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Self-reported attentional and motor impulsivity are related to age at first methamphetamine use

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Abstract

Introduction—Methamphetamine (MA) users report higher levels of impulsivity relative to healthy controls, which may either result from, or precede, their substance use. Further, there is evidence that female MA users may be more impulsive than male MA users prior to MA use. Thus, the goal of the current study was to determine whether different subtraits of self-reported impulsivity are significantly related to age at first MA use, controlling for total years of MA use.

Methods—A community sample of MA users was recruited for this study (N = 157; 113 males, 44 females). The Barratt Impulsiveness Scale (BIS-11) was used to assess self-reported impulsivity on three subscales (Attentional, Motor, Non-planning). Age at first MA use served as the dependent variable in a series of multiple regression models with BIS-11 subscales, sex, and their interaction as independent variables, controlling for total years of MA use.

Results—Attentional and Motor impulsivity were significantly related to age at first MA use when controlling for total years of MA use (Attentional: $p = 0.008$; Motor: $p = 0.003$).

Conclusions—Individuals who reported higher Attentional and Motor impulsivity started using MA at an earlier age, which could suggest that impulsivity levels may be an important marker of vulnerability towards MA use. These findings indicate that prevention efforts may be targeted towards individuals who report high levels of Attentional and Motor impulsivity, as they may be at greatest risk for earlier initiation of MA use.

Keywords

Impulsivity; Methamphetamine; Age; Initiation; Attention; Motor

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1. Introduction

Methamphetamine (MA) use has been associated with serious psychiatric and medical health issues at the individual level and is highly costly to society (for reviews see Courtney &Ray, 2014; Rawson, 2014). According to the Monitoring the Future Survey (Johnston, O'Malley, Meich, Bachman, & Schulenberg, 2016), approximately 1% of 12th graders report MA use in their lifetime, which increases to 6.2% (Center for Behavioral Health: Statistics and Quality, 2015) by the time individuals are age 26 or older. First use of MA occurs at about 22 years of age (Center for Behavioral Health: Statistics and Quality, 2015), during the transition between late adolescence and emerging adulthood. While many factors may be associated with the initiation and maintenance of MA use, impulsivity is a personality trait found to be higher in MA users relative to healthy controls (Ballard, et al., 2015; Ellis, et al., 2016; Hoffman, et al., 2006).

Impulsivity is considered to be a multidimensional personality trait in which individuals have an urge to perform a goal-directed behavior in pursuit of a reward; different forms of impulsivity may include lack of inhibition, risky decision making, and delay discounting (for review see Jentsch et al., 2014). For example, MA dependent individuals are more likely to select small immediate rewards relative to larger delayed rewards on a delay discounting task compared with controls (Ballard, et al., 2015; Hoffman, et al., 2006). They also display deficits in inhibiting pre-potent responses indicated by longer stop-signal reaction times on the Stop-Signal Task (Monterosso, Aron, Cordova, Xu, & London, 2005) relative to healthy controls. These objective measures of impulsivity suggest MA users have difficulties in multiple domains of impulsivity, including those involving impulsive choice (i.e. delay discounting), and those involving impulsive action (i.e. motor impulsivity; Grant & Chamberlain, 2014).

Furthermore, when subjectively assessing impulsivity, MA users cite impulsivity as the second highest reason for using MA, following the pleasurable effects they experience from using the drug (Newton, De La Garza, Kalechstein, Tziortzis, & Jacobsen, 2009). A recent study supports this finding, as not only were treatment-seeking MA dependent individuals less behaviorally inhibited on objective measures of impulsivity, but they also had higher levels of subjective impulsivity relative to controls (Ellis, et al., 2016). A common measure used to assess subjective impulsivity is the Barratt Impulsiveness Scale (BIS-11), which has been divided into three second-order factors, including Attentional, Motor, and Non-planning impulsiveness (Patton, Stanford, & Barratt, 1995). Attentional impulsiveness has been defined as “an inability to focus attention or concentrate”, Motor impulsiveness has been characterized as “as acting without thinking”, while Non-planning impulsiveness has been conceptualized as a “lack of futuring or forethought” (Stanford, et al., 2009). Understanding which of these components of impulsivity may be related to MA use would allow for more targeted intervention programs focused on improving specific subtraits of inhibitory control.

Sex differences in impulsivity and its subtraits may also be present in MA users, such that lack of behavioral inhibition in females, as assessed by retrospective reporting, could render them more vulnerable to engaging in MA use (Winhusen & Lewis, 2013). Additionally, a recent neuroimaging study examining sex differences in impulsivity and brain structure in MA users reported that age at first MA use was significantly negatively related to Behavioral impulsivity in female MA users, while this relationship was not present in male MA users (Kogachi, Chang, Alicata, Cunningham, & Ernst, 2016). Furthermore, in other stimulant users, such as those using crack/cocaine, female users were more impulsive than male users, and impulsivity served as a risk factor for the relationship between gender and crack/cocaine dependence (Lejuez, Bornovalova, Reynolds, Daughters, & Curtin, 2007). Finally, beyond behavioral inhibition, decision making deficits have been shown to be greater in female cocaine and MA users than male users of these substances (van der Plas, Crone, van den Wildenberg, Tranel, & Bechara, 2009), suggesting that executive functioning deficits may be present to a greater extent in female relative to male MA users.

1.1 Current study

It remains unclear whether higher impulsivity is a premorbid risk factor for initiating MA use or if heightened impulsivity is largely a consequence of MA use (Grant & Chamberlain, 2014). The current study of non-treatment seeking MA users expands upon recently reported findings (Kogachi, et al., 2016) by examining the relationships between Attentional, Motor, and Non-planning subtraits of impulsivity and age at first MA use, while accounting for number of years of MA use in a sample of non-abstinent MA users over twice as large as previously investigated (Kogachi, et al., 2016). The current study will help clarify the types of behavioral disinhibition that may be related to early initiation of MA use and whether sex and sex-by-impulsivity interactions are associated with age at first MA use. While, previous reports suggest objectively measured impulsivity in MA users is not associated with years of MA use (Ballard, et al., 2015; Hoffman, et al., 2006; Monterosso, et al., 2005), it is unclear whether self-reported impulsivity could be related to chronicity of MA use, making it an important covariate for the current analyses.

We hypothesized that higher self-reported Motor impulsivity in MA users (Monterosso, et al., 2005) would be associated with earlier initiation of MA use, controlling for total years of MA use. Further, we hypothesized that this effect would be more pronounced in female MA users relative to male MA users (Kogachi, et al., 2016). By examining age of first use, this study investigates whether impulsivity may be associated with MA use initiation in a primarily MA-using community sample.

2. Material and methods

2.1. Participant recruitment and exclusionary criteria

A community sample of non-treatment seeking MA users (N = 203) was recruited through online and print advertisements as part of a medication study (Ray, et al., 2015). As part of the parent behavioral pharmacology study, participants were included in the study if they were between 18–50 years old (to ensure a healthy sample without confounds of aging associated medical conditions), fluent in English, and reported using MA in the past month. Exclusionary criteria at the initial phone screening (N = 984) for the study included 1) major psychiatric disorders, including major depressive disorder with suicidal ideation, or psychotic disorders such as bipolar I and schizophrenia, 2) any other current self-reported substance use in order to recruit a primarily MA as opposed to polysubstance-using sample (excluding alcohol, tetrahydrocannabinol (THC), or nicotine), 3) currently seeking or in treatment for MA use (in order to avoid confounds with medication aim of the study), 4) presence/treatment of major medical conditions (to enroll a medically healthy sample of participants) and 5) use of medications contraindicated for the behavioral pharmacology study (Ray, et al., 2015). Furthermore, exclusionary criteria for the current analyses were the following, 1) absence of urine toxicology test (N = 8), 2) positive urine toxicology test for any substance other than MA or THC (N = 10), 3) missing data for age at first MA use (N = 5), and 4) incomplete data on the Barratt Impulsiveness Scale [BIS-11 (Patton, et al., 1995); N = 23)]. Following the implementation of the exclusionary criteria described above, 157 (113 males/44 females) participants were included in the final analyses for the current study. All study procedures were approved by the University of California, Los Angeles Institutional Review Board and were in accordance with the Declaration of Helsinki.

2.2. Study measures—The Structured Clinical Interview for DSM-IV Disorders (SCID-IV) was used to assess whether participants met criteria for MA abuse and/or dependence and asked participants to report their age at first MA use. Total years of MA use was calculated by subtracting age at first MA use from age at the time of study participation. The Timeline Followback (TLFB) calendar-assisted interview (Sobell & Sobell, 1992) asked participants to recall the amount of MA (in grams) they used in the past 30 days. Participants completed one of the most commonly used self-report measures of impulsivity, the 30-item BIS-11 (Patton, et al., 1995; Stanford, et al., 2009). Items were scored and divided into three different second-order subscales, including Attentional, Motor, and Non-planning impulsivity, and a total impulsivity score was calculated. Participants read each of the statements on the questionnaire and responded on a scale of 1 = Rarely/Never to 4 = Almost Always/Always, as to whether the statement applied to them. Sample items from the subscales include “I often have extraneous thoughts when thinking” (Attentional), “I act on the spur of the moment” (Motor), and “I am more interested in the present than the future” (Non-planning). While not correlated with behavioral measures of impulsivity, all subscales have been shown to highly correlate with other self-report measures of impulsivity (Stanford, et al., 2009). Internal consistency (Chronbach’s α) for the BIS-11 total score and subscales has been reported to be: Total: 0.83, Attentional: 0.74, Motor: 0.59, Non-planning: 0.72, while test-retest reliability (Spearman’s ρ) are as follows: Total: 0.83, Attentional: 0.61, Motor: 0.67, Non-planning: 0.72 (Stanford, et al., 2009).

2.3. Statistical analyses—Statistical analyses were conducted in IBM SPSS (Version 22.0). Three hierarchical multiple linear regressions were examined to investigate the relationship of self-reported impulsivity on each of the BIS-11 subscales with age at first MA use. First, total years of MA use was entered into the model, followed by the self-reported impulsivity score on one of the three subscales, sex, and the sex-by-impulsivity interaction term. Thus, each hierarchical multiple regression (i.e., testing each BIS subscale separately) examined whether self-reported impulsivity, sex, and/or their interaction were significantly ($p < 0.05$) associated with age at first MA use after accounting for total years of MA use.

3. Results

Demographic characteristics for the current study sample are presented in Table 1. On average, participants in the current study were in their mid-30's, started using MA in their early 20's, had a mean total BIS-11 score of 67.6±13.3, and the majority of the sample (N = 137) met past month DSM-IV dependence for MA. There was a significantly greater proportion of females who reported being White than males ($p = 0.02$). The number of male MA users who met DSM-IV criteria for MA abuse was proportionately greater than the number of female MA users who met DSM-IV criteria for MA abuse at a trend level ($p = 0.06$). There was also a trend, such that females reported greater total impulsivity on the BIS-11 than males ($p = 0.07$). This appeared to be driven by significantly greater Non-planning impulsivity reported by females relative to males ($p = 0.04$), and there was a trend for females to report greater Attentional impulsivity compared with males ($p = 0.08$).

All three impulsivity subscales were highly correlated with one another: Motor-Attention ($r = 0.61$, $p < 0.001$), Attention-Non-planning ($r = 0.57$, $p < 0.001$), and Motor-Non-planning ($r = 0.51$, $p < 0.001$). The Cronbach's α coefficient for the total BIS scale was good (0.87), and acceptable for each of the three subscales (Attention = 0.74, Motor = 0.74, Non-planning = 0.73). There was a significant positive relationship between the total impulsivity score on the BIS-11 and total years of MA use, in the entire sample ($r = 0.30$, $p < 0.001$), and in males alone ($r = 0.39$, $p < 0.0001$), but not in females ($r = 0.08$, $p = 0.63$). Impulsivity subscales were significantly correlated with total years of MA use in the overall sample (Attentional: $r = 0.23$, $p = 0.004$; Motor: $r = 0.07$, $p = 0.03$; Non-planning: $r = 0.36$, $p < 0.001$), in males separately (Attentional: $r = 0.29$, $p = 0.002$; Motor: $r = 0.28$, $p = 0.003$; Non-planning: $r = 0.42$, $p < 0.001$), but not in females (Attentional: $r = 0.07$, $p = 0.67$, Motor: $r = -.05$, $p = 0.74$; Non-planning: $r = 0.20$, $p = 0.20$). There was no significant correlation between number of grams of MA used in the past 30 days and the total BIS-11 impulsivity score in the entire sample ($r = -.09$, $p = 0.26$), or in males ($r = -0.11$, $p = 0.26$), or females ($r = -0.03$, $p = 0.86$), separately.

The results of the regression models indicated that Attentional and Motor impulsivity were both significantly associated with age at first MA use [Attentional (Table 2A): $\Delta R^2 = 0.05$, $\beta = -.23$, $t = -2.69$, $p = 0.008$, Cohens $f^2 = 0.07$, Power (1-β) = 0.77; Motor (Table 2B): $\Delta R^2 = 0.05$, $\beta = -.27$, $t = -3.06$, $p = 0.003$; Cohens $f^2 = 0.07$, Power (1-β) = 0.80] after accounting for total years of MA use (Figure 1; Table 2), while there were no significant effects of sex and no sex-by-impulsivity interactions (all p's > 0.10). When all three impulsivity subtraits were examined within one model, Motor impulsivity was significantly related to age at first MA use (Motor: $\Delta R^2 = 0.05$, $\beta = -.23$, $t = -2.01$, $p = 0.046$, Cohen's $f^2 = 0.11$, Power (1-β) = 0.85) after accounting for total years of MA use (Table 3).

4. Discussion

The goal of the current study was to understand the association of self-reported impulsivity in non-treatment seeking MA users with age at first MA use. These analyses serve to clarify to what extent impulsivity may be related to age at first MA use as previous studies have suggested that impulsive personality may be a risk factor for initiating or continuing to use MA (Grant & Chamberlain, 2014; Kogachi, et al., 2016; Newton, et al., 2009; Winhusen &

Lewis, 2013). Furthermore, sex and sex-by-impulsivity interactions were investigated as previous research has indicated sex differences in MA use, with greater premorbid disinhibition in female MA users relative to male users (Winhusen & Lewis, 2013), and greater Behavioral impulsivity in females who initiated MA use at younger ages (Kogachi, et al., 2016). Self-reported Attentional and Motor impulsivity were significantly related to age at first MA use in current MA users, even when controlling for total years of MA use. However, there were no main effects of sex or sex-by-impulsivity interactions significantly related to age at first MA use.

The current findings suggest that individuals reporting greater problems with attentional and motor control were more likely to start using MA at an earlier age. Specifically, individuals, who currently rate themselves higher on restlessness, inability concentrating, and acting quickly without thinking, started using MA earlier in the current study relative to those participants who scored lower on these impulsivity subtraits. While MA is known to affect the dopaminergic system (for review see Yu, Zhu, Shen, Bai, & Di, 2015) and produces neurobiological alterations in this system in chronic MA users (Wilson, et al., 1996), impulsive personality characteristics may also increase vulnerability for MA use. Impulsive personality has been linked with alterations in dopaminergic activity (Weiland, et al., 2014) and dopamine receptor availability (Caravaggio, et al., 2016), and amphetamines are often prescribed to mitigate symptoms of inattention and motor disinhibition (Chan, Fogler, & Hammerness, 2016). One hypothesis is that use of MA may be a form of self-medication (Van Meer, 2014), which could manage or control symptoms of impulsivity. However, greater impulse control issues associated with aberrant dopaminergic function during adolescence and young adulthood could also be related to earlier engagement with psychostimulants, such as MA. For example, the orbitofrontal cortex and anterior cingulate cortex have been shown to underlie impulsive action, such as disinhibition and lack of motor control in preclinical studies (Jentsch, et al., 2014), suggesting neurobiological alterations in these areas may be present prior to the initiation of MA use. It should be recognized that premorbid neural markers related to impulsivity may be moderated by other risk factors for adolescent/young adult substance use, such as drug availability and peer substance use, which are also related to MA use (Embry, Hankins, Biglan, & Boles, 2009; Russell, et al., 2008; Wood, et al., 2008). Furthermore, the current findings are supported in part by a cross-sectional study examining impulsivity as an endophenotype, in which the authors found that siblings of stimulant users also had higher levels of self-reported impulsivity on the BIS-11 relative to controls, suggesting this trait may be both a risk endophenotype present in non-drug users and a personality trait related to stimulant use (Ersche, Turton, Pradhan, Bullmore, &Robbins, 2010). However, these findings were specific to the Non-planning subscale of the BIS-11, but it is possible differences in sample characteristics or sample size may have precluded the detection of significant differences on the other subscales.

The nonsignificant effects of sex or the sex-by-impulsivity interactions were surprising given past research that has noted earlier age at first MA use in females (Dluzen & Liu, 2008) and greater behavioral impulsivity in females that was significantly related to their onset of MA use (Kogachi, et al., 2016). Sample characteristics between the current and previous studies may explain some these differences. For example, in the current sample of participants there was a trend for more males relative to females to meet MA abuse criteria. Thus, overall the males in the sample may have been more severe users than the females, which is contrary to previous findings (Dluzen & Liu, 2008). Perhaps a sample of more severe female MA users would have resulted in the expected sex differences and interaction.

4.1. Limitations

While the current study has several strengths, including the examination of different forms of self-reported impulsivity as they relate to age at first MA use using the well-validated BIS-11 scale, there are limitations that should be noted. First, the parent behavioral pharmacology arm of the study necessitated the recruitment of primarily MA-using as opposed to polysubstance-using individuals, and other exclusionary criteria, such as major psychiatric conditions, used to recruit a medically healthy sample of participants, may limit generalizability of the findings. Second, the sample size was modest, but small-to-medium effects were detected for the significant findings, with power analyses suggesting high power for the Motor impulsivity regression and slightly less than ideal power for the Attentional impulsivity regression. Other factors that may explain additional variance associated with initiating MA use will need to be investigated, and a more equal sample of males and females would be preferred in future studies. Third, only past 30 day use of MA was available for the current participants. While most participants met past month DSM-IV criteria for MA dependence, we cannot ascertain that all participants had been using MA regularly since initiating use. Fourth, it is important to note that many other factors may be associated with initiation of MA use, beyond impulsivity. Drug availability, childhood psychopathology, family history of substance use disorders, lack of parental monitoring, peer substance use, risky sex, antisocial behavior, and genetic variants are some of the many factors that have been associated with MA use (Bousman, Glatt, Everall, & Tsuang, 2009; Embry, et al., 2009; Russell, et al., 2008; Wood, et al., 2008). Longitudinal studies of adolescents and young adults who initiate MA use will be able to clarify which of these risk factors may best explain age at first MA use. Furthermore, future studies should investigate the reasons for initiating MA use at different ages, as the current study suggests there is a wide age range at which individuals first start using MA. It is likely that the factors related to age at first use of MA differ for adolescents and older adults. For example, changing financial, social, and employment obligations may be more relevant to MA use initiation at older vs. younger ages. Finally, given the cross-sectional design of the study based on retrospective reporting, we cannot conclude that higher impulsivity contributed to earlier initiation of MA use, only that this association was present.

4.2. Future directions

Since average age at first MA use is about 22 (Center for Behavioral Health: Statistics and Quality, 2015), which closely matches the mean age at first MA use in the current study, impulsivity may need to be carefully examined in late adolescence and early adulthood as a risk factor for starting to use MA. While self-reported impulsivity generally shows a linear decline from childhood to adulthood (Steinberg, et al., 2008), those individuals whose impulsivity levels remain high across adolescence or whose impulsivity shows a different developmental pattern, might be the greatest risk group for adolescent or early adult MA use initiation. Future longitudinal studies focused on substance use in the late adolescent and early adulthood period should examine subjective and objective impulsivity measures as potential vulnerability markers for using MA. These studies may inform prevention efforts aimed at reducing the number of substance users who begin using psychostimulants during adolescence and young adulthood. For example, the current findings indicate that future studies may benefit from assessing different subtraits of impulsivity in high-risk adolescents. Designing interventions that reduce acting on impulse or developing tasks that increase focus and concentration in highly impulsive youth may help prevent the onset of early MA use initiation.

5. Conclusions

The current findings indicate self-reported Attentional and Motor impulsivity are significantly negatively related to age at first MA use. These results suggest that impulsive personality should be closely examined during adolescence and young adulthood when most MA use is initiated. While impulsivity may increase as a result of MA use, impairments in attentional and motor control could be early markers that indicate risk for initiating MA use. Longitudinal studies of adolescent substance users should examine whether impulsive personality, using both subjective and objective measures, predicts the initiation of MA use during late adolescence and emerging adulthood.

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Highlights

- Impulsivity may be a risk factor for and a consequence of methamphetamine (MA) use.
- Attentional and motor impulsivity are negatively related to age at first MA use.
- Impulsivity should be examined as a risk factor for earlier onset of MA use.

Table 1

Demographics, Substance Use Characteristics, and BIS Impulsivity Scores of Methamphetamine Users.

	Total	**Females**	**Males**	***t, U, X*²**	***p***
Age	35.0(8.6)	35.3(9.7)	34.9(8.2)	−0.22	0.83
Sex (N)	157	44	113		
Ethnicity[a]					
White	63	24	39	5.29	**0.02**
Black	40	8	32	1.71	0.19
Asian	6	1	5	0.40	0.53
Latino	59	15	44	0.32	0.57
Native American	4	1	3	0.02	0.89
Past month MA dependence (N)[b]	137	40	97	0.55	0.46
Past month MA abuse (N)[b]	116	28	88	3.70	0.06
Age at first MA use	22.7(7.7)	21.8(6.9)	23.0(7.9)	0.88	0.38
Years of MA use	12.3(8.6)	13.4(9.7)	11.9(8.1)	−1.0	0.32
Grams of MA use (in past 30 days)[c]	19.0(32.9)	18.4(25.5)	19.2(35.6)	0.13	0.89
Smoking Frequency (Daily/Occasionally/Not at All)	83/24/50	25/5/14	58/19/36	0.80	0.67
Alcohol Use Frequency[b]				3.84	0.43
Never	31	10	21		
Monthly or less	57	19	38		
2–4 times a month	26	5	21		
2–3 times a week	24	4	20		
4 or more times a week	18	6	12		
Marijuana Smoker (Yes/No)[b]	70/86	15/29	55/57	2.88	0.09
BIS-11 Total	67.6(13.3)	70.7(12.4)	66.4(13.2)	−1.84	0.07
BIS-11 Attentional	16.4(4.7)	17.5(4.3)	16.0(4.7)	−1.78	0.08
BIS-11 Motor	24.4(5.5)	25.0(5.8)	24.1(5.3)	−0.99	0.32
BIS-11 Non-planning	26.9(5.6)	28.2(4.8)	26.3(5.8)	−1.88	**0.04**

Mean (standard deviation) unless otherwise noted. Bold *p* values indicate significant group differences between males and females.

[a]Participants may have indicated multiple ethnicities.

[b] Missing for one participant.

[c] Missing for 7 males and 1 female.

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Table 2

Effects of Attentional and Motor Impulsivity, Sex, and their Interaction on Age at First Methamphetamine Use

A) Attentional Impulsivity

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	22.682	.550		41.246	.000	21.595	23.768			
	Centered_YearsMAUse	−.394	.064	−.442	−6.129	.000	−.521	−.267	−.442	−.442	−.442
2	(Constant)	22.717	.638		35.614	.000	21.457	23.977			
	Centered_YearsMAUse	−.348	.065	−.390	−5.349	.000	−.476	−.219	−.442	−.398	−.378
	Sex	−.164	1.230	−.010	−.134	.894	−2.594	2.265	−.071	−.011	−.009
	Centered_BIS_Attention	−.371	.138	−.226	−2.685	**.008**	−.645	−.098	−.311	−.213	−.190
	Centered_BIS_Attention_Sex	.037	.275	.011	.134	.893	−.506	.580	−.126	.011	.009

B) Motor Impulsivity

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	22.682	.550		41.246	.000	21.595	23.768			
	Centered_YearsMAUse	−.394	.064	−.442	−6.129	.000	−.521	−.267	−.442	−.442	−.442
2	(Constant)	22.767	.633		35.955	.000	21.516	24.018			
	Centered_YearsMAUse	−.350	.065	−.393	−5.429	.000	−.478	−.223	−.442	−.403	−.381
	Sex	−.419	1.204	−.025	−.348	.728	−2.799	1.960	−.071	−.028	−.024
	Centered_BIS_Motor	−.372	.122	−.267	−3.056	**.003**	−.613	−.132	−.298	−.241	−.215
	Centered_BIS_Motor_Sex	.166	.215	.067	.773	.441	−.258	.590	−.077	.063	.054

[a]Dependent Variable: Age of first meth use

Table 3

Effects of Self−reported Impulsivity Subtraits, Sex, and their Interaction on Age at First Methamphetamine Use

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	22.682	.550		41.246	.000	21.595	23.768			
	Centered_YearsMAUse	−.394	.064	−.442	−6.129	.000	−.521	−.267	−.442	−.442	−.442
2	(Constant)	22.764	.634		35.930	.000	21.512	24.016			
	Centered_YearsMAUse	−.371	.068	−.416	−5.482	.000	−.505	−.237	−.442	−.411	−.384
	Sex	−.406	1.230	−.024	−.330	.742	−2.837	2.025	−.071	−.027	−.023
	Centered_BIS_Attention	−.237	.185	−.144	−1.283	.201	−.602	.128	−.311	−.105	−.090
	Centered_BIS_Attention_Sex	−.240	.374	−.073	−.641	.522	−.979	.499	−.126	−.053	−.045
	Centered_BIS_Motor	−.325	.161	−.232	−2.010	**.046**	−.644	−.006	−.298	−.163	−.141
	Centered_BIS_Motor_Sex	.149	.265	.060	.564	.574	−.374	.673	−.077	.046	.039
	Centered_BIS_Nonplanning	.171	.137	.126	1.248	.214	−.100	.443	−.206	.102	.087
	Centered_BIS_Nonplanning_Sex	.194	.317	.066	.614	.540	−.431	.820	−.068	.050	.043

[a] Dependent Variable: Age of first meth use