I

FUNDAMENTALS FOR PRACTICING COGNITIVE REHABILITATION

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Introduction to Cognitive Rehabilitation

It has been almost a quarter of a century since the long-term impact of acquired brain injury (ABI), particularly traumatic brain injury (TBI), has been recognized. In that time there has been a surge of interest in understanding the underlying mechanisms of injury, as well as the nature of acquired physical, cognitive, behavioral, and emotional consequences of such injuries. Rehabilitation professionals have met the challenge of working with individuals with acquired brain injury and their families in thoughtful, creative, and dynamic ways. In the United States, at least, these efforts have occurred in the context of major changes in health care delivery and technology.

The term *cognitive rehabilitation* was perhaps always too narrow, and focused too heavily on remediating or compensating for decreased cognitive abilities. The term *rehabilitation of individuals with cognitive impairment* probably better captures the emphasis on injured individuals that has and will always be the target of cognitive rehabilitation. Although some of the fundamental goals of improving and compensating for cognitive abilities continue to be mainstays of rehabilitation efforts with this population, the last 25 years have allowed a richer appreciation for the influence of contextual variables; the personal, emotional, and social impacts of brain injury; and their interactions with cognitive function. All of these factors have been incorporated to an even greater degree into treatment plans and goals. Short- and long-term emotional and social supports are needed for many individuals dealing with persistent sequelae of brain injury.

For decades the field seemed to be trapped in an internal struggle over whether it is better to focus on training processes, skills, or functional abilities, and in what ways and in what contexts that training might be accomplished. Though the struggle is perhaps not entirely over, it is increasingly

acknowledged that functional changes must be the goal of treatment, and that there are many ways to go about facilitating those functional changes. If we have learned anything, it is that a cookie-cutter approach will not work. Individuals and families respond differently to different interventions, in different ways, at different times after injury. Premorbid functioning, personality, social support, and environmental demands are but a few of the factors that can profoundly influence outcome. In this variable response to treatment, cognitive rehabilitation is no different from treatment for cancer, diabetes, heart disease, Parkinson's disease, spinal cord injury, psychiatric disorders, or any other injury or disease process for which variable response to different treatments is the norm. Below, we outline some of the major forces that have shaped and continue to shape cognitive rehabilitation.

MAJOR FORCES SHAPING COGNITIVE REHABILITATION

New Perspectives and Findings with Regard to Neuroplasticity

Researchers now know that the brain is a far more plastic organ than was long thought to be the case, and that following injury, it is capable of considerable reorganization that can form the basis of functional recovery. New experimental work has clearly demonstrated changes in regional dendritic arborization that result in increased connections among surviving neurons (Kolb & Gibb, 1999). What are especially important from the point of view of cognitive rehabilitation are the demonstrated relationships among dendritic growth, structured environmental stimulation, and the recovery of lost functions. Our challenge is to understand the principles underlying this recovery and the types of postinjury experience that optimally drive it. This potential to reinstate function in damaged brain region as a consequence of neuroplasticity is discussed in greater length in Chapter 3 of this volume.

Advances in Technology

The exponential growth in new technology has had profound influences on rehabilitation. One way in which these effects can be felt is in the growth and development of powerful information-based tools that can be adapted for individuals with cognitive limitations. Increasingly smaller yet more powerful computers and chip-based technology are putting sophisticated devices for storing and retrieving information at our fingertips. Watches, cell phones, paging systems, and hand-held computer devices can all be linked to other computers and systems to expand ways in which individu-

als with physical and/or cognitive impairments can interact with the world. Moreover, as the technological revolution continues to advance, costs and size are coming down, and usability and flexibility are going up.

New applications of already existing technology can support sophisticated tracking, orienting, and signaling devices for people with severe memory impairments. The ability to develop skills and knowledge in a functional context is being met in brand new ways through the use of "virtual reality" environments. Individuals with severe physical limitations (even high-spinal-cord injuries) can now interact with and affect their environment through computers signaled by eye movements, or even by keyboards placed on the roof of a person's mouth!

Whole apartments have been adapted and wired to support increased independence in the community. Appliances can be monitored for safety; flexible devices for paging or communicating are available; and adapted equipment allows efficient cooking, bathing, cleaning, gardening, and self-care. These innovations are being fueled not only by technological advances, but by the increased proportion of older adults in our society. Changes are occurring so rapidly that it is difficult to anticipate fully how they will help increase independence even in the next few years.

Emphasis on Empowerment

Over the last few decades, there has been an increased focus on self-sufficiency and self-help. Books, magazines, and opportunities for involvement with groups have promoted a take-charge approach to health, adjustment, and satisfaction. Widespread access to the Internet is arming people with disabilities and their families and caregivers with information, resources, and a wide range of mechanisms for support; as a result, they are beginning to feel less isolated. For example, there is a Web site run for and by individuals with the relatively rare neurological disorder prosopagnosia, which affects a person's ability to recognize even familiar faces. Accessible at http://www.choisser.com/faceblind/, it affords individuals with prosopagnosia the opportunity to gain information and share experiences with others who are "faced" with the same challenges.

A number of empowerment principles should guide rehabilitation efforts. Interventions should have as their ultimate goal an increase in skill or knowledge, a belief, a change in behavior, and/or the use of a compensatory strategy that will increase or improve some aspect of independent function. Interventions sometimes need to balance maximization of safety with risk taking as an individual takes on new skills and challenges. The rehabilitative process should work to reinforce individuals and families by building on their strengths. Individuals and families should be involved in setting goals, but also in selecting, developing, participating in, and evaluating the intervention plan. The role of a therapist in cognitive rehabilita-

tion has been likened to that of a teacher or coach. This is because much of the emphasis in any rehabilitation program is on providing education, fostering awareness, and facilitating goals, rather than on treatment per se, as performed by a doctor or dentist.

Changes in the Health Care Sector in the United States

Rehabilitation professionals and the individuals and families they work with have faced cutbacks similar to, if not more extreme than, those faced by other medical professionals and consumers of health care. This has translated into shorter inpatient stays, reduced outpatient coverage, fewer day treatment programs, and more limited ancillary support services. Every rehabilitation professional has felt the loss of team autonomy in decision making about rehabilitation needs, together with the mandate to reduce costs above all else. The changes have forced rehabilitation professionals to use time as effectively as possible and to focus on short-term, measurable, functional outcomes. Long-term needs are likely to be met by families themselves and other community service agencies, which need to be educated about the effects of brain injury. There is no doubt that families, schools, mental health agencies, and communities have taken up the burden of managing the often lifelong consequences of significant brain injury. Many of the techniques that have been developed and shown to work in increasing independence and promoting self-sufficiency and community involvement, including return to work, are simply now not funded for many people. Restriction of health care dollars to "medical healing" leaves the great majority of clients with brain injuries and their families alone, scrambling to heal functionally, psychologically, and emotionally. It seems ironic that in a time of such unprecedented economic prosperity in the United States, hospitals, rehabilitation programs, outpatient services, and access to psychological support are being cut back or phased out altogether. At the same time, programs in some parts of the world have seen tremendous growth in and commitment to this segment of the population. Let us hope that the pendulum will swing back again.

Focus on Function

Although meaningful changes in an individual's everyday life have always been the goals of rehabilitation, it has been a challenge to articulate and measure appropriate goals and successful outcomes in individuals who have such a broad range of difficulties in many aspects of life. The emphasis on function has, however, encouraged the development of more ecologically based and relevant assessment scales and tools. Individuals affected by brain injury and their families are now much more likely to be involved

from the beginning in identifying treatment goals. Indeed, mutual goal setting and involvement of families, friends, and coworkers in the rehabilitation process are now very common.

MANAGEMENT OF ATTENTION, MEMORY, AND EXECUTIVE FUNCTIONS

Although we have broadened the scope of this text to address behavioral issues, issues related to working with families, and a broader range of strategies designed to address emotional and adjustment issues, a strong emphasis on the important role of cognitive impairment remains. It is common in rehabilitation texts to consider the cognitive processes of attention, memory, and executive functions as separate units. Several reasons encourage us to integrate a discussion of the theoretical backdrop for these three cognitive domains. First, these areas are commonly targeted in neurorehabilitation programs. Second, impairments in each of these cognitive processes can have devastating effects on people's day-to-day functioning. Most importantly, the cognitive components involved in attention, memory, and executive functions overlap and interact in complex ways that make it difficult to discuss one process without referring to one of the other domains. The circuitry and structures subserving attention, memory, and executive functions are widely shared and are particularly vulnerable to disruption following acquired brain injury (Finlayson & Garner, 1994; Sohlberg & Mateer, 1989). In particular, these functions are commonly disrupted following injury to anterior frontal and temporal brain systems—areas that are often affected by TBI resulting from acceleration–deceleration forces. Reviews of treatment efficacy have often focused on attention, memory, and executive functions. Coelho, DeRuyter, and Stein (1996), for example, organized a review of treatment efficacy for cognitive–communicative disorders according to these three domains, as did Mateer, Kerns, and Eso (1996) in discussing the management of children with acquired disorders of attention, memory, and executive functions.

It is well established that impairments in attention, memory, and executive functions can profoundly affect an individual's daily functioning. Even mild changes in the ability to attend, process, recall, and act upon information can have significant effects on effectively completing basic everyday tasks. Consider the cognitive skills required for successful meal preparation as an example. The individual must plan a menu, identify needed ingredients, develop a shopping list for required items, and leave sufficient time for shopping and preparing the meal. Then the individual must sequence many food preparation activities in an organized way so that everything is ready at dinner time. Even a mild attention or executive function deficit can render this difficult, ineffective, or even impossible.

Attention, Memory, and Executive Function as Interdependent Processes

Attention, memory, and executive functions are related and interdependent. Their close interdependence stems from both a functional association and their shared neurocircuitry. Various components and subcomponents for each process may be identified, depending upon one's conceptualization of the specific process; however, regardless of one's theoretical framework, a great degree of overlap exists. When attempting to parcel out or define the components of attention, memory, or executive functions, a researcher necessarily borrows from the other two processes. For example, most researchers conceptualize attention as a hierarchy of subcomponents. High in the attention taxonomy are complex attention abilities such as working memory, selective attention, and the ability to shift attention between different tasks (Posner & Petersen, 1990; Sohlberg & Mateer, 1987; Sturm, Willmes, Orgass, & Hartje, 1997). These subcomponents of attention mirror certain abilities one often attributes to executive functions. For example, the ability to make mental shifts and engage in flexible thinking is an accepted subcomponent of executive functions (Lezak, 1993; Stuss & Benson, 1986). Similarly, it is difficult to distinguish between selective attention and mental flexibility.

When one considers the neurocircuitry serving attention, memory, and executive functions, the overlap becomes further evident. For example, a primary function of the prefrontal cortex has been described as the temporal organization, integration, formulation, and execution of novel behavioral sequences that are responsive to both environmental demands and constraints and to internal motivations and drive, such that they contribute to orderly purposive behavior (Mateer, 1999). Obviously, these frontal functions are integrally involved in attention and memory processes, as well as those of executive function.

Functionally, it is difficult to independently evaluate the operations involved in attention, memory, and executive functions. With the exception of laboratory tasks, which may engage very discrete components of one cognitive process, most functional activities involve multiple types of processing. Completing activities that engage the circuitry for one process will necessarily activate other processes. For example, when an individual is using executive function skills to plan and organize the activities involved in meal preparation, the processes of memory and attention will also be required and utilized.

Interdependence between Cognitive Abilities and Other Domains

In the same way that cognitive abilities overlap with each other, cognitive abilities also overlap with, influence, and are influenced by emotional diffi-

culties (e.g., anger, anxiety, depression), behavioral difficulties (e.g., impulsivity, frustration, inappropriateness), and physical problems (e.g., motor impairments, sensory changes, headache, musculoskeletal pain). The artificial distinction among cognition, emotion, and motivation has steadily eroded. However, it is still common in rehabilitation texts to see box diagrams in which cognitive problems are dealt with in cognitive rehabilitation and/or speech therapy; emotional and behavioral problems are dealt with in some sort of affective rehabilitation therapy (e.g., group counseling, individual psychotherapy); and physical problems are dealt with through medical management and by physical and occupational rehabilitation specialists. Although the notions of interdisciplinary or even transdisciplinary treatment attempt to bridge and coordinate the various approaches, there has been very little written or investigated with regard to how to practice this philosophy in patient interactions and not just in a paper trail. In addition, health care practices have in some situations tended to break up rather than to bolster multidisciplinary treatment and teamwork.

Yet working on problems from multiple perspectives is crucial if we are to be successful. It has been suggested, for example, that working on a demanding cognitive task can actually have some effect on the ability of elderly people to maintain balance and equilibrium, potentially contributing to falls (Shumway-Cook, Wollacott, Kerns, & Baldwin, 1997). Combining therapeutic cognitive and motor activities may approximate the demands of everyday life more closely than artificially separating them in separate therapy sessions. The experience of cognitive inefficiency or failure can also give rise to catastrophic emotional reactions, manifested as fear, anxiety, and depression. These can further impede cognitive performance, setting up a cycle of negative self-expectancy on the part of a client, and resulting in conditioned avoidance of activities. Talking about emotional adjustment in the abstract, outside the context of cognitively demanding situations, may not address the underlying triggers for emotional reactions. Every rehabilitation specialist working with cognitively impaired individuals—not just a psychologist or social worker—needs to be alert for, and to have some knowledge and experience in working with, emotional reactions to frustration and loss. Indeed, we argue that dealing with these responses is an integral, not an ancillary, part of effective treatment.

To meet these needs, solid teamwork is essential. Rehabilitation professionals need to approach their task from a broad, long-term perspective, developing information, expertise, and goals with other professionals, clients, and their families. Interventions need to be person-focused rather than discipline-focused (Ponsford, Sloan, & Snow, 1995). This is best accomplished when clinicians are flexible and not overly concerned with role boundaries. Strong interdisciplinary teamwork and communication can reduce stress and provide motivation and encouragement to clinicians, who are often faced with challenging situations and clients. It also allows cross-

fertilization of ideas from different perspectives. The interventions discussed in this text can be carried out by different members of the team, depending on the particular structure of the rehabilitation setting, although working as a team will almost always yield better outcomes.

DEVELOPING THEORIES FOR WORKING WITH COGNITIVE IMPAIRMENT

Although we have separate chapters in the book devoted to attention, memory, and executive functions, we are cognizant of the fact that these are highly interactive and interdependent processes. In this section we discuss some of the basic assumptions and models of cognitive processes underlying cognitive rehabilitation.

Basic Assumptions

What theories do clinicians need to understand in order to develop effective interventions with individuals who have acquired cognitive disorders? How can these theories be elaborated and applied to specific assessment and intervention plans? Theories specific to our understanding of particular aspects of cognition are discussed in the chapters dedicated to clinical management. We begin here by identifying some assumptions underlying this book's discussion of cognition and its approach to managing deficits in attention, memory, communication, executive functions, and behavioral and emotional dysregulation, the specifics of which are discussed in the ensuing chapters.

1. *Rehabilitation specialists cannot isolate cognition.* Brain damage affects cognitive, social, behavioral, and emotional functioning. Each of these four domains interacts with the others. It is inappropriate to consider management of difficulties in one domain, such as cognitive function, without attending to the others.
2. *Rehabilitation specialists will need to adopt an eclectic management approach.* Effective management of cognitive disorders requires drawing on a broad range of traditions, including behavioral, sociological, psychological, and neuropsychological disciplines.
3. *Rehabilitation specialists need a way to conceptualize the cognitive areas.* We hold that disorders need to be understood before they can be rehabilitated. Working from a taxonomy or model of a cognitive process helps clinicians to organize assessment and treatment activities and practices.
4. *Rehabilitation specialists need to apply current knowledge from the fields of cognitive psychology and the neurosciences.* There is a rapidly

expanding knowledge base within these fields that should guide our treatment. Having a grasp of the theoretical underpinnings of attention, memory, and executive functions will allow clinicians to develop effective treatments. For example, understanding the notion of preserved priming may provide clues for how best to teach an individual with amnesia to learn to use a compensatory memory system.

5. *Rehabilitation specialists need to form partnerships with clients and their families.* It is important to recognize the clinical power inherent in collaborations that build upon the expert knowledge families have about their own members and functioning. Families provide critical direction for cognitive rehabilitation efforts. Clinicians are unlikely to effect meaningful changes in attention and memory function in the absence of a working relationship with a client's family.

Models of Cognitive Processing

We can now begin to build a theoretical foundation for treatment itself. This involves choosing one or more models, as appropriate, for conceptualizing the various cognitive processes that need to be addressed in the treatment plan. Exploring the nature of attention, memory, and executive functions has been a focus of experimental psychologists for decades. Various theoretical interpretations and conceptual models have been put forth for each of these processes. In their discussion of attention, Kerns and Mateer (1996) describe four different types of models: cognitive processing, factor-analytic, neuroanatomical, and clinical models of attention. We also discuss a fifth type here: functional models.

Cognitive processing models usually examine the target process based on information from a normally functioning population as opposed to clinical samples, using laboratory-based tasks. It is worth mentioning, however, that cognitive psychologists have increasingly looked to clinical samples to inform them about the structure and function of cognition, and cognitive neuroscience is one of the fastest-growing areas of research. Indeed, with the advent of functional neuroimaging, it has become increasingly difficult to study cognitive functions without some consideration of their biological substrate. *Factor-analytic* models consider cognitive processes psychometrically. Constructs for the cognitive process are derived by conducting factor analyses of performance on psychometric tests thought to assess attention, memory, and executive functions. Models for these same cognitive processes have also been generated by identifying each of their *neuroanatomical* substrates. The cognitive processing and factor-analytic models commonly divide a process into a number of distinct components and subcomponents; neuroanatomical models identify the different brain regions that subserve these components.

Each of the models described above draws upon information from

normally functioning individuals. With the advent of the field of cognitive rehabilitation, there has been a shift toward incorporating clinical observations from the disordered population into our theoretical models. Clinical models have emerged out of overlapping perspectives from cognitive psychology, neuropsychology, and the detailed analysis of cognitive function in persons with neurological impairment. Similar to factor-analytic models, most clinical models view attention, memory, and executive functions as having a number of dissociable components. Again, these components are based on clinical observations that are matched against components identified by cognitive and experimental psychologists.

A fifth type of modeling that is extremely relevant to cognitive rehabilitation is the use of *functional* descriptions. This involves describing how cognitive processes might be used for the completion of day-to-day tasks. For example, *prospective memory* is the ability to carry out intended actions. It is a very functional memory construct. A task analysis for prospective memory might consist of (1) formation and encoding of the intention and action; (2) a retention interval, during which both the intent to perform an action in the future and the actual task to be performed are held in memory; (3) the performance interval, or the space of time in which the intention is to be recalled; (4) initiation and execution of the intended action; and (5) evaluation and recording of outcome, which prevent the action from being performed again at some later time (Ellis, 1996). Similar models have been developed for everyday problem-solving strategies. Models describing "everyday" attention, memory, and executive functions are increasingly important in guiding our treatment.

As we discuss the theoretical underpinnings of the various cognitive processes in the following chapters, we will be describing cognitive processing theory and identifying the relevant neuroanatomical substrates, but will also be drawing upon clinical and functional models of cognitive functioning. We have used a combination of clinical, cognitive, and functional models in conceptualizing and implementing treatment.

MEASURING EFFICACY AND OUTCOME

Whereas a decade ago we described a vacuum in terms of efficacy work (Sohlberg & Mateer, 1989), there is now a larger literature on the efficacy of rehabilitation. As indicated earlier, research in this area continues to be hampered by methodological problems involving heterogeneity of clients, heterogeneity of treatment approaches and settings, and the fact that almost all of this work goes on in active rehabilitation settings that have clinical service rather than research as their mandate.

Nevertheless, documentation of outcomes is critical to justify the time and resources expended by clients, caregivers, and therapists; to accurately

estimate service delivery needs and costs; and to inform the development and delivery of treatment. The aims of outcome documentation should be as follows:

1. To determine whether and which interventions result in functional gains, reduction of handicap, and achievement of goals.
2. To determine whether gains are maintained over time, and, if so, to what degree.
3. To ascertain whether the intervention results in better outcomes than would be expected or observed without provision of rehabilitation, and, if so, how.
4. To obtain the information needed to modify programs to be more effective.

Measurement of treatment efficacy and outcome occurs on many levels. The effectiveness of a specific intervention in one subject or a small group of subjects may be ascertained by the use of single-case designs, which rely heavily on obtaining a stable baseline of performance and then using each subject as his or her own control. For example, the number of times a person initiates conversation in a group can be recorded over 4 or 5 days, and once a baseline level is determined, an intervention can begin (e.g., an educational approach or external prompting) while behavioral data continue to be collected. If the level of initiation increases following initiation of the intervention, it can be inferred that the intervention has made a difference in the behavior. There are a variety of such designs, many of which have been used and reported in rehabilitation to monitor the effects of an intervention and to support its efficacy in published research. For a review of such designs, the reader is referred to Sohlberg and Mateer (1989).

Another technique for measuring individual outcomes in brain injury rehabilitation is the use of Goal Attainment Scaling (GAS; Malec, 1999; Malec, Smigielski, & DePompolo, 1991). The first step in the GAS process involves identification of general goals, which are then developed into specific goal statements. Once three to six specific goals are satisfactorily negotiated and endorsed by the client, weights are sometimes applied to the goals to indicate the importance of each to the overall treatment plan. The third step is to define the time period after which progress on the goals is assessed. The fourth and fifth steps involve articulating the "expected outcome" in objective, behavioral terms, and specifying other outcome levels. This scaling of goals is typically done on a 5-point scale ranging from –2 to +2, with 0 the "expected" level, –2 "much less than expected," and +2 "much better than expected." The scale can be used to describe such observable, externalized behaviors as the percentage of time a client uses a memory book to record information, as well as internalized behaviors hav-

ing to do with use of coping skills to manage stress. The sixth step is for the therapist and client together to score the status of the client prior to treatment and at a specified follow-up time. Malec and colleagues propose that GAS is a useful method for measuring progress toward the types of highly individualized goals that characterize rehabilitation.

Although measurement of treatment efficacy at the individual level is important, it is difficult to measure broader outcomes and more global efficacy for rehabilitation in single cases. Case reports and single-case designs, by definition, are unique in some respects; though they are useful, they do not tell us about how the majority of clients would respond. In addition, most individuals receive multiple forms of intervention that are difficult to quantify. There has been a concerted effort to develop and evaluate the efficacy of various tools for quantifying outcome. In 1999 alone, there were entire conferences and journal issues devoted to the issue of evaluating outcome in rehabilitation (e.g., Fleminger & Powell, 1999). Outcome research is now better designed and better supported by health care facilities and granting agencies.

The emphasis on functional assessment and outcome evaluation from a quantitative perspective has been matched by growth in the application of qualitative research methodologies to measurement in rehabilitation. McColl and colleagues (1998), for example, use qualitative techniques to provide an expanded conceptualization of community integration, derived from the perspective of people with brain injuries. For professionals who are frustrated with limitations in the ability to measure change meaningfully and sensitively with psychometric instruments, qualitative techniques often better capture the nature of intervention effects, some of which may not have been anticipated.

Studies of treatment effects on larger numbers of subjects are needed, and several comprehensive reviews of specific program outcomes have been published. Hall and Cope (1995) reviewed 28 studies published between 1984 and 1994 that examined the benefits of TBI rehabilitation. Methods in the various studies included comparing outcomes of patients given rehabilitation versus those not given rehabilitation; outcomes of patients who received different intensities or types of rehabilitation; pre- versus posttreatment abilities in a nonacute population; and outcomes for early versus late initiation of rehabilitation in matched groups. Sample sizes in the studies ranged from 24 to 433. Hall and Cope reported that patients receiving acute rehabilitation had only one-third as long a stay in postacute rehabilitation as those who did not receive such treatment. Outcomes for outpatient and day treatment programs showed a positive benefit in terms of functional outcomes, including long-term involvement in productive activity and return to work. Several studies showed evidence of improvement with rehabilitation treatment after spontaneous recovery had slowed or stopped. Although differences across studies in sample charac-

teristics; in outcomes measured; and in the length, types, and intensity of rehabilitation made firm conclusions difficult, there was generally support for the benefit of rehabilitation.

One of the largest studies of outcomes from a single program was that provided by Ponsford, Olver, Nelms, Curran, and Ponsford (1999), based on their work in at the Bethesda Rehabilitation Centre in Melbourne, Australia. Approximately 120 patients are admitted each year, most still in posttraumatic amnesia. The program offers inpatient rehabilitation (average stay about 48 days) and outpatient or community-based phases, including transitional living resources and a community team (average stay about 4–5 months). Resources are available for supported work trials, integration aides, and ongoing individual support. A total of 1,268 individuals with moderate to severe injury were seen for follow-up between 2 and 10 years after injury. More than 90% had attained independence in mobility and light activities of daily living, but one-third continued to need support in shopping, financial management, and/or home maintenance. Only 45% had returned to previous leisure activities, and more than half were depressed and anxious, with many being socially isolated. Half were working 2 years after injury, but many did not maintain employment. Ponsford and colleagues (1999) stated that the many and varied roles played by persons in our society mean that rehabilitation goals vary greatly from one person to another, and a measure that is meaningful for one individual is not necessarily applicable to another. Changes in the program prompted by the analysis included development of a community- based team, a focus on leisure time, more monitoring and assistance with employment, and a greater emphasis on development of coping strategies to facilitate adjustment.

Controlled studies with large numbers of subjects that either compare different treatments or use a nontreatment control group are still quite limited. An extensive review of published studies (Chesnut et al., 1999) identified 3,098 potential articles, of which 600 were found to apply to the question "Does the application of cognitive rehabilitation improve outcomes for persons who sustain TBI?" In a subsequent analysis, the authors determined that only 32 articles satisfied all of their exclusion and inclusion criteria (Carney et al., 1999). Of these 32, the authors concluded that only 15 reported results of studies that included a control group (either randomized or matched comparison), and of these, only 6 reported results for what they termed "direct" outcome measures (e.g., functional measures of health or employment status) rather than indirect measures (e.g., cognitive status on psychological tests).

Although additional studies are certainly needed, there is a growing consensus about "what works." This consensus has been bolstered by a statement prepared by the National Institutes of Health (NIH) Consensus Development Panel on Rehabilitation of Persons with Traumatic Brain In-

jury (1998), which addresses the issue of treatment efficacy. Excerpts from that statement are provided below:

> The goals of cognitive and behavioral rehabilitation are to enhance the person's capacity to process and interpret information and to improve the person's ability to function in all aspects of family and community life. Restorative training focuses on improving a specific cognitive function, whereas compensatory training focuses on adapting to the presence of a cognitive deficit. Compensatory approaches may have restorative effects at certain times. . . . Despite many descriptions of specific strategies, programs, and interventions, limited data on the effectiveness of cognitive rehabilitation programs are available because of heterogeneity of subjects, interventions, and outcomes studied. Outcome measures present a special problem, since some studies use global "macro"-level measures (e.g., return to work), while others use "intermediate" measures (e.g., improved memory). These studies also have been limited by small sample size, failure to control for spontaneous recovery, and the unspecified effects of social contact. Nevertheless, a number of programs have been described and evaluated.
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> Cognitive exercises, including computer-assisted strategies, have been used to improve specific neuropsychological processes, predominantly attention, memory, and executive skills. Both randomized controlled studies and case reports have documented the success of these interventions using intermediate outcome measures. . . . Compensatory devices, such as memory books and electronic paging systems, are used both to improve particular cognitive functions and to compensate for specific deficits. Training to use these devices requires structured, sequenced, and repetitive practice. The efficacy of these interventions has been demonstrated.
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> Psychotherapy, an important component of a comprehensive rehabilitation program, is used to treat depression and loss of self-esteem associated with cognitive dysfunction. Psychotherapy should involve individuals with TBI, their family members, and significant others. Specific goals for this therapy emphasize emotional support, providing explanations of the injury and its effects, helping to achieve self-esteem in the context of realistic self-assessment, reducing denial, and increasing ability to relate to family and society.

The NIH Consensus Statement was further supported by a comprehensive review of cognitive rehabilitation (Cicerone et al., 2000).

There has also been a concerted effort to promote multicenter research on TBI rehabilitation through the Traumatic Brain Injury Model Systems (TBI-MS) network in North America. This group (accessible at http://www.tbims.org) has worked to identify useful outcome measures and to promote large-scale intervention studies. Although such studies will be valuable, it continues to be difficult to organize and interpret studies in a patient population that is so diverse in terms of injury locus, severity, and effects. Even when these variables can be matched or controlled for, indi-

viduals still differ widely in terms of their premorbid functioning, emotional and personality makeup, and response to intervention. Small-scale studies, using single-case designs or multiple-baseline designs, continue to provide a valuable contribution to our understanding of what works, as do individual case studies and reports.

Another positive development in the measurement of outcome and treatment efficacy has been the creation of several scales that have proven to be useful in characterizing outcomes following brain injury. Although activities-of-daily-living scales such as the Functional Independence Measure (Granger & Hamilton, 1987), the Disability Rating Scale for Severe Head Trauma (Rappaport, Hall, Hopkins, Belieza, & Cope, 1982), and the Glasgow Outcome Scale (Jennett & Bond, 1975) are widely used in medical settings, their emphasis on self-care and their limited range make them unsuitable for measuring long-term outcome following ABI. Many other measures that tap daily living skills, as well as emotional, social, and vocational outcomes have been developed. These include the Sickness Impact Profile (Bergner, Bobbitt, Carter, & Gibson, 1981), the Katz Adjustment Scale (Katz & Lyerly, 1963), the Neurobehavioral Rating Scale (Levin et al., 1987), the Portland Adaptability Inventory (Lezak, 1987), the Mayo–Portland Adaptability Inventory (Malec & Thompson, 1994), the Supervision Rating Scale (Boake, 1996; Boake & High, 1996), and the Craig Handicap Assessment and Reporting Technique (Whiteneck, Charlifue, Gerhart, Overholser, & Richardson, 1992), to name but a few of the more commonly cited ones. These outcome measures, which are discussed in more detail in Chapter 4, allow clinicians to better address not only daily functioning, but also the ability to fulfill roles in the family, at work, and in social and leisure pursuits.

Outcome and treatment efficacy related to emotional and psychological adjustment has continued to be more difficult to measure. Many of the traditional scales for assessing levels of depression and anxiety are heavily weighted by items that reflect somatic or vegetative symptoms. These include such areas as difficulty with sleep, feelings of fatigue, weakness, and headache, all of which can also be direct consequences of a brain injury. It is important to do an item analysis of responses on such scales, to determine whether one is picking up purely somatic symptoms or a genuine depression. Scales that have relatively few items pertaining to somatic symptomatology may be more sensitive to depression following brain injury (e.g., the Leeds Scales for Self-Assessment of Anxiety and Depression; Snaith, Bridge, & Hamilton, 1976).

The field has also begun to appreciate the importance of such constructs as *awareness of deficit* and *locus of control* in terms of how they affect the participation and rehabilitation progress of individuals affected by brain injury. Individuals who do not accurately perceive how their abilities have changed, who fail to appreciate the impact or consequences of those changes, and/or who feel they have little capacity to change of-

ten do not make as much progress as others do in a treatment program (Ben-Yishay & Daniels-Zide, 2000; Prigatano & Ben-Yishay, 1999). Ben-Yishay argues that those who are successful in rehabilitation are those who are self-aware and who have been successful in reconstituting a sense of self. He makes a distinction between clients who learn to *self-examine* and those who *adjust*. Productivity in this model is considered only one important outcome, with life meaning, a sense of peace, social activities, and a capacity for joy and intimacy being equally important and valid constructs and goals

New models for measuring efficacy are unquestionably needed. Despite considerable research supporting various interventions, there is still little consensus about what are specific accepted treatments within the framework of cognitive rehabilitation. The field might profit from adopting criteria that have been used to identify *evidence-based* or *empirically validated* psychological and psychosocial interventions for specific populations (Chambless et al., 1996, 1998; Task Force on Promotion and Dissemination of Psychological Procedures, 1995). In order for a treatment to be deemed empirically valid and either "well-established" or "probably efficacious," the criteria listed in Table 1.1 must be met. With these criteria, specific evidence-based treatments were initially identified for individual outpatient psychotherapy for the treatment of depression and anxiety disorders. This work has now expanded to include couple treatments, interventions for severely mentally ill patients (including family interventions for schizophrenia), interventions for chronic pain conditions, and smoking cessation programs. The designation for behaviorally and psychoeducationally oriented family interventions was based on a demonstrated role for such programs in medication monitoring, case management, prevention of relapse, and other individual treatments. Based on this model, evidence-based treatments could be designated within the realm of cognitive rehabilitation for interventions that improve attentional skills, train the use of compensatory memory or organizational systems, increase awareness, or improve family or social integration.

The Task Force has also taken a two-stage approach to looking at what its members term *efficacy* and *effectiveness* (Chambless et al., 1998, p. 3). They have initially concentrated on *efficacy*, identifying "treatments that are beneficial for patients or clients in well-controlled treatment studies." They go on to state: "Effectiveness studies are of importance as well; these include studies of how well an efficacious treatment can be transported from the research clinic to community and private practice settings." In the field of cognitive rehabilitation, there has often been a huge "burden of proof" attached to intervention studies. Effective training of a memory system, for example, is unlikely in and of itself to get someone living more independently or going back to work; basing a determination of

TABLE 1.1. Criteria for Empirically Validated Treatment

Well-established treatments

I. At least two good between-group design experiments, demonstrating efficacy in one or more of the following ways:
   A. Superior (statistically significantly so) to pill or psychological placebo or to another treatment.
   B. Equivalent to an already established treatment in experiments with adequate sample sizes.

or

II. A large series of single-case design experiments ($n > 9$) demonstrating efficacy. These experiments must have:
   A. Used good experimental designs and
   B. Compared the intervention to another treatment as in IA.

Further criteria for both I and II:

III. Experiments must be conducted with treatment manuals or detailed descriptions.
IV. Characteristics of the client samples must be clearly specified.
V. Effects must have been demonstrated by at least two different investigators or investigating teams.

Probably efficacious treatments

I. Two experiments showing the treatment is superior (statistically significantly so) to a waiting-list control group.

or

II. One or more experiments meeting the Well-Established Treatment criteria IA or IB, III, and IV, but not V.

or

III. A small series of single-case design experiments ($n > 3$) otherwise meeting the Well-Established Treatment criteria.

Note. From "Update on Empirically Validated Therapies II" by D. L. Chambless, M. J. Baker, D. H. Baucom, L. E. Beutler, et al., 1998, *The Clinical Psychologist, 51,* p. 4. Copyright 1998 by the American Psychological Association. Adapted by permission.

efficacy on such an outcome is probably unreasonable. However, effective use of a system may well be one very important element in a set of behaviors, skills, attitudes, and abilities that will increase the likelihood of returning to work. It does not mean that we do not need to understand the best practices for training use of memory systems in cognitively impaired individuals. The same can be said of increasing attention skills, improving initiation, or decreasing anxiety. It is still vitally necessary to establish the efficacy of subsets of skills that together lead to more multidimensional functional outcomes.

In summary, there have been tremendous growth and interest in tools, techniques, and strategies for looking at treatment efficacy and

outcome, at both the individual and program levels. Outcome measures are broader and more holistic in their approach. Gains have been made in identifying short- and long-term needs of individuals with brain injuries, and in determining what approaches seem to have an effect. However, this continues to be an area in need of solid interdisciplinary research.

STRATEGIES FOR PROMOTING MAINTENANCE AND GENERALIZATION

A major and continuing concern with regard to cognitive rehabilitation is whether the abilities or skills targeted in treatment will be maintained and generalized, so as to lead to sustained improvement in targeted aspects of everyday function. Generalization can be measured at multiple levels, including generalization to other similar but untrained treatment activities, to psychometric measures of the process or function addressed, to other abilities that are presumably related to or subserve the process, to structured functional activities, and to spontaneous functional activities. As an example, successful training on a high-level working memory task (e.g., alphabetized sentences) might be expected to result in better performance on other high-level working memory exercises (e.g., number sequencing), to psychometric measures that require working memory (e.g., the Paced Auditory Serial Addition Task), to a structured functional task (e.g., balancing a checkbook), and finally to a spontaneous functional task (e.g., quickly figuring out whether you have enough money for the items in a shopping cart). We have always maintained that therapists should not "expect" generalization, rather that they should "program" for generalization. It has become abundantly clear that spontaneous generalization of skills is improbable if not impossible for many clients with acquired brain injury. However, steps can be taken to facilitate and ensure generalization. Some of the principles to keep in mind with respect to increasing the likelihood of generalization include the following:

- Be explicit in training, but train a variety of target skills and have clients practice these beyond criteria (overlearning).
- Train general strategies and have clients practice these in a variety of natural settings.
- Change the environment to support new skills and behaviors.
- Enlist help and involvement from significant others.
- Promote internal attributions of change.
- Identify barriers to maintenance and plan for high-risk situations.
- Plan for recovery from setbacks, schedule booster sessions, and make long-term maintenance plans.

PRINCIPLES OF COGNITIVE REHABILITATION

Based in part on the efficacy and outcome literature, and in part on our own experience, we have developed the following set of principles for implementing effective rehabilitation with individuals who demonstrate cognitive, behavioral, emotional, and psychosocial difficulties following acquired brain injury.

- Cognitive rehabilitation is informed by medical and neuropsychological diagnosis, but is based on an ever-evolving formulation of the individual client's needs and his or her problems and strengths from physical, cognitive, emotional, and social perspectives.
- Cognitive rehabilitation requires a sound therapeutic alliance among the therapist, client, and family members or other caregivers.
- Cognitive rehabilitation emphasizes collaboration and active participation.
- Cognitive rehabilitation is goal-oriented and, while problem-focused, builds on strengths.
- Cognitive rehabilitation has a primary focus on education, with an emphasis on empowerment, self-control, and self-sufficiency.
- Cognitive rehabilitation sessions are structured, and treatment plans and activities are developed with reference to both assessment results and current performance data.
- Cognitive rehabilitation goals may include improving cognitive and behavioral skills, compensating for cognitive and behavioral limitations, and assisting a client to understand and manage emotional reactions to changes in his or her functioning.
- Cognitive rehabilitation assists clients in achieving a more accurate understanding of their strengths and limitations, and in adjusting to injury-related changes in functioning and in life circumstances.
- Cognitive rehabilitation is eclectic: It uses a variety of techniques and strategies to improve abilities; to teach new and compensatory skills; to facilitate regulation of behavior; and to modify negative or disruptive thoughts, feelings, and emotions.
- Cognitive rehabilitation seeks to understand each client's previous lifestyle, including abilities, goals, values, relationships, values, roles, personality, and behavioral patterns.
- Cognitive rehabilitation is responsive to changing theories and technologies.
- Cognitive rehabilitation professionals recognize and respond to the need to evaluate objectively the effectiveness of interventions.
- Team-based cognitive rehabilitation offers the advantage of seeing

a problem or opportunity from a number of related but distinct professional perspectives.

SUMMARY

We have attempted in this chapter to identify some of the major directions, findings, trends, and challenges facing clinicians who work with individuals with cognitive impairment. Although there have been exciting developments in cognitive theory, in knowledge about the effects of brain injury, in neuroscience, and in technology, many challenges remain in our ability to integrate these developments into our conceptualization and implementation of services. Moreover, our ability to do this has been compromised by changes in the delivery and funding of health care and rehabilitation services. There continues to be a pressing need for outcome and efficacy research on multiple levels. We have come away with a broader, more complex perspective on how to approach rehabilitation than the one we articulated over a decade ago (Sohlberg & Mateer, 1989), but many of the principles and beliefs we held then remain relevant and important. Treatment efficacy occurs and must be measured at multiple levels, and every rehabilitation professional has a role to play and a contribution to make in this ever more interesting and exciting endeavor.

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