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## BOOK REVIEWS

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Nancy M. Petry

***Pathological gambling: Etiology, comorbidity, and treatment***

American Psychological Association, Washington, DC, 2006, x + 417 pp.

ISBN 1-59147-173-7

*Pathological gambling: Etiology, comorbidity, and treatment* is the latest book of Nancy M. Petry, PhD, internationally respected expert of chemical and behavioral addictive disorders. She is working at the University of Connecticut Health Center and holding Principal Investigator position of the National Institute on Drug Abuse funded REWARD Center in Contingency Management Treatment. Dr. Petry is also the Director of the Gambling Treatment Research Center. She developed a lower cost prize contingency management treatment approach, and she also has developed and evaluated psychotherapies for the treatment of problem and pathological gambling (UCHC, n.d.). The latter method has been described in the presented book in details.

In *Pathological gambling* Petry summarizes our psychological knowledge on the worldwide spreading phenomenon of disordered gambling behavior. In the recent few years, systematic, theoretical and empirical efforts have been made to conceptualise pathological gambling, this emerging field of scientific study. It is worthy of note that despite the presence of gambling in human societies since prerecorded times, it has been brought into scientific focus only a few decades ago. Petry emphasizes the limits of our current understanding, avoiding to give the false impression that empirical data on gambling can be considered conclusive. On the contrary, she highlights the need for further pieces of research on the academic and on the clinical field as well. Her book gives rise to the feeling that we gain scientific insight into a domain shaping and developing before our eyes. On the one hand *Pathological gambling* can serve as a guide for clinicians dealing with people with gambling problems. On the other hand this book is an exhaustive summary of scientific outcomes, serving an excellent resource of data for researchers. The partitioning of the book follows this two-aspect approach: “Foundations for understanding” and “Etiology” sections presents prevalence data, assessment tools, risk factors, comorbidity and neurobiological accounts for the disorder. The second part contains the following sessions: “Research on interventions”; “A treatment model”; and “Conclusions” which focuses on different treatment strategies and their efficacy. Hereinafter, I review these sections and chapters one by one.

Following a brief historical synopsis, Petry discusses varieties of terminology. To overcome the controversies she applies uniformly a level terminology throughout the book. Level 0 gambling refers to individuals who have never gambled. Level 1 means social or recreational gambling which does not result in significant difficulties. Problems come up in Level 2 gambling (some authors characterize this gambling pattern as at-risk or problem gambling). Level 3 (a.k.a. compulsive or pathological) gambling is associated with severe consequences. Presenting prevalence data, Petry fo-

cuses primarily on the studies conducted in North America, however, there are also some findings from other countries. Lifetime prevalence for Level 2 gambling found to be 2.3% and 0.8% for Level 3 gambling in a North American meta-analysis (Shaffer, Hall & Vander Bilt, 1997). Prevalence rates are higher among adolescents and substance users which indicate the importance of prevention and routine screening for gambling problems among adolescents and substance users, respectively.

Petry dedicates a chapter to the review of available assessment tools. At the present state of research and treatment we do not have a widely accepted and exclusively used instrument. Nevertheless, there are a variety of instruments for screening and for evaluation of clinical outcomes. Petry provides detailed information about the most popular instruments – including the SOGS, the DIGS, the NODS, the GAMTOMS, the PG-YBOCS and the CGI among others – always underlining the advantages and disadvantages of each tool. This section along with prevalence chapter is an extremely useful material for research purposes.

In the section of “Etiology” demographic correlates, comorbidity, neurobiological and genetic background of the disorder are discussed. Petry concluded that taking all available data into account, earlier onset of gambling, male gender, ethnic minority membership, lower SES, divorce and separation are associated with more severe gambling problems. She draws our attention to the need for reaching at-risk populations effectively and, to adapt or tailor treatments to better suit the needs of different types of gamblers. From a treatment perspective it is important to note that Axis I and II psychiatric disorders often co-occur with pathological gambling thus, secondary disorder may require specialized intervention. Substance use disorders are the far more frequent comorbid states among pathological gamblers. Our knowledge is limited in point of co-occurrence of disordered gambling and mood disorders, personality disorders, obsessive-compulsive disorders and impulsivity. Some authors (e.g. Hollander, 1993) suggested an obsessive-compulsive spectrum of disorders. In this theory, OCD stands on the compulsive and antisocial personality disorder on the impulsive end of the continuum. Therefore underlying traits of compulsivity and impulsivity are also important to investigate among gamblers. There is data implying that different subtypes of gamblers exist, expressing different levels of antisocial traits and emotional problems (see Milosevic & Ledgerwood, 2010 for a review).

In the last chapter of the first part of the book the author delineates the current state of research on neurobiology and genetics. Data suggest a familial component of pathological gambling, which is at least partially genetically transmitted. Serotonine, norepinephire, dopamine and opioid systems

are assumed to play a role in the pathogenesis. Molecular genetic research is in its infancy yet regarding gambling. We still need more research to better understand the impact of pharmacotherapies. Remarkable development can be expected in the following years on this domain.

From the third section Petry begins to deal with the available interventions. As a continuation to the neurobiology chapter she reviews the outcomes of pharmacotherapies – SSRIs, mood stabilizers and opioid antagonists. Comorbid disorders can determine adequate medication, since no pharmacotherapies has received approval from the Food and Drug Administration for the treatment of pathological gambling. Petry also remarks that “to date, only drug use disorders with substantial physiological dependence (...) have been managed by pharmacotherapy. (...) The most fruitful area for investigating pharmacotherapy for pathological gamblers may be related to management of concomitant psychological symptoms (...)” (p. 150).

Compared to pharmacotherapies we have more extensive data on recovery without professional intervention. 36%–46% of Level 3 gamblers and 32%–46% of Level 2 gamblers can be considered recovered gamblers, and few Level 2–3 gamblers ever seek or receive treatment. (One has to keep this finding in mind when considering studies conducted on solely treatment-seeking gamblers!) Gamblers Anonymous is the most popular treatment (at least in North America) among gamblers who seek help. Preliminary findings suggest that GA attendance is associated with improved outcomes. Nevertheless, only a low percentage of participants engage themselves in the 12-step program. Pathological gambling is a disorder which entails notable emotional and financial burden not only on the gambler but also on his/her significant others (spouses, family and children). We can only support Petry in encouraging better-controlled research on family and couples therapy for pathological gambling.

In chapter 10, 11 and 12 Petry reviews professional treatment methods in chronological order. *Psychoanalytic and psychodynamic approaches* focuses on early life experiences (the concept of trauma has also arisen in connection with gambling) as well as different conscious and more importantly, non-conscious aspects of patient-therapist relationship. Psychoanalytic approach lacks systematic research and no studies have examined its efficacy. Experimental examination of the features of reinforcement and behavior costs came to the front as *behaviorist approach* gathered ground. Not only human subjects but also animals in operant conditional situation show an elevated response rate and long-term maintenance of behavior if a) initial response cost is low; b) reinforcement magnitude varies; c) reinforcement arrives immediately and d) due to a variable ratio schedule. Nowadays not many therapists use solely behavioral treatment.

The *cognitive revolution* of psychology centered beliefs and cognitive biases in the explanation of different psychological disorders. Petry describes several cognitive distortions, errors in judgments, erroneous beliefs and heuristics which can lead to errors in forecasting probabilistic events. The illusion of control, the gambler’s fallacy (the belief that a series of losses signals a forthcoming win), the availability illusion and illusory correlation characterizes the non-gambler cognition to some extent as well. It is still debated if these biases are unique to pathological gambling and, whether cognitive therapy is able to modify them. The fourth section details a short-term *cognitive-behavioral treatment model* developed by Petry herself. This model was

used in “the largest known study of psychosocial treatments for pathological gambling (Petry, Stinson & Grant, 2005)” (p. 229) funded by the National Institute of Health. Petry’s model focuses on the reinforcement of non-gambling, achieved through an individualized self-rewarding system. Treatment comprises eight sessions. The first one is devoted to the identification of triggers and the development of an action plan for high-risk time periods. The gambler is expected to be an active agent in the treatment process so he/she has to complete homework exercises (e.g. monitoring his/her own daily gambling-triggers). The second session is about the functional analysis of gambling behavior. The counselor helps the gambler to split gambling episodes into trigger factors and positive and negative consequences. In the third session they identify pleasurable activities to substitute the time spent on gambling. The next session is about managing expected and unexpected triggers, and the fifth one assists to handle craving and urges by the help of relaxation. In the fifth session therapist introduces role-plays and practices I-statements for better handling of interpersonal conflicts which are inevitable between the gambler and his/her social milieu as the disorder becomes more severe. The goal of the seventh session is to understand cognitive biases. The last session is designed to “extend the time horizon”. The client and the therapist discuss several possible life events over the next 1–10 years and the way these events influence the client’s non-gambling. An additional session on managing finances and resolving financial problems can be added due to the fact that financial concerns after several years of gambling can be immense.

Appendices A, B and C contain materials for tracking progress, for setting up a self-reward system, handouts (e.g. pleasant activities checklist, functional analysis and assertive behavior) and homework exercises. Appendix D helps “Financial planning and handling creditors” with debt analysis, income inventory, expense record and debt management plan and with providing negotiation techniques with creditors.

The mainstay of Nancy M. Petry’s book resides in the detailed discussion of the author’s cognitive-behavioral treatment strategy. Case examples make the therapeutic progress tangible and vivid. Clinicians, counselors, helpline dispatchers, social workers, casino employees, family members and virtually everyone who gets in contact with a pathological gambler (moreover, gamblers themselves) can benefit from the methods of the model and from the Appendices’ strategies and materials. This chapter reveals how research relates to intervention. It sheds light on the way academic knowledge is being put into treatment strategies and vice versa, how the efficacy of interventions being scientifically evaluated.

The last section summarizes “Conclusions”. Petry emphasizes the need for further development of adolescent screening and diagnostic instruments, because lifetime prevalence rates are higher among youth and young adults (3%–12% for Level 2, and 2%–8% for Level 3 gambling) than rates found in adult samples. In the light of prevalence rates it is urgent to introduce efficient prevention strategies and screening for high-risk populations (e.g. substance user adolescents). Progression is also needed in the domain of treatment methods. The last paragraph draws attention to the high-priority gambling-related pending questions. Etiology, nosology, assessment, consequences and treatment have unanswered questions in store for the research workers laboring on the emerging field of pathological gambling.

Petry's comprehensive book serves as a helping hand on the bookshelves of clinicians as well as researchers dealing with disordered gamblers and pathological gambling. The book combines the critical summary of research data with the presentation of efficient, practical intervention strategies excellently. A "must-have" for everyone who deals with gamblers professionally or who researches gambling scientifically.

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**Marvin Zuckerman**  
*Sensation seeking and risky behavior*  
 American Psychological Association, Washington, DC, 2008, xix+309 pp.  
 ISBN 1-59147-738-7

The well-known researcher and author Marvin Zuckerman, PhD, is professor emeritus at University of Delaware. After receiving his PhD in psychology from New York University, Zuckerman worked as a clinical psychologist. His first research areas were personality assessment and sensory deprivation experiments. Zuckerman studied individual reactions to sensory deprivation from 1958 to 1968. This remarkable body of research became the basis of the sensation seeking theory. In 1969 he moved to the University of Delaware and devoted his full attention to the study of sensation seeking. His first book on the topic was published in 1979. Zuckerman's integrative, interdisciplinary interest in human psychobiology is noticeable in this book already. The second book (1994) illustrates the extensive applicability of the sensation seeking concept, from the explanation of sports, vocations, interpersonal relationships and psychopathology. Zuckerman also presents the constantly growing number of new biochemical and genetic accounts. He asserts that basic personality traits are rooted in genes and biological mechanisms, and expressed in ceaseless interaction with the environment. He worked on the exploration of the biological basis of personality with such luminaries as Hans Eysenck and Jeffrey Gray. Zuckerman's comprehensive book on the domain, *Psychobiology of Personality* was published in 1991.

The current book – *Sensation seeking and risky behavior* – is focused on the most salient phenomenal aspects; risky behavior. Risk-taking can be expressed through sports, vocations, sexual habits, using drugs or engaging in criminal activities. All these behaviors carry health-related, financial, legal, individual and social kickbacks on various levels. For example, substance abuse jeopardizes mainly the user's health, but driving under intoxication or violent felonies threatens other people's health and life as well.

Zuckerman emphasizes two important points in understanding sensation seeking and risk-taking. First, all of the discussed behaviors (risky driving, sport and vocations; substance use and abuse; sexual and, antisocial behaviors) are intercorrelated, which implies the existence of a general factor for risk sensitivity. Second, risk taking is not the essence of sensation seeking; it is only the price to pay for experienc-

ing novel, intense and exciting stimulation. High sensation seekers engage in risky activities not for the sake of the risk itself but, behaviors satisfying their need for varied, complex stimulation which often involves risk inherently. (Some types of activities sensation seekers like, do not involve risk-taking: listening to rock music, watching violent movies or travel to exotic places.) 'Sensation seeking is a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and willingness to take physical, social, legal, and financial risks for the sake of such experience' goes the definition (p. 49).

In the first chapter Zuckerman gives a brief summary of theoretical and empirical development of sensation seeking. This concept is one of the most fruitful ideas of modern psychology, inspiring hundreds of empirical studies, including genetic, psychophysiological, and biochemical research. Important to note, that heritability of sensation seeking is around 60%, which is relatively high for a personality trait; most range from 30% to 50%. Certain precursors of sensation seeking are traceable in non-human species (e.g. cats and rats) which also supports the biological and evolutionary basis of the trait. This link enables us to build animal models of particular traits, and find common biological markers and behaviors. An expressive example of this approach is the study of cortical evoked potentials, going back to the sixties. The P1-N1 components represent the first impact of visual stimuli on the cortex. Many individuals show augmenting reactions: amplitude of evoked potential heightens as stimulus intensity increases. However, contrary to expectations, another pattern can be found. In the case of a reduced number of individuals, the amplitude of evoked potential does not follow the stimulus intensity, or sometimes the amplitude decreases at the highest intensities. Not surprisingly high sensation seekers (disinhibitors) show the former, and low sensation seekers show the latter pattern. Most mammals show similar individual differences in attitudes toward novel, intense stimuli. Augmenting cats are more active, exploratory, less fearful and poorer in their inhibitory control.

Seeking for new, varied stimuli is a key factor of the success of our species. Sensation seeking stimulated the ap-

proach of the unknown, for instance, geographical discoveries and combat bravery. However in the current book Zuckerman focuses on everyday manifestations of sensation seeking: risky driving, substance use, risky sexual behavior and criminal activity. I think it is important to keep the dual nature of sensation seeking on mind. On the one hand, it fosters exploration, approaching behavior instead of withdrawal and anxiety. On the other hand, high levels of sensation seeking can be dangerous to the individual, embroiling him/her into behaviors characterized by the risk of punishment, injury or even death. Zuckerman offers a generalized model of the relationship between appraised risk and sensation seeking. According to the model, anxiety increases linearly as appraised risk increases. Positive emotion (sensation seeking) increases with novelty to an individual set point. Beyond this point, increase in novelty leads to negative motivational states. At a certain point where anxiety starts to dominate sensation seeking, approaching behavior turns to avoidance. We all differ in regard to the optimal level of novelty (appraised risk), and this difference is mirrored in the distribution of sensation seeking.

Theoretical background of sensation seeking has been developed parallel to the augmentation of empirical (biochemical) evidences and advances in personality psychology (mostly factoranalytic studies). Zuckerman's first model was based on the optimal level theories which imply that the nervous system has an optimal level of stimulation or arousal. Below this stimulation level boredom, beyond this level anxiety occurs. Sensory deprivation is an extreme situation of under-arousal. Zuckerman hypothesized that optimal level of stimulation is more elevated in high than in low sensation seekers, and started to translate theory into assessment. The continuous development of questionnaires leads to the currently used IV and V forms of the well-known Sensation Seeking Scale (SSS). Four subscales emerged from the factoranalytic studies: *Thrill and adventure seeking* (TAS) – the desire to participate in physical activities that provide unusual sensations (e.g. bungee jumping, mountain climbing). *Experience seeking* (ES) – the desire to seek new experiences through the mind, senses and through non-conform lifestyle. *Disinhibition* (Dis) – refers to a hedonistic lifestyle with “wild parties”, sexual variety and substance consumption. *Boredom susceptibility* (BS) – refers to the aversion to monotonous conditions and restlessness when confined with such conditions.

Zuckerman did not hold to an out of date theory, and he is always willing to refine the theory of sensation seeking in the light of new empirical evidences. This happened in 1979, when he realized that the optimal level theories (differences in reticular system activity) are insufficient, and proposed a new model (in 1984), based on the optimal catecholamine system activity. According to this subsequent model – supported by empirical evidences – in an unstimulated state, dopamine and norepinephrine levels are lower in high sensation seekers than in low sensation seekers, leading to an aversive state of boredom. Increase in catecholamine level moves the high sensation seeker closer to his optimal level (positive feeling, euphoria), while the same increase evoke negative feeling (anxiety, stress) among low sensation seekers. The theory incorporates the low MAO (monoamine oxidase) levels found in high sensation seekers.

Inspired by the works of Jeffrey Gray, further theoretical modifications took place in 1995. Zuckerman presented a biosocial-biochemical model, including factors of the Zuckerman–Kuhlman alternative big five model. This highly complex interactive model postulates that high sensation seeking (expressed by the Psychoticism–Impulsive Unsocialised Sensation Seeking factor) is a function of strong approach, weak inhibition and low arousal. Approach and inhibition are in a negative relationship, but arousal stimulates inhibition. Stimuli-reactive level of dopamine is positively associated with approach, serotonin with inhibition, and norepinephrine with arousal. Hormones, MAO, DBH (dopamine beta-hydroxylase), endorphins and GABA make the relationships even more complex. Approach correlates positively with the Extraversion–Sociability factor, and arousal with Neuroticism–Anxiety factor.

As I mentioned earlier, the first chapter of the book is an introduction into the theoretical and empirical basis of sensation seeking. Zuckerman reviews relevant psychophysiological, biochemical and genetic evidences in the light of the theory. Researchers will find the last part of the chapter very useful, where he gives a brief summary of available assessment instruments. The second chapter is devoted to the issue of risk: how risk appraisal predicts risky behavior, and what kind of differences can be found among high and low sensation seekers regarding the risk/benefit balance. The following four chapters are dealing with different manifestations of risky behaviors (risky driving, sports and vocations; substance use and abuse; sex; crime, antisocial behavior and delinquency) and the way these activities relate to sensation seeking. To sum up the results: high sensation seekers are prone to engage in all kinds of risky behaviors. Thanks to Zuckerman's incredibly wide and exhaustive literature review, even the slightest detail is being discussed, and many pending questions are raised. The 45 pages References section makes *Sensation seeking and risky behavior* an essential source-book for students and science workers.

The last chapter is about prevention and treatment programs. Personality characteristics are rarely being taken into account in the development and evaluation of such programs. As a result, the presented studies are less specific to sensation seeking than the studies presented in previous chapters. Zuckerman admits that “it is difficult to change a basic personality trait like sensation seeking; however, it is entirely possible to change the ways in which it is expressed (...)” (p. 203). In sight of the low effectiveness and/or short term efficacy of prevention programs Zuckerman concludes that the most reliable treatment that does change this trait is *age*. Therapists should tailor their interventions to the unique needs of their client to temper the possible negative consequences of high sensation seeking. This book is not primarily designed to help developing interventions, however, beside researchers, clinicians may also benefit from the wide and special knowledge gathered in this volume.

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G. J. Madden and W. K. Bickel (Eds.)

*Impulsivity: The behavioral and neurological science of discounting*  
 American Psychological Association, Washington, DC, 2010, 453 pp.  
 ISBN 9781433804779

Having obtained his Master's degree in Behaviour Analysis and his PhD in Psychology Gregory J. Madden is currently an Associate Professor in the Department of Psychology at Utah State University. His research topics range from free will to interventions designed to treat drug dependence. Dr. Madden is the author and co-author of a number of scientific papers and books in the field of delay discounting. Dr. Madden served as Associate Editor of the *Journal of the Experimental Analysis of Behaviour* from 2002–2008, and currently is the Editor-Elect of this journal (2011–2014).

Warren K. Bickel is Professor at the University of Arkansas for Medical Sciences (UAMS) in the College of Medicine and College of Public Health (COPH) and holds the Wilbur D. Mills Chair of Alcoholism and Drug Abuse Prevention. He serves as Director of the UAMS Centre for Addiction Research and as Director of COPH's Centre for the Study of Tobacco Addiction at UAMS. Dr. Bickel received his PhD. in developmental and child psychology. His recent research includes the application of behavioural economics to drug dependence with an emphasis on the discounting of the future and the use of information technologies to deliver science-based prevention and treatment. Dr. Bickel is the recipient of numerous awards and honours, including an award from the Division of Psychopharmacology and Substance Abuse of the American Psychological Association, and a NIH Merit Award from NIDA. He served as President of the Division of Psychopharmacology and Substance Abuse, American Psychological Association and as President of CPDD. Dr. Bickel was Editor of the journal, *Experimental and Clinical Psychopharmacology*.

“There seems to be a corollary of Murphy's Law that applies to human choice: Whenever there is a way to get a poorer deal to pay off faster than a better one, some people will fall for it, and some of those will become addicted to it.” (Ainslie, p. 389). Every day we make choices between a smaller, immediate reward and a larger but delayed reward. Should we pay in our retirement account or should we rather enjoy that money? Should we have another drink or two or we stop for now to save ourselves from hangover or alcohol problems? Shall we give up the comfort of a warm bath and shower instead to save water resources on a global level? Some people bring more impulsive (selfish?) decisions, others less. What does our decision depend on? Is it a trait or a state variable? How can we apply research findings to clinical care especially in addiction treatment? These are the questions *Impulsivity, the Behavioral and Neurological Science of Discounting* attempts to answer in a comprehensible yet scientific manner, creating a valuable source of information for individuals researching the field as well as those working in clinical care.

Delay discounting is the preference for smaller-immediate over larger-delayed rewards. Madden and Bickel argue that in fact impulsivity and delay discounting are the very same concepts. Since the publication of Mazur's paper in 1987, delay discounting research has bloomed in many fields from Psychology to Behavioural Sciences. A review of past and current knowledge, methods, emerging research topics and a glimpse of what is yet to be discovered has therefore been long due.

The book is divided into 5 parts and 15 chapters, all written by outstanding researchers of the topic in question. Themes range from the individual level (ie. substance abuse and neurochemistry of the brain) to the societal level (evolutionary perspective and even altruism). All chapters share the same two principles: being scientific yet practical.

In Part 1: *Methods, Models and Findings*, Chapter 1 by Madden and Johnson introduce delay discounting. Which one would you choose? \$100 now or \$150 a month later? By varying the amount of money and the period of delay it becomes possible to estimate individual rates of discounting. The authors start by explaining the delay discounting concept itself, the long-standing argument between the exponential and hyperbolic function of the delay discounting curve and the crucial point of the paradigm: the methods used to measure the concept both in human and non-human studies.

Chapter 2 by Odum and Baumann reviews literature regarding the state and trait variable nature of discounting. Does the steepness and function of the discounting curve change by applying edible vs. nonedible (ie. money or drugs) rewards? The authors conclude that the more impulsive an individual's decision, the more likely they are to have smaller working memory capacity, lower IQ, lower SES and younger age, watch more pornography, have more severe addiction problems and so forth.

If delay discounting relates to so many other constructs, can it be regarded as a separate trait in itself at all? Is it delay (time) we discount or rather the probability (risk) attached to it? Green and Myerson in Chapter 3 argue that delay and probability discounting load on different factors suggesting the existence of separate delay and probability discounting – both involving further processes, traits and abilities. However, discounting manifests itself not only on a phenomenological level but also in neural processes. This is described in Part 2, *Neuroscience of Discounting and Risk Taking*.

Chapter 4 by Winstanley is about the neural and neurochemical basis of delay discounting. Emerging from animal research, delay discounting model focuses mostly on the limbic corticostriatal loop, and on the role of serotonin and dopamine interactions. In making a decision between multiple choices, a complete description of the values of the two options in question would require specification and integration over all potential possibilities taking into account the uncertainty, risk and investment opportunities with each decision. Redish and Kurth-Nelson describe this complicated process on the neural level in Chapter 5.

Chapter 6 by Heilbronner, Hayden and Platt describes current evidence concerning the mechanisms that allow decision makers to deal with the uncertainty that characterises our world; the neuroeconomics of risk-sensitive decision making. They argue that these mechanisms are embodied in neuronal and chemical events in the brain. This is how they arrive for example to the Model of Regret Minimising.

Perhaps the most researched area of delay discounting is that of individuals with addiction problems. *Discounting and Addictive Disorders* is therefore the theme of Part 3. Yi, Mitchell and Bickel introduce the topic in Chapter 7. “The subjective value of drug consumption is greater than the subjective value of nonconsumption. (...) Assuming that the

subjective value of nonconsumption is reduced as a function of the delay to its reinforcing effects, the construct of delay discounting is particularly suited to the study of substance abuse and dependence” (pp. 191–192). The authors introduce another construct: past discounting which refers to the ability to learn from previous mistakes. Both delay and past discounting are impaired in nicotine, alcohol, opioid, cocaine and methamphetamine abusers as well as in individuals with gambling problems.

As a state variable, Chapter 8 introduces the effects of drug on delay discounting, written by deWit and Mitchell. Drugs of abuse decrease choices of the larger-later rewards, however, the causal relationship is not yet clear. Readers interested in the effect of ‘active’ substance abuse versus abstinence on discounting will find valuable information in this chapter.

What is the use of knowing individual rates of discounting? In Chapter 9 Carroll, Anker, Mach, Newman and Perry discuss how impulsivity affects and predicts drug-seeking behaviour through several phases of drug abuse. The authors argue that given its strong relationship with substance abuse, delay discounting may be the very key to change behaviour and achieve abstinence. Self-control, frustration tolerance and short-term reinforcement strategies are therefore supported by evidence arising from discounting research.

Part 4 *Discounting and the Human Condition* goes beyond addiction and touches on the fields of health and ADHD. Chapter 11 by Petry and Madden reviews the contributions of behavioural economics to understanding health decision making from multiple stakeholder perspectives ranging from individuals to health systems and public health policies. How should resources be allocated? When it comes to treatment, should we support medications and substitution treatment (‘immediate rewards’) or psychotherapy which is more expensive but also more likely to result in long-term abstinence? By creating longer waiting lists healthcare providers avoid the immediate costs but waiting times are costs for treatment-seeking individuals that can discourage pro-health behaviour. The authors offer some inspiring thoughts on the matter.

There has been considerable discussion of the relationship between delay discounting and ADHD. Jonathan Williams in Chapter 12 reviews evidence to support the hypothesis that in fact great majority of ADHD and discounting results can be accounted for by multiple minor traits and states.

Part 5 *Empirical and Theoretical Extensions* extends the concept of delay discounting beyond individual level. In Chapter 13 Stevens and Stephens introduce the adaptive nature of impulsivity in all ‘4F behaviours’: fighting, fleeing, feeding and reproduction... “Female widow birds prefer males with long tails (...) which correlates with male quality. So a female confronted with a short-tailed male faces a dilemma: mate now or keep looking?” (p. 361). They quote another empirical result: when a wasp detects cues associated with short life expectancy, they lay more eggs in lower quality hosts than in the absence of the cues. When the future seems uncertain wasps are more likely to be impulsive than in safe circumstances.

George Ainslie argues in Chapter 14 that bottom-up approach explains that appetite is in fact a reward-seeking process. Based on existing knowledge from neuro-imaging studies, how can we predict the basic properties of choice? Can we make any predictions at all?

The problem for a person with alcohol problems is how to make choices in order to maximise value over the longer

time span and avoid making choices on a case-by-case basis (be sober and healthy versus have another drink). Reaching back to Gestalt, in Chapter 15 *The Extended Self* Rachlin and Jones argue that the value of an activity (being abstinent) may be greater than the sum of the values in parts (refusing drinks tonight, tomorrow etc.). In fact, this is the very basis of a consistent behaviour, self control and social cooperation. Consequently, they introduce social cooperation games (prison, ultimatum and dictator), and human altruism. Which one would you choose? \$85 for you or \$75 to your 7<sup>th</sup> closest friend? Based on their own research, they argue that the more socially close a person is, the more we ‘invest’ in the relationship by being nice (altruistic) to them.

Delay discounting is more than a simple tool to measure impulsivity. Choosing larger-delayed rewards instead of smaller-immediate ones allows us to plan our life maximising survival and well-being. Conscious beings are capable to maintain representations of future possible outcomes which is essential to a meaningful life. *Impulsivity, The Behavioral and Neurological Science of Discounting* offers not only an insight into the diversified nature of delay discounting, but also describes methods and mathematical models to measure the concept in an easy-to-understand manner.

Impulsivity is a controversial and diverse construct which proves a challenge when it comes to operationalising. Some argue (ie. Bornovalova et al., 2005; Barratt & Patton, 1983) that impulsivity involves not only delay discounting but also response inhibition, passive avoidance, motor impulsivity, affect dysregulation and so on. Therefore some report weak (if any) correlation with self-report questionnaires used to measure impulsivity which makes it difficult to interpret the generalisability of delay discounting results across other dimensions of impulsivity. Perhaps a chapter on the limitations of the paradigm would have been useful.

Nevertheless, delay discounting paradigm has important implications for prevention and treatment of disorders, especially in substance abuse, behavioural addictions, eating disorders or ADHD. Knowledge reviewed in *Impulsivity, The Behavioral and Neurological Science of Discounting* helps to predict drug-seeking behaviour and to design intervention and treatment strategies that will reduce drug abuse and other addictions through management of behaviour – both on the individual and societal level. Therefore the book is recommended for those working with impulsive clients as well as for researchers looking for a hypothesis or a method to study impulsivity.

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