

Illicit drug use and anxiety disorders: Findings from two community surveys[☆]

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Abstract

The focus of this investigation was the relationship between anxiety disorders and lifetime use of amphetamines, cocaine, hallucinogens and heroin in two contemporaneous samples. Data from two independent community surveys conducted in the US ($N=5877$) and Ontario ($N=8116$) were used to assess whether a lifetime anxiety disorder diagnosis (social phobia, panic disorder, agoraphobia, specific phobia, and generalized anxiety disorder) was significantly associated with lifetime use of amphetamines, hallucinogens, cocaine, and heroin. Posttraumatic stress disorder was assessed only in the US survey. After controlling for sociodemographics, a significant association between any anxiety disorder diagnosis and *lifetime* stimulant use, cocaine use, and hallucinogen use was found in both surveys (OR ~ 1.5 – 3.0). Any anxiety disorder diagnosis was significantly associated with lifetime heroin use in the US survey (OR ~ 3.0). Clinicians and researchers need to be aware of the relationship between anxiety disorders and illicit drug use.

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1. Introduction

Although there is a burgeoning literature on the relationship between anxiety disorders and alcohol and cannabis use disorders (Kessler et al., 1997a; Kushner et al., 2000; Degenhardt et al., 2001), only recently has there been an interest in the relationship between anxiety disorders and other forms of substance abuse (Merikan-

gas et al., 1996; Stewart and Kushner, 2001). Studies in clinical samples and community surveys have demonstrated high rates of co-occurrence of anxiety disorders with illicit drug abuse and dependence (Regier et al., 1990; Magee et al., 1996; Brooner et al., 1997; Compton et al., 2000; Skinstad and Swain, 2001; Andrews et al., 2002). However, there are limited data about the specificity of this relationship, both with regard to type of anxiety disorder and type of substance abuse.

In the current study, we considered lifetime use of a particular illicit drug rather than DSM-III-R based abuse or dependence criteria. We opted to use this approach for several reasons. First, the reliability of whether individuals used a drug ever in their life is likely to be higher

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than retrospective recall of the amount of use required in establishing a DSM diagnosis of abuse or dependence. Also, there is evidence that DSM-based alcohol abuse criteria are less reliable than those for alcohol dependence (Hasin et al., 1997). We infer that similar issues are likely to exist with the drug abuse category. Lastly, it is well known that individuals with substance use have a tendency to underreport their frequency and extent of drug use. Therefore, to ensure optimal reliability, we chose to consider lifetime use of the particular drugs rather than DSM-based abuse or dependence.

The objectives of our investigation were: 1) to examine whether there is a significant association between anxiety disorders and illicit drug use; 2) to determine whether particular anxiety disorders are more likely than others to be associated with illicit drug use (i.e., is there specificity among the anxiety disorders for this association?); 3) if association(s) exist, to determine if there is specificity for certain classes (e.g., stimulants, hallucinogens) of illicit drugs; and 4) in individuals with comorbid anxiety disorder and substance use, to assess whether the age of onset of anxiety symptoms differed from the age of onset of substance use?

2. Methods

The data came from two contemporaneous surveys; the National Comorbidity Survey (NCS; $N=5877$, 15–54 years, 82.4% response rate) and the Ontario Health Survey-Mental Health Supplement (OHS; $N=8116$, 15–64 years, 67.4% response rate). These surveys were designed and conducted in the early 1990s with the purpose of allowing comparisons between countries with respect to various issues related to mental health. A number of previous publications have accessed these two datasets to make comparisons between countries with respect to mental health service utilization (Katz et al., 1997a,b; Kessler et al., 1997c; Alegria et al., 2000; Edlund et al., 2002). For both surveys, informed consent was obtained before beginning the interviews from all respondents in accordance with each country's federal legislative requirements. Further details on the methodology of these two surveys are provided elsewhere (Kessler et al., 1994; Boyle et al., 1996).

Using the highly reliable University of Michigan Composite International Diagnostic Interview (UM-CIDI) (Kessler et al., 1998b), both the NCS and OHS asked all respondents questions to permit DSM-III-R based diagnosis of social phobia, specific phobia, agoraphobia with or without panic disorder, panic disorder with or without agoraphobia, generalized anxiety disorder, major depression, and alcohol abuse or dependence.

Based on work by Kessler et al. (1998a), social phobia can be reliably distinguished into two subtypes: a speaking subtype (SP-speaking) where respondents have social fears limited to speaking in small or large groups; and a more generalized or “complex” subtype that involves fear and avoidance of multiple situations (SP-complex). Posttraumatic stress disorder was not assessed in the OHS and only assessed in a subsample of the NCS ($N=5877$ respondents).

All respondents were asked detailed questions about lifetime use of stimulants, cocaine, hallucinogens, and heroin. For stimulant use, each respondent was asked, “have you ever taken a stimulant on your own, either without a doctor's prescription or in greater amounts or more often than prescribed, or for a reason other than a doctor said you should take them?” For cocaine use, respondents were asked if they had “ever used cocaine, crack, free base or coca paste, even once?” For hallucinogen use, respondents were asked if they had ever “used LSD or PCP or another hallucinogen, even once?” For heroin use, each respondent was asked if they had ever “used heroin even once?” Each respondent who affirmed use of the substance was categorized as being a lifetime user of the particular drug.

Multiple logistic regression analysis was conducted in the two separate surveys independently to determine whether an anxiety disorder was associated with lifetime use of the four drug types (cocaine, stimulants, hallucinogens, and heroin). The covariates used in the regression were gender, three age categories [15–24 years, 25–34 years, and 35 years or older (35–64 in the OHS and 35–54 in the NCS)], and a dichotomous education variable (less than 12 years vs. 12 years or more). Age of onset of the anxiety disorder and age at first use of each of the substances was questioned independently. For individuals who reported comorbid anxiety disorder diagnosis and substance use, paired *t*-test analysis was used to determine if there was a significant difference in the mean age of onset of the anxiety disorder compared with the mean age of onset of substance use.

For both datasets, the appropriate statistical weight was used to ensure the data were representative. In the NCS, standard errors were calculated using the Taylor Linearization method in the SUDAAN program (Shah et al., 1995) based on NCS stratification information available in the public use dataset specifically for this purpose.

3. Results

The prevalence of lifetime use of illicit substances was higher for all examined drug types in the NCS (stimulants 14.9%, cocaine 16.2%, hallucinogens 10.7%,

Table 1

Odds ratios of lifetime use of drugs with lifetime DSM-III-R anxiety disorder diagnoses in the National Comorbidity Survey (NCS) and the Mental Health Supplement to the Ontario Health Survey (OHS)

Drug	Stimulant use		Cocaine use	
	OHS	NCS	OHS	NCS
Survey	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Anxiety disorder				
Social phobia (SP)	2.16 (1.38–3.39)**	1.86 (1.48–2.33)**	2.42 (1.67–3.51)**	1.45 (1.17–1.81)**
SP-speaking subtype	1.79 (0.96–3.31)	1.81 (1.17–2.80)**	1.65 (0.96–2.85)	1.44 (1.00–2.08)
SP-complex subtype	2.67 (1.49–4.78)**	1.73 (1.35–2.22)**	3.58 (2.25–5.70)**	1.39 (1.07–1.79)**
Specific phobia	2.30 (1.35–3.94)**	1.74 (1.32–2.29)**	1.35 (0.79–2.30)	1.62 (1.32–1.98)**
Agoraphobia	–	1.77 (1.21–2.57)**	–	1.84 (1.29–2.63)**
Panic disorder	–	1.91 (1.22–2.99)**	–	1.93 (1.29–2.90)**
Generalized anxiety disorder	–	2.07 (1.47–2.91)**	–	2.39 (1.82–3.14)**
Any above anxiety disorder	2.77 (1.87–4.11)**	1.88 (1.54–2.28)**	2.35 (1.68–3.30)**	1.68 (1.40–2.03)**
Posttraumatic stress disorder	–	2.22 (1.63–3.04)**	–	2.12 (1.63–2.76)**
Drug	Hallucinogen use		Heroin use	
Survey	OHS	NCS	OHS	NCS
Anxiety disorder	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Social phobia (SP)	2.30 (1.70–3.11)**	1.61 (1.18–2.19)**	–	2.01 (1.54–2.61)**
SP-speaking subtype	–	1.46 (0.96–2.20)	–	1.70 (0.85–3.41)
SP-complex subtype	3.44 (2.35–5.04)**	1.59 (1.13–2.23)**	–	2.27 (1.26–4.10)**
Specific phobia	2.27 (1.57–3.29)**	1.51 (1.07–2.13)**	–	2.92 (1.37–6.20)**
Agoraphobia	3.09 (1.82–5.25)**	1.56 (0.98–2.49)	–	3.18 (1.25–8.04)**
Panic disorder	3.62 (1.80–7.29)**	3.02 (1.90–4.80)**	–	–
Generalized anxiety disorder	5.09 (2.81–9.13)**	2.41 (1.64–3.52)**	–	4.27 (1.90–9.55)**
Any above anxiety disorder	2.52 (1.93–3.29)**	1.77 (1.41–2.23)**	–	3.33 (2.13–5.22)**
Posttraumatic stress disorder	–	2.16 (1.61–2.91)**	–	3.18 (1.87–5.41)**

All odds ratios are adjusted for age, gender and education. Odds ratios are not displayed for those cells that were too small (unweighted $N < 30$). * $P < 0.05$; ** $P < 0.01$.

heroin 1.4%) than the OHS (stimulants 2.8%, cocaine 4.1%, hallucinogens 6.9%, heroin 0.4%). In both surveys, among those with lifetime use of stimulants, cocaine, or hallucinogens, approximately one-third of individuals had at least one lifetime anxiety disorder diagnosis (Table 1). After controlling for age, gender and education, each of the anxiety disorders was significantly associated with each of the drugs examined. When social phobia was subdivided into SP-complex and SP-speaking, only SP-complex remained consistently significantly associated with drug use. A stronger association was found between an anxiety disorder with heroin use (OR ~3.0) than the association of an anxiety disorder with stimulant, cocaine or hallucinogen use (OR ~2.0).

In individuals with anxiety disorders and illicit substance use, the mean age of onset of the anxiety disorder and the onset of drug use ranged from 10–21 years of age (Table 2). With respect to age of onset, social phobia and specific phobia consistently had a significantly lower mean age of onset than the use of each of the four drugs examined. The remaining anxiety disorders were less consistent with respect to age of onset. Although the

mean ages of onset for agoraphobia and PTSD were lower than the mean age of onset of all the drugs examined, not all of these reached statistical significance. Generalized anxiety disorder was the only anxiety disorder that had a significantly later age of onset than the age of onset for stimulant use and hallucinogen use.

4. Discussion

In two independent community surveys, we found that all the anxiety disorders, except social phobia with fears limited to speaking situations, were significantly associated with a lifetime use of cocaine, stimulants, hallucinogens, and heroin. This association remained significant after controlling for sociodemographic variables (age, gender, education). Our findings are consistent with other community surveys (Regier et al., 1990; Breslau et al., 1998), college (Valentiner et al., 2004) and clinical samples (Brooner et al., 1997) suggesting a higher co-occurrence of anxiety disorders with illicit drug dependence compared with those without anxiety disorders.

Table 2
Mean age of onset (years±standard deviation) of substance use and anxiety disorder in those with comorbid substance and anxiety disorder

	Social phobia and stimulant		Social phobia and cocaine		Social phobia and hallucinogen		Social phobia and heroin	
Social phobia (soc phob)	AO social phobia	AO stimulant	AO social phobia	AO cocaine	AO social phobia	AO hallucinogen	AO social phobia	AO heroin
Age of onset (AO)								
OHS	12.6±5.2	18.4±4.8	12.5±4.4	21.2±4.7	12.6±4.8	17.4±3.3	–	–
<i>t</i> -test	<i>N</i> =60; <i>P</i> <0.001		<i>N</i> =80; <i>P</i> <0.001		<i>N</i> =136; <i>P</i> <0.001		Cell size too small	
NCS	13.4±6.0	18.6±4.3	14.2±6.8	22.1±6.7	13.9±6.6	18.5±3.9	12.0±5.3	20.1±4.9
<i>t</i> -test	<i>N</i> =232; <i>P</i> <0.001		<i>N</i> =213; <i>P</i> <0.001		<i>N</i> =150; <i>P</i> <0.001		<i>N</i> =29; <i>P</i> <0.001	
	Simple phobia and stimulant		Simple phobia and cocaine		Simple phobia and hallucinogen		Simple phobia and heroin	
Age of onset (AO)	AO simple phobia	AO stimulant	AO simple phobia	AO cocaine	AO simple phobia	AO hallucinogen	AO simple phobia	AO heroin
OHS	9.5±6.9	19.4±6.1	9.2±6.6	20.5±5.0	9.8±6.3	17.3±3.6	–	–
<i>t</i> -test	<i>N</i> =44; <i>P</i> <0.001		<i>N</i> =48; <i>P</i> <0.001		<i>N</i> =87; <i>P</i> <0.001		Cell size too small	
NCS	13.7±8.9	19.8±5.9	14.1±8.5	22.3±6.5	11.7±7.2	18.4±3.9	13.4±6.0	21.5±11.6
<i>t</i> -test	<i>N</i> =180; <i>P</i> <0.001		<i>N</i> =186; <i>P</i> <0.001		<i>N</i> =113; <i>P</i> <0.001		<i>N</i> =29; <i>P</i> =0.002	
	Agoraphobia and stimulant		Agoraphobia and cocaine		Agoraphobia and hallucinogen		Agoraphobia and heroin	
Age of onset (AO)	AO Agoraphobia	AO stimulant	AO Agoraphobia	AO cocaine	AO Agoraphobia	AO hallucinogen	AO Agoraphobia	AO heroin
OHS	10.3±7.5	18.0±4.7	14.9±9.4	22.1±7.8	11.7±7.7	17.2±4.9	–	–
<i>t</i> -test	<i>N</i> =10; <i>P</i> =0.04		<i>N</i> =10; <i>P</i> =0.083		<i>N</i> =20; <i>P</i> =0.016		Cell size too small	
NCS	16.3±8.1	18.2±4.7	17.1±8.2	22.6±6.6	16.6±7.8	17.3±4.1	14.7±7.0	16.9±6.4
<i>t</i> -test	<i>N</i> =111; <i>P</i> =0.014		<i>N</i> =121; <i>P</i> <0.001		<i>N</i> =70; <i>P</i> =0.497		<i>N</i> =19; <i>P</i> =0.274	
	GAD and stimulant		GAD and cocaine		GAD and hallucinogen		GAD and heroin	
Age of onset (AO)	AO GAD	AO stimulant	AO GAD	AO cocaine	AO GAD	AO hallucinogen	AO GAD	AO heroin
OHS	15.5±8.6	19.5±6.6	17.4±8.1	23.5±5.6	19.5±8.9	18.1±4.3	–	–
<i>t</i> -test	<i>N</i> =13; <i>P</i> =0.122		<i>N</i> =20; <i>P</i> =0.001		<i>N</i> =31; <i>P</i> <0.394		Cell size too small	
NCS	20.9±8.7	18.5±4.7	21.9±8.7	22.8±7.0	21.3±9.8	18.4±3.7	19.3±7.0	17.1±6.5
<i>t</i> -test	<i>N</i> =103; <i>P</i> =0.005		<i>N</i> =122; <i>P</i> =0.302		<i>N</i> =81; <i>P</i> =0.007		<i>N</i> =22; <i>P</i> =0.272	
	PTSD and stimulant		PTSD and cocaine		PTSD and hallucinogen		PTSD and heroin	
Age of onset (AO)	AO PTSD	AO stimulant	AO PTSD	AO cocaine	AO PTSD	AO hallucinogen	AO PTSD	AO heroin
NCS	18.2±7.8	19.1±4.8	17.4±7.7	21.9±5.9	17.5±6.9	18.7±4.7	17.9±8.8	18.2±3.4
<i>t</i> -test	<i>N</i> =147; <i>P</i> =0.170		<i>N</i> =150; <i>P</i> <0.001		<i>N</i> =104; <i>P</i> =0.095		<i>N</i> =20; <i>P</i> =0.871	

The *N*s are unweighted. The data come from the National Comorbidity Survey (NCS) and the Ontario Health Supplement (OHS). PTSD was not assessed in the OHS.

Among the anxiety disorders, we found that the highest odds ratios were between panic disorder and hallucinogen use in both community surveys ($OR > 3.0$). All the remaining anxiety disorders had significant, but modest ($OR = 1.5–2.5$), associations with substance use. Among the social phobia subtypes, only the complex subtype, akin to DSM-IV generalized social phobia, displayed an association with illicit drug use. This finding is consistent with other work in social phobia suggesting a positive correlation between the number of feared social situations and disability (Stein et al., 2000; Sareen et al., 2001).

Our finding that social phobia and specific phobia had an earlier age of onset than drug use is consistent with a similar finding that these anxiety disorders precede the onset of alcohol use disorders (Lepine and Pelissolo, 1998; Sareen et al., 2001). With respect to agoraphobia, PTSD and GAD, we found that the onset of anxiety disorders precedes the onset of substance use less consistently. The latter findings are similar to other studies considering the timing of alcohol use with panic disorder (Sareen et al., 2001), and PTSD and substance use (Breslau et al., 2003).

What is the etiology of this association between anxiety disorders and illicit substance use? First, there may be a causal relationship wherein the presence of the anxiety disorder increases the liability for use of the substance. In support of this hypothesis, a recent study of individuals with comorbid PTSD and cocaine dependence demonstrated increased levels of cocaine craving during exposure to personalized trauma image cues (Coffey et al., 2002). We speculate that since stimulants and cocaine have similar pharmacological effects as antidepressants used to treat social phobia (Sareen and Stein, 2000a) (increasing norepinephrine, dopamine and serotonin), individuals with social anxiety may use these drugs to decrease their self-consciousness in social interactions (Camacho and Stein, 2002). Although the reduction in anxiety symptoms with stimulants and cocaine contradicts the notion that these agents are associated with increased anxiety, it is possible that some individuals will have increased anxiety symptoms while others will have a reduction in anxiety symptoms. This paradoxical phenomenon is also observed in antidepressant treatment where some individuals will have transient increases in anxiety in the early phases of treatment with later reduction in anxiety (Sareen and Stein, 2000b). On the other hand, similar to alcohol (Schuckit and Hesselbrock, 1994), intoxication or withdrawal from the drugs examined in this study could increase levels of anxiety, panic attacks or distress. Prospective longitudinal studies (Chilcoat and Breslau, 1998) and direct inquiries to persons

with comorbid anxiety and substance use about their motivation for use are required to provide empirical support for this hypothesis. Second, an indirect causal relationship may exist whereby anxiety disorders might indirectly increase risk of illicit drug use through increasing the risk for major depression (Regier et al., 1998; Stein et al., 2001) and alcohol use disorders (Magee et al., 1996), which are themselves more likely to be associated with drug use (Kessler et al., 1994). In both the NCS and OHS, we conducted separate analyses (not presented but available on request) to address this issue. When lifetime major depression was added to the covariates of age, gender, and education, the association between any anxiety disorder diagnosis and use of each of the substances remained significant. However, when we controlled for alcohol use disorders, this association became nonsignificant. Future longitudinal studies are required to examine whether anxiety disorders are independent risk factors for illicit drug use. Finally, it may be that there is no causal relationship between anxiety disorders and illicit drug use, but rather that they share risk factors in common [e.g., genetics (Kendler et al., 1998; Merikangas et al., 1998), personality characteristics (Goodwin and Hamilton, 2003), or childhood adversity (Kessler et al., 1997b)].

Several investigators have recently proposed that anxiety sensitivity may be an important mediating factor for the susceptibility of drug-taking behaviour (Norton, 2001; Stewart and Kushner, 2001). For example, increased anxiety sensitivity in a student sample was associated with increased reports of substance abuse (Wagner, 2001). Moreover, anxiety sensitivity is associated with poor coping skills that may result in an increased propensity to use drugs or alcohol (Kushner et al., 2001). Finally, these findings may be mediated via the increased levels of stress that have been shown reliably in animal experiments to induce a higher frequency of drug self-administration (Sinha, 2001). In combination, future investigation may need to identify subjects with high traits of anxiety or anxiety sensitivity in order to determine whether these subjects are more likely to transition into drug or alcohol dependence.

Four important limitations of our study should be considered. First, both surveys relied on lay interviewers who conducted fully structured diagnostic interviews. Although the UM-CIDI yields acceptable reliability and validity (Kessler et al., 1998b), it is unrealistic to expect that these interviews will match the accuracy of diagnostic classifications of trained clinicians. Also, it is unclear whether the higher prevalence of drug use in the US NCS survey compared with the OHS was due to methodologic differences in assessment or due to actual inter-country differences in use of illicit drugs.

Regardless, the association between anxiety disorders and illicit drug use was consistent across the two surveys. Second, some participants may conceal disorders from interviewers (especially socially unacceptable behavior), and this factor would lead to underestimation of prevalence and biased estimation of odds ratios. However, it is unlikely that individuals with or without anxiety disorders would have differential levels of concealing substance use. Third, examination of relative age of onset of anxiety disorder compared with illicit drug use required multiple *t*-tests. The use of multiple independent tests in the same sample can be associated with a higher likelihood of finding significance by chance. Fourth, we examined the lifetime use of illicit drugs rather than abuse or dependence. It is possible that anxiety disorders may have differential levels of association with use than with misuse of illicit drugs. Future studies will be required to examine this issue.

In conclusion, we noted a significant relationship between anxiety disorders and lifetime use of cocaine, non-prescription stimulants, hallucinogens, and heroin. Clinicians and researchers need to be aware of this relationship between anxiety and substance use. Early intervention programs targeting adolescents with certain anxiety disorders may prevent the onset of illicit drug use, thereby leading to a reduction in the societal burden of mental illness.

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