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## BOOK REVIEWS

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### Neuropsychological Treatment Broadly Defined: Art and Science

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*Cognitive Rehabilitation: A Clinical Neuropsychological Approach.* W. Brouwer, E. van Zomeren, I. Berg, A. Bouma, and E. de Haan (Eds.). 2002. Amsterdam: Boom Publishers. 296 pp.

*Neuropsychological Interventions: Clinical Research and Practice.* P.J. Eslinger (Ed.). 2002. New York: The Guilford Press. 360 pp., \$50.00.

Reviewed by ROBERT L. KAROL, Ph.D., *Director: Department of Neuropsychology/Psychology and Program Director: Brain Injury Services, Bethesda Rehabilitation Hospital, St. Paul, MN.*

Cognitive dysfunction is the *sine qua non* of brain injury. Rehabilitation of cognitive deficits is therefore central to the treatment of persons with brain injury. Nevertheless, advances in the treatment of various cognitive functions have been slow to occur. In all likelihood this slow pace reflects the complex nature of brain function and brain injury as well as the challenges that researchers encounter when they conduct research with real world populations whose condition may be evolving. Yet, brain injury treatment shows promise. After reading both of these books, the reader will have the sense that our approaches are becoming more scientific, that there are large gaps in our knowledge, with variability in knowledge across cognitive domains, and that there is still much art in the treatment of cognitive deficits. These two books provide valuable information of a complementary nature on the status of brain injury care.

Although each has distinctive chapters, the two books cover similar ground. Both books offer chapters on executive, memory, language, and apraxic dysfunction. They address visual, visuosperceptual, and neglect difficulties, but divide these topics differently. There are also areas of less overlap. *Neuropsychological Interventions* includes a section with chapters on basic topics such as the theory of cognitive change, neuropsychological assessment and research design, and pharmacological treatment. *Cognitive Rehabilitation* has unique chapters on the history of cognitive rehabilitation and on cognitive rehabilitation with persons with schizophrenia plus chapters on broad based global programmatic approaches and the lessons for cognitive rehabilitation from motor control theory.

*Neuropsychological Interventions* is perhaps the more fundamental of the two texts. It begins with a section entitled

“Foundations of Neuropsychological Interventions.” The initial chapter, “Approaching Interventions Clinically and Scientifically,” explains that the aim of the book is to present conceptualizations that are advancing the field and to relate the results of research to treatment. Next, “Theoretical Bases for Neuropsychological Interventions,” argues for a broad-based definition of cognitive rehabilitation as “efforts to promote maximal adaptive cognitive functioning in patients with neurologically induced cognitive deficits” (p. 17), not limited by etiology, method, or technology. It then gives an overview of the rationale of treatment from synaptic, neurochemical, and neuroanatomical perspectives. That neuropsychological assessment is important to the rehabilitation process is stressed in Chapter 3, “Neuropsychological Assessment for Treatment Planning and Research,” further noting that assessment of mood, personality, motivation, awareness and other psychological states must be included in a comprehensive evaluation for rehabilitation planning.

The chapter titled “Pharmacological Treatment of Cognitive Impairments: Conceptual and Methodological Consideration” advises on how to conceive of medication treatment and then proceeds to review obstacles to drug therapy, concluding with a discussion of experimental designs in pharmacological research. The last chapter in this section, “Design and Evaluation of Rehabilitation Experiments,” is devoted to research design covering such topics as control groups, randomization, outcome measurement, etc., as well as a review of particular research designs.

Taken as a whole, this section is sufficient for a brief introduction to the topics it covers, but it is cursory. Most of the subject matter deserves far more in-depth consideration to be of true value. If the reader is a neophyte to the fields

of brain injury, neuropsychology, research, or medications, then this section may begin to increase awareness and exploration of the section's subjects; for readers with a moderate background in these areas, the information should already be well-learned. Parenthetically, the chapter on pharmacological treatment might have been better placed in the next section, "Models of Intervention for Neuropsychological Impairments."

The second section of *Neuropsychological Interventions* contains chapters on the treatment of various dysfunctions. Chapter 6, "The Rehabilitation of Attention," describes how to classify attentional processes and offers some information on anatomical correlates and assessment. Treatment of neglect is given as an example, but the review of techniques, particularly for "nonspatial" attentional problems, such as contingencies, computerized tasks, or experimental presentation of a tone would benefit from more in-depth discussion. In "Learning and Memory Impairments" in chapter 7, four approaches are delineated: restoration, optimization of residual functions, compensation, and substitution. The treatment procedures summarized here are practice and rehearsal, mnemonics, environmental supports, and domain-specific learning using implicit memory and errorless learning: the important point is that treatment needs to be customized through the determination of which techniques work for which subset of memory or learning problems for which patients. As spatial neglect is discussed elsewhere, chapter 8, "Visuospatial Impairments," covers other defects of visual processing suggesting use of restorative techniques though commenting that there is limited empirical support for them yet—and compensatory strategies.

The next chapter, "Models of Language Rehabilitation," differs from the other chapters in summarizing a literature search for language rehabilitation that resulted in 522 articles of which 44 were judged pertinent and empirical in nature. The articles are sorted and compared by treatment approach (i.e., cognitive neuropsychological, cognition and learning, compensation, linguistic, social, and neurological). These findings are then summarized thus: (1) "Theoretical foundations differ across these treatment models, and as mentioned throughout the chapter, many language rehabilitation studies and models do not necessarily specify the underlying theory" (p. 209); and (2) "Finally, we are no further along in the identification of theories that can explain and predict the mechanism of change" (p. 210).

In chapter 10, "Apraxia," the author notes that "... the literature on recovery and treatment is very minimal." (p. 229), and that "there is not one accepted taxonomy or classification of the forms of apraxia" (p. 222); which perhaps explains why the chapter is organized by type of research design and the pragmatic conclusion that "therapy should be geared to help patients function more independently despite the probably lasting presence of apraxia" (p. 241).

"The Enigma of Executive Functioning" may be a misnomer for chapter 11 since it provides a useful synthesis of different theories to find commonalities, giving a sense of

advancement toward a unified conceptualization of brain function for this cognitive domain. The four theories are Teuber's corollary discharges, Luria's self-regulation and Shallice's supervisory system, Duncan's goal neglect, and Damasio's somatic markers, reviewed with treatment studies associated with each theory. The conclusion that all the theories incorporate anticipatory processes, matching of action and intended effect, and error detection for adaptation indicates that treatment works through "overt predictions, verbal mediation and adaptive problem solving, and formal self monitoring strategies" (p. 262). Chapter 12, "The Rehabilitation of Neurologically Based Social Disturbances," tackles social problems and includes an array of psychotherapeutic treatments for self-regulation, sensitivity, problem solving and awareness, with the recommendation that treatment interventions "be implemented by a mental health professional" (p. 267). This chapter would be stronger if it explored further the relationship between social dysfunction, particular neuropsychological processes and related organic damage sites, and the success of various interventions. The following chapter, "Emotion-Related Processing Impairments," presents models of neural networks and functions, as they relate to emotional processing, including frontal networks, an emotional motor system, cortical and subcortical regulation, hemispheric specialization, and central *versus* distributed processing. Assessment is considered in experimental models of emotional elicitation and expression and emotional and personality inventories. Research on emotional perception and expression is presented along with a general overview of therapeutic approaches to emotional disturbances.

The final chapter, "Summary and Analysis of Emerging Intervention Models," provides a synopsis of the preceding chapters such that a reader wishing to glean the arguments made in the book could do so from reading it. However, throughout the book experienced readers may find themselves wishing for further exploration of topics that the chapters only touch upon.

*Cognitive Rehabilitation* is generally a more detailed book than *Neuropsychological Interventions*. The book consists of 13 chapters, each beginning with an outline, a helpful feature because a roadmap is useful with the additional complexity. Chapter 1, an introduction to the book, provides a synopsis similar to that found in the last chapter of *Neuropsychological Interventions*.

Chapter 2, "An Overview of Neuropsychological Rehabilitation: A Forgotten Past and a Challenging Future" tells the history of the field up to present times that might be particularly valuable for readers new to rehabilitation, concluding with questions regarding outcomes and challenges, both current and future.

The chapters that follow address models of rehabilitation, cognitive deficits, and one particular diagnostic category. The first of two chapters on global integrated approaches, chapter 3 notes the importance of "indirect" symptoms: difficulties that arise as a person copes with "direct" brain changes, "Part of the reason that neuropsychy-

chological rehabilitation is not adequately progressed is precisely because clinicians and researchers have not taken the need to separate out direct and indirect symptoms seriously" (p. 54). The ingredients of a holistic approach are summarized with particular attention to indirect symptoms and with staff functioning noted. The remainder of the chapter focuses on outcome in terms of efficacy of treatment, research findings regarding clinical improvement and risk of further decline, and models of change, with emphasis throughout on how people adapt after injury. The second chapter on global integrated approaches reads like an extended research paper as it compares two Dutch programs: "Cognitive Rehabilitation" and "Intensive Neuropsychological Rehabilitation." The former is individualized therapy over a maximum of 2 years with some group therapy; the latter consists of 20 hours of group treatment per week for 16 weeks. The strength of this chapter is the degree to which it explains the programs as the outcome data is either descriptive or analysis of within program change.

Chapter 5, "Cognitive Rehabilitation of Central Executive Disorders," the first chapter to focus on specific brain dysfunctions, briefly describes the elements of executive dysfunction followed by an examination of four types of rehabilitation procedures: intellectual training in problem solving, behavioral training for emotional dysfunction, combination approaches, and external supports. It concludes by noting the lack of standard protocol for the treatment of executive disorders and bemoaning the lack of evidence for generalization to the real world of some treatments.

The reader must shift gears to absorb chapter 6 on schizophrenia. On one hand, the book is not otherwise organized by diagnosis; on the other hand, this chapter provides a valuable perspective for clinicians who work with brain injury to contemplate how their techniques might apply to "mental health" populations. That persons with schizophrenia have cognitive deficits is increasingly recognized; treatment efforts include the typical list of medication, cognitive training, and skills training. Readers may wish for more detail on how information from other chapters might apply to schizophrenia.

Chapter 7, "Cognitive Rehabilitation of Memory Disorders," begins a sequence of six chapters organized by particular dysfunctions. The chapter reviews five treatment approaches: psycho-educational, external aids, repetitive practice, internal strategies, and compensation through intact processing, with recommendations at least for those persons with mild to moderate memory deficits, to attend to these individuals subjective experience and training in use of external aids and techniques for specific situations.

The issue of "Compensation versus Restoration in the Rehabilitation of Language Disorders" is the focus of chapter 8. The author asserts that a theory of reconnection of partially damaged neural circuits is the best model for explaining recovery, concluding that (1) treatment inducing learning to cause reconnection of partially damaged neural circuits may help moderately impaired individuals and that this could explain their improvement, and (2) otherwise,

compensation efforts account for improvement and ought to be the basis for treatment. The atheoretical nature of most aphasic rehabilitation is noted along with and then a review of various treatments asking whether compensation could account for the changes.

"Therapy of Apraxia—Implications for Cognitive Rehabilitation," chapter 9, is an extended research report presenting the author's research with the purpose of determining whether apraxia affects a basic aptitude and whether treatment of one manifestation of apraxia will generalize to other manifestations of apraxia, supposedly because therapy affects a general aptitude. The author concludes from his research that apraxia can affect multiple manifestations, but that training still might not generalize. Multiple aptitudes may contribute to a particular failure.

Chapter 10 reviews the "Rehabilitation of Unilateral Neglect," offering two clinically evaluated methods (i.e., scanning training and limb activation training) and four other approaches (i.e., prism utilization, dorsal/ventral system interaction, manipulation of egocentric space, and arousal/attention methods). While the chapter is relatively short, it provides a useful summary of the techniques. The following chapter, "Visual Rehabilitation in Homonymous Hemianopia and Related Disorders," discusses field deficits with regard to spontaneous recovery, rehabilitation, and restoration, including use of optical devices and a detailed description of saccadic compensation training. The authors observe that "treatment for hemianopic field loss should more often be the focus of systematic rehabilitation efforts than it is at present" (p. 251), a viewpoint that likely bears repeating at many rehabilitation centers. Chapter 12, "What Cognitive Rehabilitation May Learn From Motor Control Theory," takes the perspective that cognitive treatments and motor learning ought to be integrated during rehabilitation as motor learning requires knowledge of results, knowledge of performance, variability of practice, and linkage with application, variables considered essential for all rehabilitation. Linking actual physical therapy to cognitive work is recommended.

The last chapter, "Evaluation of Neuropsychological Rehabilitation," discusses the evaluation of the effectiveness of neuropsychological treatment by summarizing recent reviews and defining neuropsychological rehabilitation as "a systematic, behavior-oriented set of interventions for people with brain dysfunctions, which is based on knowledge of the relations between brain lesions and cognitive, emotional, and behavioral problems" (p. 272). Much of the chapter is devoted to research and design considerations.

So, what can readers conclude from these two books? To begin, both books highlight that there are on-going attempts to conceptualize intervention in theoretical frameworks. Unfortunately, chapters in both books tend to conclude with statements that reflect broad generalizations, are fairly obvious, or reflect that we do not yet know enough: these observations are limited in their helpfulness. Furthermore, neither book relates how well actual practices in typical rehabilitation centers are linking treatment with theory.

In that sense, while our scientific knowledge is increasing there is still much art in cognitive treatment. Both books, at various times, do provide clinicians with useful information on intervention, but readers should know that these are not cookbooks. Of course, they do not intend to be.

Therefore, one can ask who will benefit, and in what way, from these books. The difficulty in answering that question is due to the uneven nature of both books. Sometimes the information is clearly introductory level material; sometimes it is quite precise and advanced. Some authors survey the field; other authors provide mostly research reports. There are chapters that are primarily theoretical, and there are chapters that are relatively applied. Both books would have benefited from further editing *across* chapters to achieve consistency and, perhaps, integration. Moreover, both books suffer from organizational problems: chapters seem misplaced.

Hence, whether readers find each book helpful depends upon their interest (e.g., visual disturbance *versus* memory *versus* apraxia), their background (e.g., neuropsychologist *vs.* other disciplines; researcher *vs.* clinician), and their experience (e.g., novice *vs.* expert). Any given reader will find a particular chapter valuable or not depending upon that reader's needs. The uneven nature of both books makes

prediction about satisfaction impossible. That said, in general readers will probably find *Neuropsychological Intervention* to be the more basic of the two books, and *Cognitive Rehabilitation* to be the more detailed and advanced.

A final thought regarding titles, terms, and conceptualization seem apropos at this point. Both books take a fairly broad view of their content area. The content ranges from memory, apraxia, and language disturbances, for example, at one end of the spectrum through social disturbances and emotional-related processing to even pharmacological treatment in the case of *Neuropsychological Intervention*. For *Cognitive Rehabilitation* the field includes such topics as memory, apraxia, and language, too, but then spans global treatment models and treatment of schizophrenia.

To some extent, such breadth is to be applauded. Artificial walls between cognition, emotion, and behavior are often detrimental. But it does raise an interesting set of questions that could be the focus of a future book: What is the difference, if any, between psychotherapy and cognitive rehabilitation for persons with cognitive impairment? Does it matter if the recipient has "brain injury" or "mental illness"? Finally, for the clinicians, what do the answers to these questions imply for who provides what service to whom and who will pay for what treatment?

## Searching for Madness Within the Complexity of Schizophrenia

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*In Search of Madness: Schizophrenia and Neuroscience*, by Walter Heinrichs. (2001). New York: Oxford University Press. 368 pp., \$19.95.

Reviewed by AUDRA L. CRUTCHFIELD and SHAWN K. ACHESON, Ph.D., *Department of Psychology, Western Carolina University, Cullowhee, NC 28723.*

*In Search of Madness: Schizophrenia and Neuroscience* is a concise but thorough and even-handed review of the current status of research in schizophrenia. It is an amalgam of research studies distributed across numerous domains relevant to schizophrenia and represents a much expanded version of his 1993 review article in the *American Psychologist*. In particular, the book synthesizes aspects of neuropsychological functioning, genetic, behavioral and genetic markers, and the neurochemistry of schizophrenia with information on etiology and overt symptoms of the illness. One potentially controversial and central feature of this book is Heinrichs' argument that schizophrenia is not one single illness but a heterogeneous syndrome. Heinrichs' rationale for conducting research on the studies is to exemplify the discrepancies between what researchers claim to be "common symptoms" of schizophrenia. For each topic covered, Heinrichs and colleagues combined all relevant research studies between 1980 and 1999 and performed a meta-analysis to better explain the overall status of such research. For example, regarding atten-

tion deficits on the Continuous Performance Test, he grouped all studies together between 1980 and 1999 and matched the studies according to patient sample (schizophrenia patients and controls) and measure used (the Identical Pairs version of the CPT). He then calculated the effect size to determine the variance attributed to the identified construct. This meticulous method was employed for each phenomenon that was examined.

In the first chapter, Heinrichs explicitly states his purpose is to challenge the belief that a comprehensive understanding of schizophrenia is within reach by investigating the successes and failures of current research across a variety of domains germane to schizophrenia. He provides case examples of three very different individuals who have the same diagnosis of schizophrenia. These individuals come from very diverse backgrounds, with differing social support systems, different childhoods, differing circumstances and, very different symptoms—at least for something that is identified as the same illness in all three individuals. Throughout the book, Heinrichs incorporates these vi-

gnettes and their inconsistencies to illustrate his point that schizophrenia manifests itself in a variety of ways and is not likely a single disease state.

Heinrichs goes on to explain the organization of the book—a logical progression from symptoms and diagnosis to premorbid functioning and encompassing chapters on illness markers, neuroanatomical differences, and neurochemistry. After providing empirical support for his views, he critiques current theories of schizophrenia. In a final chapter, he integrates the current research findings of schizophrenia neuroscience and provides a cohesive picture of the conjectures he made in his book.

In addition, Heinrichs identifies his audience and intended readers. He explains that his manuscript is intended for students and researchers alike who are seeking a complete and integrated summary of current research regarding the neuroscience of schizophrenia, and “anyone who has been moved by madness in some way and is willing to be moved again by reading this book” (p. 12).

Overall, Heinrichs did an outstanding job of documenting evidence that schizophrenia is a heterogeneous disorder. Time and time again, he describes published, peer-reviewed evidence that supports this notion that there are many different subgroups of schizophrenia. For instance, he provided evidence of schizophrenia patients who never shared the same symptoms. He explained that there are some individuals who have the typical positive symptoms, such as delusions and hallucinations, but no negative symptoms. Conversely, he provided other evidence of individuals who suffered with only negative symptoms, such as restrained affect and poverty of speech.

Aside from these apparent discrepancies in cases, the majority of the book consists of evidence supportive of more cognitive or biological differences. In the chapter on markers of schizophrenia, he examines research on a variety of putative markers for the development of psychosis, e.g., the validity of digit span, the Continuous Performance Test(s), backward visual masking, eye tracking abnormalities, and evoked brain potentials. Globally, Heinrichs argues that there is, in fact, “no convincing attention-related or psychophysiological marker for schizophrenia” (p. 85). The next chapter addresses executive incompetence and the inconsistencies found in frontal lobe functioning of people with schizophrenia. He presents numerous examples on various frontal lobe tasks and neuroimaging techniques that are designed to identify people with thought disorders or brain damage. Some individuals with schizophrenia will show functioning or neuroanatomical deficits in one area, while other schizophrenia patients will not. Also, he provides a critical analysis of the problems of the testing instruments themselves, reporting much evidence to suggest that our tools are not as precise when identifying complex deficits in brain functioning or structure, as we may optimistically believe.

In the next chapter Heinrichs reviews the functioning of selective memory, emotion, concentrating most of his efforts around the temporal lobe and concluding that a link

between schizophrenia and the temporal lobes has not been definitively proven at present. Much evidence shows that many individuals with schizophrenia suffer problems indicative of substantially impaired temporal lobe processing, but also numerous patients exhibit little to no impairment within this region. While impaired temporal lobe functioning is indeed found in patients with schizophrenia, it does not appear to be a necessary component of schizophrenia.

Next, Heinrichs explores the neurochemistry that has long been implicated for its crucial role in schizophrenia. He begins by describing the advent of psychotropic medications, primarily chlorpromazine (Thorazine) and its role as an impetus for the study of neurochemical abnormalities in the disease and then summarizes findings surrounding various neurotransmitters found in the brain, particularly dopamine, serotonin, and glutamate. Not surprisingly, there is some evidence that neurotransmitter abnormalities and numbers of receptors differ between schizophrenia patients with differing sets of symptoms, however, “the neurochemical effect sizes are too modest and too variable to support causal evidence for a single illness” (p. 182). An important chapter concerns the clues that scientists can obtain from studying at-risk children, mostly those who had a first-degree biological relative with the disorder. This invaluable area of study, unfortunately, is under-researched. Heinrichs briefly reviews the current thought regarding genetic influence of schizophrenia yet explains that it has been more thoroughly reviewed elsewhere (see Gottesman, 1991). He then tackles a variety of assertions such as, many people with schizophrenia were born in winter months and that viruses, which tend to proliferate in cold seasons, may have caused their condition; or birth complications—forceps, premature births and other perinatal conditions. Following a critical and broad analysis of previous research in these areas, Heinrichs found no conclusive evidence that any of the aforementioned perinatal complications can be found in the developmental history of all, or even most, patients, but rather play a peripheral role, at best, in schizophrenia’s etiology.

Perhaps, Heinrichs asserts, the key to understanding schizophrenia will not be found by gathering more empirical data at present, but by evaluating the current theories that address schizophrenia. In order to be considered a good, solid theory, various conditions regarding the disorder must be addressed: neurogenesis, symptoms, etiology, onset, and heterogeneity. According to Heinrichs, only three current theories, all formulated around the diathesis-stress model, address these crucial aspects: Paul Meehl’s theory of schizotaxia and schizotypy, Weinberger’s neurodevelopmental theory, and Walker and Diforio’s neural diathesis-stress theory. He asserts that all of these theories provide us with helpful information; yet none is completely satisfactory in its explanation of schizophrenia. Heinrichs acknowledges that theory construction is an enormously daunting and complex task because “the theorist has to stay true to what is known about the illness but also propose new concepts that lead to predictions that can be tested” (p. 247).

Finally, Heinrichs summarizes current knowledge of schizophrenia and proposes alternative categorizations for schizophrenia. He notes the numerous ways to group the illness (i.e., positive vs. negative symptoms, biological vs. behavioral abnormalities, or the subgroups observed for DSM-IV diagnosis); only time will tell which one proves to be correct. He supports divisions based on biological findings since these “lie closer than behavior to the neurogenesis of the illness” (p. 269). The pleasantly surprising aspect of this chapter was the reflective, brilliant criticism of applying the medical model to neurosciences—especially coming from a prominent neuroscientist. Possibly, he asserts, the capabilities of our current understanding and application of scientific principles is not accurate enough to uncover the intricacies of an illness as complex as schizophrenia. “[S]tudying diverse conditions as a single disease state is guaranteed to produce inconsistent findings that apply to some patients and not others. Everyone pays lip service to the heterogeneity problem, but only a small number of researchers do more and actually study multiple illness models of schizophrenia” (p. 276).

In summary, *In Search of Madness: Schizophrenia and Neuroscience* is a superb piece of writing. The material is

presented in a straightforward, thoughtful manner, is easy to follow, and interesting to read. The text integrates empirical scientific findings with compassionate and thoughtful scrutiny to produce a candid portrait of schizophrenia. Heinrichs comes across as a lucid, articulate, yet empathic scientist who offers thoughtful analysis to complex questions and hypotheses. This book is highly recommended to anyone interested in schizophrenia. Students and researchers are encouraged to challenge their conceptualizations of schizophrenia by reading this book. Perhaps over time, together, we can uncover its complexity. Until that time, “madness is among us and diminishes to the extent that we care for those who endure it” (p. 276).

## REFERENCES

- Gottesman, I. (1990). *Schizophrenia genesis: The origins of madness*. New York: W.H. Freeman & Company.
- Heinrichs, R.W. (2001). *In search of madness: Schizophrenia and neuroscience*. New York: Oxford University Press.
- Heinrichs, R.W. (1993). Schizophrenia and the brain: Conditions for a neuropsychology of madness. *American Psychologist*, 48, 221–233.

## Cognitive Neuropsychology: A Road Map to Understanding Brain–Behavior Relationships

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*The Handbook of Cognitive Neuropsychology: What Deficits Reveal About the Human Mind*. Brenda Rapp (Ed.). 2001. Philadelphia: Psychology Press. 652 pp., \$41.95 (PB).

Reviewed by J. VINCENT FILOTEO, Ph.D., Associate Professor In Residence, Department of Psychiatry, UCSD, and VA San Diego Healthcare System.

Traditionally, research findings in cognitive neuropsychology have been used as theoretical benchmarks for research in other areas of psychology attempting to explain brain-behavior relationships. Several branch disciplines in the behavioral sciences have used knowledge gained through studies in cognitive neuropsychology not only to help support theories developed in their respective areas, but also to advance more in-depth frameworks to better understand human behavior. However, within recent years there has tended to be greater emphasis placed on understanding what areas of the brain are involved in *general* cognitive functions, and researchers have tended to forget the intricacies of cognition. The explosion in the use of fMRI and other functional imaging techniques has helped to deemphasize the importance of understanding how cognitive processes can fractionate along important theoretical lines. As a result, we are often confronted with research that is devoid of theory and does little to advance our understanding of how the brain and mind work. In her edited book, *The Handbook of Cognitive Neuropsychology: What Deficits Reveal About*

*the Human Mind*, Brenda Rapp has admirably assembled a collection of chapters that reminds us of the importance of how neurological patients can inform us about the mind, and, in my opinion, how such findings can and should be used to provide a theoretical road map to understanding brain-behavior relationships.

In the preface, Rapp describes the scope of the book emphasizing that the chapters are not in depth reviews of the cognitive domains described, but rather are meant to discuss the central issues relevant to each domain and how studies of patients' deficits has helped to inform us about these specific processes. Each of the chapters meets these expectations, often going beyond reviewing relevant cognitive neuropsychological studies, but also discussing how research in cognitive psychology, cognitive neuroscience, computational science, and clinical neuropsychology has helped to inform theories in cognitive neuropsychology. The book may be directed at a variety of audiences, but most likely will serve as an excellent text book for advanced undergraduate or beginning graduate courses in cognitive

psychology. However, this book will also be invaluable to advanced graduate students and researchers in cognitive neuropsychology who need a quick reference to current research in their fields. I would also strongly recommend this book for individuals conducting functional neuroimaging research who are interested in understanding the state of our knowledge on cognition, and who wish to apply this knowledge within the framework of functional studies.

The book is divided up into nine general sections entitled “Foundations”; “Objects and Space”; “Attention and Consciousness”; “Words”; “Sentences”; “Memory”; “Music, Numbers, and Time”; “Actions and Plans”; and “Future Directions.” These sections cover the most relevant areas of cognitive neuropsychology, with only a few omissions (see below). The chapters are well-integrated and overlap is kept to a minimum. There is somewhat of an overrepresentation of language functions in the book (i.e., 1/3 of the chapters are subsumed under the sections “Words” and “Sentences”), but this is likely due to Rapp’s primary research interests as well as the fact that language functions have received considerable attention in the cognitive neuropsychology literature. Nevertheless, these chapters on language functions provide an excellent review of various methodological and theoretical approaches that not only have been applied to language processes, but can also be generalized to other areas of cognitive neuropsychology.

In the first section, “Foundations,” the chapters by Coltheart and Selnes provide a brief introduction to the field of cognitive neuropsychology. Coltheart’s chapter focuses primarily on the field of cognitive neuropsychology, defining it, reviewing important issues such as modularity, and detailing its methods. This chapter will serve as an excellent, albeit brief, review that provides a rationale for the field and an appropriate backdrop for the other chapters. Selnes’ chapter offers a good historical overview focusing on the origins of cognitive neuropsychology, primarily emphasizing the evolution of research on language functions.

The second section, *Objects and Space*, contains three chapters by Riddoch and Humphreys, De Haan, and McCloskey. Riddoch and Humphreys give an excellent overview of the research on object recognition, including general reviews of the various early and higher-level object recognition deficits following brain damage. In providing an excellent argument for the notion that the cognitive processing of faces is distinct from the processing of other visual objects, De Haan surveys multiple sources of support for this argument in addition to patient work, including single cell recordings, developmental studies, and neuroimaging research. The chapter on spatial representation by McCloskey veers somewhat from the stated objective of the book (to provide a general overview of the state of research in the specific area of research) and instead gives a more theoretical account as to how spatial representations can be conceptualized. This chapter does not go into great detail about what one would normally discuss on this topic in a handbook (e.g., more detail on neglect), but I rather liked his approach and felt that the areas relevant to this topic that

were not covered in this chapter were covered very well in other chapters.

The section entitled “Attention and Consciousness” contained two chapters, one by Umiltá and the other by Farah. Umiltá provides a top notch review of attentional functioning, primarily reviewing studies addressing how attention can be distributed within different frames of reference (e.g., space vs. objects), the movement of attention, and the mechanisms of attention (e.g., facilitation or inhibition). Farah’s excellent chapter on consciousness uses a framework in offering evidence distinguishing between three accounts of how the brain might undertake this cognitive process. This framework is then used when reviewing the relevant research, most of which focuses on unconscious perception of various visual information (e.g., objects, faces, words, etc.), but does not go into much detail about other aspects of consciousness. Nevertheless, this is an excellent treatment of the topic.

The next two sections, “Words” and “Sentences,” provide detailed reviews of very specific aspects of language processes. Hillis reviews how the lexical system is organized giving evidence for and against the notion of multiple lexical systems. In their chapter, Allen and Badecker report studies examining word morphology and how words can break down following brain damage. Rapp, Folk and Tainturier, discuss the cognitive processes involved in word reading, initially addressing the processes involved in determining letter identification and letter positioning, then going on to describe how the printed word accesses word meaning. Tainturier and Rapp’s chapter on spelling is also excellent, particularly in their discussion of how reading and spelling are associated. Nickel’s chapter on the cognitive neuropsychology of spoken word production deals with theories of lexical access and Gollan and Kroll’s chapter gives an interesting overview of lexical access among bilingual individuals. Two chapters in the section entitled “Sentences” review sentence comprehension and sentence production. Martin’s chapter on sentence comprehension was excellent, and I particularly enjoyed the discussion of the role of working memory in sentence comprehension. Berndt’s chapter on sentence production was also informative and comprehensive.

The next section, “Memory,” contains three chapters on the structure of memory, semantic memory, and memory distortion. Parkin’s chapter on the structure and mechanisms of memory provided a good historical overview of topics in this area, but was somewhat disappointing in the sense that more current theories of memory processing were not discussed. Shelton and Caramazza’s chapter on semantic memory is a very good theoretical discussion on the fractionation of semantic categories following brain damage. In their chapter, Dodson and Schacter relay the nature of memory distortions and how these types of errors in memory come about.

In the next section, “Music, Numbers, and Time,” the chapter on time perception by Mangels and Ivry was very intriguing with its good overview on the theories of time

perception. Noel's chapter on numerical cognition explores how numbers are stored and processed, making an excellent argument for the notion that certain numerical operations have verbal representations. The chapter on music by Peretz provided a superb overview of the current cognitive theories of music perception, and gave a glimpse of a very interesting topic—the relationship between music and emotion, about which I would have liked to have had more details.

The section on "Actions and Plans" contains two chapters, the first, authored by Buxbaum and Coslett, focuses on the cognitive aspects of action with a very good overview. The information they presented on a possible hand-centered coordinate system for spatial attention was especially intriguing. The second chapter by Humphreys, Ford, and Riddoch on everyday actions was equally excellent.

The final section, "Future Directions," contains a single chapter by McCloskey in which he champions the field of

cognitive neuropsychology pointing out very convincingly how cognitive neuropsychology can help address questions regarding normal human cognition, functional localization, and understanding patient's deficits. He offers good suggestions as to how in the future cognitive neuropsychology can contribute to these three areas.

Overall, this book was excellent. There were a few areas of cognition that I feel could have been included, however, such as chapters on implicit memory, emotion, and social cognition. Nevertheless, Rapp should be commended for bringing together a group of highly scholarly chapters from experts in their respective fields. This book will serve as an excellent textbook for advanced undergraduate and beginning graduate courses. Further, this book will serve as a valuable reference for individuals wishing to conduct research on the nature of cognition.