

# INTRODUCTION

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Multiple sclerosis (MS) is a nontraumatic, immune-mediated, and neurodegenerative disease of the central nervous system that afflicts persons in the prime of their lives and can have devastating personal, social, vocational, family, and financial consequences. MS was first recognized by Charcot in 1868 as a progressive neurologic disease involving multiple lesions distributed throughout the central nervous system. MS is one of the most common neurological diseases worldwide, with global prevalence estimates exceeding 2 million cases. It has been reported to have the highest prevalence estimates in Western Europe and North America, followed by areas in central and eastern Europe, the Balkans, and Australia/New Zealand.

Currently, MS is typically characterized by initial episodes of acute inflammation (i.e., acute demyelinating lesions) in the central nervous system, damaging myelinated axons and neurons. After an episodic period of acute central nervous system inflammation, during a remission phase, trophic

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factors promote remyelination of damaged axons in the central nervous system; these axons undergoing remyelination can regain their conduction capacity, although often at a diminished capacity. The ability for growth factors to remyelinate damaged axons after a relapse decreases over time, resulting in neuronal degeneration and eventually irreversible neurological disability (i.e., disease progression). Collectively, this central nervous system damage is associated with physical and cognitive impairments.

Cognitive impairment is a common and debilitating symptom of MS. Although Charcot identified that MS patients demonstrate cognitive symptoms, including slowed information processing and impaired memory, focal research on cognitive impairment in MS started only in the 1980s. The presence of cognitive impairment as part of the disease was hotly debated for the first half of the 20th century, but it is now recognized that 45% to 70% of individuals with MS experience some degree of cognitive impairment based on objective neuropsychological testing. This cognitive impairment is associated with brain atrophy and altered brain activation/functional connectivity based on neuroimaging. Indeed, MS-related cognitive impairment is further associated with high personal and societal economic costs, as well as many mental health consequences, including depression, fatigue, reduced quality of life, unemployment, and reduced ability to perform activities of daily living. Importantly, pharmacological and behavioral treatment approaches for managing MS-related cognitive impairment have largely been unsuccessful.

There is a dearth of existing volumes that have comprehensively addressed cognition and its correlates, consequences, and treatment in persons with MS. Indeed, this first edition of *Cognition and Behavior in Multiple Sclerosis* will provide a comprehensive compilation of the effects of MS on cognition in a single volume. Its purpose is to uniquely advance the science on understanding and managing the cognitive consequences of the disease by bringing together world-renowned, international experts in this area. This book aims to be the definitive text for clinicians and researchers, as well as to serve as a primary resource for students and other professionals (e.g., government officials, attorneys, public policy experts).

This volume consists of 15 stand-alone chapters that each address an important area pertaining to cognition and behavior in persons with MS. The first section of this textbook involves the latest characterization of MS-related cognitive impairment, with chapters on assessment and neuroimaging (i.e., structural and functional neuroimaging). The second section primarily involves the latest research on the mental health/behavioral correlates and consequences of MS-related cognitive impairment. This includes chapters on depression, neuropsychiatric disorders, fatigue, personality problems, activities of daily living, employment, and

economic impact, respectively, and cognition in MS. The third section involves a chapter on pediatric-onset MS. This textbook concludes with a section on treatment approaches for MS-related cognitive impairment. This includes separate chapters on pharmacology, cognitive rehabilitation, exercise and physical activity, and cognitive reserve.

The first edition of *Cognition and Behavior in Multiple Sclerosis* provides readers with a collection of the latest research by top scientists, pertaining to a largely understudied aspect of MS. By comprehensively addressing the correlates, consequences, and treatment of cognitive impairment in MS, it is our hope that this volume inspires new lines of clinical and behavioral research to improve the lives of those living with the disease, considering the common, burdensome, and challenging nature of cognitive impairment.