The Cambridge Handbook of Substance and Behavioral Addictions

Written by leaders in the addictions field, 100 authors from six countries, this handbook offers a guide to the breadth and depth of addiction processes. Through a detailed explanation of appetitive motivation, incentive sensitization, reward deficiency, and behavioral economics, it provides readers with the necessary conceptual underpinnings to fully grasp this area. Both clinical and research methods are clearly mapped out alongside an outline of their strengths and weaknesses, giving the reader the tools needed to help guide their research and practice aims. The etiology of addiction at various levels of analysis is discussed, including neurobiology, cognition, culture, and environment, which simultaneously lays out the foundations and high-level discourse to serve both novice and expert researchers and clinicians. The volume also explores the prevention and treatment of addictions including alcohol, tobacco, other drugs, food, gambling, sex, work, shopping, the internet, and several seldom-investigated behaviors (e.g., love, tanning, exercise). This practical advice is accompanied with suggestions for future research.

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The Cambridge Handbook of Substance and Behavioral Addictions

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CAMBRIDGE UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

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www.cambridge.org
Information on this title: www.cambridge.org/9781108427166
DOI: 10.1017/9781108632591

First published 2020

Printed in the United Kingdom by TJ International Ltd, Padstow Cornwall

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging-in-Publication Data
Names: Sussman, Steven Yale, editor.
Title: The Cambridge handbook of substance and behavioral addictions / edited by Steve Sussman, University of Southern California.
Description: Cambridge, United Kingdom ; New York, NY : Cambridge University Press, 2020. | Series: Cambridge handbooks in psychology | Includes bibliographical references and index.
Identifiers: LCCN 2020009197 (print) | LCCN 2020009198 (ebook) | ISBN 9781108427166 (hardback) | ISBN 9781108447850 (paperback) | ISBN 9781108632591 (epub)
Subjects: LCSH: Substance abuse. | Substance abuse–Treatment. | Substance abuse–Psychological aspects. | Compulsive behavior.
Classification: LCC RC564 .C29 2020 (print) | LCC RC564 (ebook) | DDC 362.29–dc23
LC record available at https://lccn.loc.gov/2020009197
LC ebook record available at https://lccn.loc.gov/2020009198

ISBN 978-1-108-42716-6 Hardback
ISBN 978-1-108-44785-0 Paperback

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Foreword

What are the Boundaries of Addictions?

Wilson M. Compton, MD, MPE, and Carlos Blanco, MD, PhD

In addition to substances, a large variety of inherently rewarding behaviors can produce a syndrome with the features of addiction, including severe impairments and consequences, loss of control over the behavior, and excessive salience of the behavior. Individuals who engage in those inherently rewarding behaviors have availed themselves of numerous mutual support programs (twelve-step and others) to ameliorate their symptoms, not only for substance problems but also for nonsubstance issues (Sussman, 2017), suggesting the severity of impairments that persons with nonsubstance addictive syndromes may experience. Furthermore, publication of the DSM-5 (APA, 2013; Hasin et al., 2013) has rekindled interest in defining what an addictive disorder truly is. However, the precise nature of addictive disorders cannot be always exactly delineated, and official nomenclatures only cover a few of the possible behaviors that clinicians and the overall population may consider an addictive disorder in need of prevention or treatment (APA, 2013; Blanco et al., 2008; WHO, 2018).

The boundaries for addictive disorders have been a source of clinical and research inquiry and uncertainty for decades, and the nature of these boundaries exists across a number of dimensions. One source of uncertainty rests within each particular condition. For instance, within each substance addiction, the boundaries between minimal use, misuse, heavy use, problematic use, and addiction are fuzzy. Most research suggests that the disorders exist along a continuum (much like blood pressure) but whether this includes frequency of use of a substance in addition to the number and intensity of symptoms of addiction has remained uncertain (Compton et al., 2009; Dawson, Compton & Grant, 2010; Saha et al., 2010). This same issue may apply to nonsubstance addictive behaviors.

A second area of uncertainty is whether the substance-related disorders are truly separate disorders or represent the expression of an underlying general propensity. Genetic epidemiology research on this question suggests both pathways are found – genetic factors that relate to a general "substance use disorder" propensity as well as genetic risk for specific disorders (Kendler et al., 2003; Tsuang et al., 1998), with additional work suggesting that genetic risks may be distinguished for licit versus illicit substances (Kendler, Myers & Prescott, 2007). Finding an even broader general factor, genetic epidemiology research also suggests an "externalizing spectrum" of disorders (with an underlying antisocial behavior latent trait) that may include substance use addictions and multiple nonsubstance-related disorders (e.g., Krueger et al., 2005; Witkiewitz et al., 2013).

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The third, related, area of uncertainty is whether similar appearing behaviors related to nonsubstance activities are part of a single addictive phenotype. That is, whether other behaviors that share similar symptoms as the substance addictions are part of a single underlying "addiction phenotype" or represent distinct entities. Certainly, individuals struggle to cope with a broad range of compulsive behaviors that share many features with substance addictions. However, are they components of a single dimension, multiple separate dimensions, or some hybrid of these two possibilities? Just as differences and similarities of substance addictions can be studied, research can be used to explore the unique and shared features of substance and nonsubstance addiction phenotypes.

This new *Handbook* explores these important topics in depth and provides an innovative focus on both substance and nonsubstance addictions. Authors include the leaders in the behavioral addiction arena who provide a summary of the breadth of potential behaviors that may be part of the overall addiction phenotype, and explore both the common and unique features of these behaviors. By bringing together this information across a broad range of conditions, this unique *Handbook* provides a wealth of source material to help shape the field of addiction science.

Overall, evidence (including much of the work included in this *Handbook*) suggests considerable, though incomplete, overlap among the substance and nonsubstance conditions. Symptoms of nonsubstance behaviors have been associated with other findings expected to precede, cooccur with, or be the consequences of, an addictive disorder, and the existence of multiple antecedent, concurrent, and consequent correlates supports the validity of behavioral addictions as both related and distinct entities (Franco et al., 2019). That is, for most, but not all, the patterns of risk factors, comorbidity, and outcomes indicate both shared and unique features.

For example, evidence for being part of a common addictive phenotype varies by behavior. The evidence is compelling for gambling disorder, but less so for others. For conditions such as obesity and obsessive–compulsive disorder (OCD), even with repetitive behaviors involved, the link to addictive disorders is much less clear. Gambling disorder (or addiction) shares many risk factors, overlaps extensively in patterns of comorbidity, and shares phenotypic symptom expression with substance addictions. By contrast, overeating, obesity, and substance use addictions appear to share many phenotypic characteristics and underlying neurocircuitry (Volkow et al., 2013) but overlap little in terms of comorbidity (Pickering et al., 2007) and obesity does not appear to fit well in an addictive latent factor (Blanco et al., 2015). In addition, it has been shown that substance addictions share some features with OCD, particularly repetitive, poorly controlled, stereotyped behaviors, which may be mediated by a shared, underlying compulsivity factor (Figee et al., 2016). In addition, negative reinforcement is important in

OCD and may play a key role in later stages of addiction (Koob, 2015). Yet, a key distinction between OCD and addictive disorders is that, while performing the rituals may help relieve distress and thus generate negative reinforcement, OCD does not have the positive reward inherent in the onset of addictive disorders. Such overlaps and differences within overall similarly expressed behaviors are a stark reminder that the boundaries between substance and nonsubstance addictions (and with nonaddictive disorders) need additional research.

What are the implications of this *Handbook*? Most obviously, there are consistent patterns that many practitioners and the public label as "addictions." Such terminology may support treatment-seeking by those who seek relief from distress and dysfunction. Further, even when such terminology does not fully represent the underlying etiology adequately, it may allow for development of interventions and policies that improve patient outcomes and overall public health.

In addition, phenotypic heterogeneity, both within a single behavioral addiction subtype and across different addictions, indicates the involvement of more than one neurobiological pathway for all of these conditions, with multiple causes of the dysfunctions that underlie symptoms. For example, genetic predisposition, childhood maltreatment, or recent stressful events alone or in combination can all affect executive function (Blanco, Compton & Lopez, 2018). Disturbances in executive function can be important in the etiology of multiple addiction phenotypes, and possible integrative models have been proposed (e.g., Blanco et al., 2014; Sussman, 2017). However, a mechanistic understanding is needed of the interplay of risk factors within an individual that may lead to the development of disturbances in executive function (and a likely complex extension to addictive disorders and psychiatric disorders more generally). Such research on these and other neurobiologicial pathways may inform "precision epidemiology," as part of the future of precision medicine and precision public health, thus guiding prevention at the individual and community level (Blanco et al., 2016, 2018; Clayton & Collins, 2014; Collins & Varmus, 2015; Desmond-Hellman, 2016; Kendler, Gardner & Prescott, 2006).

To address these complex issues, integrated science across disciplines is needed. For instance, although epidemiology and neuroscience are often viewed as separate disciplines, there is a growing consensus for the need to better integrate these disciplines. Neuroscience can help uncover the mechanisms underlying population-based findings, whereas epidemiological methods, including use of representative samples, can help generalize the insights generated by neuroscience. In addition, large-scale longitudinal studies would benefit from including information from additional sources, such as use of healthcare services (e.g., prescription information). The ability to combine high-quality diagnostic data (and possibly environmental and biological variables) with service outcomes would generate unprecedented opportunities to advance research and practice. One key example of this type of research is the Adolescent Brain Cognitive Development (ABCD) study (Lisdahl et al., 2018). This landmark project has successfully completed baseline neuropsychiatric, developmental, and neuroimaging assessments of 11,875 children aged nine to ten. The study is currently conducting follow up of these youth and their families with plans to evaluate them repeatedly over the ensuing decade to examine trajectories of normal and pathological conditions (Casey et al., 2018). As such, the ABCD study is poised to address just the sort of questions that remain about the development and overlap of substance and nonsubstance addictions.

A complex but important topic will be the conceptualization of the comorbidity of behavioral addictions (with substance addictions and other psychiatric disorders) and the implications for understanding causal mechanisms, measurement, and treatment. Research is also needed to link epidemiological findings to clinical and basic neuroscience. Are the brain pathways associated with different diagnostic criteria the same in behavioral addictions as in substance addictions? Such work will help to determine the overall validity and significance of behavioral addictions.

As we continue to delineate different levels of description and explanation of what a substance use disorder or (more broadly) an addictive disorder is, there are exciting opportunities for nosological research, precision epidemiology, neurobiology, and intervention development. Iteratively answering those questions should help advance science and, more importantly, improve the health of individuals with a variety of addictive phenotypes.

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Preface

The testimonials of countless persons attest to the existence of any number of behaviors that manifest themselves addictively, begetting numerous twelve-step programs and mutual support chatrooms (Sussman, 2017). Conversely, research in its cautious tone, acknowledges the likely existence of a variety of substance and behavioral addictions – but does not yet officially confirm their existence except for gambling (APA, 2013) and, very recently, online and offline gaming disorder (WHO, 2018). Official recognition is derived from the consensus of individuals, who agree or disagree for any number of reasons to include use of a substance or excessive engagement in a behavior as being an addiction.

There are several barriers to achieving a comprehensive understanding of the breadth of addictive behaviors. First, consensus on what is an addiction is not established across all decision makers, and some behaviors have been referred to as impulse control disorders instead of or prior to later being identified as an addiction (e.g., with problem gambling). Also, there may be disagreement regarding the importance of suffering negative consequences for an addiction to be considered in existence (the "positive" addiction). However, this *Handbook* takes the stance that extensive involvement in an activity that causes no problems might be better considered a "passion" rather than an addiction. Arguably, there are common features which may reflect a general understanding of addiction. These features include some type of neurobiological effect reflecting recurrent involvement with a behavior (perhaps subjectively experienced as improved affect, arousal, or cognition), followed by preoccupation with the addictive behavior, loss of control, and experience of undesired, negative consequences (see Sussman & Pakdaman, 2020). The World Health Organization includes these features explicitly in its current definition (WHO, 2018).

Second, given that there is reasonable consensus on what defines an "addiction," some researchers have set up research demands that many addictive behaviors do not yet meet. For example, some professionals desire that there be well-defined criteria specific to an addiction that have been studied in general population samples, along with neurobiological evidence, that the addictive behavior exists – beyond the subjective reports of the sufferer (Sussman, 2017). Some researchers desire that behavioral addictions should emulate drug addictions in topography and neurobiological responses. Some researchers wonder whether some behaviors are impulsive or compulsive disorders rather than addictions (see Blum & Grant, 2020). When one considers the current status of neurobiological knowledge (or lack thereof) regarding even currently recognized addictions (see Burger, Shearrer & Sadler, 2020; Christie & Bechara, 2020; Vaccaro & Potenza, 2020), one may begin to assert that subjective experience and common criteria are the best sources of information available – which do permit examination of addictions as a quantitative phenomenon that can apply to many types of behavior.

Finally, there are practical concerns. Some professionals take a rather skeptical stance and warn that admitting the existence of any number of addictive behaviors would lead to the drying up of precious insurance coverage. So, an addiction arguably may need to demonstrate excessive costs to self and others prior to being labeled as a problematic or "true" addiction. Several addictions that might cause problems to self may not cause tremendous social problems, such as work, shopping, or exercise addictions – although at the extremes anything is possible. For example, consider the social costs incurred by that shopaholic who experiences incredible debt within a family or steals from the workplace to pay off loans.

There is a shallow quality to a conceptual understanding of addictions when one takes a focus on substances, though substance addictions do tend to harm self and others quite unambiguously with recurrent engagement. Unfortunately, substance addictions may get confounded with physiological tolerance and withdrawal which, for many persons, is irritating but not a life-long difficulty. For example, someone taking medication as prescribed may find themselves suffering from withdrawal symptoms when they stop taking the medication. Even though they suffer withdrawal symptoms, it does not well-describe the loss of control or preoccupation aspects of addiction – it is just a painful inconvenience until the (nonvulnerable) person can get through a neurobiological readjustment. Only some people may find it practically impossible to quit substance use, or some other addictive behavior, suggesting that vulnerability, along with living in difficult life contexts, plays a role (e.g., see Blum et al., 2020; Sussman & Pakdaman, 2020).

While perhaps not having a substance addiction problem, there are persons that cause havoc to themselves and families through participation in gambling, gaming, or other behavior addictions. There is no physiological withdrawal due to the intake of exogenous ligands (drugs), though endogenous ligand turnover (naturally occurring neurotransmission) may indeed have become dependent on participation in these behaviors (Sussman, 2017). That is, one's neurobiology is flexible; it "learns" to respond and adapt to behavioral signals. Humans think, and associational memory may impact one in all sorts of ways, including the creation of behavioral addictions (see Stacy, Pike & Lee, 2020). It is reasonable to assert that there are many types of behaviors that can become addictive. It is most feasible that addiction is a problem of life-style and associational memory, which interface with neurobiological processes associated with obtaining appetitive effects. That is, addiction probably reflects an appetitive motivation neurobiological system gone awry; may be recurrent or periodic; may be severe or not; may appear normative or deviant; and is likely to be very distressful only at some point (Sussman, Rozgonjuk & Eijnden, 2017).

This *Handbook*

The purpose of this thirty-four-chapter volume is to summarize and advance work on substance and behavioral addictions as described in

multiple disciplines including psychology, sociology, social work, ecology, economics, preventive medicine, neurobiology, neuroscience, law, philosophy, and psychiatry. This text will be a rather useful resource that can assist in graduate-level teaching, research, prevention, and treatment of the addictions broadly defined. There are no handbooks of this scope and length in existence on the topic. Given the fact that addictions broadly defined is a rapidly growing research arena, the time is ripe for such a novel work.

This edited text is designed primarily for graduate students, researchers, and practitioners interested in the breadth and depth of addiction processes to better understand conceptual underpinnings, etiology, prevention, and treatment. Courses might include those for chemical dependence counselors in advanced training, health promotion, health education, health behavior research, public health, social work, and health psychology. It is being written at a level that anyone who has completed college general education requirements might be able to appreciate the text. Still, those with an advanced education may be better able to appreciate several concepts presented (e.g., aspects of neurotransmission, appetitive effects, behavioral economics theorems). The text presents multiple addictions, several of which are not currently recognized as such by the DSM-5 (due to need for additional research support, though acknowledged as potential addictions). The reach of this text is to multiple addictions. We consider eleven focal addictions (Sussman 2017): tobacco, alcohol, other drugs, food, gambling, internet [gaming], love, sex, exercise, shopping, and workaholism. Tanning was added as a twelfth type (see Miller & Mays, 2020).

Each of the thirty-four chapters provides an overview of the topic, citing the most current and credible research. These chapters are grouped within five parts (sections). Part I of the *Handbook* grapples with concepts of addiction in four chapters, being careful to encompass both substance (drugs, food) and behavioral addictions. Three of among the most impactful models of addiction are presented, including a general appetitive needs framework, behavioral economics, and sensitization of incentive salience. Finally, a presentation of philosophical issues in the addictions is presented, to help guide future conceptualizations or integrations of concepts.

Part II of the *Handbook* presents five chapters on clinical and research methods used to tap addictions. These include human neuroimaging, human laboratory paradigms, behavioral economics assessment, clinical assessment instruments, and qualitative assessment of addiction.

Part III of the *Handbook* explores the etiology of the addictions at various levels of analysis. These five chapters examine neurobiology of substance addictions, neurobiology of behavioral addictions, multiple memory systems and addiction, cultural influences on behavioral addictions, and the built environment and policy factors that place persons at risk for addiction.

Part IV of the *Handbook* explores prevention and treatment of the addictions. Separate chapters exist for the prevention and treatment of drug addictions, because much more research has been completed on these. The nine chapters in this section examine the prevention and treatment of: alcohol, tobacco, and other drugs (ATOD) [as two chapters], food addiction, gambling disorders, sex addiction, love addiction, shopping addiction, work addiction, and internet addiction and gaming disorder.

Finally, Part V of the *Handbook* explores ongoing and future research directions. Eleven chapters are in this section. The first chapter in this section (Chapter 24) discusses Precision Behavioral Management techniques to alter dopaminergic function and lessen the vulnerability to addiction, with relevance to the opiate crisis. The next chapter presents novel psychoactive substances and implications for prevention and treatment. This is followed by a chapter on the assessment and treatment of impaired professionals. Chapter 27 is on feedback models to assist in gambling control. The debate on food versus eating addictions is presented in Chapter 28. Next, the measurement, prevention, and treatment of exercise addiction is presented, with a lens on future research directions. Then, tanning addiction is presented as Chapter 30. It oftentimes is not treated as a focal addiction, but its prevalence is surprisingly high. The debate on the overlap among compulsions, impulsions, and addiction composes Chapter 31. Next, emotion-related therapy is discussed for its implications for the remediation of addictive disorders. Chapter 33 discusses the use of mindfulness in prevention and treatment of the addictions. The final chapter explores ethical and legal issues in addiction research and practice.

This text provides a rather comprehensive and novel presentation and should help spur on research and practice in new directions. It is hoped that this *Handbook* will catapult the arena of substance and behavioral addictions.

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Acknowledgements

I would like to thank Steven Acera and Emily Watton of Cambridge University Press, and Beverley Lawrence, for helping me bring this text to print. Their editorial efforts and support are greatly appreciated. I would also like to thank Ellen Galstyan, Leah Meza, and Sheila Pakdaman for their administrative assistance. I would also like to thank the ninety-nine coauthors of this *Handbook* that created this cohesive and comprehensive volume. We all hope that this text will help boost an understanding of the depth and breadth of addiction, assert for new research directions, and provide solutions within the arena. Finally, I thank Rotchana, Tina, Evelyn, Evan, and Max for their collective family support that helped balance out the bad days and charge up the good days.