

Preface

Modern societies face the substantial economic and social challenge of an unprecedented increase in life expectancy, given the rise in chronic medical and systemic conditions associated with aging. In addition, the baby boom generation has begun to reach retirement age. The result of this expansion of the demographic make-up of our societies will be that, by 2025, one third of the population of developed countries will be aged over 60 years (10% worldwide)¹. This surge will be associated with a particularly rapid increase in the number of older adults aged 80 years and older and accompanied by increases in the prevalence of age-related disorders as well. For example, the prevalence of Alzheimer's disease worldwide was about 26 million in 2006 and is expected to quadruple to more than 106 million by 2050.

Public health perspectives aside, people do not want to simply live longer; they want to age successfully and remain physically and mentally active in their later years. Improving the quality of life in our later years must start by understanding when and how functional declines of the central nervous system occur. Major advances in our understanding of brain aging and, in particular, the distinction between normal and pathological aging are therefore required before suitable preventive and curative strategies can be developed. In this volume we present the current state of research findings related to healthy brain and cognitive aging by integrating contributions from leading authorities on human clinical studies and translational research in animal models. The goals of such cross-disciplinary coverage are to lessen compartmentalization within one's own discipline, encourage communication across basic and clinical science areas, generate seed-beds of hypothesis generation, and ultimately maximize the potential for seamless translation of discoveries to clinical application.

In the opening chapter of this volume, Drs. Hayden and Welsh-Bohmer provide an overview of the determinants of cognitive aging and dementia. Their epidemiologic study and analysis is followed by several chapters describing age-related

¹ World Health Organization, http://www.who.int/whr/1998/media_centre/50facts/en/.

changes in cognition and emotion. Dr. Depp and colleagues review the definition and biological, psychological, and environmental determinants of successful cognitive aging while Drs. Kaszniak and Menchola provide a comprehensive overview of the behavioral neuroscience of emotion and creativity in human aging. Dr. Marighetto and colleagues critically discuss the preclinical studies examining the impact of aging on memory systems and how they can be translated to humans.

Three subsequent chapters then explore changes in the brain that accompany normal aging. Dr. Guidotti-Breting and colleagues give a thorough overview of advances in our understanding of normal aging achieved through the use of functional neuroimaging as well as important avenues for future research while Drs. Woodard and Sugarman offer insights into how such functional neuroimaging techniques can allow for the differentiation between normal aging and dementia and help predict cognitive decline. Then, Drs. Juraska and Lowry provide a detailed analysis of the neuroanatomical changes in the brain associated with age-related cognitive decline at the level of neuronal loss, white matter and synaptic changes, by integrating data from neuroimaging and stereological studies in human, nonhuman primates and rodents. They conclude by examining whether the course of neuroanatomical aging can be altered by hormone replacement in females. In the next chapter, Dr. Boulware and colleagues review studies in the same species that examine the effects of reproductive aging and hormone replacement on cognitive functions mediated by the hippocampus and prefrontal cortex.

The next series of chapters cover medical and psychiatric conditions that can negatively impact cognition in late life. This section starts with Dr. Salmon's examination of Mild Cognitive Impairment, a clinical condition characterized by significant cognitive impairment in the absence of dementia, but which frequently progresses to dementia. Then, Dr. Seidel and colleagues and Dr. Wijeratne, and colleagues highlight how functional consequences of cerebrovascular changes or psychiatric conditions in older adults exacerbate cognitive decline, respectively.

The closing chapters of this volume are devoted to an exploration of strategies to diminish and delay age-related cognitive declines, both pharmacologically and non-pharmacologically. Dr. Jak provides a critical summary of the ever-growing body of research focusing on participation in physical and cognitive activities among older adults and their impact on cognition, the brain, and cognitive aging outcomes. Drs. Redolat and Mesa-Gresa critically discuss preclinical work addressing the potential impact of physical exercise on cognition in aged rodents. Then, Dr. Kinsley and colleagues provide an overview of how reproductive experience delays the aging process in rats. Finally, Dr. Corey-Bloom presents an overview of the clinical trials for mild cognitive impairment, their limitations as well as the potential strategies for overcoming the identified problems in future trials.

This volume provides topics that will be useful to researchers, clinicians and students interested in the current knowledge and research challenges in neurobiological perspectives in aging as well as future research directions in aging research.

Reference

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