

**Cognitive Neurorehabilitation,  
Second Edition**

Evidence and Application

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Evidence and Application

Edited by

**Donald T. Stuss,**

**Gordon Winocur**

**Ian H. Robertson**



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## Preface

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The field of cognitive neurorehabilitation has advanced notably in several ways since the publication, in 1999, of the first edition of *Cognitive Neurorehabilitation: A Comprehensive Approach*. The science has improved. This is particularly evident in the methods of treatment; in understanding the different factors that might affect successful outcome; in the expanded use of neuroimaging modalities to understand the limitations and benefits of neurorehabilitation; and in the understanding of the potential pathophysiological mechanisms in different patient groups that are key to the development of new procedures. Our overall objective in editing this new and expanded volume remains in essence the same as the first: summarize the latest developments in cognitive neuroscience research related to cognitive neurorehabilitation; review the principles that form the platform of successful interventions; and synthesize new findings about the rehabilitation of cognitive changes in different populations.

*Cognitive Neurorehabilitation, Second Edition: Evidence and Application* provides understanding of *why* cognitive neurorehabilitation may or may not work; *how* to use different neuroimaging methods to evaluate the efficacy of interventions; *what* personal and external factors impact rehabilitation success; *how* biological and psychopharmacologic changes can be understood and treated; *how* to treat different disorders such as language and memory; and *where* the field is going in research and clinical application.

*Cognitive Neurorehabilitation, Second Edition: Evidence and Application* is intended to be a comprehensive reference volume for those interested in the

scientific base of cognitive neurorehabilitation, and will include the most up-to-date information for the practicing clinician. The book is an expanded edition, with five major sections compared with four in the first edition, and 32 chapters compared with 22 in the first. More importantly, as reflected in the title, this is a totally new volume, not just a “second” edition. The content is much more comprehensive in scope, containing information not present in the first edition. Chapters that were present in the first edition have been significantly updated to reflect current knowledge. For example, there are state-of-the-art reviews of the principles underlying successful neurorehabilitation, the methods and value of neuroimaging, and new neurorehabilitation procedures. Some important chapters in the first edition on clinical programs and services were not included in the second edition because of our desire to emphasize the neuroscience underpinnings of neurorehabilitation.

The volume consists of six Parts, each organized and prefaced by its section editor(s): (I) *Principles of cognitive neurorehabilitation*, extending from the basics of neuroplasticity to principles of compensation, incorporating all levels of evidence currently available; (II) *Application of imaging technologies*, an overview of the use of structural and functional neuroimaging procedures including MRI, ERPs and MEG; (III) *Factors affecting successful outcome*, with chapters discussing the impact of internal and external factors including mood, self-awareness, exercise and diet; (IV) *Pharmacologic and biological approaches*, covering the rationale for pharmacologic strategies as well as practical examples related to different disorders, and current advances in promoting neural regeneration and stem cell research; (V) *Behavioral/neuropsychological approaches*, summarising the strengths and weaknesses of therapies targeting motor and various types of cognitive disorders (e.g., attention, aphasia, neglect, “executive”, memory); and (VI) an *Overview*, evaluating the current status of rehabilitation through the lens of neuroscience research, and suggesting the future of cognitive rehabilitation.

This second edition maintains positive features of the first edition, including summary bullet points

throughout the chapters; the scientific emphasis; the content organization. Within each chapter, there are highlights of different sections to provide the reader, especially students, with key summaries of the content. The topics broadly cover subject matter important to cognitive rehabilitation, from basic anatomy and chemistry, to rehabilitative methods, to consideration of psychosocial factors. The overall organization of the book and the structure of each chapter were designed so that the volume would also be a suitable textbook at the graduate level. The book is not, however, a practical “cookbook” of what to do for different neurorehabilitation healthcare professionals.

There are also many new features. We have added chapters that reflect the changes in knowledge, thinking and approaches in the last decade. We have included information not presented in other neurorehabilitation books: e.g., variability of performance; mechanisms underlying success and failure in rehabilitation of executive dysfunction; the role of neurogenesis in brain recovery; the potential of stem cell research. We have added color figures which should highlight in a striking visual manner the most important information, especially in neuroimaging.

We tried to reach four primary audiences (reflected in the type of contributors).

- (a) Healthcare professionals actively involved in rehabilitation. This includes clinical psychologists, neuropsychologists, occupational therapists and to some degree physiotherapists. For this group, our goal was to provide a reference for clinicians to evaluate the scientific basis of treatment.
- (b) Rehabilitation physicians actively involved in cognitive neurorehabilitation. Neurologists, physiatrists and psychiatrists will find the information important in guiding their referrals, and in evaluating the quality of service provided.
- (c) Students. For all graduate programs interested in the scientific basis of cognitive rehabilitation, the information in this second edition should be indispensable. Although there is value for undergraduate courses, the book was geared to a higher level.
- (d) Researchers in rehabilitation. Our goal was to provide scientific information to help

researchers in cognitive rehabilitation gain new background information and insights. We also hope that the book will serve as a creative ferment to stimulate new research. And, finally, we hope to convince cognitive neuroscientists that, indeed, there is “science” in cognitive neurorehabilitation.

A secondary market goal was that some of the information provided would be of interest and value to healthcare workers involved in neurorehabilitation, but not necessarily in the front lines of research or clinical care (e.g., social workers, hospital administrators). Such professionals play a critical role in all aspects of rehabilitation medicine and contribute significantly to the process of knowledge transfer.

We hope that we have to some degree achieved our stated objectives, and that this volume will directly or indirectly improve the lives of those

whom we try to help through cognitive neurorehabilitation. We thank all the authors who contributed to this second edition.

Particular thanks go to Susan Gillingham, who did all the organisation work. Without Susan, *Cognitive Neurorehabilitation, Second Edition: Evidence and Application* would not have come to fruition.

We are pleased to dedicate this second edition of *Cognitive Neurorehabilitation* to the many patients who have given their time and effort to participate in the many research projects that have advanced the science, in the hope that maximum benefit may come to similar individuals in the future.

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