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Effect of Methamphetamine Dependence on Everyday Functional Ability

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Abstract

Background—Methamphetamine (METH) is an increasingly popular and highly addictive psychostimulant with a significant impact on public health. Chronic METH exposure has been associated with neurotoxic effects, profound neuropsychological deficits, and impaired quality of life, but few studies have examined the effect of the drug on the ability to carry out everyday activities. We assessed the effect of METH dependence on everyday functioning using the UCSD Performance-Based Skills Assessment (UPSA-2), a performance-based measure designed to evaluate real-life skills.

Method—UPSA-2 performance was quantified in 15 currently abstinent individuals with a history of METH dependence and 15 drug-free comparison subjects. The Positive and Negative Syndrome Scale (PANSS) and Wisconsin Card Sorting Task (WCST) were administered to assess psychopathology and executive function.

Results—METH-dependent participants exhibited significant impairment on the UPSA-2 total score and several UPSA-2 subscales, including comprehension, finance, transportation, communication, and medication management compared to drug-free comparison subjects. Lower UPSA-2 scores were associated with impaired performance on the WCST, higher PANSS scores, and drug use at an earlier age.

Conclusion—METH dependence may be associated with decreased everyday functioning ability potentially mediated by frontal cortex dysfunction or the emergence of psychopathology related to chronic drug use.

Keywords

methamphetamine; UPSA; functional ability

1. Introduction

Methamphetamine (METH) is an extremely potent and highly addictive drug that is inexpensive, easy to synthesize, and one of the most widely abused drugs, with an estimated 35 million METH users worldwide (Romanelli & Smith, 2006). Recent studies have demonstrated that METH dependence is associated with significant impairment in health-

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related quality of life, including degraded physical and social functioning (Costenbader, Zule, & Coomes, 2007; Sommers, Baskin, & Baskin-Sommers, 2006), although these deficits can improve with treatment (Gonzales et al., 2009). In addition, increasing evidence suggests that chronic METH use can result in profound neuropsychological deficits (Nordahl, Salo, & Leamon, 2003), including impairment in executive function and response inhibition (Scott et al., 2007) that may persist after extended abstinence (Johanson et al., 2006; Salo et al., 2002). However, in contrast to the substantial body of literature reporting METH-induced impairment on conventional neuropsychological tests, relatively few studies have assessed the effect of chronic drug use on the functional ability to engage in everyday tasks of daily living (Verdejo-Garcia & Perez-Garcia, 2007).

There are a number of approaches to assessing everyday function, including 1) self-report measures, 2) caregiver or confidant reports, and 3) direct observation of behavior in home and work settings, but the validity of these methods is limited by a variety of factors (Patterson, Goldman, McKibbin, Hughs, & Jeste, 2001a). Self-report measures such as quality of life scales (Heinrichs, Hanlon, & Carpenter, 1984; Lehman, Postrado, & Rachuba, 1993) or activities of daily living (ADL) questionnaires (Lawton & Brody, 1969) have been widely utilized, but are influenced by poor participant insight and cognitive deficits present in dementia or psychiatric illness. Many individuals are unable to provide the name of a contact person able to report on their daily functioning (Patterson et al., 1996) and long-term observation of subjects in their home or work environment is often not feasible.

In contrast to these methods, several performance-based measures have been developed to administer tasks that focus on real-life skills in a clinical setting (Kuriansky, Gurland, & Cowan, 1976; Loewenstein et al., 1989). A more recent scale, the UCSD Performance-Based Skills Assessment (UPSA-2) (Patterson et al., 2001a; Patterson, 2005), was designed to quantify everyday functioning across 6 domains, including: 1) planning recreational activities, 2) finance, 3) communication skills, 4) transportation, 5) household skills, 6) and medication management. The UPSA has demonstrated strong inter-rater and test-retest reliability (Patterson et al., 2001a; Patterson, Moscona, McKibbin, Davidson, & Jeste, 2001b) and is reported to be correlated significantly with independence of living and neuropsychological deficits (Bowie, Reichenberg, Patterson, Heaton, & Harvey, 2006; Twamley et al., 2002). Although initially conceived as a measure to assess functional deficits in geriatric psychosis, the UPSA has been administered successfully to younger cohorts (Heinrichs, Statucka, Goldberg, & McDermid Vaz, 2006; Pietrzak et al., 2009), individuals with bipolar disorder (Depp et al., 2009), and has also been tested in Swedish and Latino samples (Harvey et al., 2009; Patterson et al., 2005).

While performance-based testing has been used to assess functional ability in a variety of populations, including individuals with HIV (Heaton et al., 2004), dementia (Razani et al., 2007), and schizophrenia (Heinrichs et al., 2006), this method has not been widely utilized to assess the potential of functional deficits associated with chronic drug use. Previous studies have reported that chronic METH-dependent individuals exhibit a decrease in everyday functioning as determined by self-report measures (Sadek, Vigil, Grant, & Heaton, 2007) and a prospective memory paradigm (Rendell, Mazur, & Henry, 2009), but the effect of chronic METH use on everyday task performance has not been studied extensively. The lack of research in this area is somewhat surprising in light of the neuropsychological deficits associated with chronic drug use and the demonstrated relationship between cognitive impairment and functional ability in real-world settings (McClure et al., 2007).

The objective of the current study was to assess everyday functional ability in abstinent individuals with a history of METH dependence and a drug-free comparison group using the UPSA-2 task. We hypothesized that UPSA-2 scores would be significantly lower among

METH-dependent subjects when compared to a sample of comparable drug-free comparison subjects. In addition, we administered the Wisconsin Card Sorting Task (WCST) to assess executive function in these groups. Previous work has shown that impaired WCST performance in schizophrenia outpatients is associated with lower UPSA scores (Kurtz & Wexler, 2006). Therefore, we also examined the relationship between UPSA results and neuropsychological deficits as assessed by the WCST.

2. Methods

2.1. Participants

15 METH-dependent participants were recruited through the HIV Neurobehavioral Research Center (HNRC), an institute that collaborates with community organizations and drug treatment centers throughout the San Diego area. Subjects met SCID (Structured Clinical Interview for DSM-IV) criteria (First, 1994) for lifetime history of Substance Use Disorder for METH Dependence, reported symptoms of METH abuse or dependence within the past two years, and were also required to be abstinent from the drug for at least 7 days before testing. The history and pattern of drug use, including the length, frequency, and estimated quantity of METH use were obtained through a substance use questionnaire (Table 1). 15 drug-free comparison subjects who had never met SCID criteria for any substance use disorder were recruited from advertisements in the San Diego community. Comparison and METH groups were comparable for age, gender, education, ethnicity and had equivalent premorbid IQ as assessed by the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1997) (Table 1).

Participants from both groups were excluded if: 1) they met SCID criteria for schizophrenia, bipolar disorder, or current major depression, 2) any neurological conditions or head trauma, 3) treatment with electroconvulsive therapy, 4) a history of stroke, heart attack, or cardiac disease, 4) infection with HIV or hepatitis C, 5) a positive result for cocaine, amphetamine, PCP, opiates, or cannabis on a urine toxicology Rapid Drug screen (Pharmatic Inc., San Diego, CA) administered during the test session, 6) substance dependence on illegal drugs other than METH in the past 5 years, 7) alcohol abuse or dependence within the past 12 months, 8) a remote (i.e., more than 5 years prior to study enrollment) but significant history of alcohol or other substance dependence, as described in previous studies (Rippeth et al., 2004; Woods et al., 2005). After subjects were initially screened during a phone interview, 20 METH-dependent and 16 drug-free comparison participants were tested in our laboratory. In the METH-dependent group, 5 of these subjects were excluded from the current study due to meeting criteria for current major depression, recent alcohol abuse, or positive amphetamine toxicology. One individual in the comparison group who denied any drug use tested positive for cocaine and was excluded from the dataset, resulting in a final sample of 15 participants in each group. Three subjects included in the METH-dependent group did meet criteria for lifetime history of Attention Deficit Hyperactivity Disorder (ADHD).

Given that chronic METH exposure has also been associated with increased prevalence of psychotic symptoms (McKetin, McLaren, Lubman, & Hides, 2006), we administered the Structured Clinical Interview – Positive and Negative Syndrome Scale (PANSS) to assess for the presence of psychopathology. The PANSS consists of a 30 item rating scale that determine the extent of “positive” psychotic symptoms that include paranoia, hallucinations, or unusual thought content, “negative” symptoms that include flat affect, emotional withdrawal, and lack of spontaneity, and miscellaneous symptoms of general psychopathology that include anxiety, poor attention, and somatic concerns. All participants provided written informed consent to the current protocol approved by the UCSD institutional review board.

2.2. Measures

UPSA-2—Functional ability was assessed with the UPSA-2 (Patterson, 2005). Participants were asked to perform tasks in 6 separate domains considered necessary for successful and independent functioning in the community: 1) Comprehension and Planning, 2) Financial ability, 3) Communication skills, 4) Transportation, 5) Household skills, and 6) Medication management as described below.

In the first domain, comprehension and planning skills were assessed by having participants read a fictional article about the opening of a theme park. They were subsequently required to describe the activities at the park and plan a trip to the recreational facility. Financial ability was evaluated by a counting change task and having the subjects identify important aspects of a utility bill. Participants also engaged in role-playing tasks that included using a telephone and scheduling a medical appointment to test their communication skills. The transportation domain involved reading and interpreting a generic bus route and planning the use of a public bus system. Household skills were assessed by preparing a shopping list for a specific cooking task based on food items presented in a mock pantry. Finally, participants were required to organize a medication routine where they were asked to role-play how they would take a number of different medications over the course of a single day.

Administration of the UPSA-2 requires about 30 minutes. Each of the UPSA-2 domains generates a raw score that is converted to a domain score ranging from 0 to 20 points. The 6 domain scores are summed to create a total UPSA-2 score up to a maximum of 120 points, with higher scores indicating improved performance.

WCST—Participants were administered the Wisconsin Card Sorting Test-64 Card Version (WCST-64) (Heaton, 1993). The WCST is a rule generation and set-shifting task that assesses perseverative behavior, a tendency to engage in repetitive and maladaptive responses linked to frontal cortex pathology (Goldberg & Miller, 1986; Perry & Braff, 1998). Participants are required to sort cards based on three perceptual dimensions (color, shape, and number) and are provided feedback to enable identification of the correct matching rule. After a number of correct responses, the card sorting category changes. Dependent measures include 1) total number of errors, 2) perseverative errors, and 3) number of categories completed. Perseverative responding is indicated by a failure to abandon the previous sorting rule when it has been explicitly changed (e.g., from shape to color). Error scores for the task are converted to T scores corrected for age and education, where a higher score indicates improved performance on the measure.

2.3. Statistical Analyses

Statistical analyses were performed using SPSS and data were examined for normality of distribution and homogeneity of variance. Appropriate transformations were conducted to maximize data normality for the UPSA battery (reflected $\log_{10}$ for the medication and comprehension domain scores; and reflected square root for the communication and household domain scores). Mean values for the UPSA-2 total score and each of the domain scores were calculated for the comparison and METH groups. Group differences across all domains were assessed using multivariate analyses of variance (MANOVA), followed up by univariate ANOVAs for each domain. Post-hoc differences were examined using Bonferroni-adjusted multiple t-test comparisons and r was calculated as the effect size (Rosenthal, 1991).

Bivariate Pearson r correlations were performed to compare relationships between UPSA-2 measures and characteristics of METH use, including the age of first drug use, duration of continuous drug use (in years), the total amount of drug consumed (in grams), frequency of use, number of days METH was used in the past year, and length of abstinence from the drug.

WCST and PANSS measures were assessed using independent sample t-tests. PANSS data was collected for all subjects; however, two individuals in the drug-free comparison group did not receive the WCST. Bivariate Pearson r correlations were performed to compare WCST and PANSS scores with performance on the UPSA-2 measures. To reduce the probability of a Type 1 error associated with a large number of statistical analyses, the level of significance for comparisons was set at $p < 0.025$, rather than $p < 0.05$.

3. Results

The MANOVA performed for UPSA-2 data indicated a significant main effect of group [$F(7,22) = 5.8, p < 0.01$]. Subsequent univariate ANOVAs revealed a main effect of group on the total UPSA score [$F(1,28) = 32.8, p < 0.001$], comprehension [$F(1,28) = 21.58, p < 0.001$], finance [$F(1,28) = 14.2, p < 0.01$], communication [$F(1,28) = 10.1, p < 0.01$], transportation [$F(1,28) = 8.6, p < 0.01$], and medication management [$F(1,28) = 11.8, p < 0.01$]. Bonferroni posthoc tests indicated that the drug-free comparison group exhibited significantly improved performance on the total UPSA-2 score ($p < 0.001$), comprehension domain ($p < 0.001$), financial domain ($p < 0.01$), communication domain ($p < 0.01$), transportation domain ($p < 0.01$) and the medication management domain ($p < 0.01$) compared to the METH group, but no difference was observed for household skills (Table 2). There was a large effect size of group (r values) on the total UPSA-2 score (0.73), comprehension domain (0.66), financial domain (0.58), communication domain (0.52), transportation domain (0.48), and medication management domain (0.54).

We did not observe any significant correlation between UPSA-2 performance and the length of METH use, the amount of total drug consumed, duration of abstinence, or the number of days METH was used in the 12 months prior to testing. There was a trend towards a positive correlation between the age at which drug use was initiated and the total UPSA-2 score ($r = 0.51, p = 0.054$); this result suggests that participants who started using the drug at an earlier age performed more poorly on the UPSA-2. A significant negative correlation between the frequency of METH use and performance on the UPSA-2 financial score ($r = -0.63, p = 0.016$) indicated that more frequent METH use was associated with more impaired performance in this domain.

METH-dependent participants showed significant impairment on the WCST, including more total errors [$t(26) = 3.1, p < 0.01$], greater perseverative errors [$t(26) = 2.8, p < 0.01$], and fewer completed categories [$t(26) = 3.0, p < 0.01$] compared to the drug-free comparison group. Total error T-scores (with higher scores indicating fewer WCST errors) were positively correlated with the total UPSA-2 score and improved performance in the medication, financial, and transportation domains (Table 3). Fewer perseverative errors were significantly correlated with better transportation scores and associated with a trend towards a higher total UPSA-2 score and improved performance in the financial domain. Finally, the number of WCST categories completed was positively correlated with the UPSA-2 total, financial and transportation scores. These data suggest that poor performance on the WCST was related to impaired functional ability as assessed by a variety of UPSA-2 measures.

The METH-dependent group exhibited significantly higher total ($t(28) = -5.28, p < 0.001$) and positive symptom ($t(28) = -4.12, p < 0.001$) PANSS scores compared to drug-free comparison subjects (Table 1), but did not differ on the negative symptom scale ($t(28) = 0.638, p = 0.53$). There were no significant correlations between PANSS scores and UPSA-2 measures in the comparison group. For METH-dependent subjects, the PANSS total score was negatively correlated with the total UPSA-2 score and the household skills score, while the positive symptom PANSS subscale was negatively correlated with the total UPSA-2 score, the household skills score, and the comprehension score (Table 4).

Although some evidence suggests that ADHD may contribute to METH-induced cognitive deficits (Sim et al., 2002), the three METH-dependent subjects who also met criteria for lifetime ADHD exhibited equivalent performance on the UPSA (average score of 86.7) compared to the non-ADHD METH sample (average score of 83.2). Performance on the PPVT was also unaffected, with average scores of 97.5 and 97.7 for the ADHD and non-ADHD METH-dependent participants, respectively. In addition, ADHD METH-dependent participants showed a tendency towards fewer errors on the WCST (average total error score of 50.7 vs. 40.0 for the non-ADHD METH-dependent sample). These data suggest that the presence of comorbid ADHD in several METH-dependent subjects (at least in this very small sample) does not account for the differences in functional ability observed between METH-dependent and drug-free comparison participants.

4. Discussion

The findings of the current study indicate that abstinent METH-dependent subjects exhibited impaired functional ability on the UPSA-2 task relative to drug-free comparison participants. The METH-dependent group demonstrated worse functional performance in several specific domains, including comprehension and planning, engaging in financial transactions, setting up travel arrangements, communication skills, and managing a medication regimen. There was no significant group difference in the household skills domain (shopping for food items), although it is conceivable that the limited score range in this domain (from 0 to 4 raw points) may have precluded observation of more subtle group differences in this category; alternatively, this activity may have been relatively more familiar to all participants and thus easier to perform. In addition, initiation of drug use at an earlier age and a higher frequency of drug administration were associated with greater impairment in functional performance. Our results thus support the conclusion that chronic METH exposure is associated with decreased ability in carrying out tasks of everyday living.

Numerous studies have confirmed that METH use is associated with cognitive impairment, including deficits in memory, attention, and executive function (Barr et al., 2006). Recent work has indicated that neuropsychological deficits observed after chronic METH exposure are directly linked to neurotoxic effects of the drug on human frontostriatal circuitry (Scott et al., 2007). For example, decreases in glucose metabolism and fractional anisotropy in the frontal cortex of METH-dependent individuals has been correlated with increased total errors and perseveration on the WCST (Chung et al., 2007; Kim et al., 2005). In the current study, METH-dependent individuals exhibited increased errors, greater perseveration, and completed fewer categories on the WCST compared to the drug-free group. WCST measures were also significantly correlated with performance on the total UPSA-2 score and multiple UPSA-2 domains, including medication management, finances, and transportation. These data would suggest that impaired functional ability in METH-dependent individuals may be mediated by executive cognitive deficits driven by frontal lobe dysfunction. It is relevant to note, however, that WCST data was not obtained for two drug-free comparison subjects, reducing the n of this group to 13; thus, evaluation of this effect with larger samples is warranted.

The present data are supported by previous research indicating that chronic METH use is associated with self-reported disruption in everyday activities (Rendell et al., 2009; Sadek et al., 2007) and increased errors in planning a daily schedule (Rendell et al., 2009). METH dependence has been linked to impaired activity in communication, work, and recreation domains (Sadek et al., 2007) and functional deficits exhibited after several months of abstinence (Rendell et al., 2009), similar to our findings with the UPSA task.

While individuals with a diagnosis of schizophrenia, bipolar disorder, or depression were excluded from participation, METH-dependent participants did exhibit quite low, but

significantly higher total and positive symptom PANSS scores compared to drug-free participants. PANSS scores in the METH-dependent group were correlated with a lower total UPSA-2 score and impairment in the comprehension and household skills domains. In contrast, previous studies reported that negative but not positive symptoms were associated with impaired UPSA performance (Kasckow et al., 2008; Patterson et al., 2001a; Twamley et al., 2002). This discrepancy may reflect the fact that these reports measured functional ability in older schizophrenia populations (average age in 50s) as compared to our younger METH-dependent sample (average age 37). Our results do suggest the possibility that functional impairment in individuals with chronic METH dependence could be related to the emergence of drug-related abnormal perceptions or thoughts, even if such symptoms are not severe enough to merit a diagnosis of METH-induced psychosis.

There are a number of limitations to consider in the interpretation of the current data. The size of the clinical sample was relatively small, so future studies assessing functional ability in larger populations of METH-dependent individuals would be appropriate to determine if the current findings are representative of adults with a history of METH dependence. It is also possible that premorbid deficits in executive function may increase the probability of drug use, making cause and effect determinations more difficult. In addition, the current report does not assess the effect of chronic dependence on other drugs of abuse, such as cocaine, on functional ability. Also, self-report of drug administration can be unreliable, resulting in substantial under/over reporting of the actual drug use. This factor should be considered, for example, in light of the fact that we did not observe significant correlations between the estimated quantity of METH consumed and any of the UPSA-2 performance measures. Finally, while the UPSA-2 provides a measure of everyday task ability, the test does not directly measure how each subject actually performs in their home/work environment, as do observer-based measures such as the Specific Level of Function Scale (Bowie et al., 2008). Recent work has suggested variability in the association between test-derived measures of functional ability and real-world function (Harvey et al., 2009), so it is appropriate to be cautious about predicting real-world activity based solely on what is still a laboratory measure.

In conclusion, a sample of abstinent METH-dependent individuals exhibited impaired functional ability on the UPSA-2 task relative to a drug-free comparison group, suggesting that chronic METH use may have a significant negative impact on performance of everyday activities. These findings indicate that laboratory assessment of everyday task ability could potentially be a useful tool to determine the capacity of drug users to function effectively in the community, similar to previous work evaluating functional ability in psychiatric or disease populations (Heaton et al., 2004; Heinrichs et al., 2006). The data have potentially important implications for the structure of substance abuse intervention, given that individuals with poor functional ability may have difficulty responding to the cognitive-behavioral therapy and motivational enhancement techniques commonly used to treat METH addiction (Rendell et al., 2009). Utilization of measures such as the UPSA may enable a more comprehensive assessment of the impact of drug use on cognitive and psychosocial function, ultimately improving treatment and intervention methods in substance abuse populations.

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Table 1

Demographic factors and drug use history for comparison (n = 15) and METH-dependent (n = 15) subjects. PPVT results are presented as age-adjusted standard scores. The PANSS total score ranges from 30 to 210, and the Positive and Negative symptoms subscales range from 7 to 49. Higher scores indicate more severe psychopathology.

Parameter	Comparison	METH-Dependent	Difference
Age (years)	37.8 ± 2.5	36.9 ± 2.2	ns
Gender	11 M, 4 F	12 M, 3 F	ns
Education (years)	14.1 ± 0.6	13.6 ± 0.6	ns
Ethnicity (n)			ns
<i>Caucasian</i>	11	11	
<i>Latino</i>	2	3	
<i>African-American</i>	2	1	
Peabody Picture Vocabulary Test scores	100.9 ± 3.2	97.6 ± 2.3	ns
Age at first METH use (years)	-----	22.1 ± 2.0	
Duration of continuous METH use (years)	-----	10.6 ± 1.7	
Frequency of METH use (per month)	-----	23.4 ± 2.5	
Total amount of METH used (in grams)	-----	6390.1 ± 1378.6	
Number of days METH used in past year	-----	54.5 ± 24.2	
Duration of METH Abstinence (Days)	-----	259.7 ± 57.4	
PANSS Total Score	33.6 ± 0.8	43.2 ± 1.7***	
PANSS Positive Symptoms	8.1 ± 0.3	12.3 ± 1.0***	
PANSS Negative Symptoms	7.7 ± 0.3	7.5 ± 0.2	

Data are represented as means ± S.E.M. Asterisks indicate significant group differences

p < 0.001.

Table 2

UPSA-2 measures for drug-free comparison (n = 15) and METH-dependent (n = 15) subjects. UPSA-2 total score range is from 0 to 120; the score range for each individual domain is from 0 to 20. Higher scores indicate improved functional performance.

Measure	Comparison	METH-Dependent
UPSA-2 Total Score	104.5 ± 1.2	83.9 ± 3.4 ^{***}
Comprehension/Planning Domain	16.5 ± 0.6	11.3 ± 1.0 ^{***}
Financial Domain	18.8 ± 0.4	16.5 ± 0.5 ^{**}
Communication Domain	16.6 ± 0.6	12.5 ± 1.2 ^{**}
Transportation Domain	16.8 ± 0.5	14.3 ± 0.7 ^{**}
Household skills Domain	16.7 ± 0.6	14.7 ± 1.5
Medication Management Domain	19.1 ± 0.3	14.5 ± 1.7 ^{**}

Data are represented as means ± S.E.M. Asterisks indicate significant group differences

^{**}
p < 0.01

^{***}
p < 0.001.

Table 3

Pearson r correlations between WCST measures and UPSA-2 domain measures for all participants (n = 28). WCST total error and perseverative error data are calculated as T scores normalized for age and gender. Higher T scores indicate improved performance (fewer errors).

Measure	WCST DATA		
	Total Errors T score	Perseverative Errors T score	Categories Completed
UPSA-2 Total Score	0.58**	0.39 [†]	0.49**
UPSA-2 Comprehension/Planning	0.26	0.16	0.29
UPSA-2 Financial	0.47*	0.42 [†]	0.50**
UPSA-2 Communication	0.41	0.30	0.41 [†]
UPSA-2 Transportation	0.60**	0.47*	0.67***
UPSA-2 Household skills	0.11	0.04	0.10
UPSA-2 Medication Management	0.51**	0.26	0.19

Asterisks indicate significant correlations

*
p < 0.025

**
p < 0.01.

[†].
indicates a trend (p < 0.05).

Table 4

Pearson r correlations between PANSS Total and Positive Symptoms scores and UPSA-2 domain measures for METH-dependent participants (n = 15). Individuals with higher PANSS scores showed more impaired performance on the total UPSA-2 score and in the comprehension/planning and household skills domains. No significant correlations were observed for the Negative Symptoms subscale in METH-dependent participants or between any PANSS measure and UPSA-2 domain in drug-free comparison subjects.

Measure	PANSS Total Score	PANSS Positive Score
UPSA-2 Total Score	− 0.66 **	− 0.60 **
UPSA-2 Comprehension/Planning	− 0.56 †	− 0.60 *
UPSA-2 Financial	0.06	0.27
UPSA-2 Communication	− 0.29	− 0.30
UPSA-2 Transportation	− 0.22	− 0.14
UPSA-2 Household skills	− 0.61 *	− 0.62 *
UPSA-2 Medication Management	− 0.18	− 0.1

Asterisks indicate significant correlations

*
p < 0.025

**
p < 0.01.

†
indicates a trend (p < 0.05).