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Distress and sleep quality in young amphetamine-type stimulant users with an affective or psychotic illness

Jacob J. Crouse[a,*], Rico S.C. Lee[a,b], Django White[a], Ahmed A. Moustafa[c], Ian B. Hickie[a], Daniel F. Hermens[a,d]

[a] Youth Mental Health Team, Brain and Mind Centre, University of Sydney, NSW, Australia
[b] Brain and Mental Health Laboratory, Monash University, VIC, Australia
[c] School of Social Sciences and Psychology, Western Sydney University, NSW, Australia
[d] Sunshine Coast Mind and Neuroscience Thompson Institute, University of the Sunshine Coast, QLD, Australia

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ABSTRACT

Misuse of amphetamine-type stimulant (ATS) drugs may disrupt key neurodevelopmental processes in young people and confer protracted neurocognitive and psychopathological harm. ATS users with a co-occurring psychiatric illness are typically excluded from research, reducing generalisability of findings. Accordingly, we conducted a cross-sectional examination of key clinical, sleep, socio-occupational and neurocognitive measures in current, past and never users of ATS drugs who were accessing a youth mental health service (*headspace*) for affective- or psychotic-spectrum illnesses. Contrary to hypotheses, groups did not differ in psychotic symptomology, socio-occupational functioning or neurocognitive performance. Current ATS users were however significantly more distressed and reported poorer subjective sleep quality and greater subjective sleep disturbances than never users, with a trend toward greater depressive symptomology in current users. Regression analyses revealed that depressive symptoms, daily ATS use and socio-occupational functioning predicted distress, and depressive symptoms and distress predicted subjective sleep quality. Our findings suggest that distress and poor sleep quality reflect a particular pathophysiology among ATS-using patients, which may negatively impact treatment engagement. Delineating the factors that disrupt social and neurobiological development in young people (such as substance use) warrants further investigation, including longitudinal study.

1. Introduction

Amphetamine-type stimulant (ATS) drugs are synthetic sympathomimetic amines which characteristically exert marked stimulant effects on the central nervous system and represent the second-most used class of illicit substances worldwide, following cannabis (Degenhardt et al., 2013; UNODC, 2016). The ATS class comprises the structural analogues of amphetamine, with the commonest forms including methamphetamine ('ice'), methylenedioxymethamphetamine (MDMA, 'ecstasy'), and dextroamphetamine (Sulzer et al., 2005). Numerous physical health risks are associated with ATS use, including cardiovascular disease and cardiovascular-related death among methamphetamine users (Darke et al., 2017), and rare MDMA-associated fatalities related to malignant hyperthermia and other factors (Hegadoren et al., 1999). These risks may be particularly pronounced in those already at-risk of cardiovascular complications associated with poor lifestyle factors, several of which are common to psychiatric patients (e.g. cigarette smoking) (Kalman et al., 2005; Kaye et al., 2007). Within Australia, estimates of regular and dependent users has risen since 2010, with the sharpest increase reported in the 15–24- and 25–35- year-old age groups (Degenhardt et al., 2016b). With respect to neurodevelopment and serious physical health risks, ATS use by young people is concerning and warrants timely investigation.

Adolescence and early adulthood are periods of peak brain development, during which multiple age-dependent processes dynamically operate to optimise neural function (Paus, 2005). Brain maturation is however a graded process, with asynchronous development of limbic and related systems involved in sensation-seeking and reward sensitivity, and frontal systems underpinning behavioural inhibition and emotion regulation (Bava and Tapert, 2010; Paus, 2005), inadvertently leaving open a window of vulnerability for the development of substance use and mental health problems. As the peak age of both psychiatric illness onset and substance use initiation typically align with these protracted maturations, it is plausible that substance use may perturb development and amplify risk for psychopathology and associated sequelae (Lubman and Yucel, 2008). Substance use may

* Correspondence to: Brain and Mind Centre, University of Sydney, 100 Mallett Street, Camperdown, NSW 2050, Australia.
E-mail address: jcro8838@uni.sydney.edu.au (J.J. Crouse).

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Table 1
Mean scores (± standard deviation) for demographic, sleep and clinical variables between groups, tested by chi-square or ANOVA.

	ATS use, Current [a] *(n = 33)*	*ATS use, Past* [b] *(n = 66)*	*ATS use, Never* [c] *(n = 66)*	*Significance Test [p]*	*Post hoc*			*Partial Eta Squared* (η^2)
					a vs…		*(a + b) vs…*	
					b	c	c	
Sex (m/f)	13/20	27/39	27/39	χ^2 (2, 165) = 0.03 [0.988]				
Age, years	21.7 ± 4.0	21.5 ± 3.4	21.6 ± 3.7	*F* (2, 162) = 0.1 [0.937]				0.001
Predicted IQ	103.8 ± 8.4	102.3 ± 9.6	102.0 ± 9.2	*F* (2, 159) = 0.4 [0.655]				0.005
Education, years	12.2 ± 2.1	12.1 ± 2.3	12.8 ± 2.4	*F* (2, 159) = 1.7 [0.181]				0.021
BPRS (total)	40.9 ± 8.4	41.6 ± 9.7	38.3 ± 8.6	*F* (2, 161) = 2.4 [0.096]			*	0.029
BPRS (positive)	10.9 ± 2.7	10.9 ± 3.4	10.2 ± 4.0	*F* (2, 159) = 0.7 [0.495]				0.009
HDRS	14.5 ± 7.5	13.1 ± 6.1	11.2 ± 6.1	***F* (2, 162) = 3.2 [0.044]**	*	**		0.038
K − 10	31.2 ± 6.8	27.2 ± 8.5	25.2 ± 9.1	***F* (2156) = 5.4 [0.005]**	***	***		0.065
SOFAS	59.8 ± 11.6	60.8 ± 12.6	61.5 ± 11.6	*F* (2, 154) = 0.2 [0.803]				0.003
WHODAS II	42.2 ± 18.4	39.5 ± 16.1	33.6 ± 20.0	*F* (2, 131) = 2.4 [0.094]			**	0.035
PSQI, global score	11.0 ± 4.0	9.5 ± 4.0	7.5 ± 4.5	***F* (2, 119) = 5.9 [0.006]**	***	***		0.090
Sleep Quality	1.9 ± 0.9	1.8 ± 0.9	1.5 ± 1.0	*F* (2, 125) = 2.7 [0.073]			**	0.041
Sleep Efficiency	1.1 ± 1.2	1.2 ± 1.2	0.7 ± 1.0	*F* (2, 126) = 2.7 [0.073]			**	0.041
Sleep Duration	0.7 ± 1.0	0.8 ± 1.1	0.5 ± 0.9	*F* (2, 126) = 1.5 [0.227]				0.023
Sleep Disturbance	1.6 ± 0.7	1.3 ± 0.6	1.2 ± 0.6	***F* (2, 126) = 3.4 [0.035]**	**	**		0.052
Depression diagnosis	17/33 (51.5%)	37/66 (56.1%)	34/66 (51.5%)	χ^2 (2, 165) = 0.3 [0.848]				
Psychosis diagnosis	4/33 (12.1%)	14/66 (21.2%)	15/66 (22.7%)	χ^2 (2, 165) = 1.7 [0.439]				
Anxiety diagnosis	3/33 (9.1%)	5/66 (7.6%)	1/66 (1.5%)	Fisher's *p* = [.152]				
Bipolar diagnosis	9/33 (27.3%)	10/66 (15.2%)	16/66 (24.2%)	χ^2 (2, 165) = 2.5 [0.281]				

Note: Significance levels for each post-hoc Scheffe's comparison are depicted by: * *** = $p < 0.001$; * ** = $p < 0.01$; * * = $p < 0.05$; and * = trend effect. ATS = Amphetamine-type stimulant; SOFAS = Social and Occupational Functioning Assessment Scale; BPRS = Brief Psychiatric Rating Scale; K10 = Kessler 10-item psychological distress scale; HDRS = Hamilton Depression Rating Scale; WHODAS II = World Health Organization Disability Assessment Schedule 2.0; and PSQI = Pittsburgh Sleep Quality Index.

additionally disrupt sleep-wake cycles and neurocognitive functioning, which may lead to downstream impacts on recovery and socio-occupational engagement (Davidson et al., 2015).

ATS use has in particular been implicated in generating positive psychotic and affective symptoms, disrupting sleep, and compromising neurocognitive function. Early seminal work demonstrated provocation of psychotic experiences in non-psychotic participants following amphetamine administration (Angrist and Gershon, 1970), with later studies observing symptom exacerbation in psychotic patients (Curran et al., 2004) and a dose-response relationship between methamphetamine and psychotic symptoms in non-clinical users (McKetin et al., 2013). Links between affective states (e.g. distress, low mood, irritability, hyper-arousal) and ATS use have additionally been observed, commonly conceptualized as the “come-down”, often thought to be attributable to drug withdrawal (Srisurapanont et al., 1999). With respect to sleep/wake and circadian disturbances, preclinical work has revealed persistent circadian alterations and suprachiasmatic nucleus dysregulation (a key sleep-wake region) following MDMA administration (Colbron et al., 2002), with observational studies in humans revealing poorer sleep quality among current MDMA and methamphetamine users (Allen et al., 1993; Perez et al., 2008).

There is additionally a sizeable literature detailing negative associations between ATS use and neurocognition. Several cross-sectional reports suggest a portion of MDMA users display diminished memory performance (Bhattachary and Powell, 2011; Reneman et al., 2001), with a prospective study observing poorer verbal memory among MDMA-naïve individuals who had later incident use, relative to those who were persistently MDMA-naïve (Schilt et al., 2007). Two meta-analyses provide support for poorer cognition in MDMA users relative to controls across a range of domains such as learning, memory, executive function, among others (Kalechstein et al., 2007; Roberts et al., 2016). Similarly, a number of cross-sectional studies and one meta-analysis have suggested reduced performance in methamphetamine users compared to controls across a number of neurocognitive domains including learning, memory, executive function, among others (Dean et al., 2013; Scott et al., 2007), however with some evidence of recovery following abstinence (Iudicello et al., 2010).

Unfortunately, most studies examining these associations have excluded participants with a co-occurring psychiatric diagnosis, limiting generalisability of findings. Individuals with psychiatric illnesses typically present with poor sleep, psychopathology and compromised neurocognition, and the extent to which comorbid ATS use exacerbates such problems has important clinical implications. Accordingly, we examined cross-sectional associations between comorbid ATS use and neurocognition, sleep, socio-occupational functioning and psychopathology in a sample of young, help-seeking mental health outpatients. A clinical control group with no lifetime ATS use and another group of currently abstinent past users were assessed and matched for age, gender, education and estimated premorbid IQ. We hypothesised that: i) current users would perform worse than never users on measures of learning, memory, executive functioning and psychomotor speed (with small-to-medium effect sizes; Kalechstein et al., 2007; Scott et al., 2007), with past users performing intermediately; ii) current users would exhibit greater psychotic symptomology than both comparison groups; iii) all three groups would report poor subjective sleep quality, with current users reporting the poorest; and iv) current users would score lowest on a clinician-rated socio-occupational functioning scale.

2. Methods

2.1. Participants

One-hundred-and-sixty-five outpatients with an affective- or psychosis-spectrum illness were recruited from one of two youth mental health specialist service sites (*headspace*): Campderdown (inner-western Sydney) or Campbelltown (south-western Sydney) (Rickwood et al., 2007). All patients were receiving case management and relevant psychosocial interventions. It was ensured that current pharmacotherapeutic regimens were stabilized, which included the following: no psychotropic medications (65/165, 39%); third-generation antidepressants (48/165, 29%); atypical antipsychotics (48/165, 29%); anxiolytics (9/165, 5%); and mood stabilizers (18/165, 11%).

Inclusion criteria included: (i) accessing *headspace* services; (ii) aged