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Cardiovascular disease risk factors and symptoms amongst regular psychostimulant users

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CARDIOVASCULAR DISEASE RISK FACTORS AND SYMPTOMS AMONGST REGULAR PSYCHOSTIMULANT USERS

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EXECUTIVE SUMMARY

Background

Psychostimulant use is a major public health issue, with an estimated 14 million cocaine users globally, and 15-16 million methamphetamine users. These drugs are associated with a range of serious harm, including premature death, toxicity, dependence, blood born viruses, and drug-induced psychosis. Two of the most serious sequelae, however, are cardiovascular and cerebrovascular complications, both of which occur regardless of route of administration. The study aimed to:

1. Determine the prevalence, and nature, of risk factors and cardiovascular disease symptoms amongst regular psychostimulant users; and
2. Determine the predictors of cardiovascular symptoms amongst regular psychostimulant users.

Methods

All participants were weekly or more frequent users of psychostimulants. Participants were administered a structured interview that addressed demographics, drug use history, global physical health, and cardiovascular disease history and symptoms. Questions were asked about risk factors for cardiovascular disease (smoking, family history, diabetes, high blood pressure, high cholesterol), severity and frequency of symptoms of cardiovascular disease (chest pain, chronic shortness of breath, palpitations, dizziness/loss of consciousness, numbness/tingling in extremities, ankle oedema, chronic fatigue, claudication), and perceived associations between psychostimulant use and cardiovascular disease symptoms. Participants were also asked about treatment seeking for symptoms of cardiovascular disease.

Results

Risk factors for cardiovascular disease

Almost all (93%) were current tobacco smokers and 51% had hazardous or harmful drinking patterns. Nearly a third (30%) had a known family history of cardiovascular disease, with no gender difference. Over a third (37%) had sought treatment for possible symptoms of cardiovascular disease, 28% in the preceding 12 months, again with no gender differences. Fourteen percent had received prescribed medications for symptoms of cardiovascular problems, 12% in the preceding 12 months.

Symptoms of cardiovascular disease

The most commonly reported lifetime symptoms of possible cardiovascular disease were: chronic shortness of breath (78%), chest pains (66%), dizziness or loss of consciousness (64%), palpitations (61%) and numbness or tingling in extremities (59%). The most

commonly reported severe symptoms were: chronic shortness of breath (17%), chest pains (15%), palpitations (14%), chronic fatigue (13%) and dizziness/loss of consciousness (11%). All symptoms occurred at significantly higher levels after the initiation of psychostimulant use. Symptoms that had occurred weekly over the preceding 12 months included: chronic shortness of breath (33%), chronic fatigue (21%), dizziness (18%), numbness/tingling in extremities (16%), palpitations (16%) and chest pains (13%). Independent predictors of higher levels of frequently occurring symptoms were higher SDS scores, higher AUDIT scores, a family history of cardiovascular disease, and a personal diagnosis of cardiovascular disease.

Conclusions

This group of regular psychostimulant users had extensive risk for cardiovascular disease, and substantial proportions reported possible symptoms that appeared to be exacerbated by the use of psychostimulants. While a great deal of clinical attention has been given to sequelae of psychostimulant use such as blood borne virus infection and psychosis, the potential effects upon the cardiovascular systems of users are worthy of specific public health attention.

1. INTRODUCTION

Psychostimulant use is a major public health issue, with an estimated 14 million cocaine users and 15-16 million methamphetamine users globally (United Nations Office of Drug Control, 2008). These drugs are associated with a range of serious harms, including premature death, toxicity, dependence, blood born viruses, and drug-induced psychosis (Curran, Byrappa & McBride, 2004; Darke, Degenhardt & Mattick, 2007; McKetin, Kelly, McLaren, 2006; Tyndall, Craib, Currie, Li, O'Shaughnessy & Schechter, 2001). Two of the most serious sequelae, however, are cardiovascular and cerebrovascular complications, both of which occur regardless of route of administration (Darke, Kaye & Duflou, 2005; Karch, 2002; Kaye, McKetin, Duflou & Darke, 2007; Kontos, Jesse, Tatum & Ornato, 2003; Lange & Hillis, 2001; Wijetunga, Seto, Lindsay & Schatz, 2003; Yeo et al, 2007). Psychostimulants place heavy demand upon the cardiovascular system by increasing heart rate and blood pressure, and can cause myocardial ischaemia and infarction via increased myocardial oxygen demand, vasoconstriction of the coronary arteries and coronary thrombosis (Karch, 2002; Kaye, McKetin, Duflou & Darke, 2007; Lange & Hillis, 2001). Sudden acute aortic dissection and coronary vasospasm may occur even where there is no underlying coronary artery disease (Karch, 2002; Kaye, McKetin, Duflou & Darke, 2007; Lange & Hillis, 2001; Swalwell & Davis, 1999). Although psychostimulants can induce cardiovascular complications in users with normal coronary arteries (Karch, 2002; Kaye et al, 2007; Lange & Hillis, 2001; Mittleman et al, 1999), premature and accelerated development of coronary artery atherosclerosis has been consistently demonstrated in studies of psychostimulant-related death (Darke, Kaye & Duflou, 2005; Karch, 2002; Kontos, Jesse, Tatum & Ornato, 2003; Benzaquen, Cohen & Eisenberg, 2001; Karch, Stephens & Ho, 1999; Kaye, Darke, McKetin & Duflou, 2008; Logan, Fligner & Haddix, 1998; Vasica & Tennant, 2002). Chronic use has also been associated with cardiomegaly and ventricular hypertrophy, conditions that can predispose to psychostimulant-induced myocardial ischaemia and/or arrhythmia (Darke, Degenhardt & Mattick, 2007; Darke, Kaye & Duflou, 2005; Karch, 2002; Kaye, McKetin, Duflou & Darke, 2007). Finally, psychostimulant-induced cerebrovascular accidents are also well recognised (Petitti, Sidney, Quesenberry & Bernstein, 1998; Westover, McBride & Haley, 2007).

While a number of studies of cardiovascular disease and psychostimulant-related death have been conducted (Darke, Kaye & Duflou, 2005; Karch, Stephens & Ho, 1999; Kaye, Darke, McKetin & Duflou, 2008; Karch, Stephens & Ho, 1998), few data are available on living users. Consistent with the pathological effects of psychostimulants, chest pains, palpitation, tachycardia, and hypertension are the most common presentations to emergency departments relating to acute psychostimulant intoxication (Kontos, Jesse, Tatum & Ornato, 2003, Kaye & Darke, 2004; Lan, Lin, Yu, Lin & Chu, 1998, Richards et al, 1999, Turnipseed, 2003). It is not known, however, how common risk factors for cardiovascular disease are amongst psychostimulant users, how common cardiovascular disease symptoms are amongst psychostimulant users, or what factors predict them. The current study aimed to examine the levels and correlates of cardiovascular disease

symptoms amongst current regular psychostimulant users. Regular users were the focus of this study, as it is this use pattern that is associated with the majority of psychostimulant-related harm (Darke, Kaye, McKetin & Duflou, 2008). For the purpose of the study, 'regular' psychostimulant use was defined as at least weekly use over the preceding 12 months.

1.1 Study Aims

Specifically, the study aimed to:

1. Determine the prevalence, and nature, of risk factors and cardiovascular disease symptoms amongst regular psychostimulant users; and
2. Determine the predictors of cardiovascular symptoms amongst regular psychostimulant users.

2. METHODS

2.1 Procedure

All respondents were volunteers who were reimbursed AU$20 for participation in the study. Participant recruitment took place between September 2007 and November 2008, and various recruitment strategies were used which included advertisements placed in Needle and Syringe Programs (NSPs), therapeutic communities, street press publications, and word of mouth. Data was collected from a range of geographical locations, including the Sydney metropolitan area, Newcastle and Wollongong. The study had ethical approval from the University of New South Wales and all relevant area health services.

All respondents underwent a screening process to determine eligibility to be interviewed, which was either done in person or over the phone. In addition to the eligibility criteria items, a number of 'dummy' questions were asked, such as employment status and current treatment status, to keep respondents blind to the inclusion criteria. To be eligible for participation respondents had to be at least 18 years of age and to have used psychostimulants at least weekly over the 12 months preceding the interview.

Respondents were administered a structured interview. Interviews were conducted in places that were convenient to the participant, such as in private rooms at treatment facilities, public venues (e.g. cafes, parks), and at rooms in the National Drug and Alcohol Research Centre (NDARC). Confidentiality and anonymity were assured during both the screening and consenting processes. All interviews were conducted by members of the research team, and they took approximately 30 minutes to complete.

2.2 Structured Interview

2.2.1 Demographics

Demographic information was collected on gender, age, marital status, level of high school completion, tertiary education completion, and employment status.

2.2.2 Drug Use History

Respondents were asked about how old they were when they were first intoxicated and when they first injected. Respondents were also asked about which drug classes they had ever used and injected, and which ones they had used and injected in the past six months. An estimation of how many days they had used each drug class in the preceding six months was also obtained. Dependence on psychostimulants was assessed using the Severity of Dependence Scale (SDS) (Gossop et al, 1995). Scores on the SDS range from 0 to 15, with higher scores indicating greater drug dependence.

Hazardous and harmful drinking patterns were screened for using the Alcohol Use Disorders Identification Test (AUDIT) (Babor, Higgins-Biddle, Saunders & Monteiro,

2001). This brief assessment tool was designed as a simple method of identifying excessive drinking patterns. Respondents who score '8 or more' are considered to be hazardous or harmful drinkers. Higher scores are associated with greater alcohol dependence.

2.2.3 Physical Health

Physical health status was assessed using the physical health component of the Short Form 12-item Health Survey (SF-12) (Ware, Kosinski, Keller, 1996). The SF-12 is scored from 0-100, with a mean score of 50 and a standard deviation of 10. Scores lower than '50' represent 'below average' physical health. Respondents were asked if they had ever been attended to by an ambulance officer, how long ago the last time was that this had happened, and why. Similarly, respondents were asked whether they had ever been admitted to hospital, when the last time was, and why.

2.2.4 Cardiovascular Disease

Questions were asked about risk factors for cardiovascular disease (smoking, family history, diabetes, high blood pressure, high cholesterol), severity and frequency of symptoms of cardiovascular disease (chest pain, chronic shortness of breath, palpitations, dizziness/loss of consciousness, numbness/tingling in extremities, ankle oedema, chronic fatigue, claudication), and perceived associations between psychostimulant use and cardiovascular disease symptoms. As panic attacks may mimic the symptoms of cardiovascular disease, participants were asked whether they believed that their symptoms always occurred always in the context of a panic attack. Participants were also asked about treatment seeking for possible symptoms of cardiovascular disease.

2.2.5 Risk Perceptions

In order to examine risk perceptions regarding the physical harms of psychostimulant use on the body, respondents were asked how much harm they believed psychostimulants caused to the brain, lungs, liver, heart, and kidneys.

2.3 Statistical Analysis

Medians were reported for skewed variables, otherwise means and standard deviations (SD) were reported. Dichotomous categorical variables were analysed using odds ratios (OR) and 95% confidence intervals (CIs). McNemar's chi square was used to compare the occurrence of cardiovascular symptoms prior, and subsequent to, the initiation of psychostimulant use. Logistic regressions with backwards elimination were used to determine the independent predictors of symptoms of cardiovascular disease in the preceding 12 months. All analyses were conducted using SPSS for Windows, version 15.0 (SPSS Inc, 2006).

3. RESULTS

3.1 Sample Characteristics

The sample consisted of 239 regular psychostimulant users. The mean age of participants was 34.4 years (SD 8.1, range 18-75 years), and the majority were male (Table 1). Males were significantly more likely to be single than females. The mean years of formal school education was 9.8 (SD 1.6, range 4-12 years), and the majority did not complete tertiary education. Males were significantly more likely to be unemployed than females, whilst females were more likely to be employed, particularly in domestic roles.

Table 1: Demographic characteristics of the sample

	Males (N=165)	**Females (N=74)**	**Comparisons**
Sex (%)	69	31	
Mean Age (yrs)	34.6	33.9	Not significant
Mean completed school (yrs)	9.9	9.7	Not significant
Marital Status (%)			OR 2.72, CI 1.49-4.96
Single	80	60	
Married/De facto	20	40	
Tertiary Education (%)			
None	53	53	Not significant
Trade/Technical	40	38	Not significant
University/College	7	9	Not significant
Employment status (%)			OR 2.43, CI 1.17-5.05
Unemployed	89	77	
Employed	11	23	

3.2 Drug Use History

There were no gender differences in the mean ages of onset of intoxication, injecting, or regular injecting. The majority had injected drugs, with no gender differences in the proportions which had ever, or recently, injected drugs (Table 2). Males and females had used psychostimulants across the same number of days during the past six months, but females reported significantly higher psychostimulant dependence scores than males (Table 2).

There was significant polydrug use among the sample. The mean lifetime number of drug classes used was 9.8 (SD 1.7, range 5 - 12), with a mean of 7.5 (SD 1.4, range 4 – 11) used in the past six months. There were no significant gender differences in regard to levels of polydrug use (Table 2).

Table 2: Drug use characteristics

	Males (N=165)	Females (N=74)	Total (N=239)	Comparisons
Age onset (mean)				
First intoxicated (yrs)	14.5	14.4	14.5	Not significant
First injected (yrs)	20.7	21.2	20.9	Not significant
First regular injecting (yrs)	21.8	22.3	22.0	Not significant
Drug first injected (%)				
Heroin	45	41	44	
Methamphetamine	49	56	51	
Cocaine	5	3	4	
Hallucinogens	1	0	1	
Psychostimulant use (6 months)				
Days used (mdn)*	75	90.5	90	Not significant
Injected any drug (%)				
Ever	92	95	93	Not significant
Past six months	87	91	88	Not significant
Injecting past month (%)				
Not at all	28	19	26	Not significant
<= Once a week	5	5	5	Not significant
> Once a week < Daily	38	43	39	Not significant
Daily	29	33	30	Not significant
Severity of Dependence (SDS)				
Psychostimulants (mean)	6.3	7.5	6.6	$t_{(237)}=2.06$, $p<0.05$
No. of drug classes used				
Ever (mean)	9.8	9.8	9.8	Not significant
Past 6 months (mean)	7.4	7.7	7.5	Not significant

In regard to lifetime use, methamphetamine, cannabis and cocaine were the most commonly used illicit drugs, whilst methamphetamine and cannabis were the most commonly used illicit substances in the past six months (Table 3). The majority had injected drugs in their lifetime, and in the past six months.

Table 3: Drug use history

	Ever used (%)	Ever injected (%)	Used in the past 6 months (%)	Injected last 6 months (%)	Days used last 6 months*
Heroin	85	82	60	60	50
Other opioids	79	49	60	31	180
Methamphetamine	100	90	91	77	50
Cocaine	93	75	55	48	24
Ecstasy	84	29	26	6	4
Hallucinogens	72	11	6	1	2
Benzodiazepines	78	19	55	4	30
Antidepressants	61	1	34	0	180
Alcohol	100	5	70	1	30
Cannabis	98	n/a	76	n/a	96
Inhalants	33	n/a	2	n/a	3
Tobacco	99	n/a	94	n/a	180

* Median days used among those who used drugs in the last six months

The overwhelming majority reported that crystalline methamphetamine ('ice') was the main form of methamphetamine that had ever, and recently, been used (Table 4). Powder methamphetamine and base methamphetamine had been ever, and recently, used in similar proportions. All cocaine use was of cocaine powder.

Table 4: Methamphetamine forms used in last 6 months

	Males (N=165)	Females (N=74)	Total (N=239)
Any forms used last 6 months (%)			
Powder/speed	36	28	34
Base	35	39	36
Crystalline methamphetamine	84	78	82
Other	2	4	3
Main form used last 6 months (%)			
Powder/speed	11	8	10
Base	9	9	9
Crystalline methamphetamine	79	83	80
Other	1	0	1

Approximately half the sample met criteria for risky drinking patterns. There were no significant gender differences in the proportions who were classified as 'risky/hazardous', 'harmful', or 'dependent' drinkers, with just over a quarter engaging in high risk drinking patterns (Table 5).

Table 5: AUDIT groups

	Males (N=165)	Females (N=74)	Total (N=239)	Comparisons
Level of drinking (%)				
Low risk	46	57	49	Not significant
Risky/hazardous	26	16	23	Not significant
High risk/harmful	3	4	3	Not significant
High risk/dependent	25	23	25	Not significant

3.3 General Health

The mean SF-12 physical health score was 47.4 (SD 9.7, range 23.4-65.7), with no difference between males and females (47.2 v 47.9). Current global health was not significantly associated with either psychostimulant use days in the preceding 6 months ($r=-0.12$, $p=.06$) or the level of psychostimulant dependence ($r=-0.06$, $p=.40$), but was negatively correlated with the number of drug classes used in the preceding 6 months ($r=-0.19$, $p<.01$). Current injectors had significantly lower SF-12 scores than non-injectors (46.8 v 51.8, $t_{237}=2.6$, $p<.01$).

3.4 Health Services History

High proportions had ever, and in the past 12 months, been attended by ambulance officers and admitted to hospital (Table 6). There were no significant gender differences in the lifetime or recent utilisation of health services. Overdose and assault injuries were

the most common reasons for having been seen by an ambulance officer, whereas the most common reasons for having been admitted to hospital were assault injuries, injuries sustained in motor vehicle accidents, overdose, and mental health problems (i.e. suicide attempts, self harm, depression, anxiety).

Table 6: Health services history

	Males (N=165)	Females (N=74)	Total (N=239)	Comparisons
Attended to by ambulance officers (%)				
Ever	76	80	77	Not significant
Past 12 months	33	39	35	Not significant
Been admitted to hospital (%)				
Ever	76	74	74	Not significant
Past 12 months	26	27	27	Not significant

3.5 Cardiovascular Disease

3.5.1 Risk factors for cardiovascular disease

The overwhelming majority currently smoked cigarettes, and half had hazardous drinking patterns, with no significant gender differences (Table 7). Almost one-third had a family history of heart disease, and again, no significant gender differences were reported. Only small proportions had ever and recently been diagnosed with heart disease, high blood pressure, diabetes and high cholesterol. There were no gender differences in regard to the proportions having been diagnosed with any of the cardiovascular disease risk factors.

Table 7: Risk factors for cardiovascular disease

	Males (N=165) %	Females (N=74) %	Total (N=239) %	Comparisons
Current Smoker	93	92	93	Not significant
Hazardous or harmful drinking (AUDIT)	55	43	51	Not significant
Family history heart disease	26	39	30	Not significant
Ever diagnosed with:				
Heart disease				
Ever	1	3	2	Not significant
Past 12 months	0	0	0	Not significant
High blood pressure				
Ever	15	12	14	Not significant
Past 12 months	11	5	9	Not significant
Diabetes				
Ever	2	3	2	Not significant
Past 12 months	0	0	0	Not significant
High Cholesterol				
Ever	7	11	8	Not significant
Past 12 months	5	5	5	Not significant

3.5.2 Symptoms of cardiovascular disease

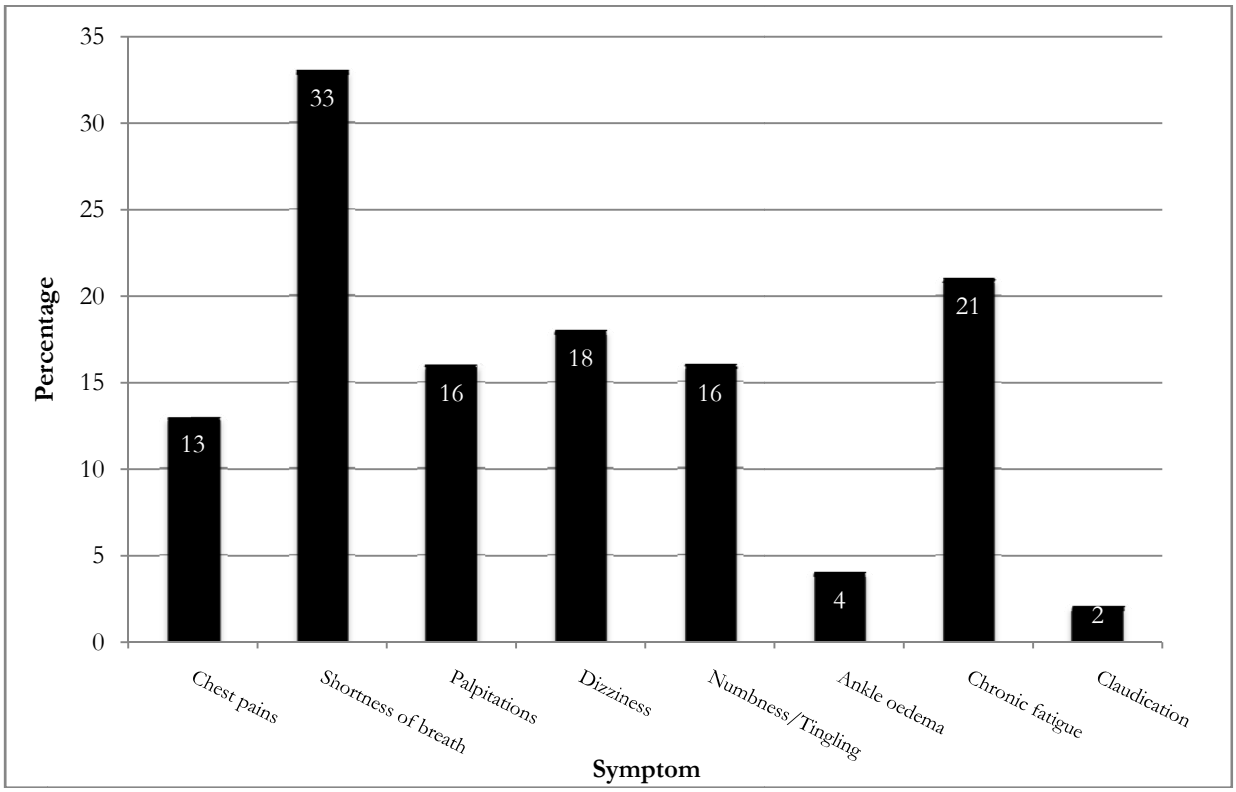
The most commonly reported lifetime symptoms of possible cardiovascular disease were: chronic shortness of breath (78%), chest pains (66%), dizziness or loss of consciousness (64%), palpitations (61%) and numbness or tingling in extremities (59%), with no significant gender differences (Table 8). The most commonly reported severe symptoms were: chronic shortness of breath (17%), chest pains (15%), palpitations (14%), chronic fatigue (13%) and dizziness/loss of consciousness (11%). Again, there were no gender differences. Of those who had experienced possible cardiovascular symptoms, minorities believed that they always occurred in the context of a panic attack: chronic shortness of breath (11%), chest pains (11%), palpitations (22%), dizziness/loss of consciousness (11%).

Table 8: Lifetime symptoms of possible cardiovascular disease

	Males (N=165) %	Females (N=74) %	Total (N=239) %
Chest pain (lifetime)			
None	34	34	34
Mild	32	31	31
Moderate	21	15	19
Severe	13	19	15
Shortness of breath (lifetime)			
None	25	15	22
Mild	33	30	32
Moderate	27	35	29
Severe	16	20	17
Palpitations (lifetime)			
None	41	34	39
Mild	28	24	27
Moderate	19	22	20
Severe	12	20	14
Dizziness/loss of consciousness (lifetime)			
None	36	35	36
Mild	38	38	38
Moderate	16	15	16
Severe	10	12	11
Numbness/tingling in extremities (lifetime)			
None	40	42	41
Mild	36	28	34
Moderate	18	19	18
Severe	6	11	8
Ankle oedema (lifetime)			
None	87	74	83
Mild	3	10	5
Moderate	7	8	7
Severe	3	8	5
Chronic fatigue (lifetime)			
None	56	49	54
Mild	16	20	17
Moderate	15	19	16
Severe	13	12	13
Claudication (lifetime)			
None	90	92	91
Mild	3	4	3
Moderate	5	3	4
Severe	2	1	2

The proportions which experienced frequent symptoms (weekly or more) in the past 12 months are presented in Figure 1. There was no relationship between the number of reported frequent symptoms in the past 12 months and age ($p=.91$) or gender ($p=.13$). The number of psychostimulant use days in the preceding 6 months was not associated with the number of reported frequent symptoms ($p=.43$). Higher levels of psychostimulant dependence in the preceding 12 months were, however, positively correlated with the number of frequently occurring symptoms ($r=0.23$, $p<.001$).

Figure 1: Proportions experiencing frequent (weekly or more) possible cardiovascular symptoms in preceding 12 months



All symptoms occurred at significantly higher levels after the initiation of psychostimulant use (Table 9). Thus, while 10% had experienced chest pain prior to psychostimulant initiation, 63% had done so since. With the exception of ankle oedema, the majority (59-78%) of those who had experienced symptoms since psychostimulant initiation believed that the symptoms were exacerbated or brought on by psychostimulant use.

Table 9: Symptoms of possible cardiovascular disease and onset of methamphetamine use

Symptom	Before 1st use %	After psychostimulant use %	McNemar chi square	Worsened or brought on by psychostimulants %#
Chest pain	10	63	118.6*	66
Shortness of breath	23	74	108.6*	63
Palpitations	9	60	118.1*	78
Dizziness	16	62	102.4*	59
Numbness	7	58	118.1*	59
Ankle swelling	3	16	25.7*	24
Chronic fatigue	10	45	82.0*	65
Claudication	2	8	13.2*	58

*$p < 0.001$; # Proportion of those who experienced symptom after initiation of psychostimulant use

Over a third had sought treatment for possible symptoms of cardiovascular disease, a quarter in the preceding 12 months, again with no gender differences (Table 10). Fourteen percent had received prescribed medications for symptoms of cardiovascular problems, 12% in the preceding 12 months. The most common medications were for high blood pressure (7%) and circulatory problems (6%). It is worthy of note that 14% reported diagnoses of high blood pressure and 8% of high cholesterol.

Table 10: Treatment seeking and prescribed medication for cardiovascular disease

	Males (N=165) %	Females (N=74) %	Total (N=239) %	Comparisons
Sought medical treatment				
Ever	36	39	37	Not significant
Past 12 months	27	31	28	Not significant
Prescribed Medication:				
High cholesterol				
Ever	3	1	2	Not significant
Past 12 months	2	1	2	Not significant
High blood pressure				
Ever	9	4	7	Not significant
Past 12 months	7	3	5	Not significant
Irregular heartbeat				
Ever	1	0	0.5	Not significant
Past 12 months	1	0	0.5	Not significant
Chest pains				
Ever	3	4	3	Not significant
Past 12 months	2	4	3	Not significant
Circulation problems				
Ever	6	7	6	Not significant
Past 12 months	4	5	5	Not significant
Heart problems				
Ever	1	0	0.5	Not significant
Past 12 months	1	0	0.5	Not significant

3.6 Predictors of frequent cardiovascular symptoms

In order to determine independent predictors of the number of frequent symptoms experienced over the preceding 12 months, simultaneous multiple regressions with backwards elimination were performed. Variables entered into the initial model were: age, sex, SDS score, psychostimulant use days in the preceding 6 months, injection status, family history of cardiovascular disease, a personal diagnosis of cardiovascular disease, AUDIT score and current smoking status. The final model was significant ($F_{4,233}$=11.82), p<.001), with an R^2= 0.17 (Table 11). Independent predictors of higher levels of frequently occurring symptoms were higher SDS scores, higher AUDIT scores, a family history of cardiovascular disease, and a diagnosis of cardiovascular disease. In order to confirm the association between psychostimulant dependence and frequent symptoms, the model was re-run, excluding cases in which symptoms were attributed always to panic attack. The final model was significant ($F_{4,233}$=7.75, p<.001), with an R^2=

0.09. Psychostimulant dependence remained a significant predictor (β=0.16, t=2.5, p<.05), as did AUDIT score (β=0.15, t=2.4, p<.05) and a diagnosis of cardiovascular disease by a medical practitioner (β=0.21, t=3.3, p<.001).

Table 11: Simultaneous multiple regression of predictors of frequent cardiovascular symptoms over preceding 12 months

	Beta	t value	P
Psychostimulant dependence (SDS)	0.22	3.57	<.001
AUDIT score	0.14	2.31	<.05
Family history of cardiovascular disease	0.24	3.95	<.001
Diagnosis cardiovascular disease	0.14	2.36	<.05

(R2=0.17, F=11.82(4,233), p<.001)

3.7 Drug use and Health Risk Perceptions

The lungs were perceived to be the least affected by psychostimulant use, whilst more than 90% of males and females believed that psychostimulant caused some harm to the brain, liver, heart and kidneys (Table 12).

Table 12: Perceived Risk of Psychostimulant Use on Health

	No harm	Little harm	Moderately harmful	Very harmful
Brain %				
Males	1	5	26	68
Females	1	5	10	84
Lungs %				
Males	17	21	24	38
Females	20	17	27	36
Liver %				
Males	6	10	35	49
Females	5	7	22	66
Heart %				
Males	3	6	28	63
Females	2	7	18	73
Kidneys %				
Males	6	8	25	61
Females	3	12	24	61

4. DISCUSSION

Several major findings emerged from this study. Firstly, large proportions of psychostimulant users had known risk factors for cardiovascular disease, independent of their psychostimulant use, and a substantial minority had been prescribed medications for cardiovascular problems. Secondly, symptoms consistent with potential cardiovascular distress, such as severe chest pain, were present amongst substantial proportions of participants. Finally, there were significant associations between the level of psychostimulant dependence and the experience of cardiovascular symptoms.

Cardiovascular disease risk factors were common amongst this sample of regular psychostimulant users. As is typical of regular illicit drug users (McCool & Richter, 2003), almost all were daily tobacco smokers. Nearly a third had a known family history of cardiovascular disease. One in seven had been prescribed medications for cardiovascular disease symptoms, and one in seven had a diagnosis of high blood pressure. Despite these risks psychostimulants were being used, on average, every second day.

Not surprisingly, given the levels of use and risk, symptoms of possible cardiovascular disease were commonly reported. Substantial proportions reported severe symptoms: a third had experienced moderate to severe chest pains and/or palpitations. Consistent with the pressures placed upon the cardiovascular system by the regular use of psychostimulants, substantial minorities reported the weekly occurrence of symptoms. Chest pains, for example, had been experience weekly by 13% in the preceding year. The overall clinical picture provided by these psychostimulant users is consistent with the high prevalence of cardiovascular disease seen amongst psychostimulant toxicity fatalities (Darke, Kaye & Duflou, 2005; Karch, Stephens & Ho, 1998; Karch, Stephens & Ho, 1999; Kaye et al, 2008), and the symptoms reported by living users at emergency department presentations (Kaye & Darke, 2004; Kontos, Jesse, Tatum & Ornato, 2003; Lan et al, 1998, Richards et al, 1999, Turnipseed, Richards, Kirk, Diercks & Amsterdam, 2003).

Psychostimulant dependence appeared to be associated with the occurrence of cardiovascular symptoms in a number of ways. Firstly, all symptoms occurred at significant higher levels after the onset of psychostimulant use. While a tenth had experienced chest pain prior to psychostimulant use, two thirds had done so since. Importantly, the majority who had experienced symptoms subsequent to psychostimulant use attributed psychostimulants as worsening, or initiating, the symptoms in question. Secondly, the frequent occurrence of symptoms was associated with higher levels of psychostimulant dependence, even after controlling for the possible role of panic attacks. It should be noted that psychostimulant dependence was not significantly associated with poorer global health, but was with the regular experience of cardiovascular symptoms. Importantly, the level of psychostimulant dependence remained a significant predictor of regular symptoms after controlling for potential confounding variables. Consistent with the fact that cardiovascular complications may occur regardless of route of administration, while injecting status was associated with

poorer general health, it was not associated with the regular occurrence of cardiovascular symptoms in multivariate analyses. It should be noted that there is scope for intervention amongst these psychostimulant users, with the overwhelming majority believing that psychostimulants had harmful effects on the cardiovascular system.

As with all research, caveats must be borne in mind. Firstly, the study was based upon self-report. Indeed, symptoms by their very nature are self-reported. The self-reported drug use and health status of illicit drug users has been demonstrated, however, to have high reliability and validity (Darke, Ward, Zador & Swift, 1991; Jackson, Covell, Frisman & Essock, 2004; Welp, Bosman, Langedam, Totte, Maes & van Ameijden, 2003). A second caveat concerns the attribution of reported symptoms. Symptoms such as chronic shortness of breath, for example, may be attributable to factors other than cardiovascular problems, such as pulmonary pathology, particularly given the level of smoking amongst psychostimulant users. This is less true, of course, of symptoms such as severe chest pain. Even with clinical inspection in routine medical examination, however, the diagnosis of coronary artery disease is difficult. It needs to be noted, however, that the factors that independently predicted frequently occurring symptoms were known risk factors for cardiovascular disease. Thus, in addition to psychostimulant dependence, heavier alcohol use, a family history of cardiovascular disease, and a diagnosis of cardiovascular disease were all independent predictors. It should also be borne in mind that psychostimulant dependence was specifically associated with cardiovascular symptoms, but not with global health. Finally, these were regular users, using on average every second day. Care should be taken in extrapolating the results to less frequent users. The demographic of these regular users were, however, typical of those seen in other studies of regular psychostimulant users (Kaye & Darke, 2004; McKetin, Kelly & McLaren, 2006; Tyndall et al, 2001).

In summary, this group of regular psychostimulant users had extensive risk for cardiovascular disease, and substantial proportions reported symptoms that appeared to be exacerbated by the use of psychostimulants. While a great deal of clinical attention has been given to sequelae of psychostimulant use such as blood borne virus infection and psychosis, the potential effects upon the cardiovascular systems of users are worthy of specific public health attention.

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