Negative Urgency Linked to Craving and Substance Use Among Adults on Buprenorphine or Methadone

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Abstract

Despite the effectiveness of medication-assisted treatment (MAT), adults receiving MAT experience opioid cravings and engage in non-opioid illicit substance use that increases the risk of relapse and overdose. The current study examines whether negative urgency, defined as the tendency to act impulsively in response to intense negative emotion, is a risk factor for opioid cravings and non-opioid illicit substance use. Fifty-eight adults (predominately White cis-gender females) receiving MAT (with buprenorphine or methadone) were recruited from online substance use forums and asked to complete self-report questionnaires on negative urgency (UPPS-P Impulsive Behavior Scale), past 3-month opioid cravings (ASSIST—Alcohol, Smoking, and Substance Involvement Screening Test), and non-opioid illicit substance use (e.g., amphetamines, cocaine, benzodiazepines). Results revealed that negative urgency was associated with past 3-month opioid cravings, as well as past month illicit stimulant use (not benzodiazepine use). These results may indicate that individuals high in negative urgency would benefit from receiving extra intervention during MAT.

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Introduction

Medication-assisted treatment (MAT) with buprenorphine and methadone—opioid agonist medications—are among the most effective treatments for opioid use disorder (OUD), with recent research linking MAT with a 10–22% reduction in opioid overdoses across the USA.[1] Importantly, a sizeable portion of adults receiving MAT continue to experience opioid cravings and engage in other non-opioid illicit substance use (SU; e.g., cocaine, benzodiazepines);[2] this is concerning because these two factors have been associated with relapse (i.e., engaging in any opioid use) during MAT[3–6] and non-opioid overdose.[7,8] It is critical to examine risk factors of opioid craving and non-opioid illicit SU during MAT. These risk factors can be used to identify at-risk adults and inform treatment plans.

Negative urgency (NU) may serve as a possible risk factor of opioid craving and non-opioid illicit SU during MAT. NU is the tendency to act impulsively in response to intense negative emotion (e.g., anger, anxiety)[9] and has been associated with increased opioid use,[10] as well as other psychopathology (e.g., eating disorder).[11] This research is consistent with self-medication theories of SU disorder that posit that individuals engage in SU to downregulate negative emotions/stress.[12,13] This may be because substances "numb" or distract from negative emotion/stress (i.e., experiential avoidance).[14] It follows that individuals high in NU would also be more likely to crave opioids and other non-opioid illicit substances in response to intense negative emotions. This is supported by research showing that NU is associated with craving of substances,[15] as well as non-opioid SU.[16]

Importantly, extant research is limited and has *not* examined NU within samples of adults receiving MAT. This is a significant limitation in the literature given that adults with OUD are a heterogenous group in terms of psychiatric presentation[17] and levels of NU trait.[18] Also, relations among NU and relapse are supported in the literature in non-MAT samples.[19] Moreover, the link between NU and SU may be stronger in adults receiving MAT for OUD than adults with less severe or subclinical psychopathology.[20] This is because NU has been found to be more predictive of severe psychopathology.[20]

The current study addressed these limitations in the research by examining adults receiving MAT with buprenorphine or methadone. We hypothesized that NU would be strongly associated (with medium effect size based on previous literature)[10,21] with (1) past 3-month opioid cravings, (2) illicit stimulant use, and (3) illicit benzodiazepine use, covarying for demographics, type of MAT, and length of time receiving MAT. Illicit stimulant use and benzodiazepine use were examined separately due to research showing that the physiological[22] and psychological properties of use vary by drug type.[23,24]

Method

Participants

Fifty-eight participants were drawn from a larger 2021 study of MAT and opioid use outcomes. Inclusion criteria for the larger study included (1) aged 18 years and older, (2) currently residing in the USA, (3) proficient in reading and writing in English, and (4) consumed opioids (non-prescribed or if prescribed, more than prescribed) in the past thirty days and/or currently receiving medication for opioid use (e.g., buprenorphine). The 58 participants were selected because they reported currently receiving MAT. Participants were recruited on SU

forums online, including Reddit and Bluelight; 49 participants were recruited from methadone and suboxone subreddits on Reddit and two participants were recruited from Bluelight. Seven participants were recruited via word of mouth in the community. Most of the sample was White (n = 52, 90%; Asian 3%; other 7%), non-Hispanic (n = 52; 90%), and cis-gender female (n = 37, 64%; intersex = 1.7%; cis-gender male = 34%). Most participants used methadone (n = 35; 60%) and had been for more than 2 years (n = 48; 83%). Approximately 29% of participants reported at least one opioid overdose requiring Narcan treatment over their lifetime. See Table 1 for additional information about participants. Participants were compensated $15 for their time. All procedures were approved by George Mason University's Institutional Review Board.

Measures

Participants were asked to complete a range of self-report questionnaires on their SU, traits, psychological health, and medical/psychological treatment. The current study focuses on questionnaires related to negative urgency, opioid cravings, and SU.

Negative urgency The current study used the four-item NU subscale of the short UPPS-P Impulsive Behavior Scale.[25] The subscale was modified so that items were rated on a scale of 1 ("agree strongly") to 5 ("disagree strongly") as opposed to on a scale of 1 to 4. A sample item includes: "When I feel bad, I will often do things I later regret in order to make myself feel better now." All items were reverse scored and summed to create a total score. Higher scores indicate greater NU traits. The NU subscale of the short UPPS-P has been shown to be reliable and valid.[25,26] The Cronbach's alpha is .89 in the current sample.

Opioid cravings A single item from the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)[27] was used to examine opioid cravings. Participants rated the following item on a scale of 1 ("never") to 5 ("daily" or "almost daily"): "During the past three months, how often have you had a strong desire or urge to use opioids?" The ASSIST has been shown to be reliable.[27] This measure specifically assesses opioid craving frequency versus intensity, although both constructs have been shown to be highly related to one another.[28,29]

Substance use Participants indicated which substances (opioids, amphetamines, cocaine, hallucinogens, benzodiazepines, alcohol, tobacco, cannabis) they had consumed over the past 30-day period (that were not prescribed or were used more than prescribed). The current paper focused on non-prescribed stimulant and benzodiazepine use because they are illicit (compared to alcohol, tobacco, and cannabis) and are associated with increased likelihood of overdose.[7,8] Other illicit non-prescribed substances, such as hallucinogens, were endorsed by very few participants (< 1.7%), making analyses unfeasible. Two separate dichotomous variables were created for past 30-day illicit stimulant use and illicit benzodiazepine use (yes = 1, no = 0). Participants were considered positive for illicit stimulant use if they endorsed use of either amphetamines or cocaine. Nine participants (16%) endorsed illicit stimulant use and illicit benzodiazepine use (44% simultaneously).

Data analysis

All analyses were conducted in SPSS 19.[30] Descriptive statistics and bivariate correlations were performed as preliminary analyses. Three participants were missing data for the measure of NU and one subject was missing accurate data on MAT type (e.g., buprenorphine or methadone); these participants were omitted from analyses using pairwise deletion. A two-step hierarchical multiple

Table 1

Demographics, MAT, and substance use information

Variable	Frequency (%) or mean (SD)
Age (years)	Range = 20–69
20–29	9 (16)
30–39	34 (59)
40–49	13 (22)
50–59	1 (2)
60–69	1 (2)
Gender: non-cis-gender male	38 (66)
Race	
White	52 (90)
Asian	2 (3)
Other	4 (7)
Ethnicity: Hispanic	6 (10)
Education	
Less than high school	2 (3)
High school	10 (17)
Some college	28 (48)
College degree	18 (31)
Employment	
Employed (full or part time)	29 (50)
Unemployed (looking or not looking)	11 (19)
Student	3 (5)
Homemaker	6 (10)
Retired	1 (2)
Unable to work	8 (14)
Lifetime overdoses requiring Narcan	
None	40 (69)
1	6 (10)
2	5 (9)
3	2 (3)
4 or more	4 (7)
MAT treatment	
Buprenorphine	22 (38)
Methadone	35 (60)
Length of time in MAT	Range = 3 months to over 2 years
Between 3 and 6 months	4 (7)
Between 6 months and 2 years	6 (10)
More than 2 years	48 (83)
Negative urgency	M = 12.36 (SD = 4.98); range = 4-20 $^{\dagger}M$ = 3.09 (SD = 1.25); range = 1–5
Opioid cravings	M = 2.95 (SD = 1.56); range = 1–5
Illicit stimulant use	9 (16%)
Illicit benzodiazepine use	9 (16%)

linear regression model was created to examine NU as a predictor of opioid craving, controlling

Table 1
(continued)

[†]Given that S-UPPS scores are calculated by summing or averaging items (Cyders et al., 2014; Dugre et al., 2019), descriptive statistics for the averaged S-UPPS negative urgency score are provided

Table 2
Bivariate correlations and descriptive statistics

Variable	1	2	3	4	5	6	7	8	9
1. Age	1.00								
2. Gender	.24	1.00							
3. Race	−.29*	.01	1.00						
4. MAT length	.29*	.08	−.16	1.00					
5. MAT type	.03	.03	−.27	.03	1.00				
6. Illicit STM	−.03	.01	.01	.10	.17	1.00			
7. Illicit BZD	−.09	−.09	.01	.10	−.13	.34**	1.00		
8. Opioid craving	.14	.09	−.10	−.05	−.12	.11	−.14	1.00	
9. Negative urgency	−.01	−.04	−.20	.11	.24	.42**	.10	.44**	1.00

*p <.05, **p <.01, ***p<.001

Gender, race, and MAT type were dummy coded (0 = male, 1 = non-male; 0 = White, 1 = non-White; 0 = methadone, 1 = buprenorphine). *STM* stimulant, *BZD* benzodiazepine

for predictors of SU, specifically age, gender, race, length of MAT, and type of MAT.[31–33] Separate two-step logistic regression models were created to examine NU as a predictor of illicit stimulant use and illicit benzodiazepine use, controlling for predictors of SU, specifically age, gender, race, length of MAT, and type of MAT.[31,32] For all models (opioid craving, illicit stimulant use, and illicit benzodiazepine use), step one included age, gender, race, length of time receiving MAT, and MAT treatment type, and step two included NU. For linear regression models, change in R^2 was assessed using an F-test (i.e., F-change) and for logistic regression models, change in log-likelihood was assessed using chi-square tests. R^2 and odds ratios were used to calculate effect sizes for linear regression and logistic regression models, respectively. Data and analysis code for this study are available by emailing the corresponding author. We have reported how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

Results

Data met assumptions of the general linear model (e.g., normally distributed residuals, homoscedasticity). Skewness and kurtosis for all variables were adequate (<2.0).[34] Illicit stimulant use was positively correlated with illicit benzodiazepine use. Furthermore, NU was positively correlated with illicit stimulant use and past 3-month opioid cravings. See Table 2 for bivariate correlations among study variables.

Supporting hypothesis one, results showed that NU positively predicted past 3-month opioid cravings, incrementally above age, gender, race, length of MAT, and MAT type ($p < .001$; Table 3). A significant R^2 change value supported the hierarchical addition of NU in step 2. NU accounted for an additional 23% of the variance in past 3-month opioid cravings, representing a large effect size.[35]

Table 3

Negative urgency predicting opioid cravings, illicit stimulant, and illicit depressant use

	OPD cravings		Illicit STM use			Illicit BZD use		
	B (SE)	ΔR^2	*B* (SE)	ΔX^2	OR	*B* (SE)	ΔX^2	OR
Step 1								
Age	.19 (.31)		−.58 (.67)		.56	−.36 (.59)		.70
Gender	.37 (.49)		.68 (.93)		1.98	−.62 (.83)		.54
Race	−.71 (.79)		.91 (1.40)		2.49	.30 (1.25)		.74
MAT length	−.52 (.47)		.54 (.98)		1.71	.85 (1.08)		2.35
MAT type	−.53 (.46)		1.43 (.91)		4.20	−1.02 (.89)		.36
Step 2		.23***		12.84***			.69	
Negative urgency	.16 (.04)***		.45 (.18)*		1.57	.07 (.08)		1.07

*p <.05, **p <.01, ***p<.001

Gender, race, and MAT type were dummy coded (0 = male, 1 = non-male; 0 = White, 1 = non-White; 0 = methadone, 1 = buprenorphine)

OPD opioid, *STM* stimulant, *BZD* benzodiazepine, OR odds ratio. ΔR^2 and ΔX^2 refer to change between the step 1 models and step 2 models

Supporting hypothesis two, logistic analyses showed that NU positively predicted illicit stimulant use ($p < .05$; Table 3), incrementally above age, gender, race, length of MAT, and MAT type. A significant chi-square value indicated that the addition of NU in step 2 provided a better fit for the data than step 1 alone (Table 3). The odds ratio for illicit stimulant use with NU as a predictor was 1.57, representing a small effect size.[35]

Hypothesis three was not supported. Logistic analyses showed that NU did not predict illicit benzodiazepine use ($p = .5$; Table 3).

Discussion

While extant research has linked higher NU traits to opioid use, no studies have examined whether NU is related to risk factors of opioid use relapse and overdose overall—past 3-month opioid cravings and non-opioid illicit SU—among adults receiving MAT for OUD. These limitations were addressed in the current study. Results supported two of our hypotheses.

In our sample, higher NU was strongly associated with higher past 3-month opioid cravings. This is critical because adults with higher opioid cravings are at a higher risk of later engaging in opioid use, possibly because they perceive opioids as a way to downregulate negative emotion/stress.[35–37] This is important to identify in adults receiving MAT because methadone and buprenorphine minimize opioid cravings.[38] Thus, despite medication that reduces opioid cravings, adults with higher NU continue to crave opioids, putting them at risk of relapsing. The effect size for NU on past 3-month opioid cravings in this sample was large, explaining up to 20% of the variance. This underscores the importance of considering NU to identify at-risk adults receiving MAT in need of targeted intervention, such as supplementary dialectical behavior therapy.

Like the results on past 3-month opioid cravings, NU was also associated with illicit stimulant use among this group of adults receiving MAT. Adults higher in NU may be more likely to engage in any SU (not just opioid use) in response to intense negative emotion. Interestingly, NU was not associated with illicit benzodiazepine use. It is unclear what caused this null finding. It may be that

adults perceive stimulants, such as cocaine and amphetamines, as more effective at coping with intensive negative emotion compared to benzodiazepines. Alternatively, adults high in NU may seek stimulants versus benzodiazepines to address dopamine-related dysfunction observed in opioid use disorder.[39] Indeed, there is research showing that stimulants act more directly on dopamine synapses versus benzodiazepines.[40] It is important to note that these possibilities have not been fully empirically tested to our knowledge. There is research, for example, to suggest that individuals do *not* select substances based on their pharmacological properties (e.g., a benzodiazepine is not always a substance of choice to cope with anxiety).[41]

Limitations and future directions

Despite the current study boosting several strengths, such employing a MAT sample and specifically assessing NU, it also has limitations that should be addressed in subsequent studies. First, the sample was not representative of the US population. Furthermore, there is likely self-selection bias given that participants were volunteers. Given that these participants were mostly recruited on online platforms, there may be additional bias present as these participants may be different (e.g., more motivated) than participants that are recruited through other methods, such as in treatment settings. Future research should replicate these findings in a larger, more demographically diverse sample that is less likely to have self-selection biases. Second, we did not examine polysubstance use, and therefore it is unclear whether participants were already using non-opioid illicit drugs during active addiction or whether non-opioid illicit drugs replaced opioid use post-treatment. Polysubstance use should be specifically assessed in the future. Third, this study was not a randomized control trial or longitudinal in nature; thus, it is not possible to draw conclusions about causation (e.g., negative urgency as predisposing factor versus consequence). This too can be a focus of future studies.

Implications for Behavioral Health

The current study found that in a sample of adults receiving MAT for OUD, adults higher in NU were more likely to engage in non-opioid illicit stimulant use and experience opioid cravings. Although future research needs to replicate and extend this work, this research has shed light on the potential of targeting NU for relapse prevention. This may involve providing adults receiving MAT high in NU with supplementary dialectical behavior therapy (DBT). This treatment modality has a large emphasis on building emotion regulation and distress tolerance skills.[42] It is possible that increased ability to regulate and tolerate intense negative emotion may reduce engagement in non-opioid illicit stimulant use and opioid cravings that increase risk of relapse. Notably, research examining efficacy of supplementary treatments, such as DBT, for adults receiving MAT high in NU is not available and needs to be conducted to definitively support implementation in treatment settings.

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Declarations

Conflict of Interest The authors declare no competing interests.

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