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Impulsivity as a moderator of the intention-behavior relationship for illicit drug use in patients undergoing treatment

Samantha J. Moshier, Matthew Ewen, and Michael W. Otto

Department of Psychology, Boston University

Abstract

Introduction—Evident across clinical practice and clinical trials is a divergence between stated intentions and subsequent drug-related behaviors in substance abuse treatment settings. Impulsivity, itself related to drug abuse, may be one variable which may moderate the degree of disconnect in the intention-behavior relationship. The present study examines the relationship between self-stated desire to quit, impulsivity, and drug use in a group of outpatients receiving methadone maintenance treatment. In particular, we examined the direct and moderating influence of different facets of impulsivity (urgency, lack of premeditation, sensation seeking, and lack of perseverance) on drug use in the context of a stated desire to abstain from drugs.

Method—84 opioid-dependent individuals undergoing counseling and methadone maintenance treatment completed a battery of self-report questionnaires including measures of impulsivity (UPPS Impulsivity Scale), stated desire to quit, and past 30-day drug use. We hypothesized that two facets of impulsivity, urgency and (lack of) premeditation, would moderate the relationship between desire to quit and past 30-day drug use, such that the relationship between intention and behavior would be weaker in those with high levels of these facets of impulsivity.

Results—Consistent with the disconnect between intentions and drug-use behaviors typical of treatment settings, desire to quit was not directly associated with self-reported past month drug use. However, in separate regression analyses, 2 facets of impulsivity, premeditation and sensation seeking, moderated the relationship between desire to quit and past month use. Whereas there was not a significant relationship between desire to quit and drug use in individuals high in sensation-seeking or lack of premeditation, the relationship between intention and drug use behaviors was preserved in those low in these facets of impulsivity.

Conclusion—These findings indicate that the relationship between desire to quit and self-reported past-month drug use is weak for those high in sensation seeking or low in premeditation. These results are discussed in the context of current interventions for substance dependence.

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Please address correspondence to: Samantha Moshier, M.A. Center for Anxiety and Related Disorders, Boston University, 648 Beacon St. Boston, MA 02215, Phone: 617-353-9610, smoshier@bu.edu.

Contributors

Ms. Moshier and Dr. Otto designed the study. Mr. Ewen and Ms. Moshier contributed the collection of the data. Ms. Moshier prepared the first draft of the manuscript and conducted the majority of the data analyses. All authors contributed to and approved the final manuscript.

Conflict of Interest

In the last 3 years, Dr. Otto has received research support from Organon (Merck) and has served as a consultant for MicroTransponder Inc. The other authors have no conflicts of interest to report.

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1. Introduction

The assumption that intention is a key determinant of behavior is fundamental to a number of behavior change theories (Ajzen, 1991; Prochaska & Velicer, 1997; Schwarzer, 1992). However, the intention-behavior relationship is an imperfect one, particularly in the realm of substance abuse treatment, where an apparent “functional disconnect” between stated intentions and subsequent behavior is an issue repeatedly confronted by clinicians and researchers in treatment settings (Otto, O’Cleirigh, & Pollack, 2007). Patients in treatment may express complete understanding of the long-term negative consequences of their use, propose steps for changing their behavior, and report strong motivation to change, yet continue to abuse substances. For example, one study of over 1000 treatment-seeking individuals found no association between readiness to change measures and later stimulant and opioid use (Gossop, Stewart, & Marsden, 2003). This is consistent with the wider research literature in motivation and behavior change. For instance, a large meta-analysis of randomized controlled trials across health behaviors of interest (i.e. HIV risk behaviors, smoking cessation, sun protection) demonstrated that a medium to large change in intention was associated with a small to medium change in behavior (Webb & Sheeran, 2006).

Research suggests that a range of situational, measurement-, and study- related variables moderate the intention-behavior relationship. For example, this relationship is weaker when the task is of greater difficulty or the behavior is more habitual (as is the case with substance use) (Webb & Sheeran, 2006). Individual difference variables relating to health behavior models have also been studied as potential moderators of the intention-behavior gap. This line of work suggests that self-efficacy, behavioral expectancies, and perceived behavioral control influence the relationship between intention and action (e.g., Lippke, Wiedeman, Ziegelmann, Reuter, & Schwarzer, 2009; Schutz et al., 2011; Webb & Sheeran, 2006).

Despite the substantial body of research on the moderators described above, trait variables that may influence the intention-behavior relationship are less studied. There is some evidence that both conscientiousness and trait procrastination may interact with intention to predict physical activity and the achievement of job searching goals, respectively (Ajzen, Czasch, & Flood, 2009; Van Hooft, Born, Taris, van der Flier, & Blonk, 2005). More recently, Mullan and colleagues (2011) found that measures of planning (as assessed with the Tower of Hanoi) and inhibitory control (as assessed by the Stroop task) moderated the associated between intention and binge-drinking in a sample of undergraduates. However, to our knowledge, trait moderators of the intention-drug use relationship have not been explored in a group of illicit drug users.

Impulsivity, 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, Barratt, Dougherty, Schmitz, & Swann, 2001), is important to consider as one individual difference variable that may influence the strength of the intention-drug use relationship. There is a lack of consensus regarding how to best define and measure impulsivity; indeed, the term itself encompasses multiple definitions and modes of measurement (e.g., neuropsychological, self-report). However, researchers tend to agree that it is a multidimensional construct. For instance, although impulsivity is strongly associated with substance use across many measures, these different measures of impulsivity are often weakly or modestly associated among themselves (Cyders & Coskunpinar, 2011; Dougherty et al. 2009).

The link between impulsivity and drug use is well established (de Wit, 2008; Dick et al., 2010). Individuals with substance use disorders have been consistently found to have elevated levels of impulsivity as measured across trait self-report questionnaires,

neuropsychological measures, and delay discounting tasks (e.g. Bickel, Odum, & Madden, 1999; Ersche, Clark, London, Robbins, & Sahakian, 2006; Madden, Petry, Badger, & Bickel, 1997; Verdejo-Garcia & Perez-Garcia, 2007). Longitudinal studies show that behavioral disinhibition is a strong predictor of subsequent substance use in high-risk populations (i.e., adolescents with substance-abusing parents), suggesting that impulsivity is a vulnerability marker for later substance use problems (for review, see Verdejo-Garcia, Lawrence, & Clark, 2008). Higher levels of impulsivity also interfere with treatment outcome via reduced retention (e.g., Moeller et al., 2001b;). Delay discounting in particular has been demonstrated to be associated with poorer treatment outcome for nicotine or alcohol dependence (Bowden-Jones et al., 2005; MacKillop & Kahler, 2009); however, the evidence for a direction association between impulsivity and treatment efficacy is more mixed for other substance dependent populations (Pasetti, Clark, Mehta, Joyce, & King, 2008).

Evidence that impulsivity may indeed be an important moderator of the relationship between intention and drug use comes out of recent studies in the motivational enhancement literature. Motivational enhancement therapy hinges on the intention-behavior relationship, aiming to promote change by increasing motivation from within the individual (Miller & Rollnick, 2002). However, studies now suggest that this approach is limited in efficacy for those with high levels of trait impulsivity. For example, in a study evaluating a motivational enhancement treatment for adolescent smokers, those with higher levels of impulsivity (measured broadly using the impulsive-sensation seeking scale) responded better to the educational control condition than to the motivational enhancement condition (Helstrom, Hutchison, & Bryan, 2007). Similarly, impulsivity and novelty seeking were found to moderate the effect of a single-session MET treatment on behavior change in a sample of problem drinkers: those with higher impulsivity and novelty seeking took fewer steps to change their drinking during the following 30 days (Feldstein-Ewing, LaChance, Bryan, & Hutchison, 2009).

The weak relationships between various measures of impulsivity have led Whiteside and Lynam (2001) to suggest that the term impulsivity may be most accurately conceptualized as an umbrella term describing a number of distinct traits that lead to impulsive behavior. They have attempted to more clearly define these distinct influences in terms of four trait pathways to impulsive behavior. *Urgency* describes the tendency to experience strong impulses under the condition of negative affect. *(Lack of) Premeditation* refers to tendency to act without deliberation or regard for consequences. *Sensation Seeking* describes a preference for excitement and openness to novel experiences. Lastly, *(Lack of) Perseverance* refers to inability to persist in activities despite difficulty or boredom (Whiteside & Lynam, 2001). These four facets are assessed using a self-report measure called the UPPS Scale (Whiteside & Lynam, 2001; Whiteside & Lynam, 2003).

An increasing number of studies utilizing the UPPS suggest that these four facets of impulsivity have distinct relationships with maladaptive behaviors. Urgency in particular has demonstrated an especially strong relationship with drug use and drug-related problems. For example, although drug users were found to have higher levels of urgency, lack of premeditation, and lack of perseverance than healthy controls, urgency alone was found to be the strongest predictor of severity of medical, alcohol, drug, employment, legal, family/social, and psychiatric problems (Verdejo-Garcia, Bechara, Recknor, & Perez-Garcia, 2007). One study of college students found that positive urgency prospectively predicted illegal drug use, while other aspects of impulsivity did not (Zapolski, Cyders, & Smith, 2009). Similarly, Spillane and colleagues found that positive urgency was the only dimension to be associated with nicotine dependence in a group of college students (Spillane, Smith & Kahler, 2010). Furthermore, increased urgency has been associated with poorer performance

on a number of neuropsychological tests sensitivity to executive function, including the Stroop color-word test, Trail-making test, and Wisconsin Card Sorting Test (Dolan, Bechara, & Nathan, 2007).

Although urgency has been a topic of focus, other facets of impulsivity proposed by Whiteside & Lynam may also play a significant role in addictive behaviors. Magid & Colder (2007) found that low levels of premeditation predicted more frequent alcohol use in college students (with sensation seeking marginally predicting alcohol use). Increased levels of sensation seeking are associated with higher odds of being a smoker, as well as increased cigarette craving following smoking cue exposure (Doran, Cook, McChargue, & Spring, 2009). Yet, these studies of the direct predictive effects of impulsivity do not address the potential importance of impulsivity in helping explain the divergence between intention and behavior seen in clinical settings.

To our knowledge, this is the first published study examining the relationship between self-stated desire to quit, impulsivity, and drug use in a group of individuals receiving methadone maintenance treatment from an outpatient clinic. In particular, we examined the apparent direct and moderating influence of facets on impulsivity and a patient's direct clinical report of a desire to abstain from drugs. Based on the findings reviewed above, we hypothesized that urgency and lack of premeditation would moderate the relationship between desire to quit and drug use. Specifically, we hypothesized that the relationship between a desire to quit and drug abstinence would be weakest for individuals with higher levels of urgency and lower levels of premeditation.

2. Method

2.1 Participants

Participants were 84 opioid-dependent patients receiving methadone maintenance treatment (MMT) at one of two outpatient clinics in the Boston area. Study measures were administered as part of a questionnaire battery used to examine the psychometric properties of a new self-report measure, results of which are published elsewhere (Moshier et al., 2012). In order to meet eligibility criteria, participants were required to be at least 18 years of age, able to read and understand English, and currently receiving methadone maintenance treatment. The sample was 56% female and predominantly Caucasian (78%) and the mean age was 40 years. Participants' level of education varied, with approximately 15% with less than a high school degree, 56% with a high school degree (or equivalent), and 29% with more than a high school education. Participants had been receiving methadone and counseling treatment at their current clinic for an average of 34 months. Eighty-five percent ($n = 72$) of participants reported that they had not worked in the past 30 days.

2.2 Procedures

Participants were recruited at the two participating methadone maintenance clinics through advertisements in the methadone clinic dosing areas. Following an explanation of study procedures, participants provided written informed consent and completed a packet of self-report questionnaires. Participants received a \$10 gift card for completing all study questionnaires. The Boston University Institutional Review Board approved all procedures.

2.3 Measures

Impulsivity—The UPPS Scale (Whiteside & Lynam, 2001; Whiteside & Lynam, 2003) is a 44-item self-report measure of four personality factors hypothesized to underlie impulsive behaviors: sensation seeking, (lack of) premeditation, (lack of) perseverance, and urgency. High scores represent greater impulsivity as assessed by these dimensions. The measure has

demonstrated strong internal consistency reliability for each of the four subscales and has been linked to self-report of risky behaviors (e.g., Whiteside & Lynam, 2003; Whiteside, Lynam, Miller, & Reynolds, 2005). In the current sample, the UPPS subscale scores demonstrated high internal consistency reliability (sensation seeking $\alpha = 0.81$; premeditation $\alpha = .76$; perseverance $\alpha = .79$; urgency $\alpha = .80$).

Desire to quit—As a proxy for the direct clinical report of the desire for abstinence, participants were asked to rate their desire to stop using drugs on a scale from 1–10, with 10 being the greatest desire, and 1 being the least.

Days of drug use—Number of days of illicit drug use in past 30 days were collected via self-report.

2.4 Statistical Analysis

Hierarchical multiple regression analyses were used to predict self-reported drug use. Desire to quit ratings and each UPPS subscale score were mean-centered prior to analysis, and the interaction terms were constructed from the mean-centered variables (Kraemer & Blasey, 2004). Demographic characteristics (age, sex, race, and length of treatment episode) were included in the first step of the regression as covariates. In the second step, desire to quit and UPPS subscale score were included to examine whether desire to quit or impulsivity directly predicted self-reported drug use, when controlling for demographic variables. Hence, Step 2 provides an index of the divergence between intention and behavior (reflected by a poor association between desire to quit and abstinence), as well evaluating direct prediction brought by considering level of impulsivity within a sample of drug abusers engaged in treatment. Step 3 provides the direct test of the role of impulsivity in moderating the link between intention and drug use behaviors by examining the interaction term between desire to quit and UPPS subscales. Significant interaction terms (indicating moderation) were further examined with follow-up tests investigating the degree of prediction of intention when considered in those low and high in the impulsivity trait of interest. Four separate hierarchical regression analyses were conducted in this fashion; one for each of the four UPPS subscales (urgency, premeditation, perseverance, and sensation seeking). To aid interpretation, significant interaction terms were followed-up by simple-slope analyses of the relationship between desire to quit and self-reported drug use at 1 SD above and below the mean of the given moderator (Aiken & West, 1991). Statistical significance was set at $p < .05$ for all analyses. Data analyses were conducted using SPSS version 16.0.

3. Results

Descriptive statistics for study measures are presented in Table 1.

3.1 Premeditation

Step one covariates (age, sex, race, and length of treatment episode) did not significantly explain variance in self reported drug use in aggregate ($F(4, 79) = .47, p = 0.76$) or alone (all $p > 0.25$). Step two predictors, desire to quit, and UPPS-premeditation subscale score, also did not significantly improve prediction (all $p > 0.09$ when considered individually). When the interaction term between desire to quit and UPPS-premeditation was included in the third step, there was a significant increase in prediction, $t(1, 76) = 2.50, p = 0.015$, when this variable was considered in the context of the other covariates. Simple slope analysis (depicted in Figure 1) revealed that desire to quit was negatively associated with self-reported drug use for those with low (one standard deviation below mean) or average scores on the UPPS-premeditation subscale (low scores, $\beta = -6.06, p = .003$; average scores, $\beta =$

$-3.39, p = .005$). However, this relationship was non-significant for those with high scores (one standard deviation above mean) ($\beta = -.734, p = .433$).

3.2 Urgency

Step one covariates (age, sex, race, and length of treatment episode) did not significantly explain variance in self-reported drug use when considered alone (all $p > .25$) or in aggregate, $F(4, 79) = .47, p = 0.76$. Likewise, the step 2 predictors, desire to quit, and UPPS-urgency subscale score, did not reach significance (all $p > 0.075$ when considered individually). The interaction term between desire to quit and UPPS-urgency added in the third step was not significant, $t(1, 76) = 0.83, p = 0.41$.

3.3 Sensation Seeking

Step one covariates (age, sex, race, and length of treatment episode) did not significantly explain variance in self-reported drug use when considered alone (all $p > .25$) or in aggregate, $F(4, 79) = .47, p = 0.76$. The step two predictors, desire to quit and UPPS-sensation seeking subscale score, did not reach significance (all $p > .06$). When the interaction term between desire to quit and UPPS-sensation seeking was included in the third step a significant increase in prediction occurred: $t(1, 76) = 2.77, p = 0.007$. Simple slope analysis (depicted in Figure 2) revealed that desire to quit was negatively associated with self-reported drug use for those with low (one standard deviation below mean) or average scores on the UPPS-sensation-seeking subscale (low scores, $\beta = -5.14, p = .001$; average scores, $\beta = -2.39, p = .009$). Among those with high levels of sensation-seeking (one standard deviation above mean), this relationship was non-significant ($\beta = .36, p = .75$).

3.4 Perseverance

Step one covariates (age, sex, race, and length of treatment episode) did not explain significant variance in self-reported drug use alone (all $p > .25$) or in aggregate, $F(4, 79) = .47, p = 0.76$. Step two predictors (desire to quit, and UPPS-perseverance subscale score) did not reach significance (all p values $> .12$). In the third step, the interaction term between desire to quit and UPPS-perseverance was not significant ($t(1, 76) = .79, p = 0.433$).

4. Discussion

The results of this study suggest that impulsivity is an important trait variable that influences the relationship between the desire to abstain from drug use and past-month use. Specifically, elevations in sensation seeking and lack of premeditation helped identify those individuals for whom the intention-behavior gap is especially pronounced. This moderating influence of these facets of impulsivity occurred in the absence of a direct association between these variables and continued drug use. Indeed, much of the evidence for a direct relationship between impulsivity and drug or alcohol use comes from less severe populations (e.g., undergraduate students, adolescents), as compared to the sample of drug users in chronic treatment assessed in the current study. Also, in past studies of substance dependent individuals, impulsivity has been inconsistently associated with severity of drug use or duration of abstinence (Verdejo-Garcia et al., 2008). Our findings are consistent with this, suggesting that instead of being directly associated with drug use within a treatment-receiving sample, impulsivity interacts with the desire for abstinence.

The current study assessed patients' desire to quit and past 30-day drug use at the same time point, providing an index of the mismatch between past behavior and stated desire. However, assessment of drug use following a stated desire to quit would provide even more valuable information regarding a mismatch between intention and future action. Prospective studies confirming our preliminary findings would help explain findings that motivational

enhancement therapy (MET) is less efficacious in individuals with high levels of impulsivity (Feldstein-Ewing et al., 2009; Helstrom et al., 2007). MET is frequently used in substance use treatment to increase patients' intention and commitment to change. However, our results are consistent with findings that increasing motivation may not be sufficient to change behavior for individuals with high impulsivity, and more specifically, high sensation seeking and low premeditation. Hence, our findings encourage the evaluation of UPPS scores as a potential moderator of treatment outcome in studies of MET.

If additional research confirms that sensation seeking and lack of premeditation account for the "intention-action" gap in treatment, it follows that helping patients modify or compensate for these treatment-limiting characteristics may be an appropriate intervention strategy. Cognitive rehabilitation strategies may hold promise for attenuating the effects of impulsivity through strengthening executive functioning. For example, Bickel and colleagues (2011) recently found that working memory training improved rates of delay discounting in individuals receiving treatment for stimulant use. Further research is needed to determine whether cognitive rehabilitation interventions such as these also have a positive effect on substance use treatment outcomes for impulsive individuals.

Contrary to our hypothesis, urgency, or the tendency to engage in rash action in response to emotion, did not significantly interact with desire to quit ratings. This suggests that, although urgency has been positively associated with illegal drug use and nicotine dependence in college students (Zapolski et al., 2009; Spillane et al., 2010) and severity of substance use related problems in individuals with substance dependence (Verdejo-Garcia et al., 2007), it may not play a role in the "functional disconnect" between patients' stated intentions and actual behavior in a treatment seeking sample.

Our findings should be viewed in light of several limitations. Primarily, it must be noted that patients' desire to quit and past 30-day drug use were assessed at the same time point, meaning that the directional effects of the current results cannot be confirmed. Patients' desire to quit is likely to fluctuate throughout the course of treatment, which may add variability to the assessment of the link between drug use and the desire to quit. Our findings using a single timepoint of assessment among patients at various stages of treatment and recovery, were robust to this source of variability. A different relationship between impulsivity, desire to quit, and drug use may exist among more homogeneous samples of patients early or late in the treatment process. Additionally, the ratings of past 30-day drug use and desire to quit were designed to serve as proxies to the actual report a clinician might elicit in session. Future research should examine the prospective relationship between desire to quit, impulsivity, and subsequent drug use, and should also involve objective measurement of drug use. Likewise, additional research is needed to further examine the role of impulsivity (and more specifically, premeditation and sensation seeking) in MET and other treatment trials.

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Highlights

We examine the role of impulsivity in moderating the intention-behavior gap in drug abuse.

We observed an intention-behavior gap for drug use patterns in opiate abusers.

Two facets of impulsivity moderated the intention-behavior gap for drug use.

High sensation seeking or low premeditation predicted a larger intention-behavior gap.

Results have implications for the potential failure of motivational enhancement strategies.

Figure 1.
UPPS-Premeditation subscale scores moderate the relationship between desire to quit and self-reported past month drug use.

Figure 2.

UPPS-Sensation Seeking subscale scores moderate the relationship between desire to quit and self-reported past month drug use.

Table 1

Descriptive statistics for participants' self-reported past month drug use (in days), desire to quit rating (1 – 10 scale in which 10 is strongest desire to quit), and UPPS impulsivity subscale scores

Measure	Mean $\pm$ SD
Self reported past-month drug use (in days)	4.58 $\pm$ 8.76
Desire to quit rating	9.48 $\pm$ 1.10
UPPS Impulsivity Subscales	
(lack of) Premeditation	23.05 $\pm$ 5.22
Urgency	33.89 $\pm$ 6.47
Sensation Seeking	30.99 $\pm$ 7.68
(lack of) Perseverance	22.67 $\pm$ 5.50