



Benzodiazepine dependence among multidrug users in the club scene

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ABSTRACT

Background: Benzodiazepines (BZs) are among the most frequently prescribed drugs with the potential for abuse. Young adults ages 18–29 report the highest rates of BZ misuse in the United States. The majority of club drug users are also in this age group, and BZ misuse is prevalent in the nightclub scene. BZ dependence, however, is not well documented. This paper examines BZ dependence and its correlates among multidrug users in South Florida's nightclub scene.

Methods: Data were drawn from structured interviews with men and women ($N=521$) who reported regular attendance at large dance clubs and recent use of both club drugs and BZs.

Results: Prevalences of BZ-related problems were 7.9% for BZ dependence, 22.6% BZ abuse, and 25% BZ abuse and/or dependence. In bivariate logistic regression models, heavy cocaine use (OR 2.27; 95% CI 1.18, 4.38), severe mental distress (OR 2.63; 95% CI 1.33, 5.21), and childhood victimization history (OR 2.43; 95% CI 1.10, 5.38) were associated with BZ dependence. Heavy cocaine use (OR 2.14; 95% CI 1.10, 4.18) and severe mental distress (OR 2.16; 95% CI 1.07, 4.37) survived as predictors in the multivariate model.

Discussion: BZ misuse is widespread among multidrug users in the club scene, who also exhibit high levels of other health and social problems. BZ dependence appears to be more prevalent in this sample than in other populations described in the literature. Recommendations for intervention and additional research are described.

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1. Introduction

1.1. Prescription medication misuse

The misuse of prescription drugs has become a considerable public health problem over the past decade (Compton and Volkow, 2006). Although the vast majority of patients use them responsibly, more than 15 million people report misusing prescription drugs for a variety of reasons (Manchikanti, 2007), including to get high, to get energy or to get to sleep, to moderate the effects of other drugs, and to have fun (United States Food and Drug Administration, 2001; Kelly and Parsons, 2007). Recent estimates show that the lifetime prevalence of prescription drug misuse trails only alcohol and marijuana (McCabe, 2005; Manchikanti, 2007); moreover, emergency department visits for prescription drug misuse have increased markedly in recent years, especially those involving benzodiazepines, opioids, and central nervous system stimulants (McCarthy, 2007; Substance Abuse and Mental Health Services Administration, 2003). Perceptions of low risk associated with prescription drug misuse may contribute to the observed increases in use; a survey conducted by the Partnership for a Drug Free America

(2006) found that 31% of respondents believed there was nothing wrong with taking medications without a prescription. The authors' prior research also documented prevalent perceptions of prescription drugs as both safer and purer than street drugs (Kurtz, 2004; Inciardi et al., 2009).

1.2. Benzodiazepine misuse

Benzodiazepines (BZs) are among the most frequently prescribed drugs with potential for abuse, yet these have not received the same attention from regulatory agencies and researchers as have opioid analgesics (Blakeslee, 2004). BZs are frequently prescribed for short-term use to patients suffering from anxiety, acute stress attacks, and sleep disorders (National Institute on Drug Abuse, 2005), as well as more serious mental illnesses, such as schizophrenia and bipolar disorder (Brunette et al., 2003). Combining these medications with other substances such as alcohol or opioids can diminish brain function and respiration to the point of death (O'Brien, 2005; Bohnert et al., 2010). The non-medical use of BZs continues to increase across a range of populations (Substance Abuse and Mental Health Services Administration, 2003) because of greater availability, more prescriptions being written, media advertising, and lax monitoring of BZ use (National Institute on Drug Abuse, 2002).

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Although BZ misuse is widespread in the United States and internationally (Haydon et al., 2005), certain populations, including young adults (McCabe, 2005), may be more likely to develop problematic use. Young adults ages 18–29 report the highest prevalence of BZ misuse in the United States (Substance Abuse and Mental Health Service Administration, 2008a,b), and the prevalence of BZ misuse within club-going samples, most frequently young adults, approaches 65–75% lifetime (Kelly and Parsons, 2007; Kurtz et al., 2005; Grov et al., 2009). In a study of ecstasy-using nightclub attendees, Kurtz (2004) found that a minority initiated BZ use in junior high or high school coincident with initiation into alcohol or marijuana use, but that most began to misuse BZs at older ages for the purpose of easing withdrawal from stimulants, such as ecstasy and cocaine.

1.3. Benzodiazepine polydrug abuse

Polydrug users ingest multiple psychoactive substances within a limited timeframe in order to increase or moderate the intensity of the effects of other drugs; for example, consuming cocaine with alcohol to prevent intoxication drowsiness (Compton and Volkow, 2006), or taking a sedative after ecstasy to fall asleep (Allott and Redman, 2006). Other studies have found that BZ misusers are often polydrug users (Harrell and Broman, 2009; McCabe, 2005), and research with club scene participants indicates that BZs are often included in drug combinations intended to increase the intensity of intoxication (Hansen et al., 2001; Inciardi et al., 2007). Club attendees also report using BZs with other drugs to mimic the effects of another drug they could not obtain, combining BZs with alcohol to save money on drinks, and using BZs to come down from stimulants (Kurtz, 2004).

Concerns about BZ polydrug use are particularly acute in South Florida, where recent reports documented that 90% of fatalities in which BZs were identified as the cause of death also involved at least one other drug (Hall, 2009). In the same year, BZ misuse accounted for 11% of emergency department reports involving drug ingestion, and was among the five most commonly mentioned substances in this regard (cocaine, marijuana, MDMA, and prescription opioids and BZs).

1.4. Benzodiazepine dependence

BZ dependence can occur even when doses are low and consumed over a short period of time (Fang et al., 2009; Lader et al., 1984). Specific characteristics of BZs are believed to contribute to their addictive potential (Fialip et al., 1987). Alprazolam and lorazepam, for example, have a short half life, making users more prone to seizures and intense withdrawal symptoms (Wolf and Griffiths, 1991). Recent data from the National Survey on Drug Use and Health (NSDUH) indicate that 2.3% of respondents misuse sedatives and tranquilizers, and that 9.8% of these meet DSM-IV criteria for abuse or dependence (Becker et al., 2007). Other research has found rates of abuse and dependence to be somewhat higher, affecting .6% and .5% of the United States population, respectively (Sheehan and Raj, 2009; Substance Abuse and Mental Health Service Administration, 2008a,b).

Although the surge in prescription drug misuse over the past decade has been accompanied by increased research in this area, concerns over BZ abuse and dependence are frequently overshadowed by regulatory and research initiatives targeting opioids. Given the pharmacologic properties and abuse potential of BZs, their widespread misuse represents a serious public health concern. This paper describes BZ misuse among adults in South Florida's nightclub scene and examines factors that predict BZ dependence.

2. Methods

2.1. Sampling plan and client recruitment

Data were drawn from a natural history study of 600 participants in Miami's club scene who use club drugs and also use prescription medications for non-medical reasons (i.e., "we are only interested in the times you used prescription medications other than as prescribed by a doctor, for instance, to get high, for fun, to relax or to come down"). The major goals of the project were to examine the onset and progression of club and prescription drug use, and to assess changes in health and social consequences of this drug use over time. Participants were interviewed at baseline and at three successive 6-month intervals. Data reported here are from baseline interviews of the 521 participants who reported recent (past 90 days) use of BZs for non-medical reasons (hereafter, *misuse*).

Eligible participants were 18–49 years old, willing to provide contact information, and reported: (a) using one or more club drugs at least three times during the past 90 days; (b) misusing one or more psychoactive prescription medications (stimulants, opioids, BZs, other sedatives, antipsychotics, and antidepressants) three times or more in the past 90 days; and (c) regularly attending large recognized nightclubs at least twice per month. Club drugs were defined to include powder cocaine, ecstasy, GHB, ketamine and LSD.

Participants were recruited into the study between May 2006 and June 2008 through respondent-driven sampling (RDS; Heckathorn, 1997). This method was chosen so as to achieve a broadly representative sample of men and women in the club scene, while also recognizing the difficulties, including intoxication, noise, and heavy security, associated with recruiting drug users at clubbing venues. Initial respondents ("seeds"), chosen for their diversity in terms of gender, ethnicity, and age, were recruited through outreach and existing contacts in the club culture. Each seed and subsequent study participant was provided with five recruitment coupons to give to other club drug users in their social network, with the understanding that they would earn \$50 for the recruitment of each additional eligible respondent. Although this amount may seem large compared to other studies, the relatively high costs associated with the clubbing lifestyle rendered the target population unresponsive to lower levels of compensation for their time.

The coupons provided the recipients with information about the study and a telephone number to call for eligibility screening. The five coupon limit was intended to prevent a few recruiters with large social networks from biasing the overall sample toward those with similar demographic and drug using profiles (homophily) and in order to lengthen the recruitment chains (Heckathorn, 1997). Theoretically, respondent-driven sampling has been shown to quickly reduce sources of respondent bias (e.g., ethnicity, gender) as successive waves of respondent contacts are enrolled and then solicited for additional contacts (Heckathorn, 1997, 2002). Although participants were not recruited at nightclubs, the clubs they reported patronizing most often were large dance clubs that are focused on the electronic music scene.

2.2. Field operations

The project was housed in a field office strategically located to facilitate access to a diverse population of club drug users. At intake, the nature of the project was explained by the research staff, including its voluntary and confidential nature and the monetary stipends. Each client was screened for eligibility, followed by informed consent and data collection. All interviews were conducted in private offices using computer-assisted face-to-face interviews. Clients received HIV and drug education literature, condoms, and a \$50 stipend upon completion of these baseline

activities. Baseline screening and interviewing procedures lasted 2–3 h. Human subjects protocols were approved by the University of Delaware's Institutional Review Board.

2.3. Measures

The Global Appraisal of Individual Needs (GAIN; Dennis et al., 2002) has eight core sections (demographics, substance use, physical health, risk behaviors, mental health, environment, legal involvement and vocational attainment), with each containing questions on the recency of problems, breadth of symptoms, and recent prevalence in days or times. The items are combined into scales and subscales that can be used for DSM-IV-based diagnoses for substance use and mental health problems. Psychometric studies have found Cronbach's alphas between .9 and .8; all have alphas over .7, and test–retest correlations of .7–.8. We adapted the GAIN by expanding the prescription drug categories to include a wide range of psychoactive prescription medications; past year abuse and dependence symptoms were assessed for each drug. For questions about prescription drug use, participants were asked to only report on non-medical use, as defined earlier.

Childhood victimization was assessed by an affirmative response to any of the following events before the age of 18: being attacked with a weapon; being beaten so as to cause bruises, cuts or broken bones; being forced to participate in sexual acts against one's will; or being abused emotionally so as to cause very bad feelings about oneself or one's life.

The General Mental Distress Scale (GMDS) is comprised of past year DSM-IV symptoms counts for depression (9 items), anxiety (12 items), and somatic disorders (4 items). This scale is reducible to classifications indicating clinical significance (subclinical, moderate and severe; Dennis et al., 2002) and was further dichotomized in the analyses presented here into "severe" and "not severe." Alpha reliability coefficients for the depression, anxiety, and somaticism subscales in this study were 0.863, 0.872, and 0.738, respectively.

Frequencies of use (days using out of the past 90 days) for the most prevalent non-BZ substances other than marijuana (alcohol, powder cocaine and ecstasy) were dichotomized at the 75th percentile, with use above that mark defined as "heavy." Heavy marijuana use was defined as every day use, which was reported by 35.3% of the sample. A measure of BZ abuse, defined as the endorsement of at least one of four DSM-IV criteria, was included for comparison to other studies. Seven DSM-IV dependence criteria for BZs were reduced to "BZ dependent" (3 or more symptoms) and "BZ non-dependent" (0–2 symptoms).

2.4. Data analyses

All analyses were conducted using the Predictive Analytics Software (PASW formerly SPSS) version 18. Descriptive statistics were calculated for the variables of interest, including gender, race/ethnicity, age, living situation, education, substance use (for the most commonly reported non-BZ substances), childhood victimization, mental distress, and BZ DSM-IV abuse and dependence symptoms. Descriptive information was also compiled on participants' age of onset for BZ misuse and the extent of lifetime and recent BZ misuse.

Bivariate logistic regression models examined relationships between demographic, non-BZ substance use, mental health, victimization, and environmental factors and BZ dependence. Those measures that exhibited significant predictive values in the bivariate models were included in a multivariate logistic regression model. The "other race/ethnicity" category, though significant in the bivariate model, was not included in the multivariate model because of the very small number of participants ($N=18$) reporting this racial/ethnic identification. Hosmer and Lemeshow tests

confirmed that the predictors were a "good fit" for each model (Tabachnick and Fidell, 2007).

3. Results

3.1. Sample characteristics

The sample for this report includes 521 participants (86.8% of the 600 in the study) who reported at least one occasion of misuse of alprazolam, diazepam, clonazepam or lorazepam in the past 90 days. The most widely used BZ in the past 90 days was alprazolam ($N=498$); fewer participants reported using diazepam ($N=83$), clonazepam ($N=44$), and lorazepam ($N=13$). Forty-one (7.9%) recent BZ misusers met DSM-IV dependence criteria for BZs. Demographic, substance use, mental health, victimization and environmental characteristics of BZ dependent and non-dependent misusers are shown in Table 1. [Summary results of chi-square and t -tests of significance are also noted in Table 1 for information; detailed statistical results of bivariate logistic regression analyses are presented in Table 3].

A relatively young (mean age = 25.6; $SD=7.79$) and educated (mean = 12.3 years; $SD=2.07$) sample of multidrug users was recruited. The racial/ethnic makeup of the sample is broadly representative of the overall population of Miami-Dade County, and also reflects the remarkable ethnic diversity of the club scene. As to this latter point, the three most popular nightclubs frequented by all participants at study intake were the top three clubs for every ethnic and age group as well (data not shown). Symptoms indicating severe levels of mental distress were reported by 46.8% of respondents. Almost two-thirds (64.3%) said that they were physically, emotionally and/or sexually abused before age 18.

3.2. Substance use

Participants reported using alcohol on an average of 45.5 days ($SD=26.53$), marijuana 60.5 days ($SD=33.70$), powder cocaine 29.6 days ($SD=27.64$) and ecstasy 14.1 ($SD=17.30$) days in the past 3 months. These were the most prevalent non-BZ substances, as 98.3% of participants used alcohol, 94.8% marijuana, 90% cocaine, and 84.1% ecstasy. Other current drug use (data not shown) was also reported, including LSD by 19.8% of the sample, psilocybin (12.9%), crack cocaine (13.6%), methamphetamine (8.6%), heroin (8.3%), and misuse of prescription opioids (55.3%). More than two-thirds (70.7%) of BZ-dependent participants, and 18.5% of non-BZ-dependent respondents, met DSM-IV criteria for BZ abuse.

Summary results of tests for significant differences by BZ dependence are also shown in Table 1. No demographic or environmental differences between BZ dependent and BZ non-dependent participants were noted, except that those reporting "other race" reported higher levels of dependence. Heavy cocaine use was associated with BZ dependence, while heavy use of alcohol, marijuana or ecstasy did not show such an association. Severe mental distress and childhood victimization were also associated with BZ dependence.

Frequency and quantity of BZ misuse were strongly associated with BZ dependence; BZ dependent participants reported using BZs on more than twice as many days lifetime and in the past 3 months, and used nearly three times as many pills per month, as non-BZ dependent misusers. BZ dependent misusers reported their first misuse at an average age of 18, compared to age 20 for non-dependent misusers, but this difference did not reach significance.

3.3. Benzodiazepine dependence

Table 2 shows the percentage of BZ dependent misusers who endorsed each BZ-specific abuse or dependence criterion. The most

Table 1
Sample characteristics by past year benzodiazepine dependence (*N* = 521).

Variable	Non-dependent misusers		Dependent misusers	
	<i>N</i> (480)	%	<i>N</i> (41)	%
Age (mean; SD)	25.5 (7.7)		26.8 (9.3)	
Gender				
Male	287	59.8	21	51.2
Female	193	40.2	20	48.8
Race				
White non-Hispanic	91	19.0	12	29.3
African-American	115	24.0	6	14.6
Hispanic	260	54.1	19	46.3
Other	14	2.9	4	9.8*
Education				
High school diploma/GED or less ^a	316	65.8	26	65.0
Some college	164	34.2	14	35.0
Health and social characteristics				
Live with parents	211	44.0	20	48.8
Severe mental distress (GMDS scale)	216	45.0	28	68.3**
Victimized before age 18	302	62.9	33	80.5*
Heavy substance use				
Alcohol ^b	120	25.0	12	29.3
Marijuana ^c	171	35.6	13	31.7
Cocaine ^d	114	23.8	17	41.5*
Ecstasy ^e	117	24.4	14	34.1
DSM-IV BZ abuse	89	18.5	29	70.7***
Benzodiazepine misuse	(Mean; SD)	(Mean; SD)		
Age at first misuse	20(06.8)	18(05.7)		
Days misuse lifetime	424(757.2)	1116(1230.0)###		
Days misuse past 90 days	23(24.4)	49(31.1)###		
Pills misused per typical month	15(23.4)	39(42.3)###		

^a One missing case.

^b 4th quartile = 66 or more days use.

^c Every day = 90 days use.

^d 4th quartile = 46 or more days use.

^e 4th quartile = 21 or more days use.

* $\chi^2 = p \leq .05$.

** $\chi^2 = p \leq .01$.

*** $\chi^2 = p \leq .001$.

$t = p \leq .001$.

commonly endorsed abuse criteria were failing to meet responsibilities and using BZs in unsafe situations. Social problems caused by BZ misuse were reported by less than 30% of dependent misusers, and legal problems were rare. A large majority (80.5%) of dependent misusers reported spending a lot of time getting, using, and feeling the effects of BZs. Needing more drug to get the same high and continuing use despite recognition that BZs caused medical, emotional or psychological problems were endorsed by almost two-thirds of dependent misusers. The remaining four dependence criteria were endorsed by about one-half of dependent misusers.

Results of the bivariate logistic regression models predicting BZ dependence are shown in Table 3. Demographic characteristics, including gender, age, race/ethnicity, and education, were not associated with BZ dependence. In terms of substance use, only past 90 days heavy cocaine use was associated with BZ dependence; odds of BZ dependence were two times higher among heavy users compared to those using cocaine less frequently. Odds of BZ dependence for participants scoring in the severe clinical range on mental distress were 2.6 times higher than for those reporting lower levels of mental distress; participants who reported childhood abuse had 2.4 times higher odds of meeting BZ dependence criteria than those who had not been victimized before the age of 18.

Finally, the significant bivariate predictors of BZ dependence were included in a multivariate logistic regression model (see Table 4). The three bivariate predictors – heavy cocaine use, severe

mental distress and childhood victimization – were each associated with approximately two times higher odds of BZ dependence in the multivariate model, although the childhood victimization measure failed to reach statistical significance.

Table 2
Abuse and dependence criteria endorsed by BZ dependent participants (*N* = 41).

	<i>N</i>	% of BZ dependent
Abuse criteria		
Kept using BZ, despite causing failure to meet responsibilities	24	58.5
Used BZ in unsafe or dangerous situations	17	41.5
Kept using BZ, despite causing social problems (e.g., fights)	12	29.3
BZ use caused repeated problems with the law	3	7.3
Dependence criteria		
Spent a lot of time getting, using or feeling the effects of BZ	33	80.5
Needed more BZ to get the same high	27	65.9
Kept using BZ despite causing medical, emotional, psych problems	26	63.4
Unable to cut down or stop using BZ	23	56.1
BZ use caused you to give up or problems at work, home or school	23	56.1
Used BZ in larger amounts or more often than intended	20	48.8
Had BZ withdrawal problems (e.g., shaking, trouble sleeping)	19	46.3

Table 3
Bivariate logistic regression models of predictors of BZ dependence (N = 521).

Predictor of BZ dependence	p	OR	95% CI
Demographic characteristics			
Female	.286	1.416	0.748, 2.683
White non-Hispanic	.116	1.769	0.869, 3.599
Age	.312	1.020	0.982, 1.060
Education > high school ^a	.915	1.038	0.527, 2.041
Health and social characteristics			
Live with parents	.757	0.903	0.473, 1.725
Severe mental distress (GMDS scale)	.005	2.632	1.331, 5.206
Victimized before age 18	.028	2.431	1.099, 5.380
Heavy substance use			
Alcohol ^b	.547	1.241	0.614, 2.509
Marijuana ^c	.615	0.839	0.423, 1.662
Cocaine ^d	.014	2.274	1.180, 4.382
Ecstasy ^e	.169	1.609	0.816, 3.170

^a One missing case.

^b 4th quartile = 66 or more days use.

^c Every day = 90 days use.

^d 4th quartile = 46 or more days use.

^e 4th quartile = 21 or more days use.

4. Discussion

4.1. Benzodiazepine misuse and dependence

Consistent with past research (Becker et al., 2007), alprazolam and diazepam were the most widely misused BZs in our sample, with 95.6% and 15.9% of BZ misusers reporting past 90 days use for each, respectively. Reports of prevalence of BZ dependence (as opposed to abuse and/or dependence) among BZ misusers are not apparent in the literature. One study of patients with co-occurring mental health and substance use disorders found that 15% of prescribed BZ users and 6% of non-prescribed users met DSM-IV BZ abuse and/or dependence criteria (Brunette et al., 2003). Becker et al. (2007) found a 9.8% sedative/tranquilizer abuse/dependence rate in a large national sample of sedative/tranquilizer misusers. The prevalence of BZ-related abuse and dependence problems among our sample of club scene participants would appear to be much higher, with 7.9% meeting dependence criteria, 22.6% abuse criteria, and 25.0% abuse and/or dependence.

Several explanations may account for these higher levels of reported BZ-related problems among men and women in the club scene compared to the other available reports. The sample for this study regularly used a wide variety of substances with the explicit goal of getting high in a dance club context, or coming down from stimulants they used there. It is possible that the interaction of various substances increased the levels of problems participants attributed to BZs, or that our sample misused larger quantities and/or dosage sizes than respondents in other reported studies. Although data are not available to answer these questions, BZ abuse and dependence problems may well be concentrated in certain high risk populations. Compared to substance abuse treatment clients, club drug users are a somewhat hidden population, and their levels of BZ-related problems are serious concerns.

The DSM-IV symptom most commonly endorsed by BZ dependent misusers was failing to meet responsibilities, indicating that their use was negatively impacting important aspects of their lives.

Table 4
Multivariate logistic regression model of predictors of BZ dependence (N = 521).

Predictor of BZ dependence	p	OR	95% CI
Severe mental distress (GMDS scale)	.031	2.163	1.072, 4.366
Heavy cocaine use ^a	.025	2.144	1.100, 4.178
Victimized before age 18	.082	2.063	0.912, 4.665

^a 4th quartile = 46 or more days use.

Many misusers who met dependence criteria also reported using in unsafe situations, which resonates with the established link between BZ use and traffic accidents (Bramness et al., 2002). The least endorsed abuse criterion for dependent BZ misusers was having repeated problems with the law. This suggests that BZ misusers may not behave in ways consistent with drug-related arrests, or alternatively, that if participants did experience problems with the law, they did not attribute the problem to their BZ use. Kurtz (2004) found that club-goers were generally unconcerned about legal sanctions related to possession of prescription drugs, and felt they would be able to adequately explain such possession even in the absence of a prescription.

Each of seven DSM-IV dependence criteria was endorsed by about one-half or more of BZ-dependent participants. The large majority (65.9%) reported needing increased amounts of the medication to get high, indicating that tolerance was a significant issue. Almost as many (63.4%) reported continuing to misuse BZs despite physical emotional or psychological problems. Although the proportion experiencing withdrawal symptoms was somewhat lower at 45%, these data are consistent with the plethora of literature indicating severe withdrawal symptoms based on the pharmacokinetics of BZs, and specifically alprazolam (Wolf and Griffiths, 1991; Vorma et al., 2003).

Heavy cocaine use was significantly associated with BZ dependence in this sample. This finding is not surprising given the level of multidrug use within club scene (Inciardi et al., 2007) and BZ using (McCabe, 2005; Compton and Volkow, 2006) populations. BZs have been reported by club drug users to be used for both increasing intoxication levels and coming down from other drugs (Kurtz, 2004). Given the complexity of these multidrug and polydrug use behaviors and the different physical and psychological manifestations of dependence on different drugs, additional research is needed to examine how BZ dependence coincides and interacts with other substance dependence disorders.

Finally, both severe mental distress and childhood victimization were strongly associated with BZ dependence, although only severe mental distress remained as a significant predictor in the multivariate model. The levels of serious mental distress and childhood victimization reported by the sample were higher than anticipated, as these characterizations of urban club scene participants are not apparent in the literature. Given the lack of additional data to contextualize these findings, it seems likely that the study drug use eligibility requirements resulted in an especially high risk sample. Young adults with extensive victimization histories might be especially attracted to the escapism of the club scene, and to suffer greater drug-involvement through their participation in it, than their non-victimized peers. Further, childhood victimization has been linked with a range of psychosocial problems in adulthood relevant to this sample, including severe mental distress and substance use (Meade et al., 2009).

The link between mental distress and BZ dependence is likely complex, although consistent with prior research showing that people with psychiatric disorders experience high rates of BZ misuse and dependence (Kidorf et al., 1996; Martinez-Cano et al., 1999; Brunette et al., 2003). Persons experiencing severe mental distress may use BZs to self medicate (Chutuape and de Wit, 1995) and subsequently become dependent on the medication. Alternatively, mental distress may result from BZ misuse and dependence, as past research has shown that depressive symptoms tend to decline as BZ use declines (Schreiber et al., 2008).

4.2. Limitations

Although the RDS recruitment procedures resulted in a sample of participants broadly representative of the racial/ethnic makeup of the County, our ability to generalize the findings to the popula-

tion of club goers in Miami may be limited by the study eligibility requirements requiring regular, recent use of club drugs and misuse of prescription medications. As well, the assessments of mental distress symptoms were conducted by trained research interviewers rather than by clinical professionals; as such, caution is warranted when comparing the prevalence of psychological distress in our study with those utilizing clinician-administered interviews.

4.3. Conclusion

The prevalence and consequences of BZ misuse among our sample serve to reemphasize the importance of strengthened measures to stem the diversion of psychoactive medications into illicit markets. Demand reduction measures are also needed for BZ misusers who acquire their medications without the benefit of labels describing appropriate uses and warnings. Knowledge of the risks of BZ misuse is likely low among men and women in the club scene, and these risks are exacerbated by their use of BZs in sequence or combination with a wide range of other substances.

Developing intervention approaches specific to this population is a complex undertaking, however, because drug use is considered to be fashionable, not problematic, in the club scene. Moreover, these young men and women tend to be suspicious of and disinterested in anything health authorities say about the risks associated with substance use (Marsden et al., 2006; Whittingham et al., 2009). Given this, peer-based approaches would likely meet with greater success, including, perhaps, web- and venue-based informational campaigns that do not rely on academic, governmental or other expert-delivered messages.

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Contributors

Steven P. Kurtz and Hilary L. Surratt designed the study and wrote the protocols. Steven P. Kurtz and Angela Mooss conducted the data analysis. Maria Levi-Minzi conducted the literature search and wrote the summaries of previous related work. All authors contributed to and approved the final manuscript.

Conflict of interest

No conflict declared.

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References

- Allott, K., Redman, J., 2006. Patterns of use and harm reduction practices of ecstasy users in Australia. *Drug Alcohol Depend.* 82, 168–176.
- Becker, W.C., Fiellin, D.A., Desai, R.A., 2007. Non-medical use, abuse, and dependence on sedatives and tranquilizers among U.S. adults: psychiatric and sociodemographic correlates. *Drug Alcohol Depend.* 90, 280–287.
- Blakeslee, S., 2004. Drug Makers Hope to Kill the Kick in Pain Relief. *The New York Times*, New York, NY, April 20.
- Bohnert, A.S.B., Roeder, K., Ilgen, M.A., 2010. Unintentional overdose and suicide among substance users: a review of overlap and risk factors. *Drug Alcohol Depend.* 110, 183–192.
- Bramness, J.G., Skurtveit, S., Morland, J., 2002. Clinical impairment of benzodiazepines—relation between benzodiazepine concentrations and impairment in apprehended drivers. *Drug Alcohol Depend.* 68, 131–141.
- Brunette, M.S., Noordsy, D.L., Xie, H., Drake, R.E., 2003. Benzodiazepine use and abuse among patients with severe mental illness and co-occurring substance use disorders. *Psychiatr. Serv.* 54, 1395–1401.
- Chutuape, M.A., de Wit, H., 1995. Preferences for ethanol and diazepam in anxious individuals: an evaluation of the self-medication hypothesis. *Psychopharmacology (Berl.)* 121, 91–103.
- Compton, W.M., Volkow, N.D., 2006. Abuse of prescription drugs and the risk of addiction. *Drug Alcohol Depend.* 83S, S4–S7.
- Dennis, M.L., Titus, J.C., White, M.K., Unsicker, J.L., Hodgkins, D., 2002. Global Appraisal of Individual Needs-Initial (GAIN-I). Chestnut Health Systems, Bloomington, IL.
- Fang, S., Chen, C., Chang, I., Wu, E.C., Chang, C.M., Lin, K., 2009. Predictors of the incidence and discontinuation of long-term use of benzodiazepines: a population-based study. *Drug Alcohol Depend.* 104, 140–146.
- Fialip, J., Aumaitre, O., Eschaliere, A., 1987. Benzodiazepine withdrawal seizures: analysis of 48 case reports. *Clin. Neuropharmacol.* 10, 538–544.
- Grov, C., Kelly, B.C., Parsons, J.T., 2009. Polydrug use among club-going young adults recruited through time-space sampling. *Subst. Use Misuse* 44, 848–864.
- Hall, J.N., 2009. Trends of non medical prescription drug misuse in Miami-Dade, Broward, Palm Beach counties, and the state of Florida, 2009. *Epidemiologic trends in Prescription Drug Misuse*. <http://www.drugfreebroward.org/clientuploads/DrugAlerts/OtherReports/PrescriptionDrugAbuseinFloridaJune2009.pdf> [Accessed on June 12, 2010].
- Hansen, D., Maycock, B., Lower, T., 2001. Weddings, parties, anything: a qualitative analysis of ecstasy use in Perth, Western Australia. *Int. J. Drug Policy* 12, 181–199.
- Harrell, Z.A.T., Broman, C.L., 2009. Racial/ethnic differences in correlates of prescription drug misuse among young adults. *Drug Alcohol Depend.* 104, 268–271.
- Haydon, E., Rehm, H., Fischer, B., Monga, N., Adlaf, E., 2005. Prescription drug abuse in Canada and the diversion of prescription drugs into the illicit drug market. *Can. J. Public Health* 96, 459–461.
- Heckathorn, D., 1997. Respondent-driven sampling: a new approach to the study of hidden populations. *Soc. Probl.* 44, 174–199.
- Heckathorn, D.D., 2002. Respondent-driven sampling II: deriving valid population estimates from chain-referral samples of hidden populations. *Soc. Probl.* 49, 11–34.
- Inciardi, J.A., Surratt, H.L., Cicero, T.J., Beard, R.A., 2009. Prescription opioid abuse and diversion in an urban community: the results of an *ultra*-rapid assessment. *Pain Med.* 10, 537–548.
- Inciardi, J.A., Surratt, H.L., Kurtz, S.P., Cicero, T.J., 2007. Mechanisms of prescription drug diversion among drug-involved club- and street-based populations. *Pain Med.* 8, 171–183.
- Kelly, B.C., Parsons, J.T., 2007. Prescription drug misuse among club drug-using young adults. *Am. J. Drug Alcohol Abuse* 33, 875–884.
- Kidorf, M., Brooner, R.K., King, V.L., Chutuape, M.A., Stitzer, M.L., 1996. Concurrent validity of cocaine and sedative dependence diagnoses in opioid-dependent outpatients. *Drug Alcohol Depend.* 2, 17–123.
- Kurtz, S.P., Inciardi, J.A., Surratt, H.L., Cottler, L., 2005. Prescription drug abuse among ecstasy users in Miami. *J. Addict. Dis.* 24, 1–16.
- Kurtz, S., 2004. Prescription drug abuse among ecstasy users in Miami. *National Institute on Drug Abuse Community Epidemiology Work Group*, vol. II.
- Lader, M., Ron, M., Petursson, H., 1984. Computed axial brain tomography in long-term benzodiazepine users. *Psychol. Med.* 14, 203–206.
- Manchikanti, L., 2007. National Drug Control Policy and prescription drug abuse: facts and fallacies. *Pain Physician* 10, 399–424.
- Marsden, J., Stillwell, G., Barlow, H., Boys, A., Taylor, C., Hunt, N., Farrell, M., 2006. An evaluation of a brief motivational intervention among young ecstasy and cocaine users: no effect on substance and alcohol use outcomes. *Addiction* 101, 1014–1026.
- Martinez-Cano, H., Ibanez, I., Gauna, M., Vela-Bueno, A., Wittchen, H.U., 1999. DSM-III-R co-morbidity in benzodiazepine dependence. *Addiction* 94, 97–107.
- McCabe, S.E., 2005. Correlates of nonmedical use of prescription benzodiazepine anxiolytics: results from a national survey of U.S. college students. *Drug Alcohol Depend.* 79, 53–62.
- McCarthy, M., 2007. Prescription drug abuse up sharply in the USA. *Lancet* 369 (9572), 1505–1506.
- Meade, C.S., Kershaw, T.S., Hansen, N., Sikkema, K.J., 2009. Long-term correlates of child abuse among adults with severe mental illness: adult victimization, substance abuse, and HIV sexual risk behavior. *AIDS Behav.* 13, 207–216.
- National Institute on Drug Abuse, 2005. Research Report Series: What are CNS depressants. <http://www.nida.nih.gov/researchreports/prescription/prescription3.html> [Accessed on June 18, 2010].
- National Institute on Drug Abuse, 2002. Research Report Series: Prescription Drugs: Abuse and addiction. <http://www.drugabuse.gov/researchreports/ResearchIndex.html> [Accessed on June 12, 2010].
- O'Brien, C.P., 2005. Benzodiazepine use, abuse, and dependence. *J. Clin. Psychiatry* 66, 28–33.
- Partnership for a Drug-Free America, 2006. The Partnership Attitude Tracking Study (PATS): Teens in grades 7 through 12. www.drugfree.org/Files/Full_Teen_Report [Accessed June 12, 2010].
- Schreiber, S., Peles, P., Adelson, M., 2008. Association between improvement in depression, reduced benzodiazepine use, and increased psychotropic medica-

- tion use in methadone maintenance treatment (MMT) patients. *Drug Alcohol Depend.* 92, 79–85.
- Sheehan, D., Raj, A., 2009. Benzodiazepines. In: Shatzberg, A., Nemeroff, C. (Eds.), *The American Psychiatric Publishing Textbook of Psychopharmacology*, 4th ed. The American Psychiatric Publishing Inc., Arlington, VA, pp. 465–486.
- Substance Abuse Mental Health Services Administration, 2003. Emergency Department Trends from the Drug Abuse Warning Network, Final Estimates 1995–2002, DAWN Series: D-24. DHHS Publication No. (SMA) 03-3780, Office of Applied Studies, Rockville, MD.
- Substance Abuse and Mental Health Service Administration, 2008a. Results from the 2007 National Survey on Drug Use and Health. Office of Applied Studies, Rockville, MD [Accessed on June 10, 2010] <http://www.oas.samhsa.gov/nsduh/2k7nsduh/2k7results.cfm>.
- Substance Abuse and Mental Health Service Administration, 2008b. Misuse of Prescription Drugs. Office of Applied Studies, Rockville, MD [Accessed on June 10, 2010] <http://www.oas.samhsa.gov/prescription/Ch6.htm#6.2>.
- Tabachnick, B.G., Fidell, L.S., 2007. *Using Multivariate Statistics*, 5th ed. Allyn and Bacon, New York.
- United States Food Drug Administration, 2001. Prescription Drug Use and Abuse, September–October, 19–24.
- Vorma, H., Kaukkarinen, H., Sarna, S., Kuoppasalmi, K., 2003. Long-term outcome after benzodiazepine withdrawal treatment in subjects with complicated dependence. *Drug Alcohol Depend.* 70 (30), 309–314.
- Whittingham, J.R.D., Ruiter, R.A.C., Bolier, L., Lemmers, L., Van Hasset, N., Kok, G., 2009. Avoiding counterproductive results: an experimental pretest of a harm reduction intervention on attitude toward party drugs among users and nonusers. *Subst. Use Misuse* 44, 532–547.
- Wolf, B., Griffiths, R.R., 1991. Physical dependence on Benzodiazepines: differences within the class. *Drug Alcohol Depend.* 29, 153–156.