CHAPTER 1

History and Systems of Cognitive Rehabilitation

Cognitive rehabilitation is a complex collection of techniques designed to enhance perception, attention, comprehension, learning, remembering, problem solving, reasoning, and so forth (Callahan, 2001; Cavanaugh, Kramer, Sinnott, Camp, & Markley, 1985; Evans & Over, 1996; Patten, 1990) in individuals who have impairments in these areas. For example, people who have experienced a brain injury typically lose their ability to process information rapidly. People with learning disabilities may not have developed these cognitive skills in their formative years. Cognitive rehabilitation therapy (CRT) is the art and science of restoring these mental processes and teaching compensatory strategies.

According to the Brain Injury Association of America (n.d.), 1.4 million people sustain a brain injury each year. The incidence of brain injury will likely increase in coming years because of returning war veterans from Iraq and Afghanistan. Consequently, the need for brain injury services has never been greater (Boake, 1991; Butler & Namerow, 1988; Godfrey & Knight, 1987; Gross & Shutz, 1986; Harrell, Parenté, Bellingrath, & Lisicia, 1992; Hayden, 1986; Herrmann, 1994; Hertel, 1994; Jacob, 1995; Parenté & Stapleton, 1993). In this book, we summarize many of these techniques as well as their theoretical underpinnings in cognitive psychology, neuropsychology, and speech–language therapy (Ben-Yishay & Diller, 1981; Guenther, 1998; Herrmann, Yoder, Gruneberg, & Payne, 2006; Hunt & Ellis, 1998; Matlin, 1998; Miller, 1980, 1984; Payne & Wenger, 1998; Sprock & Herrmann, 2004).

History

Most of the early history of CRT has been published in rather obscure sources. Boake (1991) and Parenté and Stapleton (1993), however, have published summaries of this history, and although the purpose of this chapter is not to reproduce these excellent summaries, the reader is referred to either work for a more complete historical perspective. More recent volumes have also described the history of CRT (Halligan & Wade, 2005; High, Sander, Struchen, & Hart, 2005). Our goal is to encapsulate the literature on CRT methods from World War I through World War II, and then discuss the more recent trends, issues, and controversies. We end with a summary of what we have learned so far from this brief but rapidly evolving history of mental restoration.

The history of CRT dates back to World War I (Boake, 1991). World War II stimulated further development of these methods of rehabilitation to meet the needs of soldiers who had brain injuries when they returned from combat zones. Indeed, many of the cognitive rehabilitation techniques and strategies that are in current use are the same as those that were practiced in the 1920s after World War I. For example, teaching persons with brain injury to develop functional skills that have direct transfer to the real world has been consistently emphasized since World War I.

Although dating the first attempts at CRT is not possible, some of the earliest documented records began to appear during and after World War I. The German government, for example, created "schools for soldiers" (Boake, 1991) to serve the needs of returning war veterans. These were actually rehabilitation hospitals for injured soldiers. Assessment included tests of psychological skill and performance similar to those currently used by psychologists. These evaluations included the measurement of concrete skills, with tests similar to work samples that are used in many rehabilitation and training facilities today. The Germans also pursued long-term follow-up of patients. Unlike many of today's programs, however, these early attempts at CRT did not emphasize attention and concentration or memory strategy training.

Boake's (1991) review described CRT as it developed in the former Soviet Union after World Wars I and II. Alexander Luria (1963, 1973, 1979) provided the first comprehensive writing on this topic in Russia. His work focused on the rehabilitation of soldiers in a neurosurgical unit in the Ural Mountains region of Russia. Many of the CRT techniques used today are offshoots of the techniques Luria developed. His model of rehabilitation included assessment of the individual's neurocognitive functioning, analysis of various adaptive mechanisms, and evaluation of spared skills the person could use to help obviate the deficits. He also investigated different drug treatments to improve memory. Generally, Luria's model of rehabilitation was a two-pronged strategy that was designed to strengthen a patient's spared skills and to teach the patient new compensatory skills.

Boake (1991) also described the early development of CRT in Great Britain after World War II. Two of the best examples of British brain injury rehabilitation centers were located in Oxford and Edinburgh. Zangwill (1945, 1947) was perhaps the first person to contrast what came to be known as the *substitution* and *direct retraining* methods of CRT. The substitution approach emphasized teaching skills that the person with brain injury could use in place of damaged skills. The direct retraining method involved various forms of mental exercises that were designed to strengthen a patient's mind. Zangwill generally discounted the usefulness of the direct retraining approach. Like many therapists today, Zangwill concluded that direct retraining methods had limited potential for transfer or carryover to the real world. Another of Zangwill's major contributions to CRT was to provide the first systematic evaluations of aphasia treatment.

At the same time that CRT was developing in Europe, the United States was also interested in brain injury rehabilitation, which Franz (1923) described as a form of "nervous and mental reeducation." This description developed from psychiatric influences that were growing in the United States at the time. This phrase was similar to the title of an established psychiatric journal, the *Journal of Nervous and Mental Disease,* which is still published today. Franz's unrealized dream was to organize one of the first rehabilitation research institutes in the United States that would include the study of aphasia and neuroscience.

Clearly, World Wars I and II led to considerable development of all kinds of rehabilitation techniques, including CRT. Boake (1991) pointed out that brain injury rehabilitation centers in the United States after World War II were similar to those of today. Many of these centers created interdisciplinary teams to work with patients who had brain injuries; these patients were often treated separately from others. Although there were many distinct influences, much of the early development of CRT techniques in the United States was spearheaded by psychologists and speech–language pathologists (Wepman, 1951).

During the 1970s and l980s, the field of CRT experienced enormous change, stimulated by advances in cognitive psychology, which grew rapidly in the 1960s (Barsalou, 1992; Eysenck, 1993; Lynch, 1987; Matlin, 1998; Mills, Nesbeda, Katz, & Alexander, 1982; Newell, 1990; Patten, 1990; Prigatano, 1987; Seron & Deloche, 1989). These developments were shaped by the theories of certain distinguished figures, including Luria (1973, 1979), who advanced a number of important ideas about neurocognition and the treatment of cognitive impairments. Subsequently, several researchers investigated the effects of a variety of new rehabilitation techniques on cognitive impairment (Ben-Yishay & Diller, 1981; Gianutsos, 1991; Gianutsos & Grynbaum, 1982; Miller, 1980, 1984). New publications such as the *Journal of Head Trauma Rehabilitation* and *NeuroRehabilitation* documented advances in the field. These publications fueled a zeal for research and development that has been spurred on by an expanding patient population and a growing need for CRT.

During the latter part of the 20th century, several influential CRT techniques, applications, and model programs were published (Gianutsos, 1991; Glisky & Schacter, 1989; Gordon & Hibbard, 1991; Herrmann & Palmisano, 1992; Herrmann, Raybeck, & Gutman, 1993; Herrmann, Rea, & Andrzejewski, 1988; Herrmann & Searleman, 1990, 1992; Parenté & Anderson-Parenté, 1991; Prigatano & Fordyce, 1987; Seron & Deloche, 1989; Sohlberg & Mateer, 1987, 1989; Wehman et al., 1989; Wood & Fussey, 1990). A brief summary of these techniques and applications follows.

Systems of Cognitive Rehabilitation

We have identified several distinct areas of CRT. These are listed in Table 1.1.

Stimulation therapy is perhaps the oldest method of CRT. Harrell et al. (1992) referred to this type of treatment as direct retraining. It is based on the assumption that cognitive functions will improve through stimulation of the cognitive system. The therapy usually includes paper-and-pencil exercises or computer training that stimulates one or more mental skills. Presumably, by using these skills, a person's cognition will improve, and the improvement will transfer to his or her activities of daily living. We do not discuss stimulation training in detail in this book because little research evidence is available to support its efficacy. The reader is referred to Craine and Gudeman (1981) for a comprehensive summary of various techniques.

Process training is similar to stimulation therapy, but process training focuses on specific areas of cognition. For example, Bracy's (1986) process approach to CRT emphasizes assessment and treatment of specific cognitive defects, such as poor visual scanning or visual neglect. Parenté, Anderson-Parenté, and Shaw (1989) and McClur, Browning, Vantrease, and Bittle (1994) discussed techniques for training processing in

TABLE 1.1
Types of Cognitive Rehabilitation Therapy

Stimulation therapy
Process training
Attention–concentration training
Strategy training
Nutrient and drug treatment
Prosthetic–orthotic devices
Domain-specific training
Indirect training

iconic memory. These techniques are discussed in detail in Chapter 8. In general, process training methods are all designed to improve specific aspects of cognition, and some evidence indicates that improving these cognitive skills can facilitate performance on other cognitive tasks.

Attention–concentration training is designed to improve a person's ability to focus attention, maintain vigilance, resist distraction, and perform mental manipulations quickly and efficiently. It is one of the most widely researched areas of CRT, and the research has produced commercially available training programs with proven efficacy (Sohlberg & Mateer, 1987, 1989). We discuss the theory and techniques for retraining attention and concentration in Chapters 4 and 9. This is an especially important area of CRT because attention and concentration precede many of the other types of higher cognitive training that we discuss in Chapters 11–18.

The *strategy training* method of CRT involves teaching a person mental sets that are applicable in a variety of contexts. For example, a therapist may teach a person with traumatic brain injury to use a certain strategy for solving problems, mnemonics to remember important information, or social strategies for carrying on conversations (Richardson, 1992). These methods are discussed in Chapters 11–19.

Nutrient and drug treatment operates on the premise that various substances can affect cognition by correcting chemical imbalance. For example, memory deficits secondary to long-term alcohol abuse can often be arrested with thiamine treatments (Elovic, 2000). This type of CRT is relatively new, although the results are promising. We summarize most of the available research on cognitive-enhancing nutrients and drugs in Chapter 23.

Prosthetic–orthotic devices are external aids whose purpose is to obviate a cognitive problem rather than to retrain a defective process. Using an external aid is often the most efficient and expedient way to treat certain cognitive deficits. For example, training a person with a poor memory to use a tape recorder can improve his or her functional memory immediately but may not have any effect on the underlying physiological cause of the deficits. Although the prosthetic devices do not rectify a person's memory deficits, the devices are especially effective and efficacious methods of treatment. We therefore discuss them in detail in Chapter 25.

Domain-specific training techniques emphasize training a person to function within simulated life experiences or a specific functional domain. For example, Schacter and

Glisky (1986) described the use of computer simulation to train a person to perform data entry. The theory that underlies domain-specific transfer is discussed in Chapter 6.

Indirect training (Harrell et al., 1992) is based on the idea that although CRT methods such as those previously discussed may be the most direct ways to improve cognitive problems, other indirect methods may also be effective (Herrmann & Parenté, 1994; Yesavage, Rose, & Spiegel, 1982). For example, teaching a person to adhere to better sleeping and eating habits can lead to improved cognitive function. Training a person to use a variety of external aids can result in a productive and satisfying daily routine (Herrmann, Brubaker, Yoder, Sheets, & Tio, 1999; Herrmann & Petro, 1991; Herrmann, Plude, Yoder, & Mullin, 1999; Naugle, Prevy, Naugle, & Delaney, 1988; Walker & Herrmann, 2004; Yoder & Herrmann, 2004). Even the teaching of certain social skills can give some people more control over their everyday living situations so that they can make better use of their reduced cognitive functioning (Best, 1992; McEvoy, 1992).

Our approach to CRT assumes that therapy is most effective when it is focused on all relevant subsystems in a manner that improves cognitive performance (Bracy, 1986). The relevant subsystems include all those assumed to be important in cognition—such as attention, perception, comprehension, learning, remembering, communication, problem solving, and creative thinking—as well as other aspects of a person's life that affect cognition—such as emotions, nutrition, health, stress, and social functioning (Herrmann, Weingartner, Searleman, & McEvoy, 1992). These passive manipulations can include planning a person's diet, physical fitness programs, organization of living space, and so forth.

Issues in the Development of CRT

Several important issues that have yet to be resolved continue to shape CRT. Perhaps the oldest of these issues concerns who should direct treatment. This controversy began around the year 1900 between orthopedic surgeons and educational specialists, each of whom worked with patients who had brain injuries. This issue persists today, as exemplified by the fact most insurance companies will fund medical interventions after brain injury but will not fund CRT.

Perhaps the most important issue concerns efficacy: Does CRT actually produce measurable and significant improvement in cognitive functioning above what would occur simply with the passage of time? Several authors have addressed this issue (Carney et al., 1999; Cicerone et al., 2000; Silver, 1992), and their conclusions have been mixed. Chapter 26 is devoted to an in-depth discussion of this issue. Generally, the data do not support the conclusion that CRT alone produces measurable and consistent gains. However, it is safe to say that comprehensive rehabilitation programs, in which CRT plays a role, do produce significant gains in cognition and overall functioning. It is also safe to say that before managed care companies will reimburse therapists for their efforts, therapists must demonstrate that their treatments result in an unequivocal gain in mental functioning. This may be difficult for several reasons. First, the ethical considerations that arise from providing treatment to one group of patients while withholding it from another prohibits the application of most conventional research designs, especially in clinical settings. However, insurance companies require the use of these research para-

digms to demonstrate efficacy. Second, therapists do not have the time to do research on top of their already busy treatment schedules. Finally, the managed care corporations that have taken over the health care field seldom provide funding for these types of systematic research projects.

A second issue in the development of CRT is the lack of integration or application of theory and practice. Although most of the theoretical literature on CRT provides a wealth of abstract verbiage, it has not produced many practical treatment suggestions. In addition, many therapists practicing CRT are unaware of the vast amounts of information from other areas, such as cognitive psychology, that could be used to direct treatment-oriented research efforts. Along with neurologists and psychiatrists, cognitive rehabilitation therapists and theorists have identified many of the subsystems of cognition and many of the variables that can affect cognitive functioning. However, most research has been directed toward mapping the cognitive system in relation to structure of the brain. Unfortunately, relatively little research has focused on treatments that improve cognition after brain injury, and few attempts have been made to summarize research findings in ways that are useful to CRT practitioners. The following are notable exceptions: Wilbur and Parenté (2008) integrated a large body of research that developed a training program for teaching persons with traumatic brain injury (TBI) to maintain hope; Hertel (1994) described the effects of depression on memory and the implications of this area of research for CRT; and Cicerone et al. (2000) summarized a number of research articles and abstracted several guidelines for providing interventions after brain injury. We are aware of literally thousands of books and journal articles that summarize a wealth of information on cognition and human information processing. This huge database awaits exploration and integration by CRT practitioners into their field of applied research.

Another issue shaping the field is the widening set of techniques that encompass CRT. In the past, therapists and patients alike have often misconstrued CRT as structured mental exercise. CRT, however, involves a broader canvas. For instance, CRT also includes "passive interventions" that involve arranging a person's environment, scheduling, or creating social support systems that make it easier for the person to function at work or home. One specific example is teaching a person to use an external aid, such as a tape recorder, to improve his or her memory, punctuality, and ability to retrieve necessary information quickly and efficiently. The use of nutrients and drugs for intervention is also a passive form of treatment (Kolakowsky, 1997), as are social and behavioral changes that improve a person's thinking and memory. For example, training a person's family to provide the person with reminders can eliminate many misinterpretations and missed appointments (Best, 1992; McEvoy, 1992). In general, the modern view of CRT is that it is most effective when it combines a variety of internal and external interventions.

Another issue in CRT is the broadening number of applications for this type of therapy. The best-known CRT targets are individuals who have suffered closed head injury or penetrating-missile brain injury. Indeed, the field was developed first to help these victims. However, CRT methods are also being used to treat other disorders, such as attention-deficit disorder, dementia, and schizophrenia. Potentially, CRT could help elderly individuals cope with the cognitive challenges of self-care and self-sufficiency, such as the ability to keep appointments and to recognize others and remember their names. Some CRT methods simplify troublesome cognitive problems that would other-

wise induce confusion and anxiety. In some cases, CRT methods can enable a mildly impaired client to learn an employable skill.

In addition to their use in the rehabilitation of cognitive impairments, CRT methods may be especially useful to students with learning disabilities. This population includes persons with brain injuries who may eventually return to school but have difficulty with certain courses, as well as students who have learning disabilities but have never had a brain injury. CRT techniques may also benefit students in early enrichment programs such as Head Start. Clearly, the potential for broadening the application of CRT exists, but the field is simply too new for the research effort to provide much guidance. In essence, cognitive rehabilitation is a field of enormous challenge and promise.

A final issue is the lack of generally accepted procedures for therapist certification. Progress has been made. The Society for Cognitive Rehabilitation (SCR) has created a certification procedure that has been recognized by the American Congress of Rehabilitation Medicine. The therapist's credentials must include a degree that is recognized by the therapist's professional discipline—in most cases, at least a master's degree. The therapist must also demonstrate more than 2,000 hours of supervised clinical experience and at least 100 hours of one-on-one experience providing CRT. In addition, applicants for certification must produce a videotaped therapy session and written report that is evaluated by a panel of certified members of the Society for Cognitive Rehabilitation. This certification is a major step toward creation of a standard of practice for those who treat persons with brain injury. The Brain Injury Association of America also has a certification program, in which certification is given to individuals who pass a written examination.

Conclusion

What can CRT currently provide persons with brain injury? Clearly, this population is treated far more successfully today than was possible with previous generations of clients (Grafman, 1984). Moreover, it is probably safe to say that CRT methods can arrest cognitive decline and even reverse it. For individuals who have experienced a substantial cognitive loss, cognitive rehabilitation can improve the quality of their lives and reduce the incidence of everyday problems.

CRT is also more widely available to patients than it was in previous years. Until the 1990s, the topic was not addressed in textbooks (e.g., Dikengil, Lowry, & Delgado, 1993; Gruneberg, 1992; Harrell et al., 1992; Wilson, 1987) or made the object of professional conferences (Herrmann, Weingartner, et al., 1992; Herrmann et al., 2006; Poon, Rubin, & Wilson, 1988). In recent years, various hospitals around the country have established CRT as part of their treatment offerings; a variety of providers, including speech therapists, neuropsychologists, and occupational therapists, have begun to practice CRT; and professional organizations, such as the Society for Cognitive Rehabilitation and the Brain Injury Association of America, have established certification requirements for CRT professionals. Although these certifications have been in place for over a decade, however, relatively few practitioners have become certified.

What does this text provide practitioners and persons with head injury? In this text, we give the therapist basic theoretical background that has been generally lacking in the

CRT literature. To do this, we have surveyed the vast quantities of related literature in cognition and neuroscience and present summaries of this literature in a manner that the average practitioner can use. Admittedly, in many cases our summaries are speculative. We certainly do not claim to provide the level of detail that is currently available in many of the excellent books that deal with more specific aspects of brain injury rehabilitation. Our attempt to summarize the literature is based on the assumption that the field must have a theoretical grounding and that existing theory is the best place to start. Our hope is that our theoretical discussion will generate many more applied research questions than it answers. Our primary goal is to provide the CRT practitioner with techniques he or she can actually use with clients. Unlike most books on CRT, which are basically summaries of published articles, we try to apply the research we summarize by providing practical therapy strategies. In most cases, these are methods that have worked successfully for us over the years. Wherever possible, we document the efficacy of the technique with published or original research. Our hope is that therapists will use these techniques with their clients and document their efficacy. We also hope that researchers will use these therapies as a starting point for research and development of better techniques.

Finally, in the approach we present in this book, we assume that rehabilitation of impaired cognitive performance requires consideration of all modes of psychological functioning. This assumption contrasts with prior approaches, which relied primarily, if not exclusively, on improving cognition through direct retraining methods. Although we provide a thorough grounding in active retraining methods, we also provide a thorough discussion of passive methods that can be equally effective. We believe that the combination of these approaches leads to the greatest and most rapid improvement in a person's functioning.

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