over the next 2 months, repeated serial casting in accordance with standard procedures was performed; gradually, the patient achieved increasing passive, and later active, range of motion. During the treatment period, the patient's cognitive status cleared such that he was able to use both upper extremities for activities of daily living, and he returned home to live with his parents. The therapist said that not only did the treatment produce greater range of motion, but it also reduced abnormal flexor tone. Neither of these claims however, was unequivocally supported by the report. All of the improvement may have been the result of the patient's concurrent neurological recovery rather than the result of the treatment provided. This is not an argument against the use of serial casting but an argument against making claims that are not justified by the data. As the brain-injured person recovers, many factors change at once so that it is impossible to know what leads to the improvement. Given this complex state of affairs, how is it possible to demonstrate the efficacy of occupational therapy for persons with brain injury?

Demonstrating Treatment Efficacy

Most group studies involve the use of a control group, which is provided with the same amount of attention but not with the (hypothetically) active component of treatment. The use of a control group allows the control of nonspecific factors such as attention, a stimulating environment, and spontaneous recovery. A control-group design can convincingly demonstrate a treatment response, but it should be remembered that a demonstrated accelerated rate of improvement does not guarantee an improved ultimate outcome. To establish a genuine control group, prospective randomized allocation is required. This type of research design is, however, often beyond the resources of occupational therapists working alone. The technical difficulties involved in ensuring that patients are comparable on all relevant parameters and the ethical problems that arise from withholding possibly effective treatment are considerable.

In the acute stage of recovery after brain trauma, it is very difficult to establish a specific treatment effect. One method of reducing the variables is to examine the efficacy of an approach with postacute patients. Here the recovery rate has slowed to the point where a stable baseline can be established. Giles and Clark-Wilson (1988) described four patients treated with behavioral techniques to improve personal hygiene behavior. The patients' injuries had occurred 3 to 17 years before; therefore, the improvement reported was unlikely to have been due to spontaneous recovery. Some theories suggest, however, that certain interventions may be successful only when used at a particular stage in the recovery process (Clark-Wilson & Giles, in press). Where this kind of therapeutic window is hypothesized, as may be the case in treating spasticity with serial casting, the delay of treatment until the postacute period does not assist in the assessment of treatment efficacy.

The use of single-subject experimental designs can reduce the number of variables and thereby make the research more manageable. However, single-subject methodology has been underused by occupational therapists. The view that findings from studies with a single subject or a small number of subjects are neither valid nor generalizable is erroneous (Wilson, 1987). Over the last 15 years, there has been considerable research on designs for single-subject experimentation (Hersen & Barlow, 1976; Wilson, 1987). This kind of research design should not be confused with subjective single-subject reports. An example of a single-subject experimental design is the report by Giles and Shore (1989) on training a person with memory impairment to use an electronic memory aid.

Controversy continues as to the place of statistical analysis in single-subject experimental designs. Some researchers believe a statistical analysis adds to the quality of the results; others believe studies should demonstrate clinical efficacy and that statistical manipulations are unnecessary. (For a discussion of the appropriate-ness of statistical analysis, see Kazdin, 1976.) As one who works with persons with brain injury, I prefer adequately planned and reported single-subject experimental designs that examine the role occupational therapy plays in rehabilitation after brain injury over ambitious but poorly controlled and reported studies. Further research to demonstrate the effectiveness of occupational therapy with brain-injured patients is required.

References


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