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The association between parental history and delay discounting among individuals in recovery from addiction

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ABSTRACT

Background: Family history of addiction is a risk factor for substance use disorders. Delay discounting (DD) is associated with the risk of substance use and dependence, and is predictive of the likelihood of successful abstinence and treatment outcomes; thus, we investigated the extent to which having parents with addiction (parental history of addiction) and number of addicted parents affect DD among individuals in recovery from addiction.

Methods: Data from 177 individuals in recovery from addiction from The International Quit and Recovery Registry (IQRR), an ongoing online data collection program that aims to understand addiction and how people succeed in recovery, were included in the analysis. Participants with no, one, or two parents with addiction were compared on measures of DD using an adjusting-amount task.

Results: Parental history of addiction was significantly associated with delay discounting. After controlling for age and gender, which were significantly different between groups, participants reporting two biological parents with addiction had significantly higher DD rates compared to those reporting one or no parents with addiction.

Conclusions: Participants with two parents with addiction had significantly higher rates of discounting compared to those with no or only one parent with addiction. This information can serve as a foundation to better identify and target important subgroups that need additional or non-traditional intervention strategies to address their larger degree of impulsivity and help maintain abstinence or achieve better treatment outcomes.

1. Introduction

Substance dependence is a major public health concern (National Institute on Drug Abuse, 2005; Nutt et al., 2006) involving harmful effects for the dependent individuals, their families, communities, and society as a whole (National Institute on Drug Abuse and National Institutes of Health, 2011; Nutt et al., 2007). Substance use disorders are among the most common psychiatric disorders starting in young adulthood (National Research Council, 2009) that co-occur with other mental and physical health problems, and show a strong familial pattern (Kessler et al., 2005; Sher et al., 2005). Because drug addiction is, in part, a choice between short-term reinforcement from substance use and long-term reinforcement from abstinence, the processes underlying decision-making are important to the success of treatment programs. Behavioral economics, combining psychological and economic principles, has been extensively used to understand the decision-making process in individuals with addiction (Bickel et al., 2014a; Heather and Vuchinich, 2003). Delay discounting, one of the most widely studied behavioral economic measures, refers to the subjective change in the value of a reward based on the delay to its receipt (Madden and Bickel, 2010).

Individuals with addiction have significantly higher rates of delay discounting compared to healthy controls (Amlung et al., 2016; Bickel et al., 2014b; MacKillop et al., 2011). This finding is robust in most drugs of abuse, including opiates (Madden et al., 1999), alcohol (Mitchell et al., 2005), cocaine (Coffey et al., 2003), and nicotine (Baker

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et al., 2003). In addition, delay discounting rates are positively associated with the risk of substance use with greater discounting rates reported among individuals exhibiting greater drug consumption and dependence (Fernie et al., 2013; Khurana et al., 2013; MacKillop et al., 2011), and negatively associated with the likelihood of successful abstinence from addiction (Krishnan-Sarin et al., 2007; MacKillop and Kahler, 2009; Sheffer et al., 2012, 2014; Washio et al., 2011; Yoon et al., 2007).

Several previous studies compared discounting rates in current, ex-, and never substance-dependent individuals. Bickel et al. (1999) compared rates of discounting among current, never, and ex-smokers (reported abstinence from cigarettes for at least one year, and had smoked at least 20 cigarettes daily for at least 5 years prior to quitting) and indicated higher rates of discounting among current smokers but no significant difference between never and ex-smokers (Bickel et al., 1999). Former heroin and amphetamine users (reported that they had previously been a long-term misusers of either amphetamine or heroin) discounted delayed money less than current drug users but more than non-users (Bretteville-Jensen, 1999). No significant difference in discounting was found between currently abstinent (reported no cocaine use in the past 30 days) and currently using cocaine-dependent outpatients (Heil et al., 2006). Moreover, rates of discounting by ex-alcohol dependent individuals (reported a lifetime history of alcohol dependence but were not drunk to intoxication for more than 30 days) and ex-smokers (reported abstinence from cigarettes for at least one year, and had smoked at least 20 cigarettes daily for at least 5 years prior to quitting) are intermediate to that of current users and never-users in alcohol dependence (Petry, 2001) and cigarette smoking, (Odum et al., 2002) respectively. Interestingly, in individuals with substance dependence, high delay discounting rates may persist even after years of abstinence (Mitchell et al., 2005), suggesting a possible irreversible effect of substance abuse and/or a pre-existing genetic risk (MacKillop, 2013; Meyer-Lindenberg and Weinberger, 2006; Bickel, 2015).

Addiction is heritable such that relatives of addicted individuals are eight times more susceptible to developing an addiction compared to the general population (Merikangas et al., 1998). Recent data indicates that delay discounting is also highly heritable (Anokhin et al., 2011, 2015; Mitchell, 2011; Wilhelm and Mitchell, 2009). A substantially higher correlation between immediate or delayed choices was found within monozygotic twin pairs compared to dizygotic twin pairs, suggesting the presence of a genetic contribution (Anokhin et al., 2011). In addition, rates of discounting among mothers with nicotine dependence and their children were significantly higher than mothers without nicotine dependence and their children (Reynolds et al., 2009). Few studies, however, have examined the association between delay discounting and family history of addiction. Those that have reported mixed results, with some reporting a positive association (Dougherty et al., 2014; Smith et al., 2015; VanderBroek et al., 2016), some reporting a positive association among women but not men (Petry et al., 2002) and some indicating no association (Herting et al., 2010; Sanchez-Roige et al., 2016). Importantly, these studies compared groups of participants with and without a family or parental history of addiction but did not investigate or report the effect of number of parents with addiction in the family on rates of discounting. Hence, the extent to which delay discounting is affected by the number of parents with a history of addiction remains unknown.

The purpose of the present study is to compare delay discounting rates from individuals who are registered in the International Quit and Recovery Registry (IQRR), an ongoing online registry seeking to understand the phenotype of recovery, as a function of the number of parental figures who suffer from addiction. We hypothesize that higher rates of discounting will be a graded function of the number of parents with addiction. Given the predictive relation between discounting and successful attempts at drug abstinence reviewed above (Krishnan-Sarin et al., 2007; MacKillop and Kahler, 2009; Sheffer et al., 2012, 2014; Washio et al., 2011; Yoon et al., 2007), understanding the effect of parental history and number of parents with addiction on delay discounting rates might better identify those individuals in recovery who may be at greater risk of relapse.

2. Methodology

2.1. Participants

Participants were recruited from the IQRR, an online community and registry that was launched in September 2011 and is available internationally through the IQRR website (https://quitandrecovery.org) to adults who are in self-reported recovery from one or more substance or behavioral addictions. The goals of the IQRR include understanding what allows people to succeed in overcoming addiction, tapping the insights of experiences of people who are in recovery, and understanding associations between addiction and decision-making processes. The IQRR also aims to better understand the phenotype of recovery through administration of monthly research assessments. Interested individuals who are in recovery may become IQRR members, called “Recovery Heroes,” by completing a registration process that includes providing general contact information and completing a detailed initial questionnaire concerning socioeconomic demographics, and personal and family history of behavioral addictions and/or substance use. Once registered, IQRR members are encouraged to create a website profile, which allows them to complete any available monthly research assessments.

For each monthly research assessment released, participants earn a badge available on their profile and 100 points which is exchangeable for $1.00. The present study concerns data from 224 participants who completed one of the IQRR assessments. Inclusion criteria for the present study required that participants be between the ages of 18 and 68 years (Green et al., 1994,1999) and self-report recovery from one or more substances. Individuals were excluded (n = 41) if they: 1) did not complete the delay discounting task (n = 3), 2) did not complete the parental history of addiction questions (n = 14), 3) provided non-systematic delay discounting data (n = 18; Johnson and Bickel, 2008), and 4) reported a non-substance related primary addiction (e.g., gambling, shopping, viewing pornography, or other; n = 5). These and other inclusion and exclusion criteria were determined by specific responses to the parental history questions and delay discounting items as described in detail below. Fig. 1 diagrams that of the 218 participants who were eligible and completed the assessment, 41 were excluded for the present study; thus, the final sample consisted of 177 participants. This study was conducted in compliance with the Institutional Review Board of Virginia Polytechnic Institute and State University.

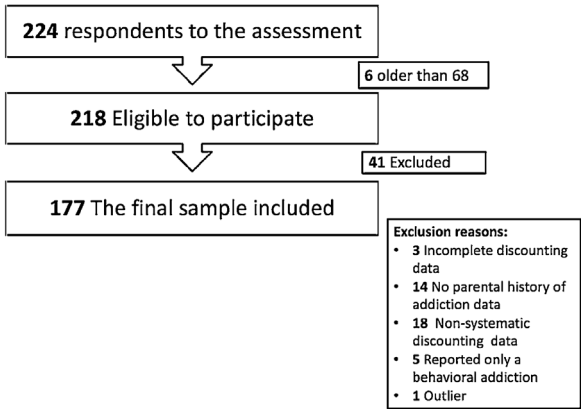

Fig. 1. Study sample of substance dependents in recovery respondents to the IQRR assessment.