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Control Yourself: Alcohol and Impulsivity

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Introduction

Alcoholism and other addictions represent a significant public health concern, estimated to cost US society over \$500 billion annually (Uhl and Grow, 2004). These disorders have remained challenging to treat despite substantial research efforts. Recently, researchers have focused on intermediary phenotypes, or endophenotypes, to study complex psychiatric disorders including addictions (Gottesman, 2003). One construct that is particularly relevant to the addictions is impulsivity (Brewer and Potenza, 2008; de Wit, 2008; de Wit, 2004; Jentsch and Taylor, 1999; Moeller et al., 2001; Verdejo-Garcia et al., 2008). Notably, however, the term ‘impulsivity’ lacks a simple operational definition, and its relation to alcohol and drug use has been studied using a range of different measures, complicating research in this area.

In order to foster discussion and move forward this important area of research, the International Society for Research on Impulsivity (ISRI; www.impulsivity.org) with the support of an R13 grant from NIAAA convened a satellite symposium on alcohol and impulsivity at the 2009 convention of the Research Society on Alcoholism. A main goal of the symposium was to bring together and engage in a day-long series of oral and poster presentations a diverse group of researchers investigating impulsivity and its relation to alcohol use. This issue of *Alcoholism: Clinical and Experimental Research* contains a special section devoted to publications emanating from the 2009 symposium. An overview of impulsivity and its relationship to alcohol behaviors and disorders follows, with a focus on the contents of this section of this journal issue.

Defining and Dissecting Impulsivity to Help Understand Alcohol Use Behaviors and Disorders

Impulsivity has been defined as “a predisposition toward rapid, unplanned reactions to internal or external stimuli with diminished regard to the negative consequences of these reactions to the impulsive individual or others” (Moeller et al., 2001; Potenza, 2007). Impulsivity is a multi-dimensional construct consisting of at least two components (de Wit, 2008; Meda et al., 2009; Reynolds et al., 2006; Verdejo-Garcia et al., 2008): choice impulsivity (as reflected by rapid temporal discounting) and response impulsivity (as evidenced by poor performance on tasks involving motoric inhibition). These components of

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impulsivity appear dissociable and differentially related to brain function (Brewer and Potenza, 2008; Everitt and Robbins, 2005; Potenza and Taylor, 2009), and thus they are likely to have separate and dissociable relations to alcohol use and dependence. The challenge for researchers in this area is to identify the basic underlying constructs and determine their role in the etiology of alcohol and drug use problems.

Overview of Contents of Section

The *Alcohol and Impulsivity* section of this issue of *Alcohol: Clinical and Experimental Research* includes both overview/review articles as well as original research findings. The reviews by Winstanley et al. and Rogers et al. focus on preclinical and clinical studies of impulsivity, respectively, and the review by Lejuez et al. describes studies of direct effects of alcohol on impulsivity. The review by Field et al. focuses mainly on the influence of alcohol on inhibitory control. Together, these review articles provide an overview of research in the field, as well as a context for the original research articles in this issue.

The original research articles include two pre-clinical studies. Gubner and colleagues investigated in 15 inbred strains of mice the relationship between inhibition on a Go/No-Go task and response to alcohol. They concluded not only that this form of impulsivity was heritable, but also that there was a positive relationship between alcohol withdrawal and both false alarms and premature responding. Oberlin and colleagues assessed the influences of amphetamine, naltrexone and memantine on delay discounting and alcohol consumption in high alcohol preferring mice. They found that amphetamine, but not naltrexone or memantine, reduced impulsivity and that naltrexone and memantine, but not amphetamine, reduced alcohol consumption. They concluded that alcohol consumption and this form of impulsivity represent dissociable behaviors in these animals.

The other original research papers examine impulsivity and alcohol use in humans. Fox and colleagues investigated the relationship between levels of exposure to stress (assessed using the Cumulative Stress/Adversity Checklist), self-reported impulsivity (assessed using the Barratt Impulsiveness Scale) and hazardous drinking (assessed using the Alcohol Use Disorders Identification Test - AUDIT) in a community sample of alcohol drinkers. They found that both recent and cumulative stress and self-reported impulsivity (non-planning, cognitive and motor) were each independently associated with AUDIT scores. Further, there was an interaction between cumulative stress and impulsivity which accounted for a significant portion of the variance, indicating that the combined effects of these risk factors may contribute synergistically to hazardous drinking. Gullo and colleagues used structural equation modeling to study relations between sensitivity to reward, self-reported impulsiveness, alcohol expectancies and alcohol use in young adults and individuals seeking treatment for substance abuse. They found that positive alcohol expectancy mediated the association between reward sensitivity and hazardous alcohol use and that drinking refusal self-efficacy mediated the relationship between rash impulsiveness and hazardous drinking. Together, the findings advance our understanding of the complex relationships between forms of impulsivity and hazardous drinking behaviors.

The final two manuscripts in the section investigate the relationships between risk-taking, sensation-seeking and impulsivity and alcohol use behaviors over time. In a longitudinal study of children developing into adolescents, MacPherson and colleagues found that sensation-seeking and risk-taking - two constructs related in some studies to impulsivity (Meda et al., 2009; Reynolds et al., 2006) - increased over time, and that increases in both constructs were predictive of and associated with increases in alcohol use. Littlefield and colleagues examined a longitudinal sample of young adults and measured impulsivity (as assessed by items from the Tridimensional Personality Questionnaire and Eysenck

Personality Inventory) and alcohol use over time. Using mixture modeling, they identified five groups differing in baseline levels of impulsivity and showing differences in patterns of change over time. Importantly, the group showing the greatest decline in impulsivity over the 18–25 year age range also showed accelerated decreases in alcohol use. Together, these two studies suggest that the developmental nature of impulsivity and related constructs influence important aspects of alcohol use escalation and desistance in a clinically relevant fashion with respect to developmental risk periods for alcohol use, abuse and dependence.

Future Directions

The articles in this issue advance our understanding of the components of impulsive behavior and their relationship to mental health and illness, including alcohol use behaviors. The absence of a uniformly agreed-upon definition for impulsivity and the use of multiple self-report and behavioral assessments purported to measure the construct have hampered the field in that the disparate measures make comparisons across studies challenging if not impossible. Nonetheless, as the articles in this section indicate, there is a growing consensus on some of the components of impulsivity, and researchers are beginning to use standardized measures to assess them. Like the 2009 symposium on alcohol and impulsivity did successfully, future meetings can convene researchers to refine the definitions and operational measures of impulsivity and to elucidate the role of these behaviors in alcohol use behaviors and disorders. Meetings of this kind facilitate collaborative interdisciplinary research on alcohol and impulsivity that will ultimately lead to strategies to reduce the public health costs of alcohol-related disorders.

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