The Neuroscience of Addiction

This book addresses a growing need for accessible information on the neuroscience of addiction. In the past decade, neuroscientific research has greatly advanced our understanding of the brain mechanisms of addiction; however, this information remains largely confined to scientific outlets. As legislation continues to evolve and the stigma surrounding addiction persists, new findings on the impact of substances on the brain are an important public health issue. Francesca Mapua Filbey gives readers an overview of research on addiction including classic theories as well as current neuroscientific studies. A variety of textual supports – including a glossary, learning objectives and review questions – help students better reinforce their reading and make the text a ready-made complement to undergraduate and graduate courses on addiction.

Francesca Mapua Filbey is a Professor of Cognition and Neuroscience and Bert Moore Endowed Chair of BrainHealth for the School of Behavioral and Brain Sciences at the University of Texas at Dallas. She conducts research aimed at understanding the biobehavioral mechanisms of addictive disorders for the improvement of early detection and intervention.

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Developed in response to a growing need to make neuroscience accessible to students and other non-specialist readers, the *Cambridge Fundamentals of Neuroscience in Psychology* series provides brief introductions to key areas of neuroscience research across major domains of psychology. Written by experts in cognitive, social, affective, developmental, clinical and applied neuroscience, these books will serve as ideal primers for students and other readers seeking an entry point to the challenging world of neuroscience.

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Francesca Mapua Filbey

University of Texas at Dallas

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To David: thank you for your love and support. To Colin: thank you for nourishing my mind. To Alastair: thank you for nourishing my spirit. To Juan and Georgina Mapua: thank you for always believing in me. To Felipe and Emerita Canlas: thank you for being my example of dedication.

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Preface

The concerted effort by the US government to determine underlying brain mechanisms for diseases during the "Decade of the Brain" in the 1990s has led to greater attention on the role of the brain in addiction. Neuroscience research has made significant progress toward our understanding of the antecedents as well as the consequences of addiction, which, in turn, has helped de-stigmatize addiction and get help to those who need it. However, to date, this information remains largely confined to scientific outlets resulting in a lag in dissemination to students and the general community. This may contribute to the lack of emphasis on addiction in most training programs, including clinical programs, despite the prevalence of addiction and its high co-morbidity with other diseases and disorders. The need for this book is further highlighted by the recent public health issues surrounding two substances: cannabis and opioids. Hence, there is a growing need for accessible information on the neuroscience of addiction that caters to both students and the general public.

Approach

This book has been written to fill a void in the areas of behavioral neuroscience and neuropsychopharmacology. To date, the single most relevant textbook on this topic is one focused on the use of neuroimaging tools to study addiction, rather than to explain it. It is also written for a scientific audience, not undergraduate students or lay people. As scientific inquiry and public interest in the addicted brain have grown, so too has the need for a comprehensive and accessible textbook that communicates extant neuroscience research on this topic. This book will serve as an educational tool for neuroscience and pre-med students and trainees at all levels. Undergraduate students in upper-division courses, graduate students and educated lay people are the target audience for this book. It is written at a level appropriate for individuals with minimal to no background in neuroscience so as to be accessible for scientists in other disciplines, including public policy, public health and developmental psychology, with interest in the adolescent brain. This book can serve as a supplemental textbook in upper-level college/university courses such as Brain and Behavior, Psychopharmacology, Neuropsychology, Behavioral Neuroscience and as a trade book for educated lay people

(as it has been written in an accessible style), and/or as a main textbook in a college/university course or seminar at the advanced undergraduate level or the graduate level (along with supplemental scientific articles). It is written in language that is accessible to students, non-specialists and educated lay people alike.

This book is included in the *Cambridge Fundamentals of Neuroscience in Psychology* series published by Cambridge University Press. The goal of this series is to introduce readers to the use of neuroscience methods and research to inform psychological questions.

Coverage and Organization

This book has been written and organized to cover the neuroscientific research that supports the most widely reported stages of addiction. I wrote the first three chapters to lay the groundwork for the more in-depth topics covered in the later chapters. The introductory chapter serves to provide a general foundation for the clinical and behavioral features of addiction. This is followed by a chapter that then describes the approaches used by neuroscience research, which are also consequently referred to throughout the rest of the book. This chapter, then, should provide a very basic familiarity with current scientific techniques as used to study addiction. The last of the foundational chapters describes the various theories that stimulate the investigative research described in subsequent chapters. The goal of these foundational chapters is to broadly set out the current thinking in the field as well as provide the necessary background knowledge to be able to integrate information from the subsequent chapters.

The later chapters starting with Chapter 4 each focus on the important constructs related to addiction and are organized to follow a somewhat ecological order of the progression of addiction stemming from acute intoxication and rewarding effects of substance use to withdrawal symptoms and addiction interventions. These chapters cover the basic research that supports the understanding of these constructs as well as issues related to the understanding of these constructs.

The concluding chapter discusses auxiliary topics relevant to these processes such as individual variability. It then provides a cohesive overview of the neuroscience of addiction zeitgeist.

Features

Each chapter contains comprehensive figures that best illustrate concepts or challenging topics. Each figure is referred to in the

corresponding text. Summary Points are provided at the end each chapter to help focus the reader on the most important points and to reinforce the gist of each chapter. Review Questions are also provided to challenge the reader's understanding of each chapter. These questions are related to the important points of the chapter. The chapters also have a Further Reading section that directs readers to supplemental materials that could facilitate further learning. The Spotlight sections take current issues and integrate these timely topics with constructs from the chapter. These spotlights help put constructs into a real-world perspective that is aimed to stimulate critical thinking in readers.